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 LUMA's Written Comments

MOTION TO SUBMIT LUMA'S WRITTEN COMMENTS ON ELECTRIC VEHICLES CHARGING INFRASTRUCTURE TOPICS

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:

1. On August 26, 2021, this Puerto Rico Energy Bureau (the "Energy Bureau") issued a Resolution (the "August 26 Resolution") indicating that it "deemed necessary and prudent to examine the necessary requirements to promote the efficient and orderly deployment of charging infrastructure for electric vehicles, to promote and facilitate their proliferation in Puerto Rico" and commencing a proceeding to evaluate matters related to such deployment. *See* August 26 Resolution at p. 1 (translation ours). The Energy Bureau further indicated that it deemed convenient to obtain the input of the various interest groups in the energy sector and parties interested in topics related to the use of electric vehicles. *See id*. at p. 2. To that effect, this Energy Bureau scheduled a virtual Workshop of Interested Parties for September 23, 2021, at 10:00 a.m. to "commence the dialogue on the tendencies for the adoption of electric vehicles and to promote the deployment of the necessary infrastructure." *See id*. (Translation ours).

2. In the August 26 Resolution, the Energy Bureau also provided interested parties until October 7, 2021, to submit their comments in writing. *See id*. at p. 3.

3. On September 23, 2021, the Energy Bureau held the mentioned virtual Workshop of Interested Parties wherein LUMA participated, among other interested parties.

4. On October 6, 2021, LUMA requested an additional thirty (30) days to submit written comments in this proceeding.

5. LUMA herein submits, as **Exhibit A**, its written comments on the questions raised by the Energy Bureau during the virtual Workshop of Interested Parties as well additional information on topics related to electric vehicle charging infrastructure deployment for the consideration of the Energy Bureau.

WHEREFORE, LUMA respectfully requests that the Energy Bureau **accept** and **consider** this filing of LUMA's written comments in connection with the subject matter of this proceeding.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 5th day of November 2021.

I hereby certify that I filed this Motion using the electronic filing system of this Energy Bureau.

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Exhibit A

LUMA's Initial Comments on Electric Vehicle Charging Infrastructure

Initial Comments on Electric Vehicles Charging Infrastructure

NEPR-MI-2021-0013

November 5, 2021

1.0 Introduction

On September 23, 2021, the Puerto Rico Energy Bureau conducted the Electric Vehicles Workshop in Case No. NEPR-MI-2021-0013. The purpose of the workshop was to gather input from stakeholders on how to improve electric vehicle penetration in Puerto Rico, with an emphasis on promoting the deployment of electric charging infrastructure.

LUMA appreciates this type of early discussion and collaboration with the Energy Bureau and stakeholders, which can help anticipate the need for future development of processes, programs and technologies to meet changing regulatory requirements and market conditions.

LUMA understands that electric vehicles (EV) are an important part of Puerto Rico's policy goals and the critical role that the electric utility and the grid plays to advance EV adoption in Puerto Rico. EVs will offer numerous benefits to customers. We recognize that this fundamental transformation of the automobile industry is already underway, and we are eager to engage in the planning processes required to prepare for this imminent transition.

The Energy Bureau and industry stakeholders have understandably identified EV charging infrastructure as a key enabling technology for EV adoption. While putting in place the specific assets for EV charging is a precursor for increased adoption, LUMA would like to broaden/expand this discussion to also consider the generation, transmission and distribution system infrastructure that is required to support EV charging infrastructure. EVs represent a significant amount of increased demand for electricity. Charging infrastructure depends on a reliable grid and adequate power supply (e.g. generation). Developing EV charging infrastructure without planning for required grid upgrades and adequate supply would negatively impact EV penetration in Puerto Rico.

It is important that proactive planning take place to understand impacts on the system and necessary changes and additions to the existing electric infrastructure.

LUMA's objective in this discussion is to encourage the Energy Bureau and stakeholders to carefully plan and coordinate any policy actions that may accelerate new technology deployment so that they do not come at the expense of our pressing need to restore the system in the near-term and improve reliability for all. We must consider the time it takes to rebuild the system, to restore system reliability and enable sufficient resource availability that EV charging depends on. This objective is in line with LUMA's strategy for Recovery & Transformation, outlined below:

- **Recovery**. The T&D system is in poor condition from inadequate maintenance and subsequent storm damage, which have deteriorated system performance, safety and reliability. The Recovery phase begins with the restoration of the utility's infrastructure and processes to a well-functioning state. During this phase, LUMA will complete foundational investments to repair the grid in the near term (one to three years) while implementing new processes, systems, and training for more effectively managing fundamental utility operations. During this period, LUMA's development of the next Integrated Resource Planning will include EV demand forecasting to inform mid and long-range distribution system investment planning and help prepare for the EV transformation.

- **Transformation**. As the utility recovers, LUMA will accelerate the pace of Transformation by training employees on the knowledge, skills, and abilities they need to manage advanced technologies and systems. In this Transformation phase, the utility will be redesigned to meet Puerto Rico's energy policies and needs for the coming decades. This phase will accelerate the

transition to greater reliance, and eventually full reliance on renewable generation and distributed energy resources, made possible through advanced operational systems and technologies designed for the utility of the future.

CURRENT **STATE**	NEAR TERM **ACTION PLAN**	MID-LONG-TERM **ACTION PLAN**	FUTURE **STATE**
Electric grid that is unreliable and highly vulnerable to future threats due to decades of damage, deferred maintenance, and underinvestment	**Recover while building the foundation for transformation.** 1. Remediate damaged and neglected assets to improve reliability and resiliency 2. Deploy modern grid enabling technologies 3. Increase interconnection of renewables and battery storage by streamlining the customer process 4. Begin delivery of energy efficiency and demand response programs 5. Collect data, conduct analysis and develop tools for improved operations and customer engagement 6. Train workforce to operate modern grid	**Accelerate transformation.** 1. Increased investment in advanced grid modernization technologies 2. Increased procurement of renewable energy and storage 3. Increased integration of advanced grid operations systems, controls, and processes	**Modern, distributed, smart grid platform leveraging 100% renewable energy resources**

2.0 Questions for Initial Comment

There are many important questions to address when planning for the transition to electric vehicles. LUMA has reviewed the thoughtful comments provided by stakeholders about the various ways to promote and accelerate EV adoption. There is an extensive body of literature available on promoting EV adoption as well as “EV Readiness Frameworks” to help local governments and city planners prepare. LUMA will not restate those here. Below are LUMA’s responses to the Energy Bureau’s request for initial comments. We look forward to engaging constructively with the Bureau and other stakeholders in this process.

2.1 Will the utility be able to own and operate charging stations?

Ownership of public charging infrastructure is a heavily debated issue and there are compelling reasons for and against utilities owning charging stations. The private sector is currently leading the EV charger installation effort in Puerto Rico. Market forces will inevitably continue to drive further adoption of electric

vehicles and the charging infrastructure needed to service them, as EV prices decline and as facility owners use charging stations to attract customers, employees and tenants. The utility is not currently in the financial position nor, given the pressing needs for fundamental transformation, does LUMA have the ability to make ownership and/or operation of a competitive vehicle charging business a priority. For this reason, it would be advantageous to focus on policies that further enable and facilitate private sector development of EV charging stations.

LUMA's role in the EV charging marketplace is to facilitate private sector adoption through streamlined interconnection procedures, stakeholder outreach/education, operation and maintenance of distribution lines up to the meter and balancing energy supply and demand. Charging facility owners are responsible for providing a competitive service to customers. These owners should also provide all charging equipment behind the meter as well as any infrastructure upgrades required to accommodate increased load. Charging facility owners will be treated similarly to other commercial businesses with a new service request.

2.2 How will charging stations' owners charge or bill to clients?

In Puerto Rico, current regulations would require a retailer reselling energy to clients for EV charging on a $ per kWh basis to register as an electric services company. This is one area where policymaking could facilitate private-sector development of charging infrastructure by making allowances in utility regulations to facilitate the establishment of charging stations without requiring companies to be registered as an electric services company.

Appropriate rate structures will also need to be developed (especially time-of-use). Careful planning and design is required to ensure that targeted rates address the barriers to adoption without resulting in additional unintended consequences to non-EV adopting customers. For example, a recent Rocky Mountain Institute study detailed challenges designing a rate that does not undercut direct-current fast-charger economics in the early years but also doesn't leave the utility (and ratepayers) shouldering extra costs.[1] A recent NYSERDA study noted that "absent pricing strategies to incentivize customers to charge during off-peak periods, the added load from PEV charging could increase peak electricity demand, especially in the summer, and increase costs for utilities and customers."[2]

These examples demonstrate that it can be difficult to establish policies, regulations and incentives when vehicles, charging stations and user behavior are still in a state of rapid development. There is a risk that a tariff change could quickly become ineffective or outmoded due to changes in technology or market conditions. Additional dedicated and/or upgraded metering infrastructure (i.e. AMI) will likely be required to enable the utility and/or station owners to charge clients, especially for time-of-use rates. We do not offer these examples to dissuade ratemaking for electric vehicles, but to suggest that they require careful planning and design by the Energy Bureau to maximize the benefits of EVs to both customers and the grid.

[1] https://rmi.org/wpcontent/uploads/2019/09/DCFC_Rate_Design_Study.pdf
[2] https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Transportation/EV-Pricing.pdf

2.3 Must the Government supply the land from its inventory for charging stations development, for instance along highways? Does a special procedure need to be adopted?

It is not mandatory that the government must supply land. Nevertheless, this might be a beneficial incentive to encourage development of strategically located charging infrastructure, or to encourage "adaptive re-use" of underutilized land that could be retrofitted and repurposed.

Capacity maps identifying transformer loading could provide developers with some information on network locations for siting EV charging stations. This information could also help identify government-owned locations in areas suitable for charging station development without significant additional infrastructure upgrades. However, many government facilities may not be in convenient areas for EV drivers, so chargers may be underutilized relative to those located at workplaces and retail parking lots which are more convenient to drivers.

2.4 Must zoning allow for complementary uses, like food trucking?

There are many zoning policies, codes and regulations that will need to be modified and/or adopted to accommodate electric vehicles. In general terms, EV charging infrastructure facilities should be treated like any other land-use. There should be application and approval processes in place so permitting can be standardized and streamlined. These zoning issues are situationally dependent, largely the domain of local zoning authorities, and beyond the purview or expertise of LUMA to comment on at this point.

Many government agencies are developing EV "Readiness Guidebooks" that provide resources to help navigate planning, zoning, permitting, infrastructure, incentives and stakeholder outreach for accelerating local EV adoption.[3] Producing a similar guidebook for Puerto Rico would be one valuable opportunity for the Energy Bureau and/or stakeholders to identify the main barriers to adoption in Puerto Rico and develop comprehensive, integrated and systematic strategies for addressing them.

3.0 Additional Discussion Topics

LUMA would like to submit the following additional information to the ongoing discussion around planning for the EV transformation in Puerto Rico.

3.1 Resource Adequacy

Near-term EV policy research and development should also consider ways to mitigate resource adequacy constraints by, for instance, shifting peak demand to utilize renewable resources during the daytime hours. Most vehicle charging is expected to occur during evening hours. This is true for light-duty vehicle owners (passenger vehicles) where vehicles will be plugged in overnight as well as most fleet vehicles, when charging will occur after hours to ensure fleet vehicles are fully charged at the start of each workday. Recent months have shown that PREPA does not have the available baseload generating resources to adequately meet current load. The current generating fleet cannot support the promotion of

[3] For example, see "Zero-Emission Vehicles in California: Community Readiness Guidebook." https://www.ca-ilg.org/sites/main/files/file-attachments/zev_guidebook.pdf?1436996039

additional load and such an increase would materially raise the risk of a baseload capacity shortfall relative to demand.

There are two key challenges for Puerto Rico's energy system if there is an accelerated deployment and resulting load increase. Policy actions would need to be taken in order to lower risks of insufficient supply:

1. **Peak Demand Challenges**: EV charging can burden the electricity grid by adding load at inopportune times. Adding large amounts of vehicle charging during peak demand periods when the generation supply may be struggling to meet increased demand is extremely problematic for the system. While curtailment of EV charging behind the meter cannot be required, there are managed charging controls and approaches that can be utilized to mitigate or curtail charging loads during high risk periods. In addition, DER (solar and storage) can also be used to mitigate daytime charging impacts.

2. **Demand Curve Challenges** – The "duck curve" is a situation that arises (and must be mitigated) as solar energy becomes a greater share of the total generation supply. As solar production increases during daytime hours, the net load (customer demand minus solar generation) decreases, as depicted in Figure 1 below. Then, as solar production ebbs during late afternoon, thermal generation and batteries need to ramp up to meet the net load without the solar contribution. This phenomenon is exacerbated in Puerto Rico because utility scale wind generation is largely coincident with solar. Typically, EV charging schedules will coincide with system peak demand, further exacerbating the duck curve issue by increasing the evening ramp and the daily system peak. Figure 1 illustrates the increased ramping requirements in California as solar generation has increased over the years.

Figure 1: Illustration of the California Duck Curve

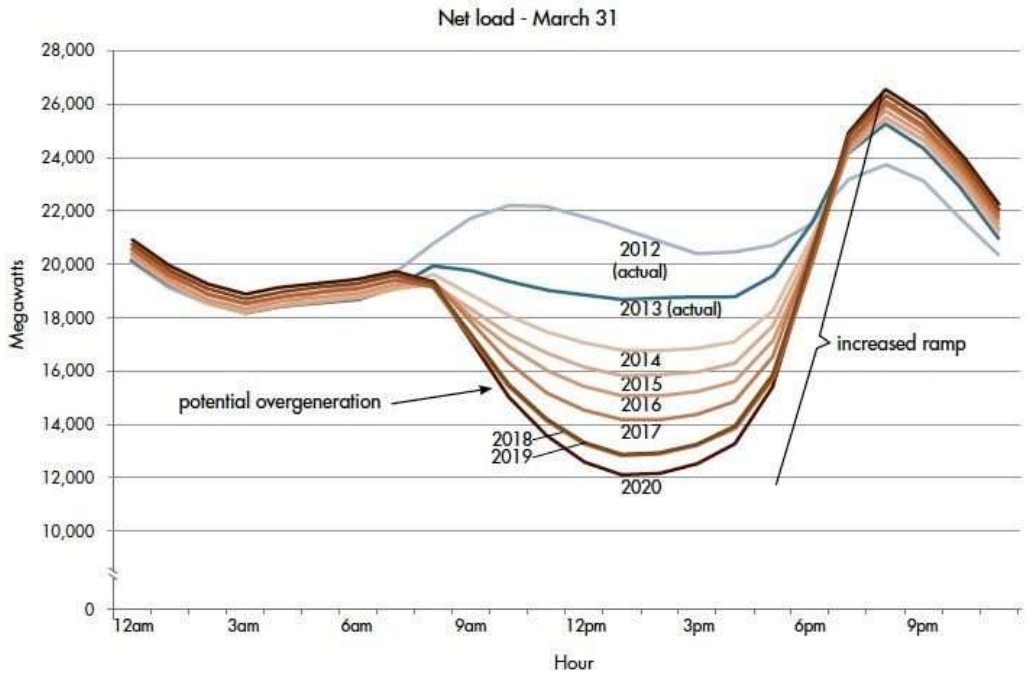
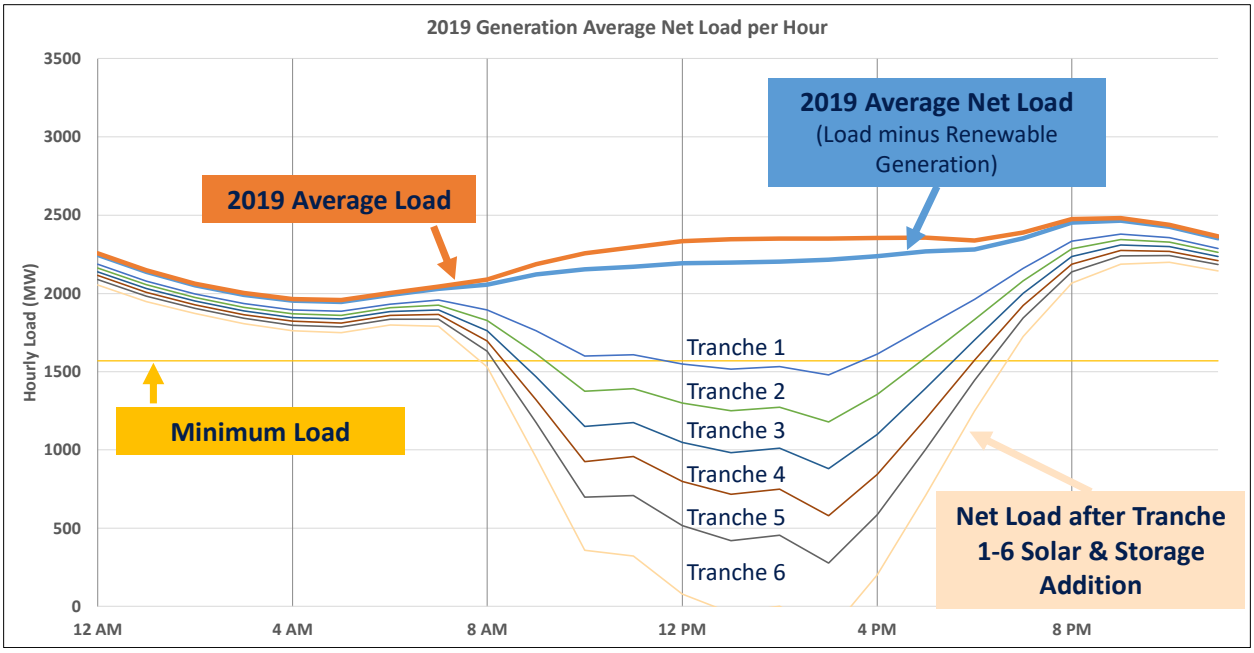


Figure 2 depicts the duck curve that is anticipated to result from the addition of Tranches 1-6 of Puerto Rico's solar and storage procurement. As renewable generation becomes a larger part of overall supply,

meeting the demand of customers during the peak evening hours will become more difficult if not mitigated. The increased ramp on the diagram graphically shows the difficulty system operators will have when switching from renewables to other forms of energy as solar radiation decreases until the sun goes down. The increased ramp in the late afternoon would have to be managed by the system operator by quickly increasing dispatch of available generation. This requires generation sources that can quickly increase output and are immediately responsive to system operator controls. During peak renewable generation (midday), operators risk curtailment of energy due to over production which will negatively affect the cost per kWh.

Figure 2: Illustration of Potential Puerto Rico Duck Curve



Encouraging daytime charging of EVs is a potential way to fill the duck curve "trough" and create a more consistent load throughout the day. Daytime charging can be incentivized in many ways to encourage employers to provide charging stations at workplace locations. LUMA and the Energy Bureau will need to explore creative strategies to plan and manage the many implications of the duck curve and the effect of EV penetration, in Puerto Rico.

Controllable storage could also be used to manage the afternoon ramp and Distributed Energy Resources (DER) could also provide renewable generation for EVs. For home charging, a combination of solar plus storage can be used to for EV charging in the event of an outage. However, this scenario also has challenges as most residential DER systems are only sized to maintain critical loads and charge a battery storage system and would need to be much larger than typical to also charge a vehicle battery.

3.2 Grid Impacts

Increase in load from electric vehicles (especially fleets) will eventually exceed feeder capacity and require system upgrades. Current residential electrical infrastructure in Puerto Rico may limit the ability to install EV chargers, where the load capacity design per home is usually limited to 5-7 kW. An EV charger could increase a home's load to nearly 10 kW, which may overload service transformers at higher penetrations, as many existing service transformers are limited to 10-25 kW.

Load capacity upgrade projects have different phases including planning and permitting. It is important that an evaluation process is followed to ensure quality of the service and reliability on the system for the neighboring customers. In some instances, these evaluations require system modeling and other studies, including grid improvement cost estimates that require time to prepare. Managed charging strategies may offer a way to reduce impacts and reduce the need for grid upgrades.

As electric vehicle owners seek faster charger times, there will be pressure on charger owners, whether public or private, do deploy fast charging. “Fast Chargers” can be 50 kW, 150kW, or 350 kW in size. For reference, a 350 kW charger can fully charge a vehicle in under 45 minutes. However, station owners may have difficulty incorporating fast chargers into their facilities due to the size of these chargers. For perspective, a large grocery store has an average peak demand of 300-500 kW. For a facility owner, installing these chargers can be the “kW load” equivalent to putting another large grocery store into a single parking slot. If multiple chargers are placed, and multiple chargers are utilized during peak times, the usage will put a strain on the infrastructure and the utility bill of the facility owner.

When the facility owner is a commercial building or a public/private charging station incorporating fast charging will likely require infrastructure upgrades. If two 150 kW fast-chargers are installed, the owner’s facility demand will increase to approximately 350 kW. The facility may not be designed for the additional load. Hence, “capacity available” at a facility can act as a barrier to charger deployment. This barrier will take the form of the additional cost incurred by a facility owner for infrastructure upgrades as well as additional cost the increased peak demand costs from the chargers may put on the facility’s utility bill.

For larger chargers (greater than level II), data collection and monitoring of charging usage profiles is important for understanding the load that chargers may put on the electricity grid. In addition, communications with chargers will be necessary in order to collect charging data and track usage. Smart charging systems can track and communicate charging data and should be promoted. Absent the end-user charger intelligence, utilities often require meters to be installed with the charger to directly track charger usage.

LUMA suggests the following areas for further research and analysis to improve grid-readiness for the electric vehicle transformation:

- Conduct baseline market research to understand current penetration of EVs and forecast the expected rate of growth. This will help understand the timing of EV adoption in Puerto Rico to determine if any additional policies are needed to influence that trajectory. This baseline would also help to estimate the impact that policies or incentives might have on the rate of deployment, providing valuable input for policy makers and T&D system planning.
- Investigate the development of a Transformer Load Management Program to monitor the power profile of distribution transformers, to help optimize asset replacement strategy and prevent overloading that might burn out transformers as EV penetration increases.
- Develop forecasts for the spatial distribution of electric vehicle adoption for each type of facility (workplace, fleet, public, retail, single/multi-family, etc.). This will help plan for land use and infrastructure impacts and help to understand and mitigate socioeconomic factors that may limit equitable access.
- Analyze charging patterns and load profiles (frequency, duration, energy/demand per charge, time of day), for different types of facilities, vehicles and chargers.

- Investigate methods for registering EV charging infrastructure installation to enable monitoring the rate of growth to plan for grid impacts.

LUMA looks forward to working with the Energy Bureau and stakeholders in order to move forward with informed policy to promote EV adoption while increasing the reliability and resilience of the grid.