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

IN RE: INTERCONNECTION REGULATIONS	**CASE NO.:** NEPR-MI-2019-0009 **SUBJECT:** Default Smart Inverter Settings Profile (Smart Inverter Settings Sheets) Approval and Establishment of Working Group Process.

RESOLUTION AND ORDER

I. Relevant Factual Background

On April 4, 2024, the Solar and Energy Storage Association of Puerto Rico ("SESA") filed with the Energy Bureau of the Puerto Rico Public Service Regulatory Board ("Energy Bureau") a letter stating that LUMA Energy ServCo, LLC and LUMA Energy, LLC (collectively "LUMA") had posted in its website Technical Bulletin 2024-0001 Smart Inverter Settings Sheets ("Smart Inverter Settings") that purportedly provided smart inverter requirements with an effective date of June 1, 2024.

On June 18, 2024, the Energy Bureau held a stakeholder workshop ("June 18 Stakeholder Workshop") through which issues associated with the adoption of Smart Inverter Settings were discussed.

On June 28, 2024, the Energy Bureau issued a Resolution and Order ("June 28 Order") through which the Energy Bureau sought stakeholder comments regarding the smart inverter requirements discussed during the June 18 Stakeholder Workshop.

Comments were received by Enphase Energy Inc. ("Enphase"), Sunrun Inc. ("Sunrun"), SESA, and Tesla Inc. ("Tesla").[1]

On September 13, 2024, LUMA filed a document titled *Motion to Submit Revised Technical Bulletin regarding Smart Inverter Settings Sheets issued by LUMA*, ("September 13 Motion") through which, LUMA provided a revised Technical Bulletin titled *Smart Inverter Settings Sheets* and accompanying Exhibits 1 and 2 which addressed stakeholder comments and other stakeholder feedback. LUMA also proposed October 17, 2024 as an effective date for the revised Technical Bulletin to enter into effect and asserted it was a reasonable timeframe given the clarifications and revisions made.[2]

On September 17, 2024, LUMA filed a document titled, *Motion to Submit Revised Technical Bulletin Regarding Smart Inverter Settings Sheets and Request to Substitute Exhibits 1 and 2 Submitted on September 13, 2024* ("September 17 Motion"), through which LUMA provided revisions to the Smart Inverter Settings. LUMA explained that the revised Technical Bulletin contained in the September 17 Motion addressed proposed revisions and most recent comments that were inadvertently omitted from the revised Technical Bulletin submitted through the September 13 Resolution.[3]

On September 26, 2024, the SESA filed a document titled *Motion in Support of Revised Technical Bulletin on Smart Inverter Setting Sheets* ("September 26 Motion"), through which SESA supported most of the revisions made by LUMA to the Smart Inverter Settings Sheets filed with the September 17 Motion.

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[1] Enphase comments received July 15, 2024; Sunrun comments received July 15, 2024; SESA comments received July 16, 2024, and Tesla comments received August 20, 2024.

[2] September 13 Motion, III. Submittal of Revised Tech. Bulleting, ¶ 5.

[3] September 17 Motion, ¶ 2.

II. Stakeholder Comments

A. Enphase Comments

On July 15, 2024, Enphase submitted comments regarding the implementation of specific smart inverter functions in accordance with IEEE 1547-2018 and UL 1741-SB. Enphase explains that it is a manufacturer of residential and commercial clean energy technologies, including solar, batteries and electric vehicle service equipment. Enphase supports SESA's comments (summarized below), including;

1. The effective date of default smart inverter settings should be three months following an Energy Bureau's Resolution and Order on the matter, and

2. "Voltage – Active Power (Volt/Watt)" smart inverter functionality should be deactivated upon LUMA's initial implementation of IEEE 1547-2018 requirements.

In addition, Enphase states that resolution of several issues is needed before LUMA implements Volt-Watt functions and recommends that the Energy Bureau initiate a working group to:

1. Establish a process and timeline for LUMA to address persistent high grid voltages within its distribution network to mitigate customer generation losses due to Volt-Watt settings;

2. Establish a process for customers to report and for the industry to track high voltage issues on the grid that would activate Volt-Watt settings and lead to generation losses; and

3. Implement structures to compensate customers for lost energy generation when persistent occurrences of high voltage often curtail solar generation due to Volt-Watt settings.

Enphase recommends that when the issues it has raised are resolved, implementation of Volt-Watt functionality should be enabled only by mutual agreement between LUMA and the customer when voltages above the ANSI C84 requirements are recorded and remain engaged until the grid voltage can be brought into compliance with the ANSI C84 requirements. Enphase relates that it supports the IEEE 1547-2018 standard and implementing smart inverter functions and that their implementation must consider the system owner's return on investment.

B. Sunrun Comments

On July 15, 2024, Sunrun submitted comments on the enablement/disablement of specific functions and associated power requirements and UL 1741-SB and SA smart inverter certification. Sunrun asserts that it supports integrating the automated functionalities of smart inverters to improve system stability, increasing hosting capacity, enhancing reliability, and reducing operating costs for all ratepayers. However, it asserts that the standards and default settings must be addressed further. Specifically, Sunrun lists as requiring additional consideration; compensation to DER owners for the grid services provided by default settings, LUMA's responsibilities regarding current voltage and other grid operating issues that trigger the default settings or otherwise adversely affect DER performance, and customer protections against excessive curtailment of their DER system.[4]

[4] Sunrun comments, p. 2.

1. Sunrun recommends that the Energy Bureau adopt an *Emergency Grid Ready Interconnection Pilot Program* based on best practices to expand hosting capacity and interconnection opportunities, improve system stability and reliability under high levels or DER penetration, and address customer protection and equity concerns. Sunrun asserts that the pilot program would address two issues of immediate concern: Ensure equitable treatment of existing residential solar customers by enhancing forward looking Expedited DER Registration processes to make sure existing customers do not incur retroactive financial responsibility for interconnection study costs or system upgrades and that this situation does not reoccur.

2. Expedite DER Registration interconnections, meet grid needs and provide customer protection through a multi-prong process by 1) leveraging smart inverter functions to safely interconnect customer sited DERs, 2) requiring timely execution of interconnection agreements and 3) establishing compliance timelines for the utility to identify and upgrade customer service transformers where needed.[5]

Sunrun explains that certain smart inverter functionalities with explicit customer protections should be implemented and that a set fee should be established for interconnection application. The consumer protections would protect customers from the effects of curtailment due to high voltage conditions and facilitate customer interconnection without undue delay or costly system upgrades. The establishment of an interconnection application fee would facilitate cost sharing of the interconnection study process and any identified customer service upgrade. Sunrun recommends that the application fee be set at $350 for new expedited DER Registrations.[6]

C. SESA Comments

On July 16, 2024, SESA submitted a comprehensive counterproposal to the April 1, 2024 version of the Smart Inverter Settings which was posted on LUMA's website. SESA affirmed its full support for the comments submitted by Sunrun and Enphase and asked for an attempt to facilitate consensus among LUMA, OIPC, SESA, and other interested parties.[7] In its comments, SESA edited explicit sections of the Technical Bulletin 2024-0001 published by LUMA on its website.

Through the September 26 Motion, SESA emphasizes the need for at least a three-month implementation window after the specific Smart Inverter Settings are finalized by the Energy Bureau. SESA also makes additional corrections and comments throughout the Smart Inverter Settings submitted by LUMA with the September 17 Motion.[8]

SESA also recommends including the Frequency-Droop Settings (Frequency-Watt) in the Smart Inverter Settings Sheet. Noting that the parameters recommended by SESA align with the default settings specified in Table 24 of the IEEE STD 1547-2018, the Energy Bureau agrees with the inclusion of these default settings. Nevertheless, these would be discussed with LUMA during upcoming stakeholder meetings.

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[5] *Id.* at pp. 2 - 3.

[6] *Id.* at pp. 3 – 5.

[7] SESA comments, July 16, 2024, p. 1.

[8] *See*, September 26 Motion, Attachment 1.

D. TESLA Comments

On August 20, 2024, Tesla submitted comments regarding the implementation of specific smart inverter functions in accordance with IEEE 1547-2018 and UL 1741-SB. Tesla explained that it has significant experience in implementing smart inverter technologies in other jurisdictions and is familiar with associated best practices, and that its interest is as an inverter manufacturer and manufacturer of residential battery energy storage and solar systems.[9] Tesla expressed significant concern with LUMA's most recent draft Smart Inverter Settings and any potential expedited implementation timeline. Tesla made three significant recommendations, which are:

1. The Energy Bureau should support a timeline that requires systems installed after a certain date to eventually implement the new Smart Inverter Settings within a more reasonable timeframe. In support of this recommendation, Tesla explains the harm that may result to the grid and implementation of residential solar and battery storage if manufactures are forced to expedite new Smart Inverter Settings within a short timeline. To achieve this, Tesla recommends that the actual implementation of Smart Inverter Settings be required at the end of 2024 or a commensurate timeline if approval of LUMA proposed smart inverter settings is delayed.[10]

2. The Volt-Watt setting should be deactivated until the Energy Bureau directs it to be turned on, following a further stakeholder process, to avoid significantly curtailing customer solar generation and battery storage dispatch. Tesla asserts that due to persistent overvoltage on the Puerto Rico grid, implementing the Volt-Watt settings as proposed will cause a portion of residential solar and battery energy storage systems to constantly curtail active power generation to a degree that would prevent the system form injecting into the grid. Tesla recommends that LUMA be required to work with manufacturers and other stakeholders to find a reasonable Volt-Watt setting or other solution and that it not be permitted to activate the Volt-Watt setting until a reasonable solution is developed and approved by the Energy Bureau. Tesla argues that a higher Volt-Watt triggering threshold than proposed is necessary to prevent frequent deactivations.[11]

3. The Volt-Var setting triggering threshold should be increased to avoid reducing the efficacy of residential solar and storage energy systems which would cause those systems to provide customers and the grid with only a portion of their intended value. Tesla asserts that the frequent triggering that would result from the proposed Volt-Var setting threshold would result in uncompensated grid services and underperformance of customers solar and battery energy storage systems. Under the proposed thresholds, more than half of customers' new systems would be curtailed the majority of the time, potentially resulting in reduced customer system life and uncompensated grid support a majority of the time. Tesla recommends increasing the Volt-Var triggering threshold to reduce the incidence of customer uncompensated grid services.[12]

[9] Tesla comments, p. 1.

[10] *Id.* at p. 4.

[11] *Id.* at p. 5.

[12] Tesla comments, pp. 7 – 8.

III. Discussion

LUMA submits through the September 13 Motion, as subsequently revised through the September 17 Motion, a revised Technical Bulletin titled *Smart Inverter Settings Sheets* and accompanying Exhibits 1 and 2 which address stakeholder comments and other stakeholder feedback. LUMA states that the revised Technical Bulletin is issued in alignment with IEEE 1547-2018 and considers stakeholder feedback provided during the Technical Conference/Stakeholder Workshop held on June 18, 2024 and from later discussions with stakeholders.[13] LUMA asserts that the updated Technical Bulletin is clarified and addresses appropriate and substantive comments from stakeholders. LUMA summarizes the revisions to the Technical Bulletin as primarily consisting of: a) Editorial revisions to ensure the bulletin language better aligns with the language in the IEEE 1547-2018; b) the addition of Enter Service requirements to ensure that the DERs can connect to the grid and inject power under non-nominal voltage conditions; and c) the postponement of the Volt-Watt function enablement. LUMA states that this last change was made in light of developers' concern about the impact of voltage regulation on active power generation of the DERs and that after six months, **LUMA will evaluate the system performance and determine whether the Volt/Watt function needs to be enabled under certain scenarios.**[14] LUMA asserts that the revised Technical Bulletin enhances compliance with Regulation 8915 improves system stability and operation under high penetration of DER. It relates that, with the Smart Inverter Settings, feeder hosting capacity is increased which enables an increased number of interconnections to a feeder before triggering a supplementary study or the need for grid upgrades. LUMA reiterates the need for a clear and binding mechanism to recover costs for supplemental studies and associated network upgrades from small DGs and asserts that to ensure grid safety and reliability, a holistic approach is needed. LUMA states that, along with such a solution, it would favor increasing the feeder interconnection threshold from 15% to 30% of the feeder annual peak load. LUMA, however, asserts these measures would not address the ongoing backlog of past due payments for supplemental studies and the related network upgrades associated with small DGs. LUMA notes, however, that as penetration levels increase, operational conditions and reliability considerations will require revisiting the Technical Bulletin.[15]

It is noteworthy that LUMA has considered stakeholder comments and other input and has modified the Technical Bulletin to reflect those comments and input. SESA, one of the commenters, states in its September 26 Motion it, "expresses its strong support for the content of the Technical Bulletin included in LUMA's September 17 filing," with certain noted exceptions. SESA requests that the Energy Bureau approve, with the modifications it presents in the September 26 Motion, the revised Technical Bulletin LUMA submitted through its September 17 Motion. SESA also asks that the Energy Bureau order "that the Volt-Watt functionality rather than being "[d]eactivated for at least 6 months since deployment of this bulletin" as presented in the September 17th filing, shall be subject to a subsequent Resolution and Order by the Energy Bureau."[16]

During a 6-month period the Energy Bureau will consider LUMA's recommendations pertaining to system performance, as it relates to this function, and also those for customer protections and system operations made by a Working Group, established in this Resolution and Order, before granting final approval of Volt-Watt functionality to LUMA.

A significant concern expressed by SESA is the Commencement Date in the revised Technical Bulletin proposed by LUMA. SESA is concerned that the effective date set forth by LUMA

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[13] September 13 Motion, I. Introduction, ¶ 2.

[14] *Id.* at III. Submittal of Revised Tech. Bulletin, ¶1 (emphasis added).

[15] *Id.* at III. Submittal of Revised Tech. Bulletin, ¶4 .

[16] September 26 Motion, p.3.

would not allow adequate time for the requested modifications in its Appendix A, publication of the final version of the revised Technical Bulletin and adequate training for companies to correctly implement the changes to the Smart Distributed Energy Resources Settings. SESA indicated that although it previously recommended an effective date of at least three months following Energy Bureau approval, it would now support an implementation date of 30 days following Energy Bureau issuance of a Resolution and Order approving the Smart Inverter Settings, contingent upon the incorporation of SESA's proposed modifications into a revised final version of the Technical Bulletin. In addition, SESA asks that the Energy Bureau facilitate regular meetings to discuss potential changes to the Smart Inverter Settings Sheets. SESA proposes bi-annual meetings and lists suggested parties to be included and topics for discussion.[17] The Energy Bureau acknowledges LUMA's efforts in revising the Technical Bulletin to reflect stakeholder comments and input. Much of the commenters' input has been incorporated and is supported by SESA in accordance with prior discussion.

The Energy Bureau **APPROVES** the revised Smart Inverter Settings Sheets submitted by LUMA through the September 17 Motion **with the modification specified below**. The Energy Bureau addresses the effective date and collaborative process, which are proposed in various comments, as set forth below.

IV. Revised Smart Inverter Settings Sheets

The Energy Bureau **APPROVES** the September 17 Motion Smart Inverter Settings Sheets with the following modification. LUMA shall modify the Table 2-7 (Volt-Watt Settings) to reflect as "Activated" and shall modify the corresponding footnote (3) to read as follows:

> (3) Will remain Deactivated for at least 6 months. Not earlier than June 30, 2025, the Energy Bureau will consider approving, through Resolution, the activation of this function after considering: (i) recommendations from LUMA and Working Group regarding system performance, (ii) implementation of adequate reporting and tracking requirements for customer curtailment, and (iii) LUMA has developed an effective plan to manage distribution voltage, that relies on Volt-Watt functionality as a last resort mechanism to temporarily correct voltage issues.

The Energy Bureau **ORDERS** LUMA to, within five (5) business days of the notification of this Resolution and Order, file a final version of the Smart Inverter Settings Sheets that reflect the modification described above. Furthermore, the Energy Bureau **ORDERS** LUMA to make the modified Smart Inverter Settings **effective January 1, 2025**.

V. Energy Bureau Smart Inverter Working Group Process

The Energy Bureau adopts Enphase's recommendation to initiate a follow-up working group process and directs stakeholders to discuss the following issues using the Working Group calendar as delineated in the table below:

1. EPRI Common File Format (IEEE 1547.1-2020, Annex B)
    a. Frequency Droop Parameters

2. Customer Protections for System Curtailment
    a. Reporting Mechanisms and Requirements: PREB, LUMA, OIPC
    b. Complaint Form, Part of Power Quality periodic reports?
    c. Escalation Process: LUMA to propose a process for consumers to escalate curtailment issues.

[17] *Id.* at p. 4.

d. Periodic Reporting: LUMA to propose how to file periodic reports quantifying curtailment impacts.

3. High Voltage Management: LUMA to describe how they address and manage sites with existing high voltages.
   a. Voltage Monitoring: LUMA to describe if AMI deployment can be prioritized at locations with DERs to establish a voltage monitoring process.
   b. Volt-Var, Volt-Watt operational sequence.

4. Normal Ramp Up Rate specifications

5. Development of Site-Specific Utility Required Settings Profile

6. Compensation Structure for Grid Services

Smart Inverter Working Group Schedule	
Date	**Topics, Activities**
November 21, 2024	• EPRI Common File Format (IEEE 1547.1-2020, Annex B) • Customer Protections for System Curtailment
December 11, 2024	Filing of Written Comments
January 14, 2025	• High Voltage Management • Normal Ramp Up Rate specifications • Development of Site-Specific Utility Required Settings Profile
February 4, 2025	Filing of Written Comments
March 11, 2025	• Compensation Structure for Grid Services
April 1, 2025	Filing of Written Comments

The Energy Bureau will timely issue an agenda before these virtual meetings.

VI. Conclusion

The Energy Bureau **APPROVES** the Smart Inverter Settings Sheets as modified herein.

The Energy Bureau **ESTABLISHES** a Smart Inverter Working Group process as described herein to address the implementation and possible modifications to the approved Smart Inverter Settings Profile.

The Energy Bureau **WARNS** LUMA that, under Act 57-2014, as amended:

(i) noncompliance with this Resolution and Order, regulations and/or applicable laws may carry the imposition of fines and administrative sanctions[18] of up to twenty-five thousand dollars ($25,000) per day;

(ii) for subsequent violations, the Energy Bureau may impose penalties of up to twenty-five thousand dollars ($25,000) per day, with the possibility of increased fines up to five hundred thousand dollars ($500,000);

(iii) any person who intentionally violates this Resolution and Order or fails to comply with any rule or decision of the Energy Bureau, may be subject to criminal charges, punishable by imprisonment for up to six months or a fine of five hundred dollars ($500) to five thousand dollars ($5,000); for

[18] All administrative fines are subject to the limitations and dispositions contained as per Section 6.36. — Penalties for Noncompliance. (22 L.P.R.A. § 1054jj)

repeat offenses, the fine may increase to a fine of not less than ten thousand dollars ($10,000) nor greater than twenty thousand dollars ($20,000), at the discretion of the Energy Bureau.

Be notified and published.

Edison Avilés Deliz
Chairman

Lillian Mateo Santos
Associate Commissioner

Ferdinand A. Ramos Soegaard
Associate Commissioner

Sylvia B. Ugarte Araujo
Associate Commissioner

Antonio Torres Miranda
Associate Commissioner

CERTIFICATION

I certify that the majority of the members of the Puerto Rico Energy Bureau agreed on November 7, 2024. Also certify that on November 7, 2024, I have proceeded with the filing of this Resolution and Order and was notified by email to mvalle@gmlex.net; arivera@gmlex.net; Valeria.belvis@us.dlapiper.com; julian.angladapagan@us.dlapiper.com; Laura.rozas@us.dlapiper.com; agustin.irizarry@upr.edu; javrua@sesapr.org; hrivera@jrsp.pr.gov; contratistas@jrsp.pr.gov; aconer.pr@gmail.com; John.jordan@nationalpfg.com; pjcleanenergy@gmail.com; cfl@mcvpr.com; gcordero@crmjv.com; Steven.rymsha@sunrun.com; azayas@azeng.net; jberdner@enphaseenergy.com; jalmodovar@enphaseenergy.com; markb@enphaseenergy.com; mrosenfeldt@enphaseenergy.com; gferrer@enphaseenergy.com; kkoch@tesla.com; Andrew.Cote@generac.com.

I sign this in San Juan, Puerto Rico, today, November 7, 2024.

Sonia Seda Gaztambide
Clerk