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

IN RE: DESPLIEGUE DE INFRAESTRUCTURA DE CARGADORES PARA VEHICULOS ELECTRICOS	**CASE NO. NEPR-MI-2021-0013** **SUBJECT: Submittal of Revised EV Rate Design Proposal**

MOTION SUBMITTING REVISED EV RATE DESIGN PROPOSAL

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

COMES now **LUMA Energy ServCo, LLC** ("LUMA"), through the undersigned legal counsel, and respectfully states and requests the following:

I. Procedural and Factual Background

1. On November 18, 2021, this Energy Bureau of the Public Service Regulatory Board ("Energy Bureau") issued a Resolution and Order (the "November 18th Order") setting forth directives for initiating electric vehicle ("EV") infrastructure deployment, including principles to guide the adoption of plans, regulations and procedures related to the electric vehicle energy sector in Puerto Rico (the "Principles").

2. Among others and in pertinent part, in the November 18th Order, the Energy Bureau ordered LUMA to: (a) file with the Energy Bureau, on or before September 1, 2022, a First Phase of an EV Charging Infrastructure Deployment Plan ("Phase I EV Plan") in accordance with the specified requirements set forth in the November 18th Order (*see* November 18th Order at p. 4); (b) file on or before May 31, 2022, a proposal for one or more rate designs targeting the customer segments set forth in the Principles and envisioned in the Phase I EV Plan and addressing the requirements in the November 18th Order ("Rate Design Proposal") (*see id*. at pp. 5-9); and (c)

attend Compliance Technical Hearings (referred to as Compliance Technical Hearings No. 1, No. 2, and No. 3) every three months in connection with the Phase I EV Plan preparation, scheduled for February 25, 2022,[1] May 31, 2022, and August 31, 2022, respectively (*see id*. at p. 5).

3. After other procedural events, on May 19, 2022, this Energy Bureau issued a Resolution and Order (the "May 19th Order") amending the dates and certain associated tasks established in the November 18th Order, providing for: (i) the filing of a draft of the Rate Design Proposal by May 31, 2022; (ii) the rescheduling of the Compliance Technical Hearing No. 2 to June 15, 2022 at 1:00 pm; (iii) the filing of a final Rate Design Proposal on June 30, 2022; (iv) the filing of a draft of the Phase I EV Plan for September 1, 2022; (v) the rescheduling of the Compliance Technical Hearing No. 3 to September 15, 2022, at 1:00 pm; and (vi) the filing of the final Phase I EV Plan on September 30, 2022. *See* May 19th Order at p. 1.

4. On May 31, 2022, LUMA submitted to the Energy Bureau the draft of the Rate Design Proposal in compliance with the November 18th Order, as amended by the May 19th Order. *See* LUMA's *Motion Submitting Draft of EV Rate Design Proposal* filed on May 31, 2022, at Exhibit 1 (the "Draft EV Rate Design Proposal"). The Draft EV Rate Design Proposal contained a proposal to undertake three EV rate pilots which included a Residential EV Separate Meter Time of Use ("TOU") Rate Pilot, a Residential EV Subscription Rate with Managed Charging Pilot, and a Public EV Charging Rate Pilot.

5. On June 15, 2022, the Energy Bureau held the Compliance Technical Hearing No. 2 which LUMA attended. During the Compliance Technical Hearing No. 2, the Energy Bureau, through its consultants, asked LUMA questions and had observations on, the Draft EV Rate Design Proposal submitted by LUMA. The Energy Bureau commented on, among other things, the Draft

[1] This First Compliance Technical Hearing was thereafter postponed to and held on March 4, 2022. *See* Energy Bureau's Resolution and Order entered on February 22, 2022.

EV Rate Design Proposal only including proposed pilot rates but not actual "rate design" proposals, and the need for specific data –such as cost allocation data (including supplemental costs) and load forecasting— to support a particular rate design. The Energy Bureau also commented on their perception over the amount of time it would take to reach final implementation of a rate as described in the Draft EV Rate Design Proposal.

6. In attention to these comments, LUMA representatives expressed concerns regarding the current lack of data to appropriately develop a final permanent rate design and the time frame to conduct the necessary modeling and due-diligence, as well as the need for enabling technology (i.e., AMI or alternative) required to implement time-varying EV rates.[2] As a result, the Energy Bureau's consultants presented suggestions on the approach and information that could be included by LUMA in the revised Draft EV Rate Design Proposal to be submitted on June 30, 2022, as ordered by the Energy Bureau. Specifically, they suggested the proposal could keep the pilot approach, while also providing more data to support further rate design, and that the rate design component should focus on the residential TOU rate for behind the meter charging. Recognizing the data limitations, they also suggested that the rate design proposal would be a first iteration of a residential TOU rate with a supporting analysis that would be more detailed than that provided in LUMA's draft rate proposal, but less than a final rate design.

7. Near the conclusion of the Compliance Technical Hearing No. 2, the Energy Bureau issued a bench order determining that the Draft EV Rate Design Proposal did not meet the

[2] As explained during the conference, the submission filed by LUMA on May 31 was a proposal for rate design(s), which would need to be fully developed and finalized in a timeframe reasonable for the data analysis, modeling and due diligence typically required for producing a final rate design. LUMA representatives explained that the rates were proposed for near-term implementation on a pilot basis, to allow for the development and refinement of all the necessary enabling technologies and billing systems to effectively implement an EV rate.

requirements of the November 18th Order and directing LUMA to submit a compliant rate design proposal by June 30, 2022 (the "June 15th Bench Order").

8. On June 27, 2022, LUMA requested, via motion, confirmation from this honorable Energy Bureau regarding the scope of the rate design proposal in light of the Energy Bureau consultants' input during the Compliance Technical Hearing No. 2. *See* LUMA's *Motion Requesting Confirmation on Matters Addressed in Compliance Technical Hearing Held on June 15, 2022 and Stay of Order Establishing Deadline to Submit Revised EV Rate Design Proposal* of that date ("June 27th Motion") at p. 4. LUMA also requested until July 21, 2022, to submit the Revised EV Rate Design Proposal, to ensure LUMA could devote, in an efficient and targeted manner, the necessary internal and external resources to develop the selected rate design proposal. *See id*. at p. 5.

II. Submittal of Revised EV Rate Design Proposal

9. LUMA now submits herein, as *Exhibit 1*, LUMA's revised EV Rate Design Proposal ("Revised Rate Design Proposal"). The Revised Rate Design Proposal incorporates the suggestions made by the Energy Bureau's consultants during the Compliance Technical Hearing No. 2 and proposes to establish a Residential EV TOU Rate. This document supersedes the Draft EV Rate Design Proposal submitted by LUMA on May 31, 2022.

A. Overview of Revised EV Rate Design Proposal

10. More specifically, the Revised Rate Design Proposal discusses: (a) the introduction and context of this proposal, including the principles and requirements for the Phase 1 EV Plan, stakeholder feedback obtained, LUMA's objectives, and additional considerations for Puerto Rico; (b) the residential EV rate alternatives considered, including case studies on rate structures in other jurisdictions, and the enabling infrastructure to support the residential EV rates; (c) the approach

to identifying the most viable rate structures for Puerto Rico, including the criteria applied to rank and screen these alternatives; (d) the roadmap to introduce the selected alternative (i.e., the Residential EV TOU Rate); (e) LUMA's approach to the development and derivation of this proposed rate, including preferred development approach, key principles, considerations and assumptions, derivation of the rate, potential savings for participating customers, recovery of metering and fixed costs, and proposed changes to other rate riders; and (f) the proposed staged implementation of this rate to enable a robust evaluation of impacts.

11. As discussed in more detail in the Revised EV Rate Design Proposal, LUMA proposes to introduce the Residential EV TOU Rate, on an interim basis. *See* Exhibit 1 at Section 6. The interim rate would apply until a final Residential EV TOU Rate can be developed based on a comprehensive cost of service study to be undertaken by LUMA for the next base rate review process. *See id*. at Section 5. In addition, the rate would initially apply to a specified number of EV driving customers who enroll in the rate, either as participants or as control customers. *See id*. at Section 7. Offering the rate on a limited basis initially will allow LUMA to identify and address any challenges in the enrollment, metering and billing processes and will also enable a more robust evaluation approach. *See id*. at Section 5. LUMA proposes that, in approximately 15 to 18 months after its introduction, LUMA would conduct an evaluation and identify key challenges and successes which would be submitted to this Energy Bureau in a report documenting results and lessons learned and, in an effort, to meet the rate objectives and the Principles in the November 18th Order, and which will inform the development of the final Residential TOU EV rate to be developed as part of the comprehensive cost of service study for the next base rate review process. *See id*.

12. The Residential EV TOU Rate was developed to be revenue neutral, assuming there is no change in the participating customer's EV charging behavior. *See id*. at Section 6.7. If there is change in this behavior resulting in shifting consumption from higher-priced TOU periods to lower-priced TOU periods, the rate would not be revenue neutral and LUMA would experience a revenue shortfall. *Id.* To address such a possibility, LUMA proposes to establish a deferral account for any such revenue shortfalls for recovery in the next base rate review process. *Id*. It should be noted that LUMA will also incur additional costs to establish the IT and billing infrastructure necessary for billing participating customers, promote the proposed interim rate to residential EV owners and evaluate the effectiveness of this rate. *See id*. Thus, LUMA proposes to establish a deferral account for these additional costs for recovery in the next base rate review process. *See id*. LUMA will estimate these costs based on detailed planning for these various activities to be completed as part of the Phase 1 EV Plan. *See id*.

13. The Residential TOU EV Rate is just one aspect of the Phase I EV Plan which will encompass a whole suite of programs and initiatives that LUMA will undertake and will include a description on how these programs and initiatives will complement and support LUMA's Residential EV TOU Rate

B. Requests to the Energy Bureau

14. As part of the Revised EV Rate Design Proposal, LUMA is requesting this honorable Energy Bureau's approval of the following:

a. For LUMA to proceed with the further development of the Residential EV TOU Rate including the detailed implementation planning and costing described in the Proposal.

b. The establishment of two deferral accounts for recovery in the next rate rebasing period as part of the introduction of the Residential TOU Rate with Separate Meter as follows:

i. A deferral account for any revenue shortfalls accruing from the introduction of the Residential EV TOU Rate as compared with the revenue LUMA would have otherwise earned on the EV charging consumption covered by the rate.

ii. A deferral account for additional costs incurred to establish the IT and billing infrastructure necessary for billing participating customers, promote the Residential EV TOU Rate to residential EV owners in Puerto Rico and evaluate the effectiveness of this rate. These costs will be estimated by LUMA based on further implementation planning and costing to be completed as part of the Phase 1 EV Plan.

WHEREFORE, LUMA respectfully requests that the Energy Bureau **take notice** of the aforementioned; **accept and approve** the Revised EV Rate Design Proposal attached as Exhibit 1, including specific requests included therein; and **deem** LUMA in compliance with the requirement to file this document in the November 18th and May 19th Orders and the June 15th Bench Order and as per the request in LUMA's June 27th Motion.

RESPECTFULLY SUBMITTED

In San Juan, Puerto Rico, this 21st day of July 2022.

We hereby certify that we filed this motion using the electronic filing system of this Energy Bureau and that we will send an electronic courtesy copy of this motion to the attorneys for PREPA, Joannely Marrero-Cruz, jmarrero@diazvaz.law and Katiuska Bolaños-Lugo, kbolanos@diazvaz.law. LUMA understands that other participants or stakeholders in this proceeding will be notified as a result of the publicity of the filings in this process. Notwithstanding, LUMA will send a courtesy copy of the filing to the following stakeholders: agalloza@aggpr.com; alberto.cortes@warrenecm.com; aldo@skootel.com;

angel.d.rodriguez@outlook.com; antonio@velocicharge.com; azayas@azeng.net; bigwheelcorp@gmail.com; blazquezmalu@gmail.com; carlosxcedeno@gmail.com; clrivera@caguasexpressway.com; flota@caguasexpressway.com; cnegrette@solrenew.com; CR.Tejera@ddec.pr.gov; dacosta@aggpr.com; daniel.perez@totalenergies.pr; dcordero@group-em.com; divine.energy@hotmail.com; eduardo.pinera@toyota.com; Edwin.Acevedo@ddec.pr.gov; emelyies.torres@toyota.com; epenergypr@gmail.com; erica.cosme@gsonnell.com; Fberrios@peritoselectricistas.org; francisco.berrios@hotmail.com; franciscojrullan@yahoo.com; gerard.berlinski@toyota.com; gerardo_cosme@solartekpr.net; gperez@solrenew.com; hamely@motorambar.net; ialsina@plazalasamericas.com; idiaz@glenninternational.com; info@carlosmatta.com; ismael.diaz@warren-ecm.com; jack@pantekpartners.com; jameauxi@aim.com; jan.rodriguez@toyota.com; javrua@sesapr.org; jbouza@caguasexpressway.com; jcardona@aggpr.com; jorrodriguez@motorambar.net; jortiz@caguasexpressway.com; jose.maeso@crowley.com; jpibernus@motorambar.com; JSantana@motorambar.com; jtosado@motorambar.net; juan.diaz.galarza@guidehouse.com; jvazquez905@gmail.com; jwilliams@solrenew.com; kenan.d.davila@sargentlundy.com; kkoch@tesla.com; l.marcano@aconer.org; lsundeen@tesla.com; Iuisgmoreno@gmail.com; Marangelly.Cruz@toyota.com; Maria.rivera@lumapr.com; marilyn.maldonado@toyota.com; Melvin.Ayala@lumapr.com; mlandron@plazaad.com; nannette.berrios@solpetroleum.com; nmontes@ccmpr.com; nrodriguez@senado.pr.gov; nsantos@glenninternational.com; Ochavez@Padigm.com; odette@grupofernandezpr.com; omundo@plazalasamericas.com; pablo.rivera@hitachipowergrids.com; patlopez00@gmail.com; dany.oliva@toyota.com; pjcleanenergy@gmail.com; rdiaz@glenninternational.com; repagan@burnsmcd.com; rry@tcm.law; Ruben.Gonzalez@pumaenergy.com; rvega@guidehouse.com; shehaly.rosado@ddec.pr.gov; Veronica@pantekpartners.com; Victor.Aponte@toyota.com; victor.martinez@totalenergies.pr; wilfredsonllc@gmail.com; zlopez@efonalledas.com; dany.oliva@toyota.com; damaris.quinones@toyota.com; heriberto.gines@toyota.com; nancy.navales@toyota.com.

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Exhibit 1

Revised EV Rate Design Proposal

Revised Draft Electric Vehicle Rate Design Proposal

July 21, 2022

NEPR-MI-2021-0013

Contents

1. Executive Summary

LUMA is hard at work accelerating the green energy transformation in Puerto Rico – ushering in an energy future that includes more solar, more wind and more electric vehicles (EVs).

Over the past year we have made significant progress in advancing clean energy priorities and improvements to the electric system. To date we have; connected over 25,000 new solar customers, adding over 130 megawatts of renewable electricity to the grid. We have worked alongside the PREB with renewable energy developers and investors to conduct studies to integrate up to 1,000 megawatts of new utility-scale solar energy and up to 500 megawatts of battery storage into the grid. Additionally, we're coordinating with three utility-scale wind and solar energy facilities approved for construction to connect an additional 175 megawatts of electricity to the grid. These multifaceted renewable energy projects are not only advancing Puerto Rico's clean energy goals, but they will also improve future reliability of the electric system for our customers.

While there is much exciting work ahead, there is no mistaking that the clean energy transformation in Puerto Rico is well underway. Most importantly, these clean energy initiatives and efforts will benefit everyone in Puerto Rico and help stress how important it is that we all continue to work together to develop sound policies and strategies as we also strive to build a more reliable and more resilient energy system.

Transforming the Transportation Sector

Transforming Puerto Rico's transportation sector is and will be a critical component of advancing our shared clean energy vision. Most important of all, by modernizing transportation infrastructure we will also bolster efforts to combat Greenhouse Gas (GHG) emissions and achieve clean energy and climate goals with the conversion to clean fuels[1].

Presently, emissions from the transportation sector are expected to continue as a leading GHG emitter in the future[2]. As such, the first step in addressing this issue is the decarbonization of Puerto Rico's generation fleet and bringing more clean fuel and energy to the island. This effort will significantly reduce GHG emissions and support the widespread adoption of electrified personal vehicles. Since most of the GHG emissions in this sector come from gasoline and diesel combustion from on-road vehicles, utilizing clean energy and electrifying those vehicles will significantly contribute to our shared goal of decarbonization.

To advance these critical clean energy goals, LUMA has developed this Draft EV Rate Proposal in compliance with the Puerto Rico Energy Bureau's (PREB) Resolution and Order dated November 18, 2021, *In Re: The Deployment of Electric Vehicle Charging Infrastructure*. This document provides adraft EV rate design proposal, to offer a roadmap for policy maker's consideration as they make decisions on Puerto Rico's clean energy policy and infrastructure. This draft EV rate design proposal is submitted in

[1] Act 17-2019 and Act 33-2019

[2] Estado Libre Asociado De Puerto Rico. (2014, September). Puerto Rico Greenhouse Gases Baseline Report - DRNA. https://drna.pr.gov/wp-content/uploads/2017/05/Puerto-Rico-GHG-2014.pdf. Retrieved May 20, 2022.

draft form as any formal rate discussions should be conducted through an Adjudicative Proceeding bolstered by more comprehensive analysis.

To be clear, LUMA is completely supportive of the growth and adoption of EVs across Puerto Rico. Our role in the EV deployment process is to incorporate the growth and widespread adoption of EV's in planning and infrastructure decisions as we move forward in the transformation and modernization of Puerto Rico's electric system. We are committed to rebuilding an energy system that supports the growth of EVs while maintaining service quality to our 1.5 million customers. In this draft EV rate design proposal, LUMA is not proposing an increase to customers rates to cover the cost of EV deployment. This draft EV rate design proposal provides a framework for how policy makers can consider using rate structures to incentivize the use of Puerto Rico's electric system to charge EVs during off-peak times, to maximize the use of renewable energy production and reduce the load on the system during peak hours. LUMA strongly believes in maintaining service for our 1.5 million customers and that that ratepayer should not subsidize private – and often wealthy – EV enterprises.

Empowering the Growth of EVs

EV adoption in Puerto Rico is currently low however usage is expected to grow due to several major factors including high gasoline prices, supportive federal policies for increased EV adoption, and general EV market dynamics with respect to technology advances and improved vehicle offerings. The shift to EVs offers an exciting opportunity to impact cleaner transportation for years to come since average personal-use and fleet vehicles are typically replaced every 10-15 years[3], implying that internal combustion vehicles purchased today will likely stay in operations through 2037. As with many new technologies, however, EVs do offer certain complexities that need to be addressed related to utility system planning, operations, and grid integration. More specifically, we must ensure that we empower the growth of EVs while also prioritizing the transformation of an energy system that is reliable and resilient for all. The next few years will lay the groundwork to manage the related complexities and facilitate the shift to clean transportation.

A key component of advancing vehicle electrification is providing smart rate options that help achieve fuel cost savings for drivers, while offering fair, equitable and appropriate cost recovery for providing electricity service to those vehicles. LUMA has developed this Draft EV Rate Proposal by examining a suite of EV-specific rate structures adopted in the US with the objective to advance EV market growth in Puerto Rico in compliance with the Puerto Rico Energy Bureau's (PREB) Resolution and Order dated November 18, 2021, in Case No. NEPR-MI-2021-0013, *In Re: The Deployment of Electric Vehicle Charging Infrastructure,* on "Principles for Initiating EV Infrastructure Deployment" (the November 18th R&O). This Draft EV Rate Proposal is part of the First Phase of an EV Charging Infrastructure Deployment Plan ("Phase 1 EV Plan") the first draft of which is planned to be filed on September 1, 2022, and revised version on September 30, 2022, in compliance with the November 18th Resolution and Order as amended.[4]

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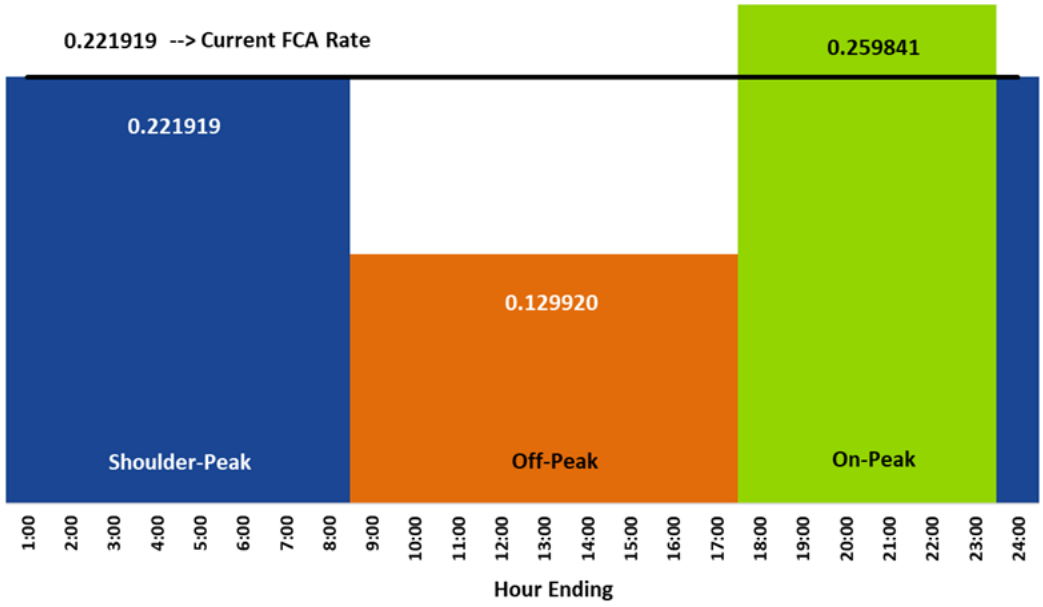
[3] https://ihsmarkit.com/research-analysis/average-age-of-vehicles-in-the-us-increases-to-122-years.html

[44] The November 18th R&O indicates that the rate proposal "shall not be interpreted or construed as a revision to the approved permanent rate." Rather, the rate proposal should be "targeted and focused on the establishment of new rates for certain specific services and to incentivize certain customer behavior."

Incorporating guidance from PREB, feedback from stakeholders, limitations of Puerto Rico's electric grid and supporting systems, the outlook of the EV market and insights from secondary research, in this draft rate design proposal a three-period Residential EV Time of Use (TOU) Rate on an interim basis is considered. This approach would replace the Fuel Cost Adjustment Rider (FCA) for customers using the electric system to charge EVs the EV charging consumption of participating customers. The customer's non-EV consumption would still be billed per the FCA rider, as updated each quarter. For illustrative purposes, using the approved FCA rider for Q1 FY2023 for the proposed values for each of the three components are shown in Figure 1-1 as compared to the FCA rider ($0.221919 per kWh) that LUMA would otherwise collect on this EV charging consumption under the Residential EV TOU Rate. These values will change quarterly in line with the FCA rider update.

Figure 1-1: Illustrative Proposed Residential EV TOU Rate



LUMA proposes the following TOU periods should apply for the Residential EV TOU Rate:

Table 1-1: Proposed TOU Periods

TOU Period	Time Period
On-peak	5PM – 11PM
Shoulder-peak	11PM – 9AM
Off-peak	9AM – 5PM

This residential TOU schedule applies to any day of the week, including holidays, and provides a short On-peak period, with 2X price differential between On- and Off-peak rates. This interim rate would apply until a permanent Residential EV TOU rate is approved through a future rate case. The Residential EV TOU Rate is one of three preferred EV rate options that LUMA identified as being the most beneficial and

viable for Puerto Rico in the near to medium-term. The other two preferred EV rate options LUMA identified are:

- Residential EV Subscription Rate with Managed Charging, and
- Public EV Charging Rate.

The Residential EV TOU Rate will be helpful in determining which rate design(s) fit best and are sustainable for EV drivers in Puerto Rico going forward. Moreover, these rates will provide LUMA with valuable insights into customer preferences and their charging behavior with respect to different price signals that will inform the development of future rate offerings used to support the growing EV market in Puerto Rico.

As informed by the November 18th Resolution and Order, LUMA identified six key objectives for EV rates: (1) focusing on residential and low-income sector and primarily on home EV charging infrastructure; (2) minimizing electricity system impacts of EV charging; (3) addressing the unique needs of and opportunities for customers with distributed generation (DG) and/or battery storage; (4) being synchronized with implementation of residential time-of-use (TOU) rates, to the extent possible; (5) supporting Puerto Rico's climate and energy goals and public policy; and (6) including a fair and equitable cost allocation and recovery mechanism.

To support these objectives, LUMA further evaluated additional considerations to support EV adoption in Puerto Rico, especially for residential customers in low-income communities and those with DG and/or storage. LUMA does not expect significant EV ownership among low-income customers for a considerable time given the barrier of higher upfront costs of EVs and relatively lower historical vehicle ownership rate among low-income customers. However, these customers would have equitable access to participate in any residential EV rates offered by LUMA on the same terms and conditions as other residential customers.

LUMA also considered the limitations of grid infrastructure, metering technology, IT systems and billing systems in Puerto Rico and the current state of the EV market when assessing the most viable rates to support EV adoption in Puerto Rico. Since all three preferred EV rate options require some form of TOU metering, which Puerto Rico does not have, LUMA identified alternative potential metering options that have been and are currently being tested by other electric utilities in the US. These options leverage energy consumption data from the EV charger or vehicle itself for billing customers, and have been successfully tested, but present challenges integrating with utility billing systems. Since these alternative metering options are still in early stage of development, the implementation timeline for LUMA's EV TOU Rate will be dependent upon procurement and successful integration of third-party submetering and billing systems. In the long-term, the installation of AMI will enable better management of energy demand, provide dynamic pricing, reduce the cost of electricity delivery, and improve customer service.

In summary, we believe the following draft EV rate design proposal offers a constructive framework for charting the path for EV adoption and integration into the electric grid while balancing the need to support our customers and maintain service without raising rates on customers. The draft EV rate design proposal builds upon insight from the PREB, stakeholders and industry research and market conditions and ensures that incentives are in place to optimize EV use of the grid and capitalize on clean energy production. We look forward to the PREB's review and assessment and we will continue to make progress on the fundamental transformation and modernization of Puerto Rico's electric system.

2. Introduction and Context

This proposal is filed in compliance with the November 18th Resolution and Order. Specifically, the November 18th Resolution and Order, established Principles "to guide the adoption of plans, regulations and procedures" related to EV infrastructure deployment (The Principles). In addition, the PREB ordered LUMA to file, on or before September 1, 2022, the First Phase of an EV Charging Infrastructure Deployment Plan to reflect the Principles and in compliance with specified requirements in the November 18th Resolution and Order ("Phase 1 EV Plan") and to file, on or before May 31, 2022, an EV rate proposal for one or more rate designs targeting the customer segments set forth in the Principles and envisioned in the Phase 1 EV Plan. This proposal is the revised Draft EV Rate Proposal. This proposal is submitted in draft form as any formal rate discussions should be conducted through an Adjudicative Proceeding. By Resolution and Order of May 19, 2022, this Energy Bureau amended the dates and certain associated tasks established in the November 18th Order, proving for, among others: (i) the filing of a draft of the rate design proposal by May 31, 2022; (ii) the filing of a final rate design proposal on June 30, 2022; (iii) the filing of a draft of the Phase I EV Plan for September 1, 2022; and (iv) the filing of the final Phase I EV Plan on September 30, 2022. On May 31, 2022, LUMA submitted a draft of the rate design proposal. LUMA is currently developing the Phase 1 EV Plan and this rate proposal is intended to form an integral part of it.

2.1 Principles and Additional Requirements for Phase 1 EV Plan

The November 18th Resolution and Order was issued in Case No. NEPR-MI-2021-0013 under which the PREB commenced a regulatory proceeding regarding the deployment of EV charging infrastructure through a Resolution and Order dated August 21, 2021 (the August 21st R&O). As directed in the August 21st Resolution and Order, the PREB held a Stakeholder Workshop on September 23, 2021. The main purpose of the Stakeholder Workshop was to: "*initiate a dialogue on electric vehicle adoption trends and to encourage the deployment of the necessary infrastructure."*

Following the workshop, the PREB issued the November 18th Resolution and Order which, among other things, set out the "Principles". According to this Resolution and Order, the Principles reflect stakeholder feedback from the September 23, 2021, workshop as well as public regulatory documents and proceedings in other jurisdictions related to EV charging infrastructure deployment. The Principles cover key elements of EV charging infrastructure deployment:

> **Principle 1: Equipment Siting/Locating**, indicating among other things, that the charging infrastructure deployment shall be sequenced by sector, starting with residential, followed by fleets, transit and, finally, multi-family structures.
>
> **Principle 2: Grid Connectivity**, indicating among other things, that rate designs shall encourage customer behavior beneficial to the (electricity) system and, to the extent possible, shall be synchronized with a concurrent implementation of TOU rate for residential customers.
>
> **Principle 3: Incentives**, with consideration given to focusing rate design on the pairing of EV charging with distributed generation (DG) and storage.
>
> **Principle 4: Charging Technology & Needs**, with existing standards such as ISO 15118 (concerning the interface between EVs and the grid) to direct deployment.

Principle 5: Benefits and Costs, indicating rate designs to shift EV charging to times when energy, particularly low-carbon energy, is abundant.

Principle 6: Utility Participation in the EV Charging Market, indicating the utility's participation in this component of the energy sector shall primarily target: a) make-ready infrastructure investments; b) services to hard-to-serve segments; and c) areas where the market does not adequately respond to demands or needs.

Principle 7: Charging/Billing those Receiving Electric Service via EV Charging, indicating billing to end users of EV charging stations shall be on a unit ($/kWh) basis, not time-based ($/minute), and that certain third parties operate under an electric tariff that includes discounts/subsidies, which should not necessarily be passed on to EV charging.

Principle 8: Government Supplying Land for EV Charging Infrastructure, especially along highways**.**

The Phase 1 EV Plan should reflect these Principles and comply with additional requirements as set out in the November 18th Resolution and Order. These additional requirements (the "Requirements") are set out below[5]:

Requirement A: Identifying near-term transportation electrification actions LUMA can take to address barriers to EV adoption in the residential sector.

Requirement B: Identifying a portfolio of actions, including investments and infrastructure to support EVs, rate design, programs, and services to contribute to the objectives of Act 17-2019[6] and Act 33-2019[7].

Requirement C: Addressing barriers to the adoption of transportation electrification in the residential and low-income sectors first.

Requirement D: Filing a draft proposal for rates related to EV charging and/or load management efforts to control the timing of charging in the residential sector.

Requirement E: Addressing disadvantaged communities, such as through programs to enable vehicle charging access to multifamily buildings and renters, low-income customers, and public transit.

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[5] Note that the Requirements were listed with lower case lettering in the November 18th R&O but are listed using upper case letters herein to better differentiate them from additional considerations related to EV rates that were also listed in the November 18th R&O with lower case lettering.

[6] Act 17-2019: Set the parameters for a resilient, reliable, and robust energy system with just and reasonable rates for all class of customers; make it feasible for energy system users to produce and participate in energy generation…unbundle and transform the electrical power system into an open system. https://bvirtualogp.pr.gov/ogp/Bvirtual/leyesreferencia/PDF/2-ingles/17-2019.pdf

[7] Act 33-2019: Set forth the public policy of the Government of Puerto Rico on climate change and on the mitigation, adaptation, and resilience processes per sector; establish a greenhouse gas emission inventory… to combat the effects of climate change. https://bvirtualogp.pr.gov/ogp/Bvirtual/leyesreferencia/PDF/2-ingles/0033-2019.pdf

Requirement F: Minimizing electricity system impacts from increased electrification of the transportation sector.

Requirement G: Information relating to the various programs and initiatives LUMA proposes within the Phase 1 EV Plan, such as the current and anticipated impacts resulting from increased transportation electrification and how the programs and initiatives address these system impacts and relate to Puerto Rico's climate and energy goals and public policy, among others.

2.1.1 Additional Considerations for EV Rate Filing

In addition to targeting the customer segments set forth in the Principles, the November 18th Resolution and Order also set out that the rate filing shall, at a minimum, address the following considerations (the "Considerations"):

Consideration a: The tariff shall be designed to be implemented as a component of the EV charging infrastructure deployment schedule.

Consideration b: Enrollment in an EV tariff shall be a prerequisite of installation of EV charging equipment on a customer's premises/property.

Consideration c: The proposed tariffs shall include particular focus on customers with DG and/or storage installed on the customer's premise, operation on the customer's side of the meter to mitigate any adverse impact of load growth on the system and to encourage DG and storage deployment.

Consideration d: Include projections of impact (energy and capacity) upon load over time.

Consideration e: Propose how costs associated with the EV infrastructure asset investments are to be allocated and recovered.

In footnote 13 of the November 18th Resolution and Order, the PREB also indicated that the rate proposal "shall not be interpreted or construed as a revision to the approved permanent rate." Rather, the rate proposal should be "targeted and focused on the establishment of new rates for certain specific services and to incentivize certain customer behavior." Lastly, footnote 13 indicated that "evaluation of this filing (the rate proposal) will take place in a separate docket." Therefore, LUMA is not requesting that PREB or Stakeholders evaluate or approve this rate design until it is filed along with associated Tariff and Terms of Service documents in a separate docket.

2.2 Related Hearings and Workshops

The PREB held Compliance Hearings and Technical Workshops related to the EV rate proposal. LUMA and key stakeholder presented strategies and findings on how to improve EV penetration in Puerto Rico including feedback on rate design strategies.

2.2.1 Stakeholder Feedback Regarding EV Rates

Stakeholders submitted comments for the Stakeholder Workshop on September 23, 2021, regarding the EV adoption trends and deployment of necessary infrastructure. The stakeholder comments informed the November 18th Resolution and Order outlining the Principles and requirements for the Phase 1 EV Plan and the additional considerations for EV Rate Design.

Several stakeholders were in favor of developing a TOU rate structure to promote the adoption of EVs and EV charging stations. They also identified key challenges to increase EV adoption and provided recommendations such as developing maps to determine the locations of EV chargers, and technical workshops to educate local workforce on regulations/electrical codes, among other things. Table 2-1 highlights specific stakeholder feedback related to EV rates.

Table 2-1: Summary of Stakeholder Feedback on EV Rates from September 23, 2021 Workshop

Stakeholder	Feedback Summary
Cambio PR	▪ The extent of additional grid storage will depend on incentives through a TOU pricing.
Tesla	▪ Tesla believes that the best and fairest way to charge EV drivers for charging services is on a $/kWh basis. ▪ Best practices for residential TOU rates are to make the peak period short enough, such as 4 hours, so that it is actionable, and that there is enough of a price differential between peak and off-peak periods to incentivize customers to charge their vehicles during off-peak times. ▪ Since many residential customers may be hesitant to enroll their entire home on a TOU rate, making the rate available to a sub-metered EV account is also beneficial.
Colegio de Peritos Electricistas de Puerto Rico	▪ Supports and promotes the integration and deployment of EV charging stations to the grid.
Oficina Independiente de Proteccion al Consumidor (OIPC)	▪ The OIPC supports and promotes the adoption of EV programs. ▪ OIPC recommends various incentives to promote the adoption of EVs and the deployment of charging stations (exemption on property tax, tax incentives to the stations that are powered with renewables, expedite permitting process, etc.).
Public Energy Policy Program of the Puerto Rico Department of Economic Development and Trade	▪ The PPPE's position is that they promote, support, and facilitate the integration of EV charging stations to the electrical grid. ▪ Recommends proceeding with the required studies to identify what needs to be done, regarding upgrades, on the Puerto Rico grid to allow the integration of EVs.
Evengo Puerto Rico	▪ The price of all EV charging services inherently incorporates some level of recovery on the fixed costs (i.e., equipment production and installation, infrastructure deployment, labor) and variable costs (i.e., electricity rates) from the operation and management of EV charging infrastructure. ▪ A unit-based pricing approach (i.e., $/kWh) will undermine competition by favoring a certain subset of market players.
Chris Nelder	▪ EV charging should be profitable to be sustainable and cheaper than the cost of gasoline.

	▪ EV chargers should be on dedicated tariffs and on separate meters. ▪ Tariffs should offer an opportunity to earn credit for providing grid services through managed charging.

2.3 Objectives of LUMA's Draft EV Rate Proposal

As stated, LUMA intends for this rate proposal to form an integral part of the Phase 1 EV Plan. Accordingly, its development was undertaken concurrently with the development of the Phase 1 EV Plan.

To help provide clarity and focus efforts, LUMA established the following "objectives" for the rate proposal, as informed by the Principles, Requirements and Considerations set out in the November 18th Resolution and Order and listed in the previous section. Given the rate proposal is an integral part of the Phase 1 EV Plan, we believe the Principles and Requirements as set out by the PREB for the Phase 1 EV Plan should also apply to the rate proposal.

Table 2-2 provides LUMA's interpretation of the Principles, Requirements and Considerations expressed as Goals for the rate proposal. For ease of reference, the specific Principle, Requirement or Consideration from the November 18th Resolution and Order that each objective supports, or addresses is also set out in the table. However, there is a degree of overlap between some of the Principles, Requirements and Considerations, and not all the Principles and Requirements are directly relevant to the rate proposal. For example, *Principle 8: Government Supplying Land for EV Charging Infrastructure, especially along highways* does not appear to be directly relevant to EV rates. Table 2-2 therefore, only includes Principles, Requirements and Considerations that are related to rate proposal.

Table 2-2: Objectives of LUMA's Rate Proposal

LUMA's Objective	Guiding Principles and Requirements from November 18th Resolution and Order
1. Focus on residential and low-income sector and primarily on home EV charging infrastructure	▪ **Principle 1:** …charging infrastructure deployment shall be sequenced by sector, starting with residential… ▪ **Principle 6:** …the utility's participation in this component of the energy sector shall primarily target… b) services to hard-to-serve segments, and c) areas where the market does not adequately respond to demands or needs ▪ **Requirement C:** Addressing barriers to adoption of transportation electrification in the residential and low-income sectors first ▪ **Requirement E:** Addressing disadvantaged communities, such as through programs to enable vehicle charging access to multifamily buildings and renters, low-income customers, and public transit. ▪ **Consideration b:** Enrollment in an EV tariff shall be a prerequisite of installation of EV charging equipment on a customer's premises/property

LUMA's Objective	Guiding Principles and Requirements from November 18th Resolution and Order
2. Minimize electricity system impacts of EV charging	▪ **Principle 2:** …rate design shall encourage customer behavior beneficial to the (electricity) system… ▪ **Principle 5:** …rate design to shift EV charging to times when energy, particularly low-carbon energy, is abundant ▪ **Requirement D:** …draft proposal for rate related to EV charging and/or load management efforts to control the timing of charging ▪ **Requirement F:** Minimizing electricity system impact from increased electrification of the transportation sector
3. Address the unique needs of and opportunities for customers with DG and/or battery storage	▪ **Principle 3:** … consideration given to focusing rate design on the pairing of EV charging with DG and storage ▪ **Consideration c:** …particular focus on customers with DG and/or storage installed on the customer's premise.... and to encourage DG and storage deployment
4. Be synchronized with implementation of residential time-of-use rates, to the extent possible	▪ **Principle 2:** …rate design shall … to the extent possible, be synchronized with a concurrent implementation of time-of-use rates for residential customers
5. Support Puerto Rico's climate and energy goals and public policy	▪ **Requirement B:** portfolio of actions, including… rate design… to contribute to the objectives of Act 17-2019 and Act 33-2019 ▪ **Requirement G:** Information relating to … how the programs and initiatives (within the Phase 1 EV Plan) relate to Puerto Rico's climate and energy policy goals and public policy. ▪ **Consideration d:** …projections of impact (energy and capacity) upon load over time
6. Include a fair and equitable cost allocation and recovery mechanism	▪ **Consideration e:** Propose how costs … are to be allocated and recovered

LUMA recognizes that *Goal 1: Focus on residential and low-income customers* has the effect of limiting market coverage, but also anticipates the development of additional rate proposals over time that address this gap and continues the sectoral sequencing set out in the November 18th Resolution and Order ("*… residential, followed by fleets, transit and, finally, multi-family structures*") or as modified by the PREB in the future.

Having established the above objectives for the rate proposal, LUMA set about identifying possible rate structures to address these objectives by reviewing those implemented or proposed in other jurisdictions. LUMA then established screening criteria based on the above objectives to identify the residential EV rate structures that are most responsive to the November 18th Resolution and Order and most attractive and viable for Puerto Rico in the near- to medium-term.

2.4 Additional Considerations for Puerto Rico

Compared to most US utilities, LUMA has a relatively high percentage of customers that are low-income households. There is also a large group of residential customers with solar PV operating (some of which also have batteries) under a net metering arrangement. The following sections provide more information on these important customer groups and the potential implications for any residential EV rates that LUMA may introduce.

2.4.1 Low Income Context for Puerto Rico

Puerto Rico has witnessed severe hurricanes and earthquakes that crippled the economy, infrastructure, and health systems and left vulnerable groups even more susceptible to poverty. The median annual household income in Puerto Rico is $21,058, which is less than the median annual household income of $64,994 across the entire US.[8] Additionally, as shown in Table 2-3, the poverty rate in Puerto Rico is 44.1%, significantly higher than Mississippi's poverty rate of 18.7%, the state with the highest poverty rate[9] in the US. Table 2-3 also shows 2021 EV registration and 2021 EV penetration for example jurisdictions including Puerto Rico. In 2021, the number of reported EV registrations in Puerto Rico was approximately 3,210[10] and 2021 EV penetration rate was at 0.12%[11].

[8] U.S. Census Bureau Quickfacts: Puerto Rico and United States Median Household Income (2020). https://www.census.gov/quickfacts/fact/table/PR/PST045221

[9] The US Census Bureau measures poverty rate by using a set of money income thresholds (the minimum level of income deemed adequate) that vary by family size and composition to determine who is in poverty.

[10] Total EV registration as of Q3/2021 was provided by National Renewable Energy Laboratory (NREL) based on data from Experian.

[11] Percent EV penetration in 2021 is calculated by dividing the number of EVs on the road (3,210) by an estimated total vehicle registration in PR (2,709,206)

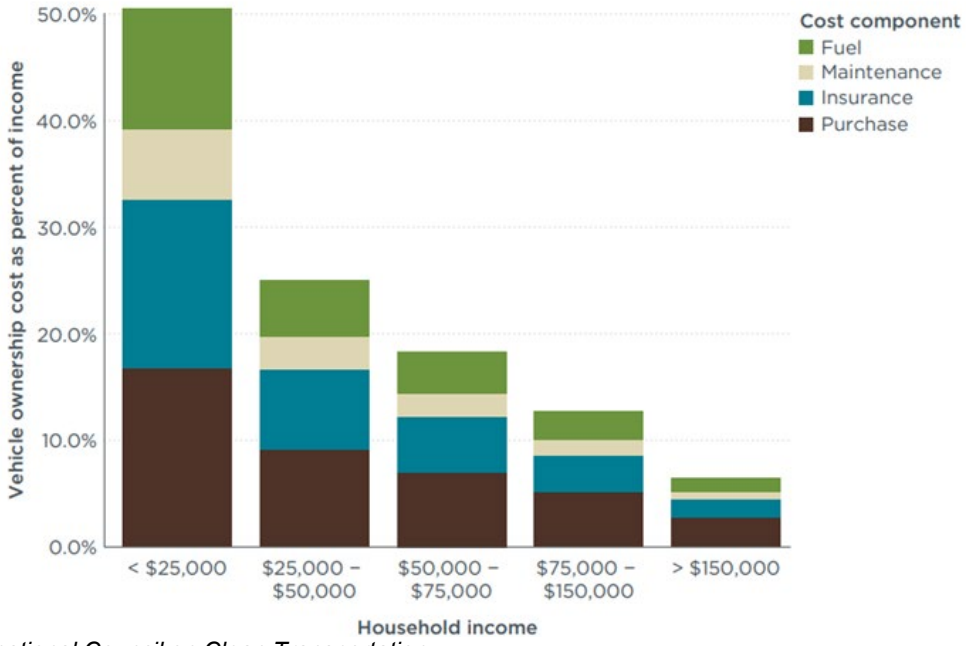
Table 2-3: Poverty Rate and EV Registrations in Puerto Rico and Some US Jurisdictions

State/Territory	Population 2021	Median Household Income ($)	Poverty Rate (%)	2021 EV Registrations	2021 EV Penetration (%)
Puerto Rico	3,263,584	21,058	44.10%	3,210	0.12%
Mississippi	2,949,965	46,511	18.70%	780	0.06%
Louisiana	4,624,047	50,800	17.80%	1,950	0.13%
New Mexico	2,115,877	51,243	16.80%	2,620	0.29%
West Virginia	1,782,959	48,037	15.80%	600	0.13%
Arkansas	3,025,891	49,475	15.20%	1,330	0.13%
District of Columbia	670,050	90,842	15.00%	2,360	2.02%
Kentucky	4,509,394	52,238	14.90%	2,650	0.24%
Alabama	5,039,877	52,035	14.90%	2,890	0.15%
Florida	21,781,128	57,703	12.40%	58,160	0.60%
California	39,237,836	78,672	11.50%	425,300	2.61%
Hawaii	1,441,553	83,173	8.90%	10,670	1.72%

Source: US Census, 2019 EV Adoption, Electrek, PREPA IRP, Guidehouse Insights EV North America

Generally, jurisdictions with higher EV penetration also have higher median household incomes, and vice versa. Except for the District of Columbia, all the states shown with a poverty rate of 15% or more had EV penetration of less than 1% in 2021.

Figure 2-1: Vehicle Ownerships Costs by Income Group



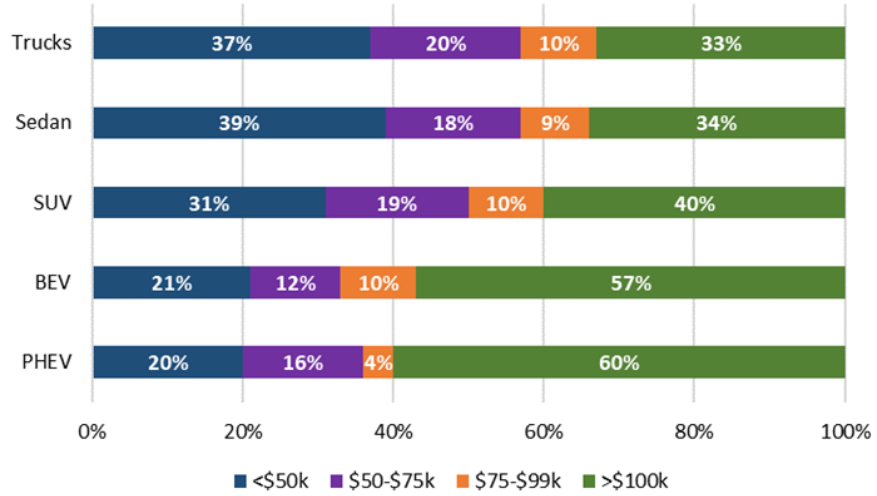
Source: International Council on Clean Transportation

Vehicle ownership represents a significant cost burden for many low-income households. The International Council on Clean Transportation (ICCT) estimates that the cost of vehicle-related expenses (including insurance, fuel, maintenance, and the car purchase) for low-income households could represent up to 50% of their household incomes as shown in Figure 2-1.

Generally speaking, "fuel" costs for an EV are lower than for gasoline-fueled vehicles and would reduce the relative cost burden of vehicle ownership, all other things being equal. However, the other vehicle-related expenses, such as insurance, maintenance, and the car purchase itself would still represent a significant burden for low-income households (almost 40% of household income according to the ICCT). Given the cost burden of vehicle ownership, low-income households would be expected to have lower vehicle ownership rates than higher-income households. Correspondingly, lower income households would also be expected to have a greater reliance on public transportation than higher-income households.

Specifically with respect to EVs, new car buyers with annual household incomes less than $50k represented only 21% of battery electric vehicle (BEV) purchases whereas they represented 39% of sedan with internal combustion engines (ICE) purchases according to the Fuels Institute, as shown in Figure 2-2. In comparison, new car buyers with an annual household income greater than $100,000 represented 57% of BEV purchases, but only 34% of ICE sedan purchases.[12]

Figure 2-2: Distribution of New Car Buyers by Household Income (2019)



Source: Fuels Institute

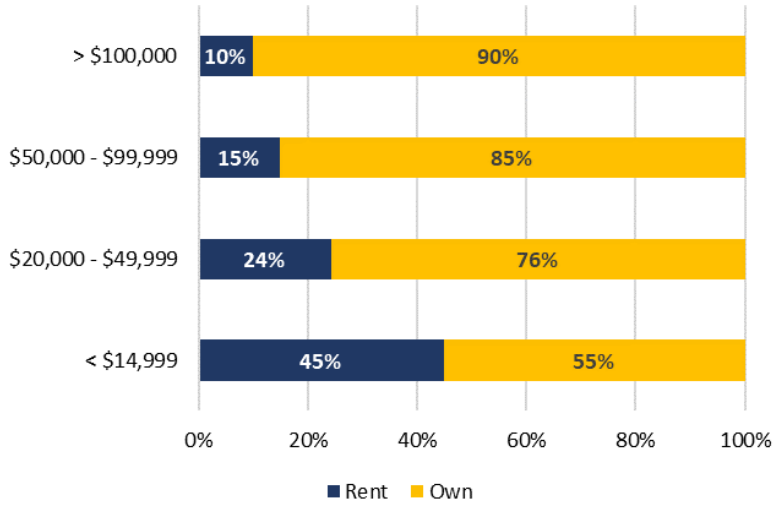
This suggests that the vehicle ownership rate among low-income households is expected to be lower than for higher income households. Further, given the price premium for EVs, we anticipate that the EV

[12] EV Consumer Behavior. Fuels Institute. (2021, June). https://www.fuelsinstitute.org/Research/Reports/EV-Consumer-Behavior/EV-Consumer-Behavior-Report.pdf?ftag=YHF4eb9d17

ownership rate among low-income households, expressed as a percentage of the EV ownership rate among higher income households, would be even lower than for gasoline-powered vehicles.

Low-income households also tend to rent their homes and live in multi-family dwellings. In Puerto Rico, 45% of households with an income less than $14,999 were renters whereas only 10% of households with an income above $100,000 rented a home as depicted in Figure 2-3. Renters typically cannot install EV chargers and rely on public chargers which also limits EV adoption among low-income renters.

Figure 2-3: Puerto Rico housing status by 2020 household income



Source: US Census

To better serve the low-income customer group and build a more customer-focused energy system, LUMA provides special electricity rates for low-income customers through three rate programs:

1) Lifeline Residential Service (LRS),

2) Residential Service for Public Housing Projects (RH3), and

3) Residential Fixed Rate for Public Housing Under Ownership of the Public Housing Administration (RFR).

An estimate of 18%[13] of LUMA's customers are enrolled into a low-income rate program. Table 2-4 shows a comparison between the General Residential Service (GRS) rate program and the three low-income rate programs. The Lifeline Residential Service (LRS) and Residential Service for Public Housing Projects (RH3) were 0.03 and 0.04 cents lower than the GRS monthly charge of 0.05 for the first 425 kWh. The Residential Fixed Rate for Public Housing Under Ownership of the Public Housing Administration (RFR)

[13] 18% = 209,163 (Customers under RH3, RFR, LRS) / 1,138,663 (Total customers under RH3, RFR, LRS GRS 112)

rate program offers a three-tier discounted charge based on the number of rooms in a household. The fixed charges per month are as low as $30 and as high as $50 providing more affordable electricity to households living in public housing.

Table 2-4: Residential Electric General Rate and Low-Income Rates

Electric Rate Program	Eligibility Requirements	Minimum Monthly Charge ($)	First 425 kWh Charge ($)	Customers	Total Annual Consumption (MWh)[14]
General Residential Service	Residential customers for domestic uses	4	0.04944[15]	929,500[16]	5,637,484
Lifeline Residential Service	Residential customers who fulfill the Nutritional Assistance Program criteria	3	0.02054[17]	158,595	595,476
Residential Service for Public Housing Projects	Residential customers of Public Housing Projects supported or subsidized in whole or in part by governmental support	2	0.00694[18]	5,319	20,614

Electric Rate Program	Eligibility Requirements	Number of Rooms	Fixed Charge per month ($)	Excess kWh Charge ($/kWh)	Customers	Total Annual Consumption (MWh)[19]
Residential Fixed Rate for Public Housing Under Ownership of the Public Housing Administration	Residential customers residing in a housing unit physically located within a housing project owned by Public Housing Administration	1	30	**Excess of 600kWh:** 0.05564	7,282	27,356
		2 or 3	40	**Excess of 800 kWh:** 0.05564	34,246	223,786
		4 or 5	50	**Excess of 1000 kWh:** 0.05564	3,721	35,073

Source: LUMA

LUMA also provides a fuel oil subsidy and equipment discount for residential low-income customers. The Fuel Adjustment Subsidy is available for handicapped, elderly and college students. The subsidy is included in the LRS and RH3 rates where a residential customer's monthly consumption does not exceed

[14] FY 2020-21

[15] $0.04944 per kWh for the first 425 kWh of monthly consumption; $0.05564 per kWh of additional monthly consumption

[16] Customers under GRS 112 Rate Program

[17] $0.02054 per kWh for the first 425 kWh of monthly consumption; $0.05564 per kWh of additional monthly consumption

[18] $0.00694 per kWh for the first 425 kWh of monthly consumption; $0.05564 per kWh of additional monthly consumption

[19] FY 2020-21

500 kWh. The Life Preserving Equipment Discount is available for customers who need electrical equipment to 'preserve life' and must be qualified as low-income household by the Department of Family.

In addition to providing lower electric rates, subsidies, and discounts for low-income residential customers, LUMA provides information on government assistance programs that can alleviate income challenges, such as the Low-Income Home Energy Assistance Program (LIHEAP) and Weatherization Assistance Program (WAP) as shown in Table 2-5.

Table 2-5: Low-income Government Assistance Programs

Government Assistance Programs	Description
Low Income Home Energy Assistance program (LIHEAP)	Helps income qualified households with electric service bills
Weatherization Assistance Program (WAP)	Helps income qualified families achieve a reduction in domestic energy consumption, by replacing old or inefficient equipment with energy saving equipment and measures
Temporary Assistance for Needy Families (TANF)	Helps income qualified families with children achieve economic self-sufficiency
Coronavirus Aid, Relief and Economic Security Act (CARES) Act	Provides economic aid to individuals and businesses that have been impacted by COVID-19
Puerto Rico's Rent Payment Assistance Program	Provides rental assistance and utilities to income qualified residents impacted by COVID-19

Source: LUMA

Although LUMA does not expect significant EV ownership among low-income customers for a considerable time given the higher up-front costs for EVs, these customers would be able to participate in any residential EV rates offered by LUMA on the same terms and conditions as other residential customers. For low-income customers already participating in one of LUMA's low-income rates and wanting to participate in the EV rate being proposed, it may be possible to preserve the effect and intent of the low-income rate while also offering the potential benefits of the EV rate. The specific details regarding how to "integrate" the low-income rates with any EV rates would be developed in a future rate design filing.

2.4.2 Customers with Solar PV and/or Battery Storage

Since 2010, an increasing number of electricity customers in Puerto Rico have installed solar photovoltaic (PV). Customers are able to participate in LUMA's net metering program. At the end of January 2022, there were more than 42,000 customers with solar PV (or other renewable generation capacity), which account for about 3.8%[20] of LUMA residential customers, operating under the net metering

[20] 3% = 51,300 Solar PV customers / 1,350,929 Residential customers under RH3, RFR, LRS and GRS rate

arrangement.[21] Most of these customers are residential customers who have a bi-directional meter installed to measure the net energy flow into or out of customers' facilities.

The net metering program allows customers to use any solar output in excess of their household load to offset their consumption during periods when the solar output is less than their household load within a fiscal year. Thus, energy exported to the grid within a fiscal year (July 1 to June 30) is valued the same as energy imported from the grid during the fiscal year based on the customer's tariff. If the total amount of energy exported within a fiscal year exceeds the amount that is imported from the grid through the meter, customers receive a bill credit at the end of the fiscal year. The value of this credit to the customer is currently 7.5 cents/kWh which is much lower than the current general residential tariff of 4.9 cents/kWh for the first 425 kWh and an additional ~0.23 cents/kWh for fuel charges, purchase power charges, public lighting charges etc. Thus, there is an incentive for customers with solar PV to size their system appropriately such that the energy produced by the solar PV is less than or equal to their gross household consumption. This incentive is demonstrated by the fact that over the twelve-month period ending June 30, 2021, net metering participants exported approximately half as much energy (136,908 MWh) as they consumed from the grid (282,157 MWh).[22]

Like the growth in solar PV installations, there has also been significant growth in the number of battery installations. Operationally, the batteries are likely to have been purchased to provide back-up power in the event of an outage. Thus, most residential batteries must remain partially charged to provide this back-up capacity at any time of day or night. For battery owners who also have solar PV, the remaining battery capacity would be available to shift any solar PV output exceeding the household load to other times when the solar PV output is lower or zero. However, there is no financial incentive to do so under the net metering policy that applies to residential PV owners. In fact, given the round-trip losses associated with charging and then discharging a battery (roughly 10% losses), as opposed to simply letting any excess solar PV flow to the grid, there may even be a slight financial disincentive to using the batteries to shift excess solar PV output.

Alternatively, for residential customers who own batteries but do not own solar PV, the batteries could be used to increase consumption during periods of low demand (by charging the batteries) and decrease consumption during periods of high demand (by discharging the batteries) but there is no financial incentive under the current flat rate structure to do so (and there is potentially a slight disincentive given round-trip losses within the battery). However, the size of this customer group is currently small.

With respect to PV ownership and battery ownership, there are four groups based on the possible combinations of these two technologies. While the vast majority of LUMA's residential customers fall into group 4 in Table 2-6 (without solar PV and without batteries), LUMA expects that the distribution of EV owners is skewed more towards groups 1, 2 and 3 (i.e., owning some combination of PV and/or batteries) than residential customers who do not own EVs.

[21] Anejo-2-Datos-Energia-Renovable-NEPR-MI-2019-0016

[22] Anejo-2-Datos-Energia-Renovable-NEPR-MI-2019-0016

Table 2-6: Solar PV and battery ownership combinations

	With Solar PV (and net metering program)	Without solar PV (with standard tariff)
Own batteries	1*	3
Do not own batteries	2*	4

*Customers under groups 1 & 2 are the prominent ones

LUMA expects there will be some degree of overlap between the ownership of EV, solar PV, and battery storage. With limited information on the actual number of customers in each of the four groups listed in Table 2-6 and which customers own EVs and have EV chargers, LUMA expects that some EV owners will have solar PV and are operating under a net metering arrangement with bi-directional metering (Groups 1 and 2 above). Further, LUMA believes that these customers comprise a not insignificant percentage of EV owners. Accordingly, LUMA believes that these customers need special consideration in the development of an EV rate. To ignore these customers or otherwise preclude them from participating in an EV rate would limit the potential benefits an EV rate has to offer.

In the subsequent sections of this submission follow LUMA's EV rate development approach:

- Section 3 describes the research and review of residential EV rate structures offered by other utilities in the US and considered by LUMA.
- Section 4 presents LUMA's approach in ranking and assessing the possible residential EV rate structures for their responsiveness to the November 18th Resolution and Order, including their attractiveness and viability for Puerto Rico.
- Section 5 provides LUMA's proposed roadmap for the implementation of EV rates, starting with timeline and necessary steps to design and implement the proposed rates, including the detailed design and evaluation of these rates as part of the Phase 1 EV Plan and the development process LUMA intends to follow.

3. Residential EV Rate Alternatives Considered

LUMA conducted comprehensive research on the types of EV rate structures proposed or implemented by utilities across the US who offer their customers EV rate options targeting residential and multi-family dwelling use cases. The focus of the research is on the EV rate structures that drive EV adoption in the residential market, including public EV charging rates.[23]

3.1 Rate Structures and Program Characteristics

A total of 36 rate proposals from 29 different utilities were evaluated based on two criteria that a rate must: (1) serve residential EV customers; and/or (2) aim to drive EV adoption among residential market

[23] LUMA considers a public EV charging rate as an option to incentivize public charging infrastructure investment and support competition in the private sector. Moreover, a public EV charging rate can also address range anxiety among residential EV drivers and support residential customers who drive taxis and/or ride-sharing platform.

segments. These rate pilots and programs were further categorized into three main groups of rate structures.

1) **TOU** is a time-varying rate that adjusts the cost per kWh throughout the day, with most offering cheaper rates when electricity demand is lower and higher rates at times of day when demand is higher.

2) ***Fixed Subscription Charge*** is where customers are charged a standard monthly fee, typically with a limit on usage and excess fees.

3) ***Off-Peak Charging Discount*** typically is a rider providing a discount to customers on a regular basis (monthly, quarterly, or annually) or per kWh in exchange for customers shifting their electricity usage to off-peak hours.

Table 3-1 provides an overview of the distribution of rate options over the two market use cases – residential and public EV charging. All EV rates reviewed have been offered to customers on an opt-in basis.

Table 3-1: Distribution of EV Rate Structures for Residential and Public Charging

Rate Structure		Program Count		Utility Count
		Residential Rate	Public Charging Rate	
TOU	Whole-House Meter	12	-	12
	Separate Meter	8	-	8
	Reduced Demand Charge	-	9	9
	Fixed Demand Charge	-	2	1
Fixed Monthly Subscription Charge		1	-	1
Off-Peak Charging Discount		5	1	5

Among EV rate structures reviewed, TOU pricing is the most common EV rate option for residential EV charging. We further group residential TOU rates based on metering requirement since the impact of price signals on customers' EV charging behavior can vary significantly between a whole-house and separately metered TOU rates. For public EV charging rates, we categorize them based on the variation in demand charges. Like residential TOU rates, the off-peak charging discount is essentially a two-period TOU tariff with a different compensation approach for charging during off-peak hours. The following

section provides detailed descriptions, features and characteristics of rate structures presented in Table 3-1, including case studies as references.

3.1.1 Residential Charging Rate Structures

1) **Whole-House TOU Rate:** While specifically designed for EV charging, a residential whole-house EV TOU rate is applied to a residence's entire electricity usage. From the utility perspective, this rate structure is the simplest mechanism to incentivize off-peak charging. To benefit most from the whole-house TOU rate, EV owners will want to charge their vehicles during periods of lower demand and shift most of their other energy use to this same time structure. Three of the EV TOU whole-house rate programs reviewed offer a price guarantee (or bill protection) feature where EV owners get credited for the difference in annual electric bills if they pay more than what they would have paid under the standard residential rate. This type of features allows customers to try the TOU rate plan with a guarantee that they will be required to pay no more with TOU rates than their former rates and is typically applicable only to the first year of rate participation.

   Case Studies

   Con Edison (ConEd) offers a whole-house TOU rate for EV customers. ConEd will install a new advanced metering infrastructure (AMI) meter for customers who sign up at no additional cost, but customers will pay a higher monthly charge for the cost of the TOU meter ($4.11 more than monthly service charge of their standard residential rate). Their TOU rates comprise of supply and delivery rates. TOU supply rates are divided into three periods: off-peak, on-peak, and super-peak. Super-peak periods are a subset of peak hours during the summer and only apply on weekdays. TOU delivery rates have a peak and off-peak time period which apply to all days of the week.

   Madison Gas and Electric offers their customers a way to "shift & save" money by charging their EVs at night and on weekends. Customers who participate in the program will receive discounted rates for electricity used during off-peak hours (9PM-10AM). In exchange, customers pay more during on-peak hours (10AM-9PM). This rate is applied to the entire household electricity usage and not only to EV charging load.

2) **Separate Meter TOU Rate:** This type of EV rate is applied exclusively to EV charging through separate metering, submetering, or an eligible EV charger. A standalone meter for EV usage provides customers with greater control and predictability over when electricity will be utilized, enabling them to pre-plan when to charge that fits best to their schedule and lifestyle. Recently, this rate option has been widely adopted since a separate meter facilitates data gathering, enabling utilities to better understand customers' EV charging behavior and load impacts that EV charging has on the grid.

   Unlike the TOU whole-house rates where utilities typically apply additional cost of TOU meters to customer monthly service charge, installing a second meter to measure the EV charging load presents an additional cost and administrative burden for the customer and utility (e.g., electrical work at customer's premise to upgrade electrical panel or install a meter socket) beyond TOU metering which may contribute to lower participation rate. Among TOU rates that leverage the capability of EV chargers to monitor charging usage, customers are typically required to connect their EV chargers with a secure home Wi-Fi and allow the utility to access their EV charging data. Additionally, EV

drivers reliant solely on Level 1 charging are unable to participate unless they pay extra for Level 2 charger installation and panel upgrades.

Case Studies

Minnesota Power provides residential EV drivers in their service territory with discounted rate for EV charging during off-peak hours (10PM-8AM on Monday-Friday, and all day on weekends and holidays). Service under this rate is separately metered. The energy rate is $0.02391/kWh for off-peak and $0.10251/kWh for on-peak usage, representing more than four times the price differential between on- and off-peak charging. Residential customers participating in this rate will pay an additional monthly cost of $4.25 for the installation of a separate meter.

Baltimore Gas and Electric (BGE) offers a special TOU rate for residential customers who own EVs and have an eligible Level 2 home charging station. Customers can place their EV charger on this TOU rate while the rest of their house remains on a standard residential rate. The qualified Level 2 charger is used to monitor EV charging load in place of a separate meter. Compared to the standard residential rate, if a customer drive 15,000 miles per year, the customer could save roughly $120 per year by plugging in their EV during off-peak hours (8PM-10AM in the Summer, and 11AM-5PM and 9PM-7AM in the Winter). Additionally, net metering customers are not eligible to enroll in this rate.

3) **Fixed Monthly Subscription Charge:** This option is similar to a cell phone plan where customers sign up for subscription rate. Customers pay a monthly flat fee for EV charging that covers up to a predetermined amount of kWh per month. In exchange for the flat fee, the utility can directly manage chargers to reschedule charging during non-peak periods. For public charging, energy and demand charges are combined into one subscription charge. Rate participants can sign up for subscription level based on their charging usage and expect a consistent month-to-month electric bill. Equipment similar to an Open Vehicle Grid Integration Platform (OVGIP)[24] will be needed to establish a two-way communication network between the utility and a vehicle's telematics application.

Case Studies

Duke Energy (Duke) has proposed a residential managed charging subscription-based rate, targeting 200 residential EV drivers. Under this 12-month pilot, customers will pay a per-vehicle monthly flat fee of $19.99 and $24.99 for Duke Energy Carolinas and Duke Energy Progress, respectively. The flat rate covers up to 800 kWh per month of EV charging usage. Any participants using more than 800 kWh per month will receive a notice or risk being removed from the pilot. In partnership with BMW, Ford, GM and

[24] The Open Vehicle Grid Integration Platform (OVGIP) is in-vehicle telematics designed to allow two-way communication between EVs and the grid using a shared communication protocol. This means utilities could see charging activity, battery percentage or call demand response events for vehicles located in a specific area, regardless of where those vehicles are or what kind of chargers they are using. It typically requires utilities to have an active smart grid system capable of two-way communication and calling demand-side management events.

Honda, Duke intends to test the Open Vehicle Grid Integration Platform (i.e., in-vehicle telematics) which allows Duke to see charging activity, battery state of charge, or call demand response events. Participants will need to have a home EV charging station and drive an approved EV, including a degree of monitoring and hands-on charging management along with their flat-fee EV charging. All rate participants are required to allow Duke to actively charge their vehicles, utilizing vehicle charge management processes. Duke will be able to pause charging for periods of no more than four hours for three times per month. Rate participants will receive twelve hours advance notice that a managed charging event will occur and have ability to opt out two times during the pilot period, otherwise they may be removed from the pilot. The total estimated cost for this pilot with up to 200 participants is no more than $600,000.

4) **Off-Peak Charging Discount:** As an alternative to TOU rates, off-peak charging discount/riders offer residential customers a monthly credit or a discount rate for charging their EVs during off-peak hours, while maintaining standard rates for all other household electricity use. Often offered as a rider, an off-peak charging discount is generally easier to implement and more flexible to develop than TOU rates. An EV rider could provide discounts to the demand charge, the energy rate, the fixed monthly customer charge, or the total customer bill.

Within the off-peak charging discount rates reviewed, there are generally two methods to compensate EV drivers for charging their EVs off-peak: (1) discount per kWh; and (2) fixed monthly or annual credit. Table 3-2 shows the range of the discounts within the two compensation approaches.

Table 3-2: Off Peak Charging Discount Rates

Type Rate	
Discount per kWh	1.7 to 3.3 cents/kWh
Fixed Credit	$48 to $50 annually

The disadvantages of an off-peak charging discount include lower charging flexibility and high operating costs to manage demand during the early years of implementation. Customers will need to diligently track off-peak periods and schedule specific times for charging. Based on the rates reviewed under the off-peak charging discount category, customers are typically required to charge their EVs with qualifying Level 2 EV chargers or install an additional meter base and EV meter provided to customers free of charge. However, customers are responsible for hiring an electrician to install the meter base in the EV charging circuit in order to install a Level 2 EV charger or a new EV meter.

Case Studies

Xcel Energy (Xcel) launched the Optimize Your Charge program on August 2021, offering an off-peak charging incentive for customers to charge their EVs during a pre-specified window for at least 25 percent of the time. Xcel provide customers with three charging schedule options that are best for the grid and customers can choose their off-peak charging schedule based on their needs. In return, EV customers receive an annual credit on their electric bill of $50 for each year that their enrollment is active.

Potomac Edison offers an Off-Peak Rewards program where residential EV drivers can earn 2 cents/kWh for net off-peak charging usage by using eligible smart EV charger between 11PM and 6AM and on weekends. Net off-peak usage is the difference between customers' charging usage during off-peak and on-peak hours. Customers participating in this program will receive Off-Peak Rewards as a MasterCard e-gift card with their quarterly earnings. To be eligible to enroll, customers are required to allow Potomac Edison remote access to the charging data generated from eligible smart charger that is connected to Wi-Fi.

3.1.2 Public Charging Rate Structures

A public EV charging rate can serve as a tool to incentivize the deployment of public charging infrastructure to serve EV drivers in Puerto Rico, due to a much more favorable business case. It also enables competition in the Puerto Rico EV market and supports a diverse cross-section of the charging industry by allowing multiple vendors and business models to participate in a public EV charging rate. Additionally, as the public charging network becomes more robust, EV adoption among residential customers with limited access to home charging will likely increase. These customers include the 31%[25] of Puerto Rico's population who rent or reside in public housing or multi-family dwellings. Tenants residing in multi-family dwellings may share common EV chargers and would likely not have equal access to the chargers during lower-priced off-peak time periods.

Given the preponderance of demand charges for non-residential customers, most utilities offer some form of discounted demand charges for public charging facilities, such as:

- ***A fixed demand charge*** where participants pay a flat fee for any level of demand charges; and
- ***A reduced demand charge*** where participants receive a discount in demand charge per kW or pay no demand charge for a set number of years, typically during the pilot phase.

The most common variation of demand charge for public charging rate is a reduced demand charge among the utility rate programs reviewed. The reduction in demand charge helps improve the business case for public EV charging while customer utilization is still low but growing. However, the benefit of public EV charging rate will only be realized if it is shared between the charging service providers and end customers.

All public EV charging rates reviewed require a separate meter for EV charging loads. Similar to the residential EV rate structures, there are several examples of utilities offering TOU rates, fixed subscription rates and discounted off-peak charging rates for public charging facilities. However, these rate structures typically apply to the energy (kWh) charge for these facilities only.

[25] US Census: Total Population in Occupied Housing Units by Tenure – Table#: B25008. US average value is 34%.

Case Studies

Pacific Gas & Electric (PG&E) offers two Business EV Rate Plans. These rates are specifically designed for customers with separately metered EV charging at locations such as multi-family dwelling, workplace, retails, fleets, and fast charging stations. These rate plans include a TOU rate for the energy charge, and two tiers of monthly subscription charge based on customer's expected maximum monthly EV charging kW consumption which can be adjusted throughout the month as often as needed. Customers can choose their subscription level in either: (1) 10kW blocks up to 100 kW with a price of $12.41 per 10kW block; or (2) 50kW blocks starting at 100kW with a price of $95.56 per 50kW block. The accompanied TOU rate has three time periods – off-peak, super-off peak and peak – and they are consistent year-round with no seasonality. Super off-peak period (9AM-2PM) is the most affordable time to charge an EV as this is when PG&E has higher levels of renewable energy generation. The energy charge during peak hours is approximately three times of that during super off-peak hours.

Avista Corporation (Avista) provides an optional commercial EV rate program for non-residential customers taking service for EV charging stations that are separately metered and serve fleet, workplace, and public charging. In the case of public DC fast charging (DCFC) sites, eligible participants must serve the general public, and include at least one DCFC charger. Under this program, there are two rate schedules with on- and off-peak pricing with no demand charge, servicing small and large load customers.

3.1.3 Rate and Program Characteristics

1) **TOU Periods:** The majority of utilities that have TOU EV rate structures offer two main usage periods (on- and off-peak). Those with more than two TOU periods offer a shoulder, super-off or mid-day period. Peak window duration ranges from 4 to 16 hours with 5 and 8 hours being the most typical among the TOU rates reviewed.

   An important aspect of TOU rate design is the determination of on-peak and off-peak hours of the day. Most utilities set TOU periods based on the need of the electric grid, while benefiting customers to use electricity supply when it is ample and reduce use when supply is limited. Utility regulators generally support TOU structures that provide clear price signals to shift EV charging load to periods where marginal cost of electricity generation is lowest. However, even with a strong price signal, customers may find it difficult to shift their demand from on-peak to other time periods under a restrictive TOU rate structure in which the on-peak period is relatively long or lower-priced period does not coincide with customers' preferred time to charge their EVs.

   Case Studies

   Hawaiian Electric Company (HECO) offers both whole-house and separate meter options for their residential EV TOU rate (TOU-RI) that is consistent with the solar generation availability and electric system generation cost. The on-peak period is delayed until later in the evening when solar output drops, and generation must otherwise ramp up quickly to balance the system. So, the low mid-day price (lower than the standard

residential rate) is used to incentivize EV drivers to charge their vehicles when renewable generation is most abundant. Under this rate, customers pay more during the on-peak and off-peak periods, compared to their standard residential rate. With the separate meter TOU option, customers will need a licensed electrician to work with the utility to install new service for EV charging only and this work will require a city building permit. This rate proposal received a tremendous support from stakeholders including the Hawaii Public Utilities Commission. However, this rate does not incentivize EV adoption because the lowest rate period is during the day when a large proportion of residential customers are away from home, and during other hours, the cost to charge is higher than the standard residential rate.

2) **Price Differentials:** Another important determining factor for a customer's change in behavior is the on- to off-peak price ratio. EV drivers need to notice that there is a substantial difference in prices during these two periods to change their charging patterns. A sufficiently large price differential can effectively encourage customers to shift their EV charging needs to benefit the grid, while saving money on their electric bills.

Table 3-3 illustrates price differentials of energy charges between on- and off-peak as well as seasonal differentiation.

Table 3-3: Price and Season Differentials

Periods / Seasons	Summer	Winter
On- and Off-Peak	1.5x to 14x	2.5x to 11x

Seasons / Periods	On-Peak	Off-Peak
Winter and Summer	0.4x to 1.3x	0.7x to 1.3x

Price and seasonal differentials shown in Table 3-3 are for the volumetric charge only. Among TOU rates reviewed, over 75% have an on-peak and off-peak price ratio between 1.5 and 4. The average price difference between on-peak and off-peak hours is approximately 12.5 cents/kWh, with a minimum of 4.5 cents/kWh and a maximum of 23.7 cents/kWh.

3) Other Characteristics:

Low Income Participation Target: To provide equitable access to EV charging and reduce barriers to EV adoption in low-to-moderate-income communities, some utilities in the US provide incentives to drive EV adoption through infrastructure rebates and EV-specific tariffs and increase awareness and participation through targeted education and outreach. For example, Ameren Illinois Company offers an EV Rider (Rider EVCP) designed for residential and non-residential customers. Any non-residential customers who are served under Ameren's Standard Commercial Rate DS-2 will receive a monthly bill credit of $15 per month for the first twelve consecutive monthly billing periods the customer remains on the Rider. This Program is limited to 600 multi-family facility, of which no more than 300 can be located outside of low-to-moderate-income areas, 150 education facility, and 15 transit facility customers.

Marketing, Education and Outreach (ME&O): A greater focus on ME&O is important for pilot or interim rate offerings since it enables customers to make well-informed decisions and avoid being surprised by certain features of the pilot. Most utilities leverage their general EV ME&O for programmatic efforts like rate pilots and programs. Pacific Gas & Electric (PG&E), for example, launched EV Charge Network program website and online application to facilitate customer enrollment, while providing programmatic information to customers. PG&E also utilizes community events and newsletters to spread the information about the program to customers.

Managed Charging: Generally, utilities have two options for managed customers' EV charging usage – passive and active. Passive managed charging relies upon customers to shift their charging behavior. To incentivize passive managed charging, several utilities employ EV TOU rates with strong price signals to influence when customers should charge their EVs. As the effectiveness of this type of charging depends solely on customers' responses to price signals, many utilities begin to consider active managed charging programs as a component on EV rate offerings. Active managed charging (or direct load control) leverages communication signals to directly control charging schedules. These dispatch signals typically come from a utility or distributed energy resource aggregator and are sent to an EV or EV charger. Generally, utilities implement active managed charging as an event-based control to manage charging load for a limited number of events during a pilot phase and/or within a specified period of time. The ability to control EV charging load actively enables utilities to realize greater grid benefits. The latest residential fixed monthly subscription rate by Duke Energy, for example, requires participants to allow Duke to pause charging for periods of no more than four hours for three times per month with twelve hours advance notice. Within the twelve hours prior to a managed charging event, participants will have the ability to opt out but only for two times during the pilot phase. Any participant who opts out of more than two managed charging events may be removed from the pilots.

3.2 Enabling Infrastructure to Support Residential EV Rates

The enabling infrastructure or technologies required to implement EV rates will depend on the rate structures and associated features offered. For example, TOU rates generally require interval metering or AMI infrastructure because TOU rates require the capability to calculate and generate TOU bills for each hour of the day. In its simplest form as a separate, flat, non-time varying, EV-specific rate that differs from the standard residential rate, the "enabling infrastructure" would only be a separate meter.

With respect to managed charging, there is a wide range of capabilities among the charging infrastructure providers and other supporting service providers. The simplest form of managed charging is called "passive" managed charging which relies on customer behavior to affect charging patterns, typically through TOU rates. An EV driver may manage their charging behavior by delaying when they plug in their EV or by setting an automated charge start time using software enabled options on the vehicle or charger.

While separate metering and AMI infrastructure is generally required for the above EV rate structures, some utilities are leveraging the capability of EV charging infrastructure and vehicle telematics to provide EV charger consumption information (by time period if necessary) to the utility. This allows the utility to avoid the cost of separate metering and AMI infrastructure until such infrastructure is more widely available or until a decision is made regarding wide-spread deployment of EV rates following successful pilots. However, this approach can potentially limit the options for customers as they are required to install only qualifying smart Level 2 EV chargers in order to participate in a rate program. This option also

presents risk to the utility and customers as the EV charger may not produce revenue-grade metering accuracy.

More sophisticated “active” managed charging could eventually treat EV charging infrastructure as a distributed energy resource (DER) and allow the utility to use this resource to manage local system constraints, generation outages, minimize generation costs and optimize network operations. Typically, this type of managed charging relies on: (1) communication signals from a utility or aggregator to be sent to an EV or EV charger to control charging events; (2) a communication signal via Wi-Fi, cellular, or vehicle telematics; and (3) a messaging protocol or standard that can help the device understand and execute the instructions.

Currently, LUMA does not have the necessary AMI infrastructure and billing/telecom capabilities to accommodate TOU rates in the Residential sector. To support possible EV rate offerings in the interim period until LUMA develops this capability, LUMA is exploring the services available from third-party vendors. For example, LUMA could potentially contract with an EV charging software solutions company to enable EV rates by leveraging vehicle telematics data. These technology solutions, however, are currently at a nascent stage and can still present challenges integrating with utility billing systems. In the long-term, LUMA will install AMI in EV residential households as AMI will enable better management of energy demand, provide dynamic pricing, reduce the cost of electricity delivery, and improve customer service.

4. Approach to Identifying Most Viable Rate Structures for Puerto Rico

Based on research conducted and described in Section 3, LUMA identifies five rate structures that are most attractive for the residential EV market in Puerto Rico. These rate structures include:

1) ***Residential TOU Rate*****:** A three-period TOU rate with clear price signals and a separate meter dedicated for EV charging load.

2) ***Off-Peak Charging Discount*****:** A discount rider rate providing savings for EV drivers who charge their EVs during off-peak hours.

3) ***Fixed Monthly Subscription Charge with a Preferred Time Window and Managed Charging*****:** A monthly flat fee charged to customers who are committed to charge their EVs during a preferred time window specified by LUMA with an additional managed charging component.

4) ***Fixed Monthly Subscription Charge with Managed Charging*****:** Similar to the previous rate structure but without a preferred time window. Customers can charge their EVs at any time of day for a fixed monthly charge with a managed charging component.

5) ***Public Charging TOU*****:** A TOU rate with demand charge that is reduced from the typical demand charge on a standard commercial rate.

In order to identify the most viable EV rate structures for Puerto Rico, LUMA developed ranking and screening criteria building off the objectives for the EV rates as described in Section 2.3.

1) **Objective #1: Focus on residential and low-income sector and primarily on home EV charging infrastructure**

   To address barriers to EV adoption in residential and low-income markets, LUMA plans to focus on providing EV rates that best serve these markets, while bringing value to the grid.

2) **Objective #2: Minimize electricity system impacts of EV charging**

   LUMA identified four screening criteria used to support ranking and prioritization of EV rate structures that minimize grid impacts from EV charging. These criteria include:

   - Deliver appropriate and clear price signals to EV drivers
   - Incentivize customer behaviors beneficial to the system
   - Support load management efforts to control the timing of charging
   - Contribute to lower GHG emissions from the grid

3) **Objective #3: Address the unique needs of and opportunities for customers with DG and/or battery storage**

   With respect to the third objective, LUMA identified a screening criterion of "supporting optimization of DG and storage capacity" to prioritize rates that align charging with grid needs and make use of increased DG and battery resources.

4) **Objective #4: Be synchronized with implementation of residential time-of-use rates, to the extent possible**

   In order to be harmonized with implementation of residential TOU rates, LUMA identified two screening criteria to ensure the alignment of the TOU rate structure with respect to periods and rates across TOU rates available for residential customers. These criteria include "Ease of implementation" and "Scalability". Rate structures that are easy to implement and highly scalable will be prioritized resources.

5) **Objective #5: Support Puerto Rico's climate and energy goals and public policy**

   To support Puerto Rico's climate and energy goals, two screening criteria were created to rank EV rate structurers that result in an alignment with policy objectives related to supporting EV adoption and reducing fossil fuel use in transportation.

   - Address barriers to the adoption of EVs
   - Address barriers to the adoption of EV charging infrastructure

6) **Objective #6: Include a fair and equitable cost allocation and recovery mechanism**

   The last objective – fair and equitable cost allocation and recovery mechanism – is primarily related to how an EV rate is established with regard to the other permanent rates available to LUMA customers, but there are some differences between the candidate residential EV rate structures that require a separate ranking and screening criteria for this objective.

Having established these ranking and screening criteria, LUMA then ranked the various candidate residential EV rate structures offered elsewhere as described in Section 3. The ranking and screening were based on LUMA's assessment as to whether the candidate rate addresses each of the specific criteria:

- ● Fully addresses;
- ◑ Partially addresses; or
- ○ Minimally addresses

LUMA took a near- to medium-term view in its assessment to reflect additional growth in the EV market and further maturity and sophistication of the EV charging infrastructure and, particularly, the capability of managed charging capabilities. This near- to medium-term view is intended to identify what residential EV rates would be most appropriate and viable for Puerto Rico circa 2027. The resultant ranking of the candidate EV rates best served residential EV market is shown in Table 4-1.

Table 4-1 displays the ranking of each EV rate structure based on Objective #2. For each screening criteria, we evaluate each rate structure individually and also across all five rate structures. Based on the first criterion (deliver appropriate and clear price signals to EV drivers), residential TOU and off-peak charging discount are ranked highest as they have the greatest potential to provide a strong and clear price signal to EV drivers. Fixed monthly subscription with preferred time partially address this criterion as the price signals are less clear and customers are compensated differently compared to the first two options. The last two rate structures minimally address this criterion. Under fixed monthly subscription, customers receive no price signals as they can charge at any time of day for a flat price. Under public TOU rate, the price signals will have an impact on customers' charging behavior only if the charging service providers set their prices based on the TOU rates.

For the second criterion, Residential TOU rate structure is ranked higest as TOU periods are generally designed to maximize the needs of the grid. Fixed monthly subscription with preferred time window and managed charging is best to support load management efforts to control the timing of charging since it provides the right incentive to shift charging behavior to the preferred time window and the managed charging component that fully addresses this criterion.

Table 4-1: EV Rate Structure Ranking to Support Objective #2

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
Minimize electricity system impacts of EV charging	Deliver appropriate and clear price signals to EV drivers	●	●	◑	○	○

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
	Incentivize consumer behaviors beneficial to the system	●	◑	◑	◑	◑
	Support load management efforts to control the timing of charging	◑	◑	●	◑	○

In Table 4-2, we rank the five rate structures based on their likelihood to address Objective #3 with a screening criterion that a rate shall "support optimization of local DG and storage capacity". With the potential to design TOU periods to align with the optimal generation from DG and the use of storage, residential TOU rate fully addresses this criterion. The same rationale applies to the public charging TOU rate but since LUMA will likely have no control over how the end-use pricing is set, we concluded that the public charging TOU rate partially addresses this criterion.

Table 4-2: EV Rate Structure Ranking to Support Objective #3

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
Address the unique needs of and opportunities for customers with DG and/or battery storage	Support optimization of local DG and storage capacity	●	◑	◑	○	◑

The ranking of rate structures for Objective #4 can be seen in Table 4-3, public charging TOU rate is ranked highest. It is easy to implement and administer due to the potential size of participation and has highest potential to scale further into other non-residential customer segments. Since the two fixed monthly subscription rates have managed charging component, LUMA will likely need to require participants to install eligible Level 2 chargers and integrate any necessary software to leverage managed charging capability. Due to the need for AMI meter and the potential size of participant target, TOU, and off-peak charging discount rank lowest in terms of ease of implementation.

Table 4-3: EV Rate Structure Ranking to Support Objective #4

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
Be synchronized with implementation of residential TOU rates, to the extent possible	Ease of implementation and administration	○	○	◑	◑	●
	Scalability	◑	◑	◑	◑	●

For Objective #5, Table 4-4 shows that all rate structures address all the screening criteria. However, when evaluating them against each other, we concluded that since TOU rate can be designed in a way that optimizes the use of renewable energy, residential TOU rate has the highest potential to contribute to lower GHG emissions from the grid than others. From the perspective of customers, fixed monthly subscription with managed charging is relatively easier to understand than others, resulting in a higher ranking for this rate structure under the second criterion. Similarly, public charging TOU rate can drive the investment in EV charging infrastructure, creating a more robust network of public charging. As a result, the public charging infrastructure supported by a TOU rate is viewed to fully address one of the key barriers to EV adoption – range anxiety.

Table 4-4: EV Rate Structure Ranking to Support Objective #5

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
Support Puerto Rico's climate and energy goals and public policy	Contribute to lower GHG emissions from the grid	●	◑	◑	◑	◑
	Address barriers to the adoption of EVs	●	●	●	●	●

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
	Address barriers to the adoption of EV infrastructure	●	●	●	●	●

Table 4-5 illustrates the ranking to support Objective #6. Since Level 2 chargers are typically needed to implement managed charging under the two fixed monthly subscription rates, a subset of EV drivers who can rely solely on Level 1 charging to serve their driving needs and/or have no access to home charging or are unable to install Level 2 chargers will be less likely to participate in such rates. Therefore, these two subscription rates with managed charging can potentially limit the participation for certain groups of residential customers.

Table 4-5: EV Rate Structure Ranking to Support Objective #6

EV Rate Objectives	Screening Criteria	Residential Charging				Public Charging
		TOU *(Price Signal Only)*	Off-Peak Charging Discount *(Price Signal Only)*	Fixed Monthly Subscription *with Preferred Time & Managed Charging*	Fixed Monthly Subscription *With Managed Charging*	TOU *(Price Signal Only)*
Include a fair and equitable cost allocation and recovery mechanism	Ensure equitable access to EV charging infrastructure	●	●	◑	◑	●

Based on this assessment, LUMA believes that the three most attractive and most viable EV rates for residential customers in the near- to medium-term are:

1. Residential EV TOU Rate
2. Residential EV Subscription Rate with Managed Charging
3. Public Charging TOU Rate

The residential EV rates will provide customers with flexibility to take advantage of either “self-managed charging” whereby customers can control their EV charging based on utility price signals provided through the TOU rates or “externally-managed charging” (fixed subscription rate with managed charging). Additionally, LUMA would optimize the operation of the EV charger in response to system price signals, system constraints, generation outages as part of the fixed monthly subscription rate with additional

customer flexibility to operate their chargers as needed on a limited basis. Both rates would also enable some degree of optimization of local DG and battery storage.

The public charging rate will incentivize EV charging infrastructure investment from the private market and as a result, enable a charging network that is sufficient to address range anxiety, and provide charging alternatives for residential customers who cannot conveniently charge at home or need a charge to complete a trip.

With respect to the TOU rates (both residential and public), LUMA believes that a three-period TOU rate would be more effective than a two-period TOU rate. Even though it may be more difficult to explain and understand, the use of three-period TOU rates for EV charging has the several advantages, including:

1) More flexibility compared to two-period TOU rates
2) Matching three TOU periods with the underlying costs and allocations through the functionalization process allows for greater price differentials between on-peak and off-peak as compared to two-period rates
3) Enables shorter focused on-peak and off-peak periods to drive customer behavior as compared to two-period TOU rates

In comparing the two rates that LUMA's ranking determined were less attractive and less viable for PR in the near- to medium-term:

- LUMA believes that an off-peak charging discount (either per kWh or an annual fixed amount) offers less pricing flexibility than a three-period TOU rate and implicitly requires a relatively long duration "higher priced period". Further, an off-peak charging discount does not allow for any higher-than-normal pricing periods. Together, LUMA believes that these factors would limit the overall effectiveness of off-peak charging discount as compared to three-period TOU rates.

- LUMA believes that a fixed monthly subscription rate with a preferred time window would not be as attractive to customers, particularly given that one of the key value propositions of the managed charging that would be integral to any fixed subscription rate offered by LUMA would be "*simply plug your EV into the charger and let us take care of the rest to ensure you always have a fully charged EV when you need it*". This type of managed charging will ultimately enable flexibility for LUMA to control charging in response to price signals, emission-intensity, local system constraints and generation outages. Having this capability only available within a preferred time window will limit the effectiveness of such a rate.

As customers are far from homogenous, LUMA believes that providing a menu of rate options over time will allow different types of customers to find price structures that best suit their varied needs, resulting in increased EV adoption and EV infrastructure investment. The following section provides considerations, key activities and timeline for EV rate design and implementation.

5. Roadmap for Introduction of Residential EV Rates

The EV market in Puerto Rico is in its infancy but is expected to grow quickly. The impact of EVs on PR's electricity system is currently limited but will increase over time. Similarly, the capability and sophistication of enabling technology such as EV charging infrastructure and its ability to support managed charging – to mitigate grid impacts, respond to price signals and/or minimize greenhouse gas emissions from EV

charging – is growing rapidly. There are also many unknowns regarding residential customer EV charging behavior and the degree to which EV rates can modify charging behavior (i.e., charging times) or encourage greater EV adoption.

Incorporating guidance from PREB, feedback from stakeholders, limitations of Puerto Rico's electric grid, the outlook of the EV market and insights from secondary research, LUMA proposes to introduce a three-period Residential EV TOU Rate on an interim basis. This interim rate would apply until a final residential EV TOU rate can be developed based on a comprehensive cost of service study that LUMA will need to undertake in the future.

The roadmap for introducing the Residential EV TOU Rate is shown in Figure 5-1, which is part of the larger Phase 1 EV plan. It starts with this revised draft EV rate proposal submission on July 21, 2022. Following LUMA's submission of the revised draft EV rate proposal to the PREB, LUMA anticipates that PREB will initiate a new regulatory rate review proceeding. Through the new rate review proceeding, LUMA would update the proposed rate based on updated FCA cost information and any local EV charging consumption data that becomes available prior to finalizing the draft rate design. The EV TOU Rate's complete tariff and terms of service documentation will also need to be developed and reviewed in that proceeding.

In parallel with the development of the final rate design filing, LUMA will begin assessing the requirements for implementing a TOU rate via submeter, which will include assessing required implementation technologies, contracting with a submeter data provider, integrating necessary software, developing meter data transfer protocols, setting up billing system updates, training employees and developing educational material templates. Once the final rate design is developed and approved, the submetering contractor is in place, and alternative billing systems or meter data management solutions have been developed, LUMA will start to implement the rate, create marketing, educational and outreach campaigns, recruit and enroll participants during the interim period.

Offering the rate on a limited basis initially will allow LUMA to identify and address any challenges in the enrollment, metering and billing processes and will also enable a more robust evaluation approach (see Section 6 for details of the proposed evaluation approach).

Figure 5-1: Roadmap for Introduction of Residential EV TOU Rate

As noted, the introduction of the Residential EV TOU Rate and other EV rates is just one aspect of the comprehensive Phase 1 EV Plan that LUMA is currently developing for submission later this summer. While the focus of this current submission is EV rates, the Phase1 EV Plan will encompass a suite of programs and initiatives LUMA will undertake, which will complement and support LUMA's Residential EV TOU Rate.

LUMA recognizes that there will be significant changes to participating customers' bills given that one component of their consumption will be subject to a tiered rate and another component will be subject to a time-varying rate. LUMA operates Information Technology (IT) Operating Technology (OT) and billing systems that are currently not configured with the advanced capabilities such as TOU rates for a large customer population. Today, Oracle CC&B is the system used for all electric customer billing and is the program of record for customer information. While the Oracle CC&B product provides functionality and mechanisms for this type of billing it is not configured with a functional Meter Data Management System (MDMS) necessary to receive the meter data details for a TOU or TOU EV charging rate to bill based on interval data. LUMA is currently undergoing several significant performance improvements related to the billing systems in the System Remediation Plan. These issues and other metering related issues need to be addressed prior to new program considerations.

For these reasons, LUMA would need to measure the EV charging consumption of participating customers through a separate EV charging submeter in the near term. The Residential EV TOU Rate would only apply to the EV charging consumption measured by this submeter. The participating customers' existing whole-house meter would remain unchanged and would continue to measure the total electrical consumption of the customers' home – including the EV charging consumption. The participating customer's non-EV charging consumption would be determined by subtracting the EV charging consumption as measured by the EV charging submeter from the total consumption as measured by the existing meter.

The customer's bill must then be calculated separately for the EV using the TOU rates. In the near-term, these calculations are too complex and costly to integrate within the current Billing system and display on the customer's bill. As a temporary solution, LUMA will likely initially offer the Residential EV TOU Rate via a rebate to participating customers on a quarterly, or annual basis. Thus, participating customers would continue to receive their "normal" bill, and LUMA would then issue rebates to these customers on a regular basis reflecting what they should have paid under the EV rate until such time as LUMA can fully incorporate all the changes into a single, live bill to participating customers. This option provides a near-term solution to enable the functionality of a program while recognizing the significant time required to address the software and hardware needs of the metering and MDMS systems.

Approximately 15 - 18 months after the introduction of the Residential EV TOU Rate, LUMA will conduct an evaluation and identify key challenges and successes to customer behavior change, by submitting a report documenting results, lessons learned and to meet the rate objectives and the Principles outlined on the November 18th Resolution and Order. This evaluation will inform development of a final residential TOU EV rate to be developed as part of a comprehensive cost of service study during the next Rate Case.

5.1 Proposed Residential EV TOU Rate

This section describes LUMA's approach to the development and derivation of the proposed Residential EV TOU Rate.

The sections below broadly reflect the sequence followed by LUMA in the development process:

1) Determine Rate Developmental Approach
2) Key Principles, Considerations and Assumptions
3) Derivation of the Proposed Interim TOU EV Rates
4) Proposed Changes to Other Rate Riders
5) Recovery of Metering and Fixed Costs
6) Proposed Deferral and Variance Accounts

5.2 Determine Rate Developmental Approach

LUMA identified three possible options for determining the Interim TOU EV rates:

1. Leverage the 2015 Rate Case that forms the basis for LUMA's current rates
2. Undertake an updated Cost of Service study specifically for the Residential EV TOU Rate reflecting updated costs, billing determinants and allocations
3. Develop "revenue neutral" rates based on specific components of a residential customers current bill

Option 1 – Leveraging the 2015 Rate Case would require significant recalculation and reconfiguration of the original analysis to accommodate three TOU periods. Additionally, the underlying data to support this analysis does not currently exist. This option was ruled out as non-viable.

Option 2 – Undertaking an Updated Cost of Service study as part of a Rate Case would be the most accurate and holistic approach but would take considerable time and effort. LUMA is currently working towards such an update, but this is not expected to be complete until after the 2024 Integrated Resource Planning exercise currently underway. LUMA intends to propose residential TOU rates as part of the Rate Case and expects that the final, approved TOU rates would be introduced concurrently with all the other final, approved rates. At that time, it is expected that the interim Residential EV TOU Rate would be superseded by the permanent Residential EV TOU rates developed for the next Rate Case and as approved by the PREB.

After careful consideration, LUMA determined that Option 3 – Develop revenue neutral rates – was the only viable option based on available time, information, and implementing a fair and equitable rate. Accordingly, LUMA's underlying principle in the development of the Residential EV TOU Rate is as follows:

> ***Absent a change in customer charging behavior, LUMA will collect the same amount of revenue from EV charging customers under the Residential EV TOU Rate as they would have if the EV charging consumption were included under the customers' otherwise applicable billing arrangements.***

This "revenue neutral" approach does not result in unintended bill impacts to non-participating customers and ensures that, as a group, eligible residential customers' electricity costs would remain the same if they participated in the Interim TOU EV rates and did not change their EV charging behavior. However, the Residential EV TOU Rate would also provide participating customers with an opportunity to reduce their EV charging cost by shifting consumption to lower priced TOU periods.

5.3 Key Principles, Considerations and Assumptions

LUMA will need to measure the EV charging consumption of participating customers through the use of a separate EV charging submeter. The Residential EV TOU Rate would apply to the EV charging consumption measured by this submeter. The participating customers' existing meter would remain unchanged and would continue to measure the total electrical consumption of the customers' facility – including the EV charging consumption. The participating customer's non-EV charging consumption would be determined by subtracting the EV charging consumption as measured by the EV charging submeter from the total consumption as measured by the existing meter.

LUMA's residential customers are subject to several rate riders on top of the tiered base rate. For the purposes of calculating the revenue that must be replaced by the Interim TOU EV rates, LUMA proposes that only the Fuel Cost Adjustment (FCA) Rider, which corresponds most closely to variable generation costs, should apply to the EV charging consumption. In effect, the FCA charges would be "shaped" by time period the under the proposed Residential EV TOU Rate.

LUMA carefully considered the possible inclusion of the base rate and Purchased Power Charge Adjustment (PPCA) Rider in the proposed interim Residential EV TOU Rate, but rejected both of these components for inclusion for the following reasons:

1. The base rate comprises three components: 1) transmission and distribution (T&D) costs, 2) Holdco costs, and 3) fixed generation costs. LUMA is aware that other jurisdictions have explored or implemented some form of TOU rates for transmission or distribution costs, but there is currently insufficient information to support the analysis necessary to establish fair and equitable TOU transmission or distribution rates in Puerto Rico. Over time, as better information becomes available, LUMA intends to explore such rates in the future. With respect to Holdco costs, LUMA believes it is appropriate to allocate these costs on a uniform per kWh basis and that there is no reasonable basis to allocate these costs differently within different time periods (i.e., to "shape" these costs by TOU period). Lastly, given Puerto Rico's current resource adequacy challenges due to high forced outage rates and relatively low generation plant availability, all generation, including "peaking" units, is regularly called upon throughout the day to meet system demand. This differs from most other electricity systems where peaking plants are generally only called upon during peak periods and the fixed costs of these units have been "concentrated" into the peak TOU period for the purposes of determining TOU rates. LUMA is hopeful that resource adequacy will improve into the future and will explore the merits of "shaping" the recovery of certain fixed generation costs within the base rate into TOU periods.
2. Similar to the fixed generation cost component of the base rate, the PPCA largely recovers fixed generation costs. As discussed, all generation, including "peaking" units, is regularly called upon throughout the day to meet system demand given Puerto Rico's current resource adequacy challenges. LUMA is hopeful that resource adequacy will improve into the future and, at that time, will explore the merits of "shaping" the recovery of certain fixed generation costs within the PPCA into TOU periods.

In summary, the key design principles, considerations, and assumptions for the Interim EV rates are as follows:

1. The Interim EV rates should be revenue neutral if there is no change in customer behavior.

2. Participating customers' EV charging consumption will be measured through an EV submeter.
3. The Residential EV TOU Rate will only apply to the customers' EV charging consumption.
4. The Residential EV TOU Rate will replace the FCA charges that participating customers would have otherwise paid for their EV charging consumption, and they will continue to pay the other rate components and riders on their EV charging consumption.
5. All participating customers' non-EV consumption will be subject to the standard rates and riders applicable to residential customers.

5.4 Derivation of the Residential EV TOU Rate

Given the above principles, considerations and assumptions, the key steps LUMA used to derive the proposed Residential EV TOU Rate are as follows:

1. Identify the different TOU periods (when and which days they apply)
2. Estimate the percent of EV consumption in each of the TOU periods
3. Estimate the FCA revenue that LUMA would otherwise realize on residential EV charging consumption (this becomes the revenue that must be earned through the Residential EV TOU Rate to ensure revenue neutrality)
4. Establish desired relativity between rates for the different TOU periods

The steps LUMA used to derive the proposed Residential EV TOU Rate Proposed TOU periods are further described below:

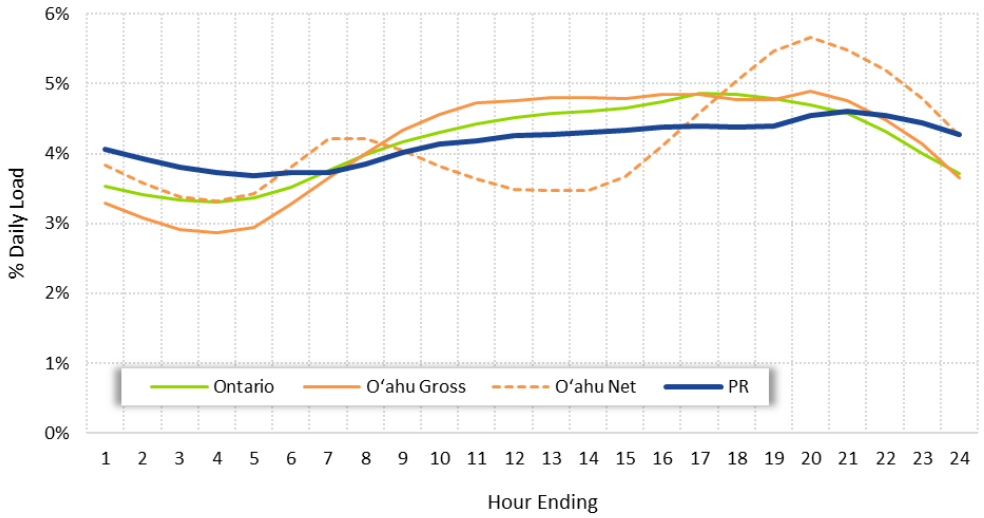
5.4.1 Identify TOU periods

In thinking about possible TOU periods, it is important to note that Puerto Rico's electricity demand profile is relatively higher in the later evening and early morning than most other U.S. and Canadian jurisdictions, and thus justifies a longer peak period. For example, Figure 5-2 shows percent of daily average summer load profiles[26] for Puerto Rico, Ontario and O'ahu, Hawaii for the period June through September 2021. The summer period was chosen because this would provide the most direct comparison given Ontario's climate. As can be seen, the Puerto Rico demand profile peaks a little later in the day, and the demand remains relatively higher in the late evening and early morning hours. This demand profile may be due to Puerto Ricans operating their air conditioning later in the evening and earlier in the morning than in Ontario.

O'ahu's net demand profile (O'ahu Net) is illustrated in Figure 5-2 to show what the electricity demand profile on O'ahu looks like when accounting for impacts of EV charging, battery storage charging and discharging, and energy efficiency measures. Absent the impact of battery storage, Puerto Rico's non-renewable (I.e., fossil –fueled) generation output profile over the day is expected to look similar to O'ahu's net demand profile in the future as more solar PV generation is added to the Puerto Rico grid.

[26] Percent of daily average load is calculated by dividing an average hourly demand by the sum of demand in all hours.

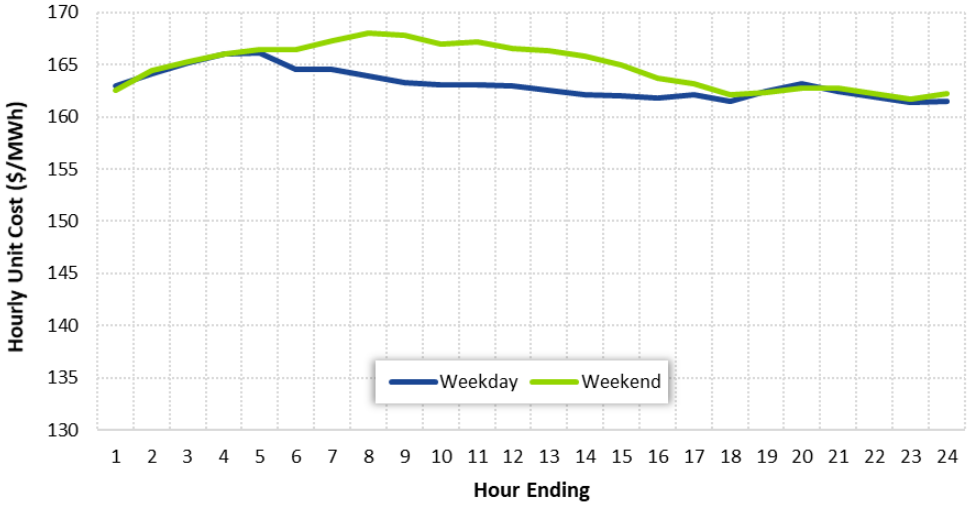
Figure 5-2: Comparison of Puerto Rico, Ontario and O'ahu Summer Daily Demand Profiles



Source: LUMA, Independent Electricity System Operator (http://reports.ieso.ca/public/Demand/), and Hawaiian Electric's Integrated Grid Planning Forecast Assumptions Working Group Documents (https://www.hawaiianelectric.com/documents/clean_energy_hawaii/integrated_grid_planning/stakeholder_engagement/working_groups/forecast_assumptions/20210312_draft_oahu_inputs_workbook_2.xlsx)

Puerto Rico's demand profile also impacts the hourly generation cost profile for Puerto Rico – with higher generation costs continuing later into the evening and earlier into the morning for Puerto Rico than many other jurisdictions. This can be seen in Figure 5-3 showing LUMA's projected Fiscal Year 2023 Hourly FCA costs. As can be seen, the hourly FCA unit costs by day type are relatively flat and remain high through the early morning hours. It is also interesting to note that the FCA costs during daytime hours on the weekend are slightly higher than those during the weekdays, as shown in Figure 5-3.

Figure 5-3: Projected Fiscal Year 2023 Average Hourly FCA Costs



Based on the hourly FCA costs, a more detailed view of LUMA's projected Fiscal Year 2023 Hourly FCA costs are shown in Figure 5-4. As can be seen, the variation of hourly FCA costs within a month is relatively small, ranging from $8/MWH to $15/MWH. Additionally, there is no clear pattern of cost variation within the weekday and weekend profiles.

Figure 5-4: Heatmap of Projected Fiscal Year 2023 Hourly FCA Costs ($/MWH) by Month[27]

Day Type	Hour	Month											
		1	2	3	4	5	6	7	8	9	10	11	12
Weekday	1	165.3	159.4	154.2	149.0	149.7	143.3	181.0	178.9	169.5	175.3	164.8	165.6
	2	165.4	162.8	157.1	150.7	152.5	144.4	182.1	178.0	172.0	174.1	165.5	164.8
	3	167.7	163.5	157.8	150.5	154.2	145.2	183.0	179.2	173.0	175.4	166.8	166.4
	4	167.3	164.7	158.5	151.5	155.6	146.0	184.2	180.1	174.6	175.0	167.7	167.4
	5	167.5	164.7	158.5	151.4	155.2	146.6	186.0	180.3	174.3	174.7	167.7	167.2
	6	165.7	162.6	157.2	148.8	154.3	145.1	183.1	179.2	173.5	174.9	165.0	165.3
	7	165.9	162.2	157.3	148.5	154.5	144.9	183.8	180.1	172.8	174.3	163.7	166.0
	8	163.8	162.1	157.0	149.1	153.0	144.3	182.4	179.0	171.4	174.8	164.7	164.9
	9	163.8	162.0	156.2	148.7	152.3	143.6	181.0	177.8	169.8	175.2	162.9	166.4
	10	164.7	161.2	156.2	149.9	150.5	144.2	181.0	176.9	168.9	175.2	162.7	165.6
	11	165.1	162.0	155.3	149.3	151.6	143.5	180.5	178.3	168.1	174.5	163.6	164.8
	12	165.8	159.9	156.1	149.3	150.7	144.1	180.8	178.2	166.9	175.9	163.2	164.8
	13	164.1	161.4	154.5	147.9	148.9	143.7	180.5	178.2	167.1	176.4	163.4	164.2
	14	163.9	160.5	154.3	149.0	148.8	142.6	180.5	177.9	166.9	176.2	161.8	163.6
	15	164.2	160.4	153.0	147.4	147.8	143.1	180.4	178.3	167.4	177.7	162.4	161.9
	16	164.9	157.8	151.3	145.8	146.6	142.8	183.0	179.8	167.1	178.4	163.1	161.6
	17	165.4	159.6	150.6	144.6	145.6	142.0	182.5	180.7	166.7	180.1	164.3	163.0
	18	164.1	158.4	149.4	144.4	145.9	141.8	182.4	180.5	166.1	179.6	162.6	162.8
	19	165.7	158.0	150.1	144.5	145.7	141.6	181.8	182.4	167.3	181.9	166.3	164.1
	20	164.9	159.0	150.8	147.3	146.8	142.9	184.6	184.7	167.9	181.1	165.1	163.2
	21	164.0	158.0	149.4	146.0	147.0	142.8	182.3	184.5	167.6	180.5	165.0	162.6
	22	163.9	156.7	150.0	146.0	146.9	142.8	181.8	183.8	166.9	179.5	162.8	161.9
	23	162.4	159.2	150.5	146.1	145.7	142.7	182.5	181.1	166.6	176.9	162.3	161.1
	24	162.0	158.9	152.6	147.7	146.6	142.4	181.6	179.1	167.0	175.7	162.0	162.2
Weekend	1	170.5	163.8	154.3	142.2	149.5	140.8	177.3	176.9	169.5	176.0	164.0	163.2
	2	171.6	166.2	157.6	144.5	151.4	142.4	177.7	176.9	171.1	177.2	166.4	166.9
	3	172.7	164.3	160.2	146.6	153.1	143.8	179.2	175.7	174.4	174.4	169.2	167.9
	4	172.6	165.1	160.0	146.8	153.5	145.0	180.8	175.8	176.7	174.2	171.1	168.3
	5	171.3	166.8	160.7	146.8	154.7	146.3	182.1	176.7	178.2	174.8	168.3	168.4
	6	171.6	165.0	161.3	147.0	156.1	147.5	181.8	175.8	178.9	174.7	167.5	168.6
	7	171.4	165.6	159.6	149.5	157.5	150.3	183.7	178.2	180.4	174.9	166.7	168.1
	8	173.2	166.3	160.5	149.4	156.9	150.2	184.1	179.2	181.2	175.2	168.4	169.5
	9	173.2	166.1	160.9	148.8	161.1	149.0	183.2	178.6	179.5	175.0	168.1	169.2
	10	172.3	165.9	161.1	148.1	158.6	147.8	181.5	178.3	178.5	174.4	166.9	168.3
	11	174.2	165.6	164.1	147.3	156.6	147.0	181.3	178.2	178.3	174.6	170.5	167.7
	12	172.0	165.2	162.6	147.0	155.7	146.3	180.8	182.0	177.3	172.9	168.1	167.3
	13	171.4	164.9	161.9	146.0	155.4	145.0	180.0	183.5	175.8	176.4	167.3	166.8
	14	170.6	164.7	161.3	145.8	154.3	144.9	179.9	182.6	174.9	175.3	166.2	167.6
	15	170.5	163.2	159.1	143.2	154.7	143.6	178.4	183.5	172.4	175.2	167.1	167.2
	16	167.4	159.2	157.5	144.1	154.7	142.1	177.3	181.1	170.8	174.5	167.4	166.4
	17	167.5	161.7	153.0	144.2	155.0	143.1	176.2	179.9	168.4	174.7	165.7	166.4
	18	164.8	158.2	151.7	145.3	152.9	141.0	177.2	178.8	167.1	176.6	163.3	165.3
	19	168.7	156.9	153.0	142.7	153.3	140.7	175.1	179.3	166.2	176.8	164.9	166.9
	20	165.6	159.4	150.3	143.6	155.8	138.6	177.4	179.9	167.6	177.8	166.3	167.6
	21	164.2	158.1	150.4	145.0	154.4	139.8	178.8	180.4	167.2	179.5	164.1	166.3
	22	165.3	156.4	152.5	144.0	153.7	139.6	177.5	180.6	166.3	177.3	163.4	166.9
	23	165.0	158.2	150.5	143.5	152.2	138.4	177.3	178.8	166.7	175.5	163.7	166.6
	24	166.4	158.8	152.7	144.6	153.9	139.8	177.4	178.5	167.5	174.7	164.3	164.5

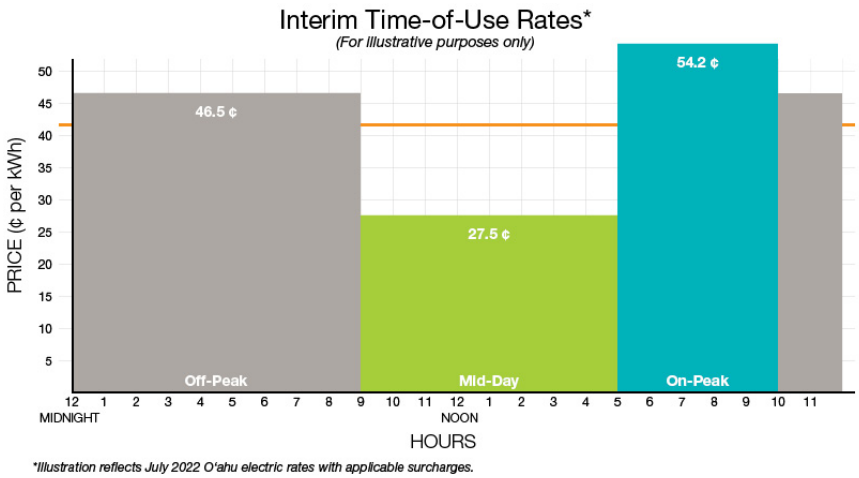
These three figures (Figure 5-2, Figure 5-3, and Figure 5-4) shed some light onto how the TOU periods could be identified. First, Puerto Rico's demand profile (shown in Figure 5-2) and PR's hourly FCA cost (shown in Figure 5-3) show that in the near term, cost and demand do not vary significantly from one hour to another. However, the O'ahu net load profile (O'ahu Net shown in Figure 5-2) provides valuable insight into what PR's non-renewable generation profile could look like in the future. The famous duck curve

[27] FCA cost values in the heatmap represent average hourly unit costs by month, hour, and day type.

experienced by many utilities in the U.S. is expected to develop in Puerto Rico in the future as more utility-scale solar comes online. LUMA believes that the EV TOU rate should be forward-looking and hence should reflect the expected FCA cost profile that will develop in the medium-term. This expected cost profile will be lower during the middle of the day (reflecting the impact of solar generation), slightly higher in the evening period (reflecting ramping challenges as solar generation output decreases and system demand increase) and relatively high throughout the rest of the day.

With this insight in mind, we evaluate a residential TOU rate currently being offered by Hawaiian Electric Company (HECO). Schedule TOU-RI is available for all residential customers in a single-family home, is not exclusive for EV charging and is the only TOU rate option available for residential EV drivers. Schedule TOU-RI allows customers to receive the lowest rate for their household during the mid-day period when solar and other renewable energy is most abundant. Figure 5-5 displays HECO's Schedule TOU-RI rate with applicable surcharges.

Figure 5-5: HECO's Residential TOU Rate (Schedule TOU-RI)



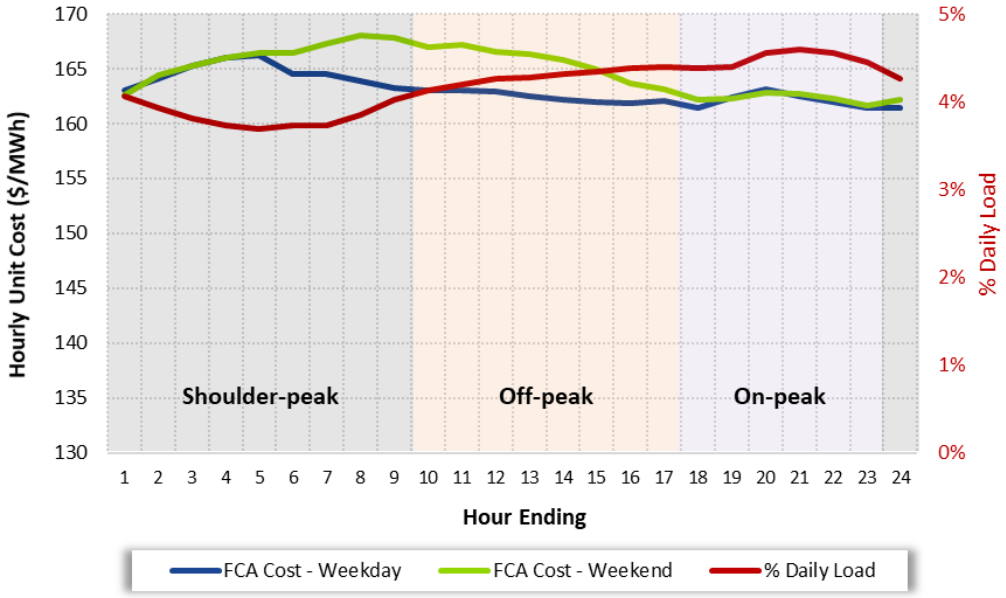
Source: Hawaiian Electric Company's TOU Program (https://www.hawaiianelectric.com/products-and-services/save-energy-and-money/time-of-use-program)

Based on the information provided thus far, LUMA proposes three-part TOU pricing with distinct rates for the On-peak, Shoulder-peak, and Off-peak periods similar to Schedule TOU-RI being offered by HECO, but with the On-peak period extending one hour longer to 11:00pm given the relatively high consumption in Puerto Rico during the late evening as compared to Hawaii. This can be seen in Figure 5-2 and the cost impact of this higher late evening demand can be seen in Figure 5-3 and Figure 5-4 with relatively high FCA costs continuing through to 11:00pm. LUMA did consider an On-peak period extending to midnight given the demand and cost profiles but was concerned that the duration of the On- peak period would be seven hours, which may be too long for customer acceptance. Based on this, LUMA believes that a six hour On-peak period starting at 5:00pm strikes the best balance between customer acceptance and "cost-reflectivity" (based on the expected future FCA cost profile when utility-scale solar PV and batteries are operational).

As can be seen in Figure 5-6, the On-peak hours reflect periods when system demand is relatively high, and the Off-peak hours reflect periods when fossil fuel generation output will be lower due to new solar

generation coming online. The Shoulder-peak hours are those hours that are neither Off-peak nor On-peak and reflect periods of intermediate system demand. This TOU schedule is applied to all days of the week including holidays.

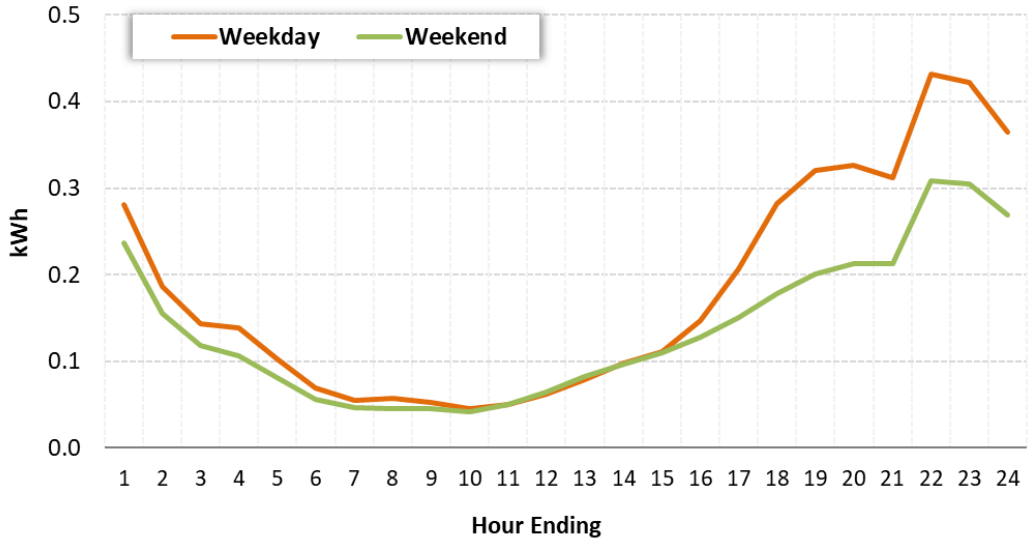
Figure 5-6: Proposed TOU Periods



5.4.2 Estimate residential EV charging consumption by TOU period

At this time, LUMA does not have accurate information regarding the residential charging profiles of EV owners in PR. Guidehouse has worked extensively with regulators and utilities in developing EV-specific rates and has collected numerous residential EV charging profiles under flat, non-time-varying rates from various clients and has provided this information to LUMA on an anonymized, non-attribution basis for use in developing the Interim TOU EV rates. The average weekday and weekend residential EV charging profiles provided by Guidehouse are shown in Figure 5-7.

Figure 5-7: Average Weekday and Weekend Residential EV Level 2 Charging Profiles[28]



Based on this EV charging load profile, the % of EV charging consumption in each of the three TOU periods is shown in Table 5-1.

Table 5-1: Percentage of EV Charging Consumption by TOU Periods

TOU Period	% EV Charging Consumption
On-peak	46.8%
Shoulder-peak	33.9%
Off-peak	19.3%

5.4.3 Required Average EV Revenue

This rate would effectively replace the Fuel Cost Adjustment Rider (FCA) for the EV charging consumption of participating customers. The revenue that LUMA would otherwise collect from participating customers is based on

1) the participating customers' EV charging consumption multiplied by; and
2) Fuel Cost Adjustment (FCA) Rider

[28] Estimated profiles are calculated based on the following assumptions: (1) daily vehicle miles travelled (VMT) in Puerto Rico = 15.5 miles; (2) average fuel efficiency of light-duty EVs = 0.2611 kWh per mile; (3) Percent consumption allocated to weekday and weekend = 76.7% on weekday and 23.3% on weekend; and (4) The resulting weekly EV charging consumption = 28.33 kWh.

Using the approved FCA rider for Q1 FY2023 for illustrative purposes, the proposed values for the FCA rider that LUMA would otherwise collect on EV charging consumption under the Residential EV TOU Rate are $0.221919 per kWh.

5.4.4 Proposed Relativity Between TOU Rates

For the period when the Residential EV TOU Rate is in effect, LUMA proposes that the following multipliers be used in determining the rates for the three TOU periods:

- The On-peak rate shall be two (2) times the Off-peak rate
- The Shoulder-peak rate shall be 100% of the average revenue that would have otherwise been collected in lieu of the Residential EV TOU Rate

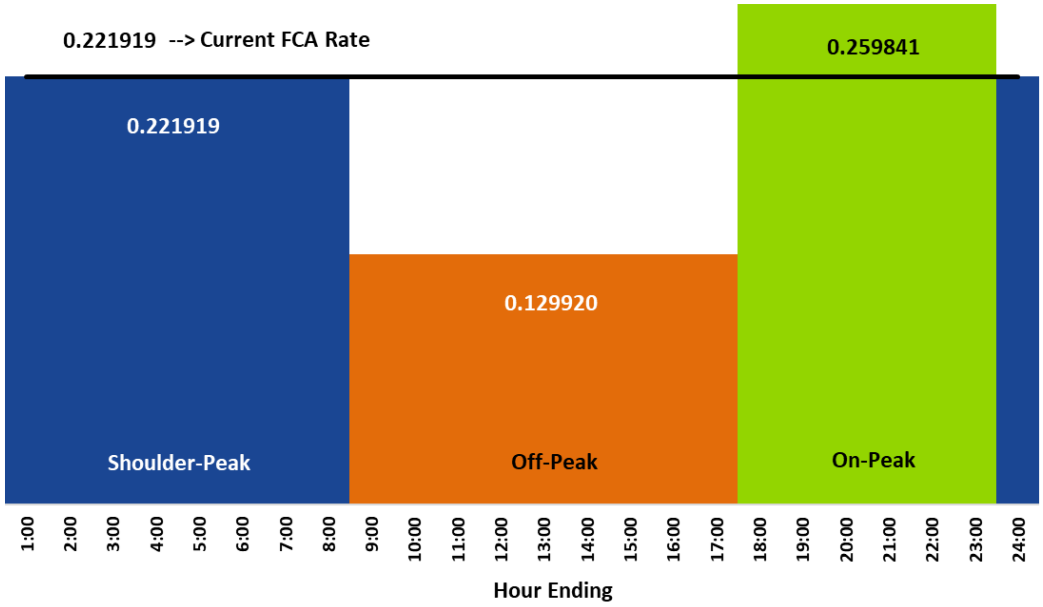
It is anticipated that the effective discount offered by the Off-peak rate will encourage residential customers with EV chargers to sign up for the Interim EV TOU rate, and that the relative pricing between the different TOU periods will encourage customers to shift their EV charging consumption from the higher-priced period to the lower-priced periods. LUMA recognizes that setting TOU rates based on this approach is not an exact science and other multipliers could achieve similar objectives but believes that the proposed multipliers yield fair and reasonable rates that will be attractive to residential EV owners and will encourage shifting of EV charging consumption away from higher-priced TOU periods to lower-priced TOU periods.

As discussed, LUMA expects to be able to develop more cost-reflective rates in the future as time-based system cost data becomes available to support the comprehensive cost of service study LUMA will undertake prior to the next Rate Case. In the interim, LUMA's proposed principle of revenue-neutrality will ensure that other LUMA customers will not be negatively impacted by the introduction of Interim TOU EV Rates.

5.4.5 Proposed Residential EV TOU Rate

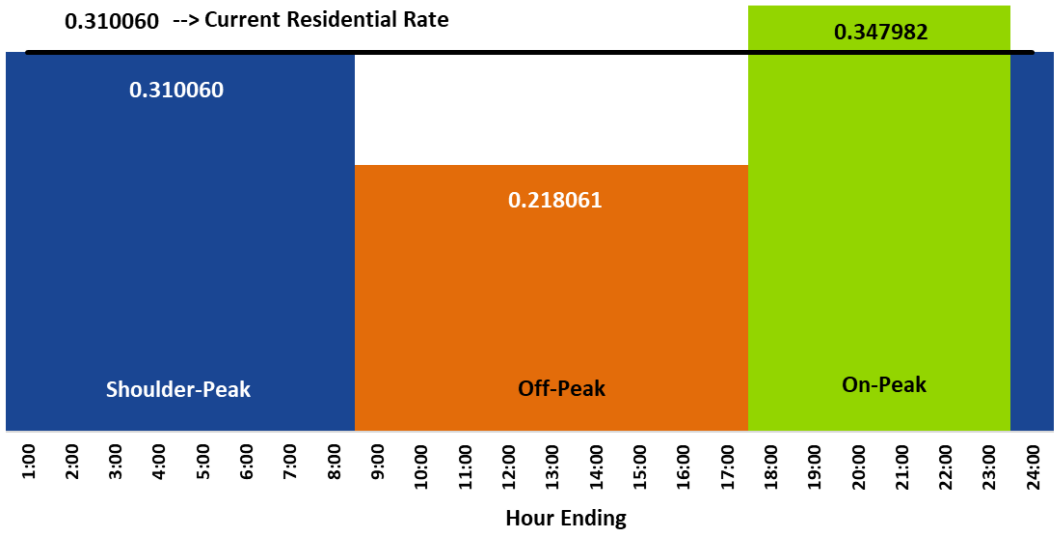
Based on the proposed TOU periods, % of consumption in each of the proposed TOU periods, revenue to be recovered via Residential EV TOU Rate and the proposed multipliers set out above, the resultant three TOU rates within the Residential EV TOU Rate using the Q1 FY 2023 FCA rider are illustrated in Figure 5-8 and compared with the $0.221919 per kWh FCA that that the TOU rates would replace. Specifically, the proposed Off-peak rate would be $0.129920 per kWh, the Shoulder-peak rate would be $0.221919 per kWh, and the On-peak rate would be $0.259841 per kWh.

Figure 5-8: Illustrative Proposed Residential EV TOU Rate



If the other two main components of a residential customer's bill (PPCA and base rate) are added to the about proposed EV TOU rates for the FCA, the combined rate for each of the three TOU periods is as shown in Figure 5-9 and compared with the $0.310060 per kWh rate that customers would otherwise pay for these three GRS rate components (higher tier base rate, FCA rider and PPCA rider). LUMA believes that the resulting effective residential EV TOU rates will provide a clear and attractive price signal to residential customers that will encourage shifting of residential EV charging consumption from higher price to lower priced periods.

Figure 5-9: Illustrative Proposed Residential EV TOU Rate with base rate and PPCA



As the FCA and PPCA are updated quarterly, LUMA proposes to repeat steps 3 and 4 above with the updated Fuel Cost Adjustment (FCA) Rider to determine updated TOU rates that would then be applied concurrently with the changes in the FCA.

5.4.6 Proof of revenue neutrality

In order to be revenue neutral under the proposed rate, LUMA estimates the total revenue received from residential EV charging consumption under the current residential base rate (General Residential Service – GRS). This is done by estimating the residential EV charging consumption in 2023 by multiplying projected EV population of 6,987 by the annual energy consumption (kWh) per vehicle which is estimated to be 1,478 kWh. The resulting estimated annual EV consumption is 10,324,002 kWh. This annual EV consumption is used in the EV TOU rate design model on line 2, 3, and 3 under column “Billing Determinants” as shown in Figure 5-10.

In the next step, the FCA rate shown in line 2 are used to calculate the revenue generated from the FCA rider that the TOU rates would replace. The resulting total revenue from residential EV charging consumption that will be used to confirm the revenue neutrality of the EV TOU rate design is $ 2,291,092 as shown in line 13, column “Current Res Revenue” as seen in Figure 5-10.

Figure 5-10: EV TOU Rate Design Model

Line	Description	Billing Determinants	Units	Current Res Rate	Current Res Revenue	Proposed EV TOU Rate	Proposed EV TOU Revenue
1	Pass-Through Charges						
2	Fuel Cost Adjustment "FCA"	10,324,002	kWh	$ 0.221919	$ 2,291,092		
3	Purchase Power Cost Adjustment "PPCA"	10,324,002	kWh	$ 0.032501			
4							
5	Rate-Specific Charges						
6	Base Customer Charge	not applicable to EV component of bill					
7	First 425 kWh	-	kWh				
8	More than 425 kWh	10,324,002	kWh	$ 0.055640			
9	ON-Peak Energy Charge (FCA-only)	4,835,613	kWh			$ 0.259841	$ 1,256,489
10	OFF-Peak Energy Charge (FCA-only)	1,993,237	kWh			$ 0.129920	$ 258,962
11	SHOULDER-Peak Energy Charge (FCA-only)	3,495,152	kWh			$ 0.221919	$ 775,641
12							
13	Subtotal				$ 2,291,092		$ 2,291,092
14							
15	ON-Peak Energy Charge					$ 0.347982	
16	OFF-Peak Energy Charge					$ 0.218061	
17	SHOULDER-Peak Energy Charge					$ 0.310060	

To identify the amount of EV consumption by TOU periods (assuming for simplicity that ALL residential EV charging consumption was billed under the Residential EV TOU Rate), the estimated total EV consumption is allocated based on percent EV charging consumption by TOU periods as shown in Table 5-1. The proposed EV TOU rate can now be calculated by first assuming the price differentials shown between Shoulder-peak to the current residential base rate, and On-peak to Off-peak as shown in Table 5-2.

Table 5-2: Price Differentials

Period Comparison	Price Differential
Shoulder-peak to Base Rate	1X
On-peak to Off-peak	2X

These price differentials will ensure that the proposed EV TOU rate sends a clear price signal to residential EV customers to charge their EVs outside of the On-peak time window. The 1X price differential between Shoulder-peak and the FCA will neither encourage nor discourage residential EV drivers to charge during the Shoulder-peak hours and ensures that the "behavioral focus" of the proposed Residential EV TOU is on shifting residential EV charging consumption to the Off-peak period. Using these price differentials, EV TOU rates by TOU periods can be calculated using the following equations:

Equation 6-1: Off-peak Rate Calculation

$$Price_{Off} = \frac{Revenue - Sales_{Shoulder}(Price_{Base} * 100\%)}{Sales_{Off} + (Sales_{On} * 200\%)}$$

Equation 6-2: On-peak Rate Calculation

$$Price_{On} = Price_{Off} * 200\%$$

Equation 6-3: Shoulder-peak Rate Calculation

$$Price_{Shoulder} = Price_{Base} * 100\%$$

where,

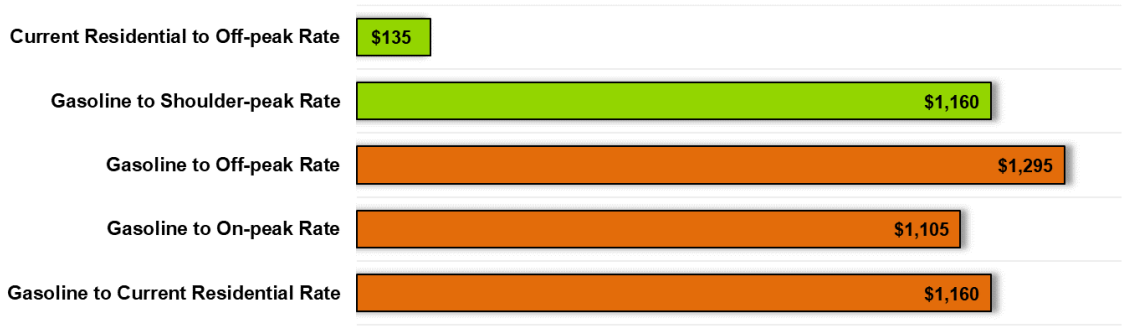
$Price_{Off}$	is Off-peak rate
$Price_{On}$	is On-peak rate
$Price_{Shoulder}$	is Shoulder-peak rate
$Price_{Base}$	is average current residential base rate
$Revenue$	is total revenue calculated based on FCA cost
$Sales_{Off}$	is total sales from EV charging during Off-peak period
$Sales_{On}$	is total sales from EV charging during On-peak period
$Sales_{Shoulder}$	is total sales from EV charging during Shoulder-peak period

Illustrative proposed TOU rates based on the approved FCA cost of $0.221919/kWh for Q1 FY2023 are shown in Figure 5-8. To calculate the effective rate for residential EV Consumption, the Purchase Power Cost Adjustment (PPCA) and the higher tier base rate are added to the proposed TOU rates with the results shown in Figure 5-9.

5.5 Potential Savings for Participating Customers

To ensure that the proposed Residential EV TOU Rate provides sufficient savings to customers and in turn drive EV adoption in PR, LUMA estimates the potential savings that residential customers will receive when enrolling in this rate (exclusive of any fixed charges for metering and other fixed costs, borne by customers, that could be incorporated into the rate). Figure 5-11 shows the range of potential savings based on two powertrains – gasoline and battery-electric vehicle, and four charging rates – current residential base rate, On-peak, Off-peak and Shoulder-peak rates.

Figure 5-11: Potential Savings



As seen in Figure 6-8, residential EV drivers would save over $1,000 annually ($90/month) on their “fuel” costs, when switching from gasoline-powered vehicle to EVs and upward of $1,280 annually ($107 a month) when charging their EVs solely during Off-peak hours. Additionally, current EV drivers can potentially save $135 annually when shifting all of their EV charging consumption to Off-peak hours.

5.6 Recovery of Metering and Fixed Costs

LUMA proposes that the cost of separate EV charger metering and other fixed costs associated with the implementation of the Residential EV TOU Rate shall be borne by participating customers as an additional fixed charge on their bill. These costs will be estimated by LUMA based on more detailed implementation planning activities to be completed as part of the Phase 1 EV Plan.

5.7 Proposed Changes to Other Rate Riders

As discussed, the Residential EV TOU Rate will replace the FCA for the EV charging consumption of participating customers. These customers will still be required to pay for their non-EV consumption. This section focusses on the changes requires to the charges for participating customers’ non-EV consumption to maintain 1) revenue neutrality and 2) the required effects of certain riders.

On a monthly basis, LUMA will have four metered kWh quantities available for EV participants:

- Total consumption from the main meter
- On-, Shoulder- and Off-peak consumption from the EV charging submeter

A fifth quantity, the non-EV charging consumption of the customer, can be readily determined by subtracting the EV consumption (sum of On-, Shoulder- and Off-peak consumption) from the total consumption. Using these quantities, LUMA proposes the following changes to the billing calculation of

the participating customers for the other components of their bill. These changes should be further reviewed and discussed in the subsequent rate review proceeding and may be subject to revisions by LUMA.

Table 5-3: Initial proposal of treatment of other GRS rate components for non-EV charges on bill

Rates Component / Rider	Proposed Adjustment
Base Rate	No change. Tiered pricing will be applied based on **total consumption** (non-EV + EV charging consumption)
FCA – Fuel Cost Adjustment	Applied to **non-EV consumption**
PPCA – Purchased Power Cost Adjustment	No change. Applied based on **total consumption** (non-EV + EV charging consumption)
FOS – Fuel Oil Subsidy	No change. Applied based on **total consumption** (non-EV + EV charging consumption)
CILTA – Contributions in Lieu of Taxes	No change. Applied based on **total consumption**
SUBA-HH – Help to Humans Subsidies	No change. Applied based on **total consumption**
SUBA-NHH – Non Help to Humans Subsidies	No change. Applied based on **total consumption**
EE – Energy Efficiency	No change. Applied based on **total consumption**
NM – Net Metering	Credit will be based on what the participating customer would otherwise pay for their **total consumption (non-EV and EV consumption)**
SC – Securitization Charges	Placeholder – adjustment to be determined if and when this rider is applied
QF – Purchases from Qualifying Facilities	Not applicable to residential customers
LP – Life Preserving Discount	No change. Applied based on **total consumption**
DD – Direct Debit	No change. Applied based on **total consumption**
TUP – True-up of Provisional Rates Increase	No change. Applied based on **total consumption**

The table below provides a simplified view as to how the base rate and riders would apply to the total consumption, non-EV charging consumption or EV charging consumption in determining the EV charging bill component (green) and the other billing components (red).

Rates Component / Rider	Total Consumption	
	Non-EV charging Consumption	EV charging Consumption
Base Rate	Non-EV component	
FCA – Fuel Cost Adjustment	Non-EV component	**EV charging component covered under Interim TOU EV rates**
PPCA – Purchased Power Cost Adjustment	Non-EV component	
FOS – Fuel Oil Subsidy	Non-EV component	
CILTA – Contributions in Lieu of Taxes	Non-EV component	
SUBA-HH – Help to Humans Subsidies	Non-EV component	
SUBA-NHH – Non Help to Humans Subsidies	Non-EV component	
EE – Energy Efficiency	Non-EV component	
NM – Net Metering	Credit, if any, based on what they would otherwise pay for their total consumption (non-EV charging and EV charging consumption)	
SC – Securitization Charges	Placeholder only	
QF – Purchases from Qualifying Facilities	Not applicable to residential customers	
LP – Life Preserving Discount	Non-EV component	
DD – Direct Debit	Non-EV component	
TUP – True-up of Provisional Rates Increase	Non-EV component	

5.8 Proposed Deferral and Variance Accounts

LUMA proposes to establish two deferral accounts as part of the introduction of the Interim TOU EV Rates

1. As discussed above, the proposed Residential EV TOU Rate is specifically designed to be revenue neutral assuming no change in participating customers' EV charging behavior. To the extent that participating customers shift their consumption from higher-priced TOU periods to lower-priced TOU periods, the Residential EV TOU Rate will not be revenue neutral and LUMA would experience a revenue shortfall. To address such a possibility, LUMA proposes to establish a deferral account for any such revenue shortfalls for future recovery. Recognizing the potential longer term benefits that would accrue to all customers through shifting of EV charging consumption to periods when energy costs and system demand are lower, one possible

approach would be to utilize the existing FCA variance recovery mechanism to recover any FCA shortfalls due to the introduction of the Residential EV TOU Rate in subsequent periods.

2. LUMA will also incur additional costs to establish the IT and billing infrastructure necessary for billing participating customers, promote the Residential EV TOU Rate to residential EV owners in PR and evaluate the effectiveness of the Interim TOU EV rates. LUMA proposes to establish a deferral account for these additional costs for future recovery. These costs will be estimated by LUMA based on detailed planning for these various activities to be completed as part of the Phase 1 EV Plan.

6. Proposed Evaluation Approach

This section describes a staged implementation of the Residential EV TOU Rate that will enable a robust evaluation of impacts. The implementation approach reflects an experimental design that will test the effectiveness of one or more treatments (in this case TOU rates) and identify the impact of these treatments on an outcome variable of interest (participant EV consumption behavior). Careful and deliberate design is essential to ensure a robust evaluation that can deliver actionable insights.

The Uniform Methods Project[29] notes that "t*he optimal evaluation scenario for a consumption data analysis is a randomized control trial (RCT) experimental design."* An RCT is an experimental design in which a sample drawn from a known population is randomly assigned to a treatment group (to which the experimental treatment is applied) and a control group (to which the treatment is not applied). This ensures that the expected value of the treatment effect is equal to the true value in the population from which the sample is drawn.

One form of RCT often applied in energy efficiency, demand response, and rate-based evaluations enlists a sampling strategy known as "recruit-and-delay". The procedure works in the following manner: applicants to a rate are either enrolled in the rate (and so become treatment participants), or wait-listed – (hence, the term "recruit-and-delay") and so act as control customers. Consequently, the underlying population to which estimates of the treatment effect apply are those customers with an interest in enrolling in the rate.

Consequently, the proposed enrollment strategy is to solicit applications from EV driving customers on the understanding that of those that apply approximately 300 customers[30] will be enrolled in the rate, either

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[29] National Renewable Energy Laboratory, *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures – Chapter 8: Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol*, April 2013. https://www1.eere.energy.gov/wip/pdfs/53827-8.pdf

30 This sample is ambitious – approximately 5% of the approximately 5,952 EVs on the road in PR in 2021 (data received during the second technical workshop) – and may not be attainable. The proposal directly addresses contingencies to be applied should customer enrollment fall materially below that targeted.

This initial sample size has been suggested by LUMA's consultant and evaluator, Guidehouse, based on that firm's prior experience in evaluating rate pilots (particularly those targeted to EVs) in North America. No power analysis has been proposed to estimate the sample size required to attain (for example) statistically significant impact estimates under assumed pilot outcome conditions. The value of such an exercise would likely be quite low, given the input data that would need to be used for such an analysis are sufficiently inappropriate (in terms of geography, rate design, metering style, etc.) that any conclusions it would offer would be relatively low confidence.

as participants or control customers. All customers enrolled in the rate will be equipped with TOU metering equipment and provided with some form of incentive to ensure that they agree to its installation.

All enrolled applicants would continue to be subject to standard rates for a 3-month baseline period. In this period none of the enrolled customers would be subject to TOU rates. In the 4th month of the baseline period the evaluator would perform a stratified (e.g., by charging type, vehicle model, etc.) random allocation of enrolled applicants to participant and control group and validate the allocation.[31]

After the 3-month baseline period the treatment (the TOU rate) would be applied to the customers allocated to the participant group. Following an additional 12-month treatment period, impacts could be estimated using a lagged dependent variable (LDV) regression analysis. An LDV regression analysis is a special case of the difference-in-difference estimator that takes advantage of additional covariates (e.g., seasonal patterns) to improve estimated precision. This estimator is consistent (unbiased in repeated samples) and effectively controls for contemporaneous impacts from non-treatment exogenous effects (e.g., the introduction of public health measures, extreme weather events, etc.) ensuring very robust estimated impacts.

Should enrollment be lower than expected, smaller sample sizes could be used, though such sample sizes will affect the precision of the estimated impacts and make it more challenging to estimate robust impacts for sub-groups of interest (e.g., Level 1 versus Level 2 charging).

[31] The experimental design can be validated by estimating the "impacts" of the pilot on the participant group during a portion of the baseline period using the same regression model specification as will be applied for the treatment period evaluation. If the estimated treatment effect in the baseline period is trivially small and not statistically significant, the evaluator can have a high degree of confidence that the final estimated impacts will also not be biased.

7. Exhibits

7.1 List of EV Rates Reviewed

Table 7-1 shows a list of EV rate programs and pilots reviewed by LUMA and described in Section 3.

Table 7-1: List of EV Rates Reviewed

Electric Company Name	Program Name	Rate Structure	Residential / Public Charging Rate
Appalachian Power Company (Virginia)	Off-Peak Charging Rate (RS-PEV)	TOU - Whole House Meter	Residential
Con Edison	Residential TOU with Price Guarantee and Reduced Monthly Customer Charge	TOU - Whole House Meter	Residential
Delmarva Power	Residential Whole House TOU Rate	TOU - Whole House Meter	Residential
Duquesne Light Company	Whole Home EV Rate	TOU - Whole House Meter	Residential
Evergy (Kansas Central)	Residential EV Rate	TOU - Whole House Meter	Residential
Madison Gas & Electric	Shift & Save TOU Rate	TOU - Whole House Meter	Residential
New York State Electric & Gas	Residential EV TOU Rate	TOU - Whole House Meter	Residential
Orange & Rockland Utilities	SC 19 EV TOU Rates with Price Guarantee	TOU - Whole House Meter	Residential
Potomac Electric Power Company	Residential Whole House TOU Rate	TOU - Whole House Meter	Residential
Public Service Company of Oklahoma	Residential Service Plug-In EV Rate (RSPEV)	TOU - Whole House Meter	Residential
Rochester Gas and Electric Corporation	Residential EV TOU Rate	TOU - Whole House Meter	Residential
Baltimore Gas and Electric	Evsmart Vehicle Charging TOU Rate	TOU - Separate Meter	Residential
Delmarva Power	Plug-In Vehicle Rate Plan	TOU - Separate Meter	Residential
Evergy (Missouri Metro)	Residential TOU Rate	TOU - Separate Meter	Residential

Georgia Power Company	Plug-In EV Rate	TOU - Separate Meter	Residential
Hawaiian Electric Company	Residential Interim TOU Service (Schedule TOU-RI)	TOU – Whole House & Separate Meter	Residential
Minnesota Power	Residential EV Rate	TOU - Separate Meter	Residential
Public Service Gas and Electric (New Jersey)	Residential EV Distribution Only (Schedule RS)	TOU - Separate Meter	Residential
Atlantic City Electric	Rate MGS-SEVC	TOU - Reduced Demand Charge	Public
Avista Utilities	Commercial EV Rate (Schedule 23)	TOU - Reduced Demand Charge	Public
Baltimore Gas and Electric	Rider 5 - EV Charging Distribution Demand Credit	TOU - Reduced Demand Charge	Public
Central Maine Power	Rate B-DCFC Optional Targeted Service Rate	TOU - Reduced Demand Charge	Public
Florida Power & Light	DCFC Public Charging Demand Limiter	TOU - Reduced Demand Charge	Public
Hawaiian Electric Company	Commercial Public EV Charging Facility Service Pilot (EV-F)	TOU - Reduced Demand Charge	Public
PECO	Pilot Discount for Fast Charging Infrastructure	TOU - Reduced Demand Charge	Public
Public Service Company of Oklahoma	Commercial EV Fleet Rate (CEVF)	TOU - Reduced Demand Charge	Public
Public Service Gas and Electric (New Jersey)	Commercial Distribution Demand Charge Rebate (Schedule GLP)	TOU - Reduced Demand Charge	Public
Pacific Gas & Electric Company	Business EV Rate (BEV1)	TOU - Fixed Demand Charge	Public
Pacific Gas & Electric Company	Commercial EV Rate (BEV2)	TOU - Fixed Demand Charge	Public
Alabama Power Company	Rate Rider PEV Plug-In Electric Vehicle	Off-Peak Charging Discount	Residential
Ameren Illinois	Residential EV Rate Program	Off-Peak Charging Discount	Residential

Ameren Illinois	Optional EV Charging Program (Rider EVCP)	Off-Peak Charging Discount	Residential/ Multi-Family
Appalachian Power Company	Residential Off-Peak Charging Rate	Off-Peak Charging Discount	Residential
Potomac Edison	Off-Peak Rewards Program	Off-Peak Charging Discount	Residential
Public Service of Colorado	Optimize Your Charge	Off-Peak Charging Discount	Residential
Duke Energy	Residential EV Managed Charging Pilots	Fixed Monthly Subscription Charge	Residential

7.2 Draft Tariff Sheet for Residential TOU EV Rate

This section provides a draft tariff sheet for the draft Residential TOU EV Rate. This is only meant to provide an example and will be replaced by detailed tariff terms and conditions which will be developed and reviewed in an Adjudicative proceeding on EV Rates.

DRAFT Residential Electric Vehicle Time-of-Use Rate

DESIGNATION:

EV TOU

AVAILABLE:

Available to residential customers in single-family units everywhere in Puerto Rico for service only to electric vehicle (EV) loads including battery charging and accessory usage.

APPLICABLE:

This rate schedule shall apply to residential customers for domestic use. This schedule is available to residential customers who purchase or lease an on-road plug-in EV and charge the vehicle through a connection to the LUMA electric distribution system at their primary residence on a separate meter exclusively used for the purpose of charging Plug-in Electric Vehicles (PEVs).

Participation requires the installation of a smart charger capable of measuring and transmitting hourly time-of-use data. The customer is responsible for all costs associated with the equipment and installations needed for its replacement. Service under this rate will commence when the appropriate equipment has been installed.

A plug-in electric vehicle is any vehicle propelled by an engine that utilizes, at least in part, on-board electric energy from a battery charging system. Electric vehicles include plug-in hybrid-electric vehicle (PHEV) and battery electric vehicles (BEV). Low speed EVs and electrically powered motorcycles or bicycles are not eligible for this rate option.

One objective established by the Energy Bureau for the EV TOU Rate is to mitigate any adverse impact of load growth on the system, while encouraging DG and storage deployment. Therefore, the EV TOU Rate is not a replacement to NEM interconnection agreements already executed with customers. A NEM customer enrolling in the EV TOU Rate is still a NEM customer contractually and legally. EV TOU enrollment will be through an amendment to the customer's existing interconnection agreement, rather than invalidating the customer's existing interconnection agreement.

ENROLLMENT CRITERIA:

Customers taking service under this rate plan are required to demonstrate eligibility by providing the following:

1. Documentation verifying possession, through ownership or lease, of an EV as determined by LUMA's sole discretion and appropriate home charging equipment.
2. The customer must maintain and provide a valid, current registration for electric vehicles charging at the account location.
3. The customer must provide certification that service under this rate will be for EV charging only, and such additional certification as LUMA may determine is required.
4. Identification number(s) of the EV charging equipment

CHARACTER OF SERVICE:

This is a supplementary service for customers who are currently on General Residential Service (and others as applicable) and replaces the Fuel Cost Adjustment Rider charge that the customer would otherwise pay for their EV charging consumption as measured by the separate PEV meter.

For the purposes of calculating the other components of the customer bill, the total consumption as measured by the main meter will be adjusted to reflect the customer's EV charging consumption as measured by the separate PEV meter and this adjusted quantity will be used to determine the Fuel Cost Adjustment Rider charges that will apply.

TIME-OF-USE RATING PERIODS:

On-peak, Off-peak and Shoulder-Peak hours shall be those listed below. On-peak, Off-peak and Shoulder-peak hours shall begin at the same time for each day of the week.

DETERMINATION OF TIME-OF-USE ENERGY USAGE:

The Customer shall install networked EV Charging equipment to measure the customer's EV charging kilowatt hour usage by time-of-day rating periods defined below.

RATES:

All customers served on this rate schedule will be charged based on their usage during the following On-, Shoulder-, and Off-peak periods:

TOU Period	Time Period	Ending Time	Customer Charge
On-peak	5:00 PM	11:00 PM	0.259841per kWh
Shoulder-peak	11:00 PM	9:00 AM	0.221919 per kWh
Off-peak	9:00 AM	5:00 PM	0.129920 per kWh

**Rates does not include applicable taxes*

MINIMUM CHARGE:

The Minimum Charge shall be the Service Charge plus any applicable Adjustments.

LATE PAYMENT CHARGE:

The Late Payment Charge of one and one-half percent (1.5%) per monthly billing period will be applied if payment is not received by the due date on the bill.

OTHER APPLICABLE SURCHARGES:

All surcharges applicable to Schedule GRS shall also apply to Schedule EV TOU and shall be added to the customer's monthly bill.

RECONCILIATION CLAUSES AND RIDERS:

This rate shall vary with changes in the Fuel Cost Adjustment Rider applicable to customers taking power under the General Residential Service rate (and others as applicable).

TERMS AND CONDITIONS OF SERVICE:

1. **Terms of Service:** Customers receiving service under this Schedule may elect to change to another applicable rate schedule but only after receiving service on this Schedule for at least 12 consecutive months. If a customer elects to discontinue service on this Schedule, the customer will not be permitted to return to this Schedule for a period of one year.
2. **Changes of Address:** The address of the EV submeter must be at the same address as the customer's main meter. Participating customers must report any change of address to LUMA within ten business days of the effective date of the change of address. As of the effective date of the change of address, LUMA will default to using the current tariff of the primary meter for all load at that premises. LUMA will effectuate any required rate and billing changes coincident with the start of the next billing cycle.
3. **Qualification for Schedule EV TOU:** Customer taking service under this Schedule must demonstrate eligibility to the satisfaction of LUMA.
4. **Use of Energy by Customer:** For purposes of this tariff, the provision of EV charging service for which there is a direct per kWh charge shall not be considered resale of service.
5. **Voltage:** Service under this schedule will be supplied at the standard lighting voltage.
6. **Metering:** Residential EV TOU Rate shall be separately served and metered and must at no time be connected to facilities serving customer's other loads. The point of Delivery must contain equipment to separately meter EV charging facilities. Service under this Schedule is provided at the sole option of LUMA and based upon the availability of metering equipment and customer infrastructure improvements necessary for charging.
7. **Failure of Meter Timing:** Should the timing device on the meter fail causing the On-peak, Off-peak and Shoulder-peak energy consumptions to be incorrectly registered, participating customers will be billed on the consumption, as registered, on the otherwise applicable residential rates.
8. **Load Control:** Where LUMA determines that the operation of the EV charging facilities may interfere with service to that customer or other customers, LUMA at its option may install a load management device to manage the customer EV charging load and/or when EV

charging will occur. LUMA may, from time to time, interrupt electric service to the EV charging load when there is insufficient generation to meet a projected peak demand period (at the discretion of LUMA), automatically via an under-frequency relay when LUMA's system frequency drops to a specified level, or for evaluation purposes. Company shall not be liable for any loss or damage caused by or resulting from any interruption of service except in the case of gross negligence on the part of LUMA.

9. **Load Profile Data Recording:** In addition, and for purposes of monitoring customer load, LUMA may install at its expense, load searching metering to profile the load served and may collect such data at reasonable time intervals. LUMA's data collection activities shall not interfere with the provision of service under this Schedule.
10. **Facility Access:** The customer shall supply, at no expense to LUMA, a suitable location for meters and associated equipment used for billing and for load research. The rate contemplates that this service will utilize existing facilities with no additional major expenditures. Customer shall reimburse LUMA for any expenditure for facilities necessary to serve this load which would not otherwise be required to serve customer's load.
11. **Interconnection:** Customers taking service under this Schedule shall have no electrical interconnection beyond LUMA's Point of Delivery between electrical loads eligible for service under this Schedule and any other electrical loads.
12. **Rule and Regulations:** Service supplied under this Schedule shall be subject to LUMA's Rules and Regulations.
13. **Survey:** Customers participating in the receiving service under this Schedule, may be asked to participate in surveys and reviews of LUMA's electric vehicle residential rates and services.
14. **Special Terms and Conditions:** LUMA reserves the right to inspect at all reasonable times the devices which qualify the residence for service and for any program incentives under this Schedule. If LUMA finds that in its sole judgement the availability conditions of this tariff are being violated, it may discontinue billing the customer under this Schedule and commence billing under the appropriate residential service rate schedule.
15. **Billing Calculation:** A Customer's bill is calculated according to the rates and conditions above.