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

IN RE:	**CASE NO. NEPR-MI-2019-0009**
INTERCONNECTION REGULATIONS	**SUBJECT: Motion to Submit Final Technical Bulletin Regarding Smart Inverter Settings Sheets in Compliance with Resolution and Order of November 7, 2024, and Request for Agenda for Workshop Scheduled for November 21, 2024**

MOTION TO SUBMIT FINAL TECHNICAL BULLETIN REGARDING SMART INVERTER SETTINGS SHEETS IN COMPLIANCE WITH RESOLUTION AND ORDER OF NOVEMBER 7, 2024 AND REQUEST FOR AGENDA FOR WORKSHOP SCHEDULED FOR NOVEMBER 21, 2024

TO THE PUERTO RICO ENERGY BUREAU:

COME NOW LUMA Energy ServCo, LLC and **LUMA Energy, LLC** (collectively "LUMA"), through the undersigned legal counsel, and respectfully state and request the following:

I. Introduction

LUMA is pleased to submit to the Puerto Rico Energy Bureau of the Public Service Regulatory Board ("Energy Bureau") a final version of LUMA's Technical Bulletin on Smart Inverter Settings Sheets, in compliance with the Energy Bureau's Resolution and Order of November 7, 2024.

This Technical Bulletin is issued pursuant to LUMA's responsibilities under the Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement[1] and aims to provide updated technical guidance aligned with the IEEE 1547-2018 standard for interconnection and interoperability of distributed energy resources ("DERs"). It is designed to enhance

[1] Puerto Rico Transmission and Distribution System Operation and Maintenance Agreement by and among LUMA, the Puerto Rico Electric Power Authority and the Puerto Rico Public Private Partnerships Authority dated as of June 22, 2020.

compliance with the Regulation for the Interconnection of Generators with the Distribution System of the Puerto Rico Electric Power Authority, Regulation No. 8915.

The Technical Bulletin outlines the specific settings required for smart inverters to ensure they meet standards for grid support and operational efficiency and includes adjustments to default settings, which aim to improve the integration and functionality of DERs within Puerto Rico's distribution system. These settings are part of a much-needed integrated approach to maintain grid safety and reliability.

This final version of the Technical Bulletin is the result of a process of revisions of an initial version published by LUMA in April 2024, resulting in a revised version submitted to the Energy Bureau on September 17, 2024. Additional modifications are being incorporated in this final Technical Bulletin.

As per the Energy Bureau's directives, the Technical Bulletin becomes effective on January 1, 2025.

II. Relevant Procedural History

1. On April 4, 2024, the Solar and Energy Storage Association of Puerto Rico ("SESA") submitted to the Energy Bureau a letter regarding an *Urgent Request Regarding LUMA's Publication of a "Smart Inverter Settings Sheets- Technical Bulletin"/ NEPR-MI-2019-0009* ("SESA's Request"), in which it objected to the validity of a Technical Bulletin published by LUMA on April 1, 2024, titled "Smart Inverter Settings Sheets- Technical Bulletin" (the "Technical Bulletin") which required compliance by distributed energy resources with the IEEE 1547-2018 standard for smart distributed energy resources settings as set forth therein. SESA also requested that the Technical Bulletin be subject to the Energy Bureau's approval and that stakeholder workshops be held before the approval, among other things.

2. On April 15, 2024, the Energy Bureau issued a Resolution and Order ("April 15th Order") in which, among others, it granted LUMA and the Independent Consumer Protection Office ("ICPO") until April 20, 2024, to present their position regarding SESA's Request. *See* April 15th Order on page 3. In addition, the Energy Bureau scheduled a Technical Conference for May 16, 2024, at 10:00 a.m. (the "May 16th Technical Conference") to discuss the "suitability of the requirement that a supplemental study be required for distributed generators ("DGs") interconnecting to a feeder exceeding 15% of its annual peak load[2] […] and the measures proposed by LUMA, in the [Manual of Technical Requirements for Interconnection submitted by LUMA in this proceeding[3]] and/or the Technical Bulletin, to reduce or manage the operational challenges of the high penetration of DGs and avoid or postpone having to make improvements in the distribution network". *See id.* at pages 2-3 (footnotes added; translation ours).

3. On April 22, 2024, LUMA submitted a response to SESA's Request indicating, among others, that the Technical Bulletin was not a regulation but rather a technical document that sought to apply the IEEE 1547-2018 standard for smart distributed energy resources as provided in, and in compliance with, Regulation 8915, and that, therefore, a rulemaking process was not required.

4. On May 3, 2024, SESA filed a *Reply to LUMA's April 22, 2024, Response to Urgent Request*, essentially reiterating their position regarding the Technical Bulletin and

[2] This is a requirement arising from the Regulation for the Interconnection of Generators with the Distribution System of the Puerto Rico Electric Power Authority, Regulation 8915 ("Regulation 8915"). *See* Regulation 8915, Section IV, Art. A, Parr. 4. It also appears in Section 1.28(B) of the proposed *Generating Facility and Microgrid Interconnection Regulation* issued by the Energy Bureau by Resolution of June 15, 2021.

[3] This refers to a manual proposed by LUMA in this proceeding, the most recent version of which was submitted on May 19, 2022. *See* LUMA's *Motion Submitting Complete Version of Technical Interconnection Requirements Document* filed on that date.

requesting the stay of the Technical Bulletin and that a regulatory review process be undertaken, among others.

5. On May 13, 2024, the Energy Bureau issued a Resolution and Order rescheduling the May 16th Technical Conference for June 18, 2024.[4]

6. On June 12, 2024, the Energy Bureau issued a Resolution ("June 12th Resolution") establishing an agenda for the "Technical Conference/Stakeholder Workshop" scheduled for June 18, 2024, and expanding the topics for Technical Conference/Stakeholder Workshop of June 18, 2024 to include how to best implement the grid support functionality of smart inverters and what equipment requirements are needed to orderly provide this capability to the electric grid. *See* June 12th Resolution on page 2.

7. On June 17, 2024, LUMA filed a motion submitting the presentation prepared by LUMA to be provided during the Technical Conference/Stakeholder Workshop scheduled by the Energy Bureau for June 18, 2024 (the "June 18th Presentation"). *See Motion to Submit Presentation for Technical Conference/Stakeholder Workshop Scheduled for June 18, 2024,* filed on June 17, 2024.

8. On June 18, 2024, the Energy Bureau held the June 18th Technical Conference/Stakeholder Workshop ("June 18th TC/Workshop").

9. On June 21, 2024, LUMA submitted a corrected version of June 18th Presentation and a redlined Technical Bulletin shown and discussed during the June 18th TC/Workshop as part of the June 18th Presentation and another revised version of the Technical Bulletin to address comments received during the June 18th TC/Workshop. *See Motion to Submit Presentation Shown*

[4] This was in response to a *Motion to Request the Rescheduling of the Technical Conference Set for May 16, 2024,* filed by LUMA on April 29, 2024.

at Technical Conference/Stakeholder Workshop Held on June 18, 2024, with Correction and Revised Technical Bulletin filed on June 21, 2024 ("June 21st Motion").

10. On June 25, 2024, SESA filed a *Request for Various Orders Regarding June 18th Conference and Technical Bulletin* in which it requested that the Technical Bulletin be subject to the Energy Bureau's review and approval, and that the Energy Bureau make a determination regarding the implementation schedule, among others.

11. On June 28, 2024, the Energy Bureau issued a Resolution and Order ("June 28th Order") granting stakeholders ten (10) business days to provide comments about "the enablement/disablement of specific functions and its associated power requirements and UL-1741-SB and SA smart inverter certification" and indicated that it would provide "guidance about the adoption of the discussed smart inverter requirements after evaluating the stakeholder comments".

12. On July 15, 2024, each Sunrun Inc., Enphase Energy, Inc. and SESA, separately submitted comments to the Energy Bureau in attention to the June 28th Order.

13. On August 20, 2024, Tesla, Inc. submitted comments to the Energy Bureau regarding the implementation of specific smart inverter functions in accordance with IEEE 1547-2018 and UL 1741-SB.

14. On September 13, 2024, LUMA filed with the Energy Bureau a *Motion to Submit Revised Technical Bulletin Regarding Smart Inverter Settings Sheets Issued by LUMA* ("September 13th Motion") in which it submitted an updated version of LUMA's Technical Bulletin and a redline version of an updated Technical Bulletin showing the changes made to the previous version of the Technical Bulletin submitted on June 21, 2024. *See* September 13th Motion on pages 1 and 8 and Exhibits 1 and 2. LUMA explained that the updated Technical Bulletin took into consideration the comments and suggestions shared by stakeholders during this process and

proposed that the Technical Bulletin enter into effect by October 17, 2024. *See id*. at pages 1, 8 and 9.

15. On September 17, 2024 LUMA submitted a *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 17th Motion") whereby LUMA submitted a revised Technical Bulletin to include an additional revision and requested this Energy Bureau to substitute the September 13th version with the version submitted with the September 17th Motion ("September 17th Technical Bulletin"). *See* September 17th Motion on pages 1-2 and Exhibit 1.

16. On September 26, 2023, SESA submitted a *Motion in Support of Revised Technical Bulletin on Smart Inverter Setting Sheets*, whereby SESA stated its support for the Technical Bulletin submitted by LUMA with some modifications and conditions proposed in their motion.

17. On October 1, 2024, Tesla Inc. submitted a document titled *Tesla, Inc. Response to LUMA's Motion to Submit Revised Technical Bulletin Regarding Smart Inverter Settings Sheets* in which it indicated it was conditionally supportive of the Technical Bulletin and proposed certain modifications set forth in their comments.

18. On November 7, 2024, the Energy Bureau issued a Resolution and Order ("November 7th Order") approving, among others, the Smart Inverter Settings Sheets in the September 17th Technical Bulletin 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.

See November 7th Order on page 6. The Energy Bureau also ordered LUMA to, within five (5) business days of the notification of the November 7th Order, file the final version of the Smart Inverter Settings Sheets reflecting the above modification and to make the modified Smart Inverter Settings effective January 1, 2025. *See id*.

19. In addition, the Energy Bureau established a "Smart Inverter Working Group process […,] to address the implementation and possible modification to the approved Smart Inverter Settings Profile" and directed the Working Group to discuss a list of issues set forth in the November 7th Order in virtual meetings to be held in accordance with a schedule set forth therein. *See id*. at pages 6-7. The Energy Bureau also indicated that it would timely issue an agenda before these virtual meetings. *See id*. at page 7. The first meeting in this schedule is set for November 21, 2024 to discuss the topics: "EPRI Common File Format (IEEE 1547.1-2020, Annex B)" and "Customer Protections for System Curtailment". *See id*.

III. Submittal of Technical Bulletin

20. In compliance with the November 7th Order, LUMA submits herein, in *Exhibit 1*, the final Technical Bulletin containing the final Smart Inverter Settings Sheets incorporating the modifications required by the Energy Bureau. As stated in the Final Technical Bulletin, the Smart Inverter Settings Sheets will be effective January 1, 2025.

IV. Request for Agenda

21. LUMA recognizes that the Energy Bureau has indicated that it will be timely issuing an agenda for the virtual meetings of the Working Group. LUMA respectfully proposes that these agendas be issued no later than seven (7) business days prior to the date of the meeting,

to allow LUMA sufficient time to prepare for these meetings, including any materials that may be necessary, if any, so as to more productively discuss the issues presented. Therefore, since the first meeting in the schedule is in six (7) days, LUMA respectfully requests that the Energy Bureau provide the agenda for that meeting as early as possible.

WHEREFORE, LUMA respectfully requests this Honorable Energy Bureau to **take notice** of the above; **accept** the final Technical Bulletin containing the final Smart Inverter Settings in *Exhibit 1* herein; **deem** LUMA in compliance with the November 7th Resolution and Order with respect to the finalization and submittal of such document; and **provide** the agendas for the Working Group meetings no later than seven (7) business days prior to the meetings, and in the case of the meeting scheduled for November 21, 2024, as earliest as possible.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 15th day of November 2024.

We hereby certify that we filed this Motion using the electronic filing system of this Puerto Rico Energy Bureau and that copy of this Motion will be notified to hrivera@jrsp.pr.gov; arivera@gmlex.net; mvalle@gmlex.net; agustin.irizarry@upr.edu; javrua@sesapr.org; contratistas@jrsp.pr.gov; aconer.pr@gmail.com; john.jordan@nationalpfg.com; cfl@mcvpr.com; and mqs@mcvpr.com.

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Exhibit 1

Final Technical Bulletin with Final Smart Inverter Settings

LUMAPR.COM

SMART INVERTER SETTINGS SHEETS

November 15, 2024

LUMA Energy publishes the Technical Bulletin 2024-001 to provide supporting technical information to the current regulation, *Regulation for the Interconnection of Generators with the Distribution System of the Puerto Rico Electric Power Authority and to Participate in Net Metering Programs*, Regulation No. 8915, February 6, 2017. This bulletin seeks to apply the IEEE 1547-2018 standard for smart distributed energy resources (DERs) settings. Regulation 8915 in its Article of Control and Protection, #2 indicates that "In addition to the requirements contained in this Section, the customer's DG must comply with applicable standards, including, but not limited to, IEEE 1547, IEEE 519 and IEEE/ANSI C37.90 (Standard for Relays and Relay Systems Associated with Electric Power Apparatus)".

The main purpose of adopting the requirements in this bulletin is to improve the system stability and operations under high penetration of DERs. Starting **January 01, 2025**, all DER applications must indicate the use of inverters meet the utility required default settings and functions that are specified in this bulletin.

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1. Required Smart Inverter Functions

Smart Inverters must be (a) UL 1741 SB listed, (b) set to the default setting provided in this document, and (c) perform the default functions, provided in this document, "Smart Inverter Settings Sheets".

Customers must comply with the requirements set forth in this "Smart Inverter Settings Sheets" except where alternative site-specific Smart Invert settings and function statuses are defined in the interconnection agreement as a result of a detailed interconnection study. Any alternative settings and function statuses defined in the interconnection agreement will take precedence and supercede the default settings and function statuses provided in this document. Notwithstanding the following provisions of this "Smart Inverter Settings Sheets", customer's Smart Inverter(s) shall conform with the requirements and functions required pursuant to interconnection agreement.

1.1. Communication Requirements

Table 1-1 lists the eligible communication protocols for Smart Inverters connected to the distribution system. Smart Inverters connecting to the distribution system shall be capable of supporting at least one of these protocols.

Table 1-1- List of eligible communication protocols

Protocol	Transport	Physical Interface/Layer
IEEE 2030.5 (SEP 2.0)	TCP/IP	Ethernet
IEEE 1815 (DNP3)	TCP/IP	Ethernet
SunSpec Modbus	TCP/IP	Ethernet
	N/A	RS-485

1.2. Smart Inverter Functions and Control Modes

Table 1-1 lists functions and control modes that must be supported by Smart Inverters as well as the default status of each function and control mode.

Table 1-2- Smart Inverter Control Modes

Applicable to Retail Customers Interconnected			
Function/ Control Mode of Operation	**Required/Optional**	**Description**	**Default Activation Status**
Anti-Islanding	Required	Refers to the ability to detect loss of utility source and cease to energize	Activated
Constant power factor	Required	Refers to Power Factor set to a fixed value.	Deactivated
Active Power- Reactive Power	Required	Refers to the control of real power output as a function of reactive power	Deactivated
Constant Reactive Power	Required	Refers to Reactive Power set to a fixed value	Deactivated
Voltage Ride through	Required	Refers to the ability of Smart Inverter to ride through a certain range of voltages before tripping off	Activated
Frequency Ride through	Required	Refers to ability of Smart Inverter to ride through a certain range of frequencies before tripping off	Activated
Voltage – Reactive Power (Volt/Var)	Required	Refers to control of reactive power output as a function of voltage	Activated
Voltage – Active Power (Volt/Watt)	Required	Refers to control of real power output as a function of voltage	Activated
Frequency Droop (Frequency – Watt)	Required	Refers to control of real power as a function of frequency	Activated
Enter Service	Required	Refers to the ability of smart inverters to begin operation with an energized utility source.	Activated.
Normal Ramp-up Rates	Optional	Refers to ability to transition between energy output levels over the normal course of operation	Activated, if available
Connect/Reconnect Ramp-up rate	Required	Refers to ability to have an adjustable entry service ramp rate when a DER restores output of active power	Activated

2. Smart Inverter Function and Control Mode Settings

This section lists the required settings for Smart Inverter functions and control modes.

2.1. Anti-Islanding

Smart Inverters shall detect the unintentional island and trip as specified in Table 2-1.

Table 2-1- Responses to Islanding and Open Phase Conditions - ACTIVATED

Applicable to Retail Customers Interconnected	
Condition	**Maximum Trip Time (s)**
Islanding/Open Phase	2

2.2. Response to Abnormal Voltage

2.2.1. Voltage Trip Settings

Smart Inverters shall meet the abnormal voltage response requirements, as specified in Table 2-2.

Table 2-2- Smart Inverter Response to Abnormal Voltage

Voltage Trip Settings	Default Voltage (pu)	Adjustable Range for Voltage (pu)	Default Trip/Clearing Time (s)	Adjustable Range for Trip Time (s)
Over Voltage 2 (OV2)	V ≥ 1.2	1.2	0.16	Fixed at 0.16
Over Voltage 1 (OV1)	V ≥ 1.1	1.1 - 1.2	13	1 - 13
Under Voltage 1 (UV1)	V ≤ 0.88	0 - 0.88	21	11 - 50
Under Voltage 2 (UV2)	V ≤ 0.5	0 - 0.5	2	2 - 21

2.2.2. Voltage Ride-Through

Smart Inverters shall meet the Low/High Voltage Ride-Through requirements, as specified in Table 2-3.

Table 2-3- Low/High Voltage Ride-Through Minimum Requirement – ACTIVATED

Voltage Range	Voltage Range (pu)	Operating Mode/Response	Maximum Ride Through Time (s) (design criteria)	Minimum Ride Through Time (s) (Design Criteria)
High Voltage 2	V ≥ 1.2	Cease to Energize	0.16	N/A
High Voltage 1	1.1 < V ≤ 1.2	Momentary Cessation	0.083	12
Near Normal Voltage	0.88 ≤ V ≤ 1.1	Continuous Operation	N/A	Infinite
Low Voltage 1	0.7 ≤ V <0.88	Mandatory Operation	N/A	20
Low Voltage 2	0.5 ≤ V ≤ 0.7	Mandatory Operation	N/A	10
Low Voltage 3	V ≤ 0.5	Momentary Cessation	0.083	1

2.3. Response to Abnormal Frequency

2.3.1. Frequency Trip Settings

Smart Inverters shall meet the abnormal frequency response requirements, as specified in Table 2-4.

Table 2-4- Smart Inverter Response to Abnormal Frequency

Frequency Trip Settings	Default Frequency (Hz)	Adjustable Range for Frequency(Hz)	Default Trip/Clearing Time (s)	Adjustable Range for Trip Time (s)
Over Frequency 2	f ≥ 62	61.8 - 66	0.16	0.16 - 1000
Over Frequency 1	f ≥ 61.2	61.2 - 66	300	21 - 1000
Under Frequency 1	f ≤ 58.5	50 - 58.8	300	21 - 1000
Under Frequency 2	f ≤ 56.5	50 - 57	0.16	0.16 - 1000

2.3.2. Frequency Ride-Through

Smart Inverters shall meet the Low/High Frequency Ride-Through requirements, as specified in Table 2-5.

Table 2-5- Low/High Frequency Ride-Through Minimum Requirement – ACTIVATED

Frequency Ride-Through Settings	Frequency Range (Hz)	Operating Mode	Minimum Ride Through Time (s)
High Frequency 2	f ≥ 62	N/A	N/A
High Frequency 1	61.2 < f ≤ 62	Mandatory Operation	299
Near Normal Frequency	58.8 ≤ f ≤ 61.2	Continuous Operation	Infinite
Low Frequency 1	57 ≤ f < 58.8	Mandatory Operation	299
Low Frequency 2	f ≤ 57	N/A	N/A

2.4. Voltage-Reactive Power Control Mode Settings

An example Volt-Var characteristic is shown in Figure 2-1. The voltage-reactive power characteristic shall be configured in accordance with the default parameter values specified in Table 2-6.

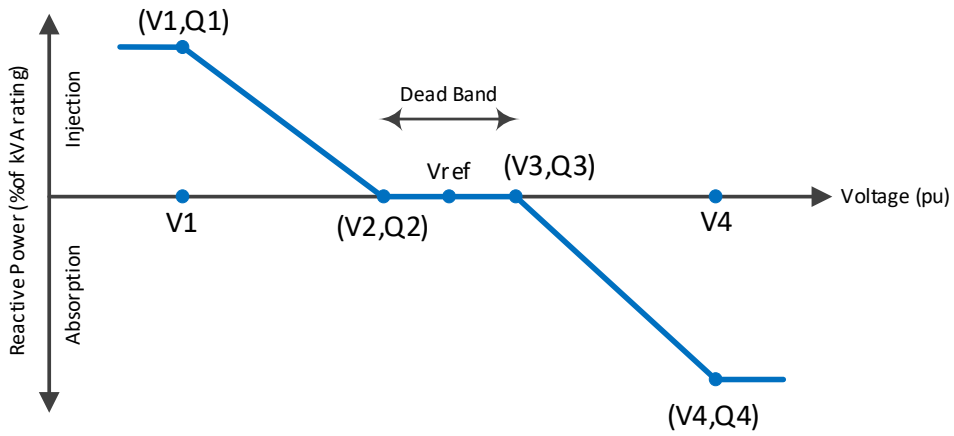

Figure 2-1. Example Volt-Var characteristic

Table 2-6- Volt-Var Settings – ACTIVATED

Volt-Var Parameters	Definitions	Default Values (% of nominal rating)	Allowable Range	
			Minimum	Maximum
Vref	Dead band center	VN	95% VN	105% VN
V2	Dead band lower voltage limit	98% VN	Vref – 3%VN	Vref
Q2	Reactive power injection or absorption at voltage V2	0	maximum reactive power capability, absorption	maximum reactive power capability, injection
V3	Dead band upper voltage limit	105% VN	Vref	105% VN
Q3	Reactive power injection or absorption at voltage V3	0	maximum reactive power capability, absorption	maximum reactive power capability, injection
V1	Voltage at which DER shall inject Q1 reactive power	92% VN	Vref – 18%VN	V2 – 2%VN
Q1[(1)]	Reactive power injection at voltage V1	44%	0	maximum reactive power capability, injection
V4	Voltage at which DER shall absorb Q4 reactive power	108% VN	V3 + 2%VN	Vref + 18%VN
Q4[(1)]	Reactive power absorption at voltage V4	44%	maximum reactive power capability, absorption	0
Open loop response time	Time to 90% of the reactive power change in response to the change in voltage	5 sec	1 sec	90 sec

[(1)] This requires that the Smart Inverter operates with a reactive power priority and generate/absorb reactive power to the ranges specified in this table irrespective of active power production.

2.5. Voltage-Active Power Control Mode Settings

Two examples of these characteristics are shown in Figure 2-2. The characteristic shall be configured in accordance with the default parameter values specified in Table 2-7.

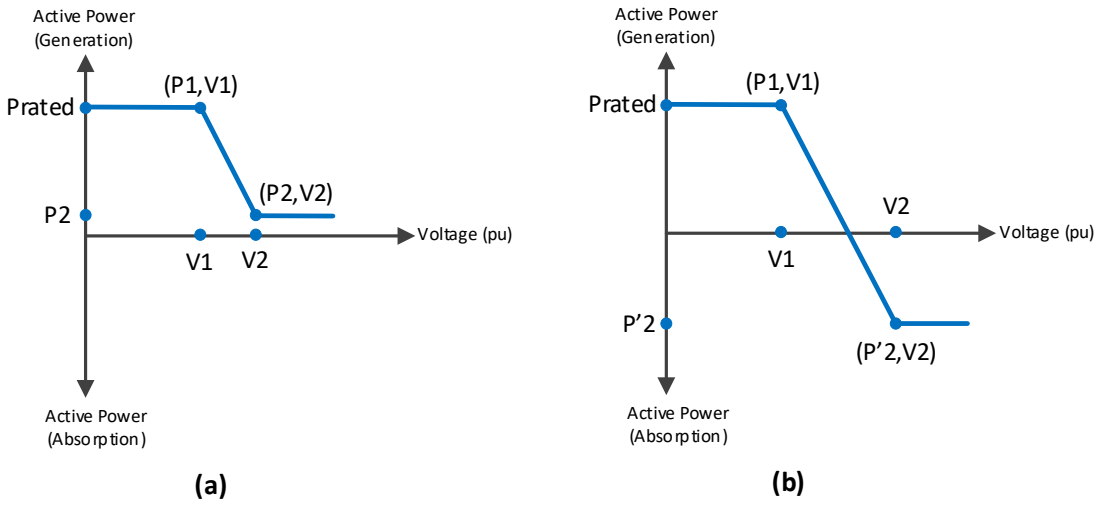

Figure 2-2. Example Volt-Watt characteristics

Table 2-7- Volt-Watt Settings – [3]ACTIVATED

Voltage-active power parameters	Default Settings	Ranges of allowable settings	
		Minimum	Maximum
V1	106% VN	105% VN	109% VN
P1	P_{RATED}	NA	NA
V2	110% VN	V1 + 1% VN	110% VN
P2 (applicable to DER that can only generate active power)	The lesser of 0.2 P_{RATED} or P_{MIN}[1]	P_{MIN}	P_{RATED}
P'2 (applicable to DER that can generate and absorb active power)	0	0	P'_{RATED}[2]
Open-loop response time	10 sec	0.5 sec	60 sec

[1] P_{MIN} is the minimum active power output in p.u. of the DER rating (i.e., 1.0 p.u.).
(2) P'RATED is the maximum amount of active power that can be absorbed by the DER.
(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.

2.6. Enter Service Settings

Smart Inverters shall be set to the Enter Service Settings in Table 2-8.

Table 2-8- Enter Service Settings

Enter Service Criteria			Ranges of allowable settings
Permit Service		Enabled	Enabled/Disabled
Applicable voltage within range	Minimum value	≥ 0.88 p.u.	0.88 p.u. to 0.95 p.u.
	Maximum value	≤ 1.06 p.u	1.05 p.u. to 1.06 p.u.
Frequency within range	Minimum value	≥ 59.5 Hz	59 Hz to 59.9 Hz
	Maximum value	≤ 60.1 Hz	60.1 Hz to 61.0 Hz
Enter Service Delay		300 s	0 seconds to 600 seconds
Enter Service Randomized Delay		N/A	1 second to 1000 seconds
Enter Service Ramp Rate		50 s	1 second to 1000 seconds

2.7. Ramp Rate Settings

The following is the ramp-rate requirement during normal and reconnection operation of Smart Inverters:

- Normal ramp-up rate (Optional): For transitions between energy output levels over the normal course of operation, the default value is 100% of maximum current output per second with a range of adjustment between 1% to 100%.
- Connect/Reconnect Ramp-up rate: Upon starting power into the grid, following a period of inactivity or a disconnection, the inverter shall wait for 300 seconds before reconnecting and shall be able to control its rate of increase of power from 1 to 100% maximum current per second. The default value is 2% of maximum current output per second. The maximum active power step during restoring output is 20%