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

In Re: INTERCONNECTION REGULATIONS	Case no. NEPR-MI-2019-0009 Subject: Response to Urgent Request filed by SESA on April 4, 2024

REPLY TO LUMA'S APRIL 22, 2024 RESPONSE TO URGENT REQUEST

TO THE HONORABLE ENERGY BUREAU:

COMES NOW, the Puerto Rico Solar Energy Industries Association Corp. dba Solar and Energy Storage Association of Puerto Rico ("SESA"), represented by the undersigned legal counsel, and very respectfully prays and requests:

I. Relevant Procedural History and Background

1. On March 22, 2024, LUMA Energy ServCo, LLC and Luma Energy, LLC ("LUMA") published on its website a document titled "Smart Inverter Settings Sheets – Technical Bulletin"[1] ("March 22 Technical Bulletin"), which LUMA informed would become effective on April 1, 2024. LUMA later removed the March 22 Technical Bulletin from the website.

2. On April 1, 2024, LUMA published another document titled "Smart Inverter Settings Sheets – Technical Bulletin"[2], (hereinafter, "Technical Bulletin"). While the Technical Bulletin was slightly different from the March 22 Technical Bulletin, the most significant change was its effective date, which according to LUMA would now be June 1, 2024.

3. On April 4, 2024 SESA submitted to the Puerto Rico Energy Bureau ("Energy Bureau") a letter titled "Urgent Request Regarding LUMA's Publication of a

[1] Please find the Smart Inverter Settings Sheets – Technical Bulletin published on March 22, 2024, as **Attachment 1** to this response.
[2] This document is already part of the record in this proceeding.

"Smart Inverter Settings Sheets – Technical Bulletin" ("SESA's Request") objecting to the legal validity of the Technical Bulletin and the manner in which it was published without the Energy Bureau's review and approval as required by Act 57-2014.[3]

4. On April 9, 2024, LUMA filed a motion requesting the Energy Bureau until April 18, 2024 to submit a response to SESA's Request.

5. On April 15, 2024 the Energy Bureau issued a Resolution and Order ("April 15 R&O") granting the Independent Consumer Protection Office ("ICPO") and LUMA until April 20, 2024 to present their position regarding SESA's Request. Also, the Energy Bureau indicated there would be a Technical Conference "to discuss…the measures proposed by LUMA, in the MTR or the 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."[4]

6. On April 19, 2024, the ICPO filed its motion to comply with the April 15 R&O ("Moción en Cumplimiento de Orden Emitida el 15 de abril de 2024"). In its motion, the ICPO stated that it had a meeting with representatives of LUMA to discuss questions regarding the Technical Bulletin.[5] In the meeting, LUMA informed the ICPO that the Technical Bulletin would have prospective effect for all Distributed Generators ("DG") and, allegedly, that DGs have the capacity of adjusting to the new specifications published in the Technical Bulletin without the need of additional equipment or components.[6] Consistent with SESA's position, the ICPO argued in its motion that there are valid concerns about the Technical Bulletin because it should have been previously reviewed and approved by the Energy Bureau. The ICPO also posited that LUMA's directives should be approved by the Energy Bureau to ensure compliance with public policy, applicable law and regulations. Lastly, the ICPO argued that prior to the

[3] Section 6.3 (w) of the Puerto Rico Energy Transformation and RELIEF Act, Act 57-2014, provides that the powers and duties of the Energy Bureau include the review and approval of "proposals to the interconnection regulations and minimum technical requirements (MTRs), additional technical requirements (ATRs), and any other type of requirement established for the interconnection of distributed generators and microgrids to the electric power grid, and oversee compliance therewith." 22 L.P.R.A. § 1054b.
[4] See April 15 R&O, at page 2.
[5] See ICPO Motion on page 2, paragraph 7.
[6] See ICPO Motion at pages 2-3, paragraphs 8-9.

publication of a Technical Bulletin, stakeholders in the energy industry should be provided with advance notification and participation.

7. On April 22, 2024, two (2) days after the deadline established by the Energy Bureau, LUMA filed a motion to comply with the April 15 R&O. LUMA's arguments in response can be condensed as follows: (a) the Technical Bulletin is not a regulation and, hence, neither a rulemaking process nor the Energy Bureau's approval was required to issue it because the Regulation to Interconnect Generators to the Electric Distribution System of the Electric Power Authority and Participate in the Net Metering Programs, Regulation No. 8915 ("Regulation 8915") provides for the application of "applicable standards in effect, including, but not limited to, IEEE 1547"[7]; (b) the Technical Bulletin does not contradict Act 57-2014 with respect to the Energy Bureau's authority pertaining to interconnection regulations and technical requirements, and it does not require the Energy Bureau's review or approval because the Technical Bulletin is not an amendment to Regulation 8915 and merely a "clarification" which does not need to be reviewed by the Energy Bureau, which reasoning should also apply to other related Technical Bulletins[8]; (c) the IEEE 1547-2018 standard set forth in the Technical Bulletin is not a System Operation Principle and, therefore, the Energy Bureau's approval is not required[9]; (d) the timeline of two months to implement the Technical Bulletin is reasonable, and there are no technical compliance issues of concern because the Technical Bulletin does not require the acquisition of new equipment or components and the IEEE 1547-2018 standard to apply has already been adopted in over 25 states and regions in the US and Canada[10]; and (e) stakeholder meetings or collective efforts are not needed to establish the technical specifics of the IEEE 1547-2018 standard set forth in the Technical Bulletin because it is "not a regulation of an amendment to a regulation but, rather, a clarification of an existing requirement of Regulation 8915"[11].

8. On April 29, 2024, LUMA filed a document titled "MOTION TO REQUEST

[7] See LUMA Motion 1 at page 4-8
[8] See LUMA Motion 1 at Page 8-9
[9] See Id., at page 10
[10] See Id., at page 13
[11] See Id., at page 13

THE RESCHEDULING OF THE TECHINICAL CONFERENCE SET FOR MAY 16, 2024"[12]. LUMA contends that it "has identified the key individuals with most knowledge on technical interconnection requirements and/or involved in the preparation of the TIR Manual of the Technical Bulletin to participate in the Technical Conference."[13] But the "subject matter expert who has vast knowledge of the Technical Bulletin and the topics to be discussed in the April 15th Order…is not expected to be available on the scheduled date of the Technical Conference because he will be on extended work leave."[14] Because of the aforementioned, LUMA requested the Energy Bureau to reschedule the Technical Conference to June 11, 2024 or other dates referenced in the motion in which the "key subject matter expert" would be available.[15]

9. For the reasons set forth below, SESA opposes LUMA's claims and respectfully requests the Honorable Energy Bureau to order LUMA to remove the Technical Bulletin from its website, stay its implementation and follow the appropriate procedure for the Technical Bulletin's approval and publication.

II. The Technical Bulletin is an amendment to Regulation 8915 and, therefore, it is required to follow the rulemaking process set forth in Act 38-2017.

10. Because the Technical Bulletin is modifying certain aspects of the IEEE standard applied under Regulation 8915 and Regulation 8915 itself, it should follow the rulemaking process set forth in the Government of Puerto Rico's Uniform Administrative Procedure act ("LPAU" for its Spanish acronym).[16] The Technical Bulletin cannot be considered a Guidance Document[17] or an Official Interpretation[18], which would not have

[12] This document is already part of the record in this proceeding.
[13] See LUMA Motion 2, at page 4
[14] See Id., at page 4
[15] See Id., at page 4
[16] 3 L.P.R.A. § 9611-9630.
[17] Act 38-2017, Ch. II, Sec. 1.3 (c) defines guidance documents as: "a record, whether in electronic or paper format, of general applicability developed by an agency which lacks the force of law but states the agency's interpretation of any law, the agency's public policy, or that describes how and when the agency shall exercise discretionary functions. It includes official interpretations as to a law or regulations administered by it." 3 L.P.R.A. § 9603 (c)
[18] In Asoc. de Maestros v. Comisión, 159 DPR 81, 93-94 (2003), the Court explained that it "is an expression of the agency that provides clarification of the law it administers, or of its rules and regulations… these rules are created when administrative agencies adopt guidelines or other informal regulations for the purpose of providing uniformity in their own processes, guiding administrative discretion, or other internal purposes."

to follow the LPAU rulemaking procedures and may contain non legislative rules or interpretative rules[19]. The Technical Bulletin is not a rule concerning the internal management of an agency or intra-agency or interagency communications that does not affect the rights, procedures, or practices available to the public.[20] In sum, none of those exceptions apply to the Technical Bulletin because LUMA is imposing new and/or different rights, obligations and establishing a pattern of conduct, through a legislative rule[21], that has the force of law for prosumers, manufacturers and distributors of solar equipment, installers and participants in the solar energy market that have DGs or will eventually want to install a DG.

11. Among others, the Technical Bulletin changes the Frequency Settings established in Regulation 8915, which is the legally binding document that went through the appropriate rulemaking procedure provided under LPAU and was registered before the Secretary of State. Section 2.3.1 of the Technical Bulletin provides Frequency Response and Disconnection parameters[22] that are completely different from those contained in Table Four (4) of Regulation 8915.[23]

12. LUMA contends that it has "all the right and responsibilities of [the Puerto Rico Electric Power Authority ("PREPA")] with respect to the implementation of Regulation 8915".[24] However, although LUMA is a private entity, it is acting as PREPA's agent and assuming public responsibilities from PREPA under the "Puerto Rico Transmission and Distribution System Operating and Maintenance Agreement" ("T&D OMA") and, as such, LUMA's actions must absolutely be subject to LPAU's requirements. Otherwise, private operators of essential, government-owned infrastructure would be free to impose rules or regulations without government oversight, thereby creating an unwanted exception to the LPAU requirements that has neither been legislated nor recognized by the courts. Therefore, the Technical Bulletin

[19] Id.
[20] Act 38-2017, Ch I, Sec. 1.3 (m) (1), 3 L.P.R.A. § 9603 (m) (1).
[21] Asociacion de Maestros at pp. 94-95, The Court affirms "if the new rule is irreconcilable with an existing legislative rule, then the new rule is properly an amendment to the first and, consequently, must be considered as a legislative rule whose approval must observe the regulatory process described above [LPAU] (emphasis added)".
[22] See Smart Inverter Settings Sheets – Technical Bulletin, at page 4.
[23] See Regulation 8915, Sec. IV, Art. B, Table 4.
[24] See LUMA Motion 1, at page 6.

should be subject to the rulemaking process set forth in the LPAU. The manner in which LUMA published the Technical Bulletin is a clear subterfuge to circumvent the rulemaking processes set forth in the LPAU. LUMA's contentions that Regulation 8915 permits it to publish the Technical Bulletin without any type of review because it states the "applicable standard" would also subvert the authority of the Energy Bureau contained in Act 57-2014 to review and approve "any other type of requirement established for the interconnection of distributed generators," but this will be discussed *infra*.

13. SESA also takes issue with LUMA's proposed approach to the publication of Technical Bulletins[25], because it presents a fundamental contradiction to the principles of transparency and accessibility in regulatory affairs. Placing the Technical Bulletin amidst content tailored for renewable energy project initiators not only obfuscates its importance but also undermines the ability of stakeholders to readily access critical regulatory information. Such a decision not only hampers the public's ability to stay informed but also creates unnecessary barriers for those seeking to engage with regulatory processes. It is imperative that regulatory information be readily accessible and clearly delineated to ensure compliance and foster trust in the regulatory framework.

14. Furthermore, the lack of transparency surrounding LUMA's handling of the March 22 Technical Bulletin, including its unexplained posting and subsequent removal[26], raises serious doubts about the integrity of the regulatory process. Without a public record of previous drafts, stakeholders are left in the dark about the evolution of regulatory decisions, hindering their ability to provide informed feedback and participate meaningfully in the process. Such opacity not only erodes public trust but also violates the principles of accountability and procedural fairness.

15. Moreover, if LUMA intends to post iterative drafts of documents like the Technical Bulletin, it effectively transforms its website into a regulatory docket, a function within the exclusive purview of the Energy Bureau. By circumventing this

[25] See LUMA Motion 1, at page 8.
[26] See **Attachment 1** and https://lumapr.com/wp-content/uploads/2024/03/Technical-Bulletin-2024-0001-Smart-Inverter-Settings-Sheet_.pdf

requirement and assuming a role reserved for regulatory bodies, LUMA risks undermining the authority and independence of the Energy Bureau, as well as compromising the integrity of the regulatory process.

III. The publication of the Technical Bulletin by LUMA undermines the Energy Bureau's authority under Act 57-2014.

16. Certainly, as LUMA indicates, the IEEE 1547-2018 standard is a technical requirement for interconnection of DGs.[27] Act 57-2014 provides that the Energy Bureau has the duty to "review and approve proposals to the interconnection regulations and minimum technical requirements (MTRs), additional technical requirements (ATRs), and any other type of requirement established for the interconnection of distributed generators and microgrids to the electric power grid, and oversee compliance therewith".[28] Clearly, the foregoing provision provides no exception to the Energy Bureau's review and approval authority of proposals for interconnection regulations and "any other type of requirement" for the interconnection of DGs. Notably, the statute does not differentiate between an "amendment" or a "clarification."

17. LUMA seems to argue that because Regulation 8915 refers to the "applicable standard in effect," including IEEE 1547, it does not need to go through the LPAU rulemaking process for the adoption in Puerto Rico of standards that are "not specifically listed therein." Hence, the claim is that LUMA can unilaterally determine to apply the "applicable" IEEE standard and publish the Technical Bulletin without the Energy Bureau's oversight, review and approval.

18. Respectfully, the argument is a deliberate attempt to circumvent the authority of the Energy Bureau under Section 6.3 (w) of Act 57-2014 by relying upon the general "applicable standard" language employed in Regulation 8915. If this theory were accepted, which SESA contends the Energy Bureau should not, it would mean that administrative agencies – or LUMA, acting as PREPA's agent – could "pre-wire" language into their regulations to avoid having to go through the rulemaking process by simply adopting by reference "applicable standards" which no regulator ever reviewed

[27] See LUMA Motion 1, at page 12.
[28] Act 57-2014, Sec. 6.3 (w), 22 L.P.R.A. § 1054b.

or approved.

19. It bears mentioning that the T&D OMA provides that that "[p]ursuant to Section 5(f) of Act 120 and subject to the provisions of this Agreement, Operator shall at all times comply with the public policy and regulatory framework applicable to the T&D System".[29] Thus, under its contract, LUMA must comply with the regulatory framework applicable to the T&D system, including the Energy Bureau's oversight and approval of interconnection requirements. The T&D OMA also provides that "[n]otwithstanding anything to the contrary herein, no provision of this Agreement shall be interpreted, construed or deemed to limit, restrict, supersede, supplant or otherwise affect, in each case in any way, the rights, responsibilities or authority granted to PREB under Applicable Law with respect to the T&D System, Owner or Operator".[30] Furthermore, the interconnection agreement published in LUMA's website, for clients who want to interconnect generators to the distribution system, acknowledges that clients must comply with technical requirements published by LUMA but approved by the Energy Bureau.[31]

20. In sum, before its adoption, the Technical Bulletin needs to undergo a proper review by the Energy Bureau with ample participation by energy stakeholders. If adopted as presented, the Technical Bulletin will cause irreparable harm to prosumers, manufacturers and distributors of solar equipment, installers and other participants in the solar energy market. SESA is attaching to this motion a commented version of the Technical Bulletin with margin notes that provides a brief explanation of some of the fundamentally flawed technical requirements being published by LUMA.[32] SESA is sharing its commented version of the Technical Bulletin as a demonstration to the Energy Bureau of what the initial input would look like in a series of workshops, professionally facilitated by the Energy Bureau, geared towards a comprehensive

[29] See T&D OMA, Art 9, Sec. 9.9.
[30] See Id., Art. 20, Sec. 20.17.
[31] Acuerdo para Interconectar Generadores con el Sistema de Distribución Eléctrica de la Autoridad de Energía Eléctrica y Participar en los Programas de Medición Neta, paragraph 1.5 (https://lumapr.com/wp-content/uploads/2023/11/Acuerdo-Interconexion-y-Medicion-Neta-Distribucion_Individuos-aka-Anejo-F1-Revised-11.8.22.pdf).
[32] Please see SESA's INITIAL input on LUMA's April 1st Technical Bulletin as **Attachment 2** to this motion.

understanding and a consensus on the best way to handle the many specific issues that need to be well understood by all parties involved.

IV. LUMA's assertion that "the timeline to implement the technical bulletin is reasonable, and that there are no technical and compliance issues of concern" is incorrect.

21. SESA completely disagrees with LUMA's position that the Technical Bulletin can be implemented as proposed and that there are no technical or compliance issues. As the representative body for the energy industry, SESA is keenly aware of the technical, compliance, and timing issues of concern within the solar industry. LUMA is not. SESA's commented version of the Technical Bulletin presents some of the problems that are anticipated but would welcome the opportunity to present its views in a more robust fashion and with expert support in the context of the regulatory process.

22. In addition, LUMA's initial proposed timeline for the adoption of the March 22 Technical Bulletin on April 1st, posted on its website on March 22 and removed on March 26, is deeply concerning. The imposition of a mere 5-business day implementation window for technical settings, devoid of any stakeholder input, reflects disregard for the complexity and significance of the changes being proposed. These technical settings, which remain fundamentally flawed and unimplementable as drafted, demand thorough consultation and consideration with all relevant stakeholders. LUMA's unilateral approach not only undermines the collaborative spirit essential for effective regulatory processes but also risks compromising the reliability and safety of the energy infrastructure.

23. Finally, the urgent timeline suggested by LUMA for the implementation of the Technical Bulletin by June 1 is impractical and has no basis. The only timeline on record in these proceedings is the timeline stated on page 28 of the Draft Interconnection Regulations, posted on July 15, 2021, which states: "Voltage fluctuation and harmonics limits are both addressed by IEEE 1547-2018. However, until full adoption of IEEE 1547-2018 is complete, IEEE 1453 and IEEE 519 may be used for the respective requirements. Equipment tested to comply with the updated harmonics

requirements of IEEE 1547-2018 will not be available *until approximately 18 months or more after publication of the revision of IEEE 1547.1*." (emphases added)[33]

24. In sum, SESA respectfully requests the Honorable Energy Bureau to stay the implementation of the Technical Bulletin, order the rulemaking process to proceed, and for a minimum 3-month implementation window following the final approval of Smart Inverter Settings by the Energy Bureau. The foregoing timeline is rooted in practical necessity and industry expertise. The intricate process involved, spanning from hundreds of manufacturers' awareness and adjustment to new requirements; the programing "grid profiles" into the software of their inverters; to installer's education and training, underscores the complexity and scale of the undertaking. It is crucial to recognize that none of these essential steps can commence until the Energy Bureau officially approves the definitive Smart Inverter Settings. Rushing through this critical phase without adequate time for preparation and coordination not only jeopardizes the integrity of the implementation process but also poses significant risks to the functionality and safety of the energy grid.

25. Additionally, SESA firmly opposes LUMA's request to reschedule the May 16 Technical Conference. LUMA indicates it "has identified the key individuals with most knowledge on technical interconnection requirements and/or involved in the preparation of the TIR Manual of the Technical Bulletin to participate in the Technical Conference." Consequently, if LUMA has identified multiple individuals involved in the preparation for the Technical Bulletin, there should be no problem with LUMA's participation in the May 16, 2024 Technical Conference due to the unavailability of one person. Even more problematic, LUMA proposes to postpone the Technical Conference to June 11, 2024, by which time the Technical Bulletin would already be in effect, if the Energy Bureau does not order its stay.

WHEREFORE, the Solar and Energy Storage Association respectfully requests the Honorable Energy Bureau to order LUMA to remove the Technical Bulletin from its website, stay its implementation, direct the regulatory review process to proceed and

[33] IN RE: INTERCONNECTION RELATIONS, Resolution and Order of July 15, 2021, Footnote 4, at p. 28.

keep the May 16, 2024 Technical Conference as presently scheduled.

Respectfully submitted, on May 3, 2024, in San Juan, Puerto Rico.

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 was notified to Agustin.irrizary@upr.edu; javrua@sesapr.org; hrivera@jrsp.pr.gov; contratistas@jrsp.pr.gov; aconer.pr@gmail.com; john.jordan@nationalpfg.com; Lionel.santa@prepa.pr.gov; arivera@gmlex.net; mvalle@gmlex.net; laura.rozas@us.dlapiper.com.

McCONNELL VALDÉS LLC
Counsel for Solar and energy Association of Puerto Rico
PO Box 364225
San Juan, Puerto Rico 00936-4225
270 Muñoz Rivera Avenue
San Juan, Puerto Rico 00918
Phone Numbers: (787) 250-5669, (787) 250-5623
Fax Number: (787) 759-9225
www.mcvpr.com

/s/ Carlos J. Fernandez Lugo
Carlos J. Fernandez Lugo
PR Supreme Court ID no. 11,033
cfl@mcvpr.com

/s/ Manuel G. Quintana Soler
Manuel G. Quintana Soler
PR Supreme Court ID no. 23,364
mqs@mcvpr.com

Attachment 1

LUMAPR.COM

SMART INVERTER SETTINGS SHEETS

January 3, 2024

VERSION HISTORY:

Version	Date	Description
1	06/20/2022	Initial Draft
2	10/25/2022	Revised based on LUMA comments
3	01/03/2024	Final document

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 **April 1, 2024**, all DER applications must meet the default setting requirements that are specified in this bulletin.

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1. Required Smart Inverter Functions

Smart Inverters must be (a) set to conform to the default setting requirements and (b) capable of performing the default functions, both provided in this document, "Smart Inverter Settings Sheets", as applicable.

Customers must comply with the requirements set forth in this "Smart Inverter Settings Sheets" or, any alternative Smart Invert settings and functions that may be defined in the interconnection agreement. Any alternative settings and functions defined in the interconnection agreement will take precedent and override the default settings requirements and functions provided in this document. Notwithstanding the preceding 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 minimum communication requirements for Smart Inverters connected to the distribution system.

Table 1-1- Minimum Requirements for Communication and Interface

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

1.2. Control Modes

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

Table 1-2- Smart Inverter Control Modes

Applicable to Retail Customers Interconnected

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
Adjustable constant power factor	Required	Refers to Power Factor set to a fixed value.	Deactivated
Adjustable Constant Reactive Power	Required (If available)	Refers to Reactive Power set to a fixed value	If capable, deactivated
Voltage Ride through	Required	Refers to 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 (Volt/Var)	Required	Refers to control of reactive power output as a function of voltage	Activated
Voltage – Active Power (Volt/Watt)	Required (If available)	Refers to control of real power output as a function of voltage	Activated
Frequency - Watt	Required (If available)	Refers to control of real power as a function of frequency	If capable, deactivated
Ramp Rates	Required	Refers to ability to have an adjustable entry service ramp rate when a DER restores output of active power or changes output levels over the normal course of operation.	Activated

2. Smart Inverter Function Settings

This section lists the required settings for smart inverter functions.

2.1. Anti-Islanding Settings

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. Voltage Settings

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	0.16	Fixed at 1.2	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 Settings

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 Ride-Through Settings	Voltage Range (pu)	Smart Inverter Response (Operating Mode)	Maximum Response Time (s)	Minimum Ride Through Time (s)
High Voltage 2 (HV2)	V ≥ 1.2	Cease to Energize	0.16	N/A
High Voltage 1 (HV1)	1.1 ≤ V ≤ 1.2	Momentary Cessation	0.083	12
Near Normal Voltage (NNV)	0.88 ≤ V ≤ 1.1	Continuous Operation	N/A	Infinite
Low Voltage 1 (LV1)	0.7 ≤ V ≤ 0.88	Mandatory Operation	N/A	20
Low Voltage 2 (LV2)	0.5 ≤ V ≤ 0.7	Mandatory Operation	N/A	10
Low Voltage 3 (LV3)	V ≤ 0.5	Momentary Cessation	0.083	1

2.3. Frequency Settings

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 OF1 (Hz)	Default Trip/Clearing Time (s)	Adjustable Range for Trip Time (s)
Over Frequency 2 (OF2)	f ≥ 62	61.8 - 66	0.16	0.16 - 1000
Over Frequency 1 (OF1)	f ≥ 61.2	61.2 - 66	300	21 - 1000
Under Frequency 1 (UF1)	f ≤ 58.5	50 - 58.8	300	21 - 1000
Under Frequency 2 (UF2)	f ≤ 57	50 - 57	0.16	0.16 - 1000

2.3.2. Frequency Ride-Through Settings

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	High Frequency Range (Hz)	High Smart Inverter Response (Operating Mode)	Minimum Ride Through Time (s)
High Frequency 2 (HF2)	f ≥ 62	N/A	N/A
High Frequency 1 (HF1)	61.2 ≤ f ≤ 62	Mandatory Operation	299
Near Normal Frequency (NNF)	58.8 ≤ f ≤ 61.2	Continuous Operation	Infinite
Low Frequency 1 (LF1)	57 ≤ f ≤ 58.8	Mandatory Operation	299
Low Frequency 2 (LF2)	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.

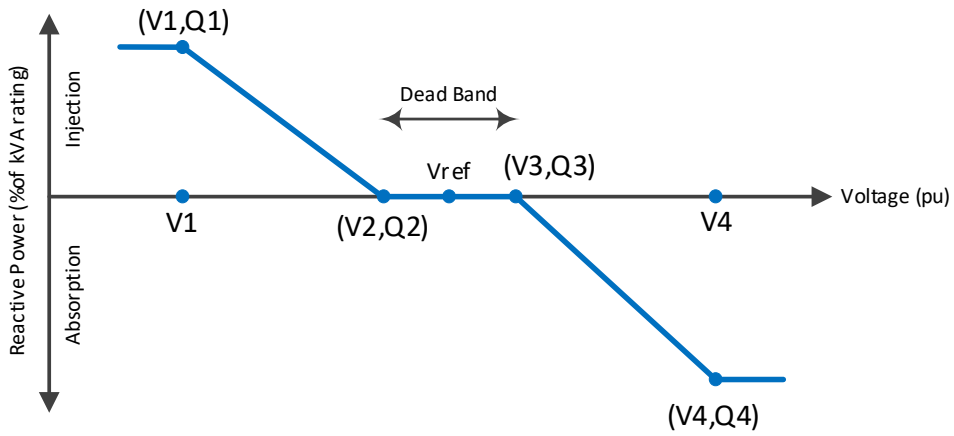

Figure 2-1. Example Volt-Var characteristic

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	102% VN	Vref	Vref + 3%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.

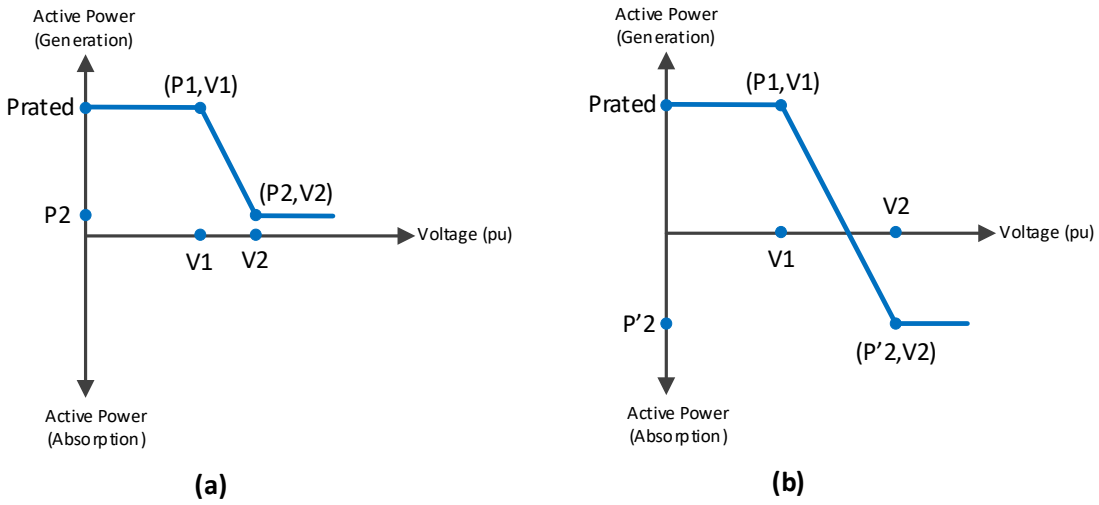

Figure 2-2. Example Volt-Watt characteristics

Table 2-7- Volt-Watt Settings – 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.

2.6. Ramp Rate Settings

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

- Normal ramp-up rate: 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%

Attachment 2

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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 October 1~~June 1~~**, 2024**, all new Net Energy Metering notices of certification ~~applications~~ must indicate use of inverters meet the utility required settings and functions ~~default setting requirements~~ that are specified in this bulletin.

Commented [U1]: Replace "June 1" with "October 1".

Reason: Industry needs at least a 3-month implementation window, AFTER the specific Smart Inverter Settings are finalized by PREB. The October 1st date assumes that PREB issues final Smart Inverter Settings by July 1st 2024.

Commented [U2]: Replace the word "applications" with "notices of certification".

Reason: Law 17-2024 specifies the start date for the 30-day Net Metering application to customer bills begins the day that the utility receives a "receipt of notice of the certification of the distributed generator installed by an engineer or an expert electrician".

Commented [U3]: Replace "default setting requirements" with "utility required settings and functions".

Reason: IEEE-1547 contains "default settings", some of which are identical to what is included in this document, and some of which are very different.

It's important to make the distinction that what is in this document is "utility required" as opposed to "default".

Table of Contents

Commented [U4]: We recommend various changes throughout this document to the names within the Table of Contents, and those changes aren't reflected in this Table of Contents.

List of Tables

List of Figures

1. Required Smart Inverter Functions

Smart Inverters must be (a) UL 1741 SB listed, b) set to ~~conform to~~ the default settings ~~requirements~~ provided in this document, and~~-~~ (~~b~~c) ~~capable of~~ perform~~ing~~ the default functions~~, both~~ provided in this document, "Smart Inverter Settings Sheets."~~, as applicable.~~ Functions and control mode settings required in this document are based on IEEE 1547-2018 requirements for DERs that are both Normal Operating Category B and ~~,~~Abnormal Operating Category III ~~DERs~~.

Customers must comply with the requirements set forth in this "Smart Inverter Settings Sheets" except where~~or, any~~ alternative site-specific Smart Inverter settings and function~~s~~ statuses are ~~that may be~~ defined in the interconnection agreement as a result of a detailed interconnection study. Any alternative settings and function statuses~~s~~ defined in the interconnection agreement will take precedent and ~~override~~ supersede the default settings ~~requirements~~ and function~~s~~ statuses provided in this document. Notwithstanding the ~~preceding~~ following provisions of this "Smart Inverter Settings Sheets", a customer's Smart Inverter(s) shall conform with the requirements and functions required pursuant to their interconnection agreement at the time of approval.

1.1. Communication Requirements

Table 1-1 lists approved communication protocols per Table 41 of IEEE 1547-2018. ~~minimum communication requirements for~~ Smart Inverters connected to the distribution system shall be capable of supporting at least one of these protocols.

Table 1-1~~. Minimum Requirements for~~ Approved Communication Protocols ~~and Interface~~

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

1.2. ~~Control Modes~~ Smart Inverter Functions & Control Modes

Table 1-~~2~~1 lists functions and control modes that must be supported by Smart Inverters as well as their default status ~~of each control mode~~.

Commented [U5]: Rewording needed to make it clear about what specifically within IEEE 1547-2018 is being required, because what is or isn't mandatory depends on the specific category within IEEE 1547-2018.

Ie, there are inverters which are "IEEE 1547 compliant" which wouldn't meet the specifications in this document.

Commented [U6]: It's necessary to be very clear abut what is and isn't required, and under what circumstances.

That isn't possible with the April 1st language that would allow LUMA to require entirely different things in an "interconnection agreement" that are different from what is in this Smart Inverter Settings, unless it's very clear what the conditions are ("as a result of a detailed interconnection study"), for when a customer would be required to have settings different from what is contained in this document.

Commented [U7]: Important clerical wordsmithing for clarity.

Commented [U8]: These changes are needed to align the content of this subsection with language used in IEEE 1547-2018.

Commented [U9]: The language in this table in the April 1st document used language different from that of IEEE 1547-2018.

Commented [U10]: Reword title of section to be "Smart Inverter Functions & Control Modes".

Reason: This subsection includes some content described as "functions" and others described as "control modes" in IEEE-1547.

For example, Anti-Islanding and Ride-Through are Functions which are not Control Modes as described by IEEE 1547-2018.

Table 1-2- Smart Inverter Functions & Control Modes

Applicable to Retail Customers Interconnected			
~~Mode of Operation~~Function/Control Mode	Required/Optional	Description	Default Activation Status
Anti-Islanding	Required	Refers to the ability to detect loss of utility source and cease to energize	Activated
~~Adjustable C~~constant ~~power~~ Power ~~factor~~Factor	Required	Refers to Power Factor set to a fixed value~~.~~	Deactivated
~~Adjustable~~ Constant Reactive Power	Required ~~(If available)~~	Refers to Reactive Power set to a fixed value	~~If capable, d~~Deactivated
Voltage ~~Ride~~ Ride ~~-~~through	Required	Refers to ability of Smart Inverter to ride through a certain range of voltages before tripping off	Activated
Frequency ~~Ride~~ 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 ~~(If available)~~	Refers to control of real power output as a function of voltage	Deactivated ~~Activated~~
Frequency Droop (Freq/Watt)~~Frequency - Watt~~	Required ~~(If available)~~	Refers to control of real power as a function of frequency	~~If capable, deactivated~~ Activated
Enter Service	Required	Refers to the ability of a Smart Inverter to begin operation with an energized utility source	Activated
~~Ramp Rates~~	~~Required~~	~~Refers to ability to have an adjustable entry service ramp rate when a DER restores output of active power or changes output levels over the normal course of operation.~~	~~Activated~~

Commented [U11]: The only setting missing from this list, as detailed in IEEE 1547-2018, is Reactive Power Mode, also called "Watt-Var".

We recommend adding it to this list, as "Required" and "Deactivated" by default, to fully define all Control Modes in IEEE 1547-2018.

Commented [U12]: Activating Volt-Watt triggers concerns about curtailment of export of solar power to the power grid, which reduces customer compensation of Net Metering credits on their bill.

Because of this chance of loss of customer compensation, we are opposed to the Volt-Watt setting being Activated, unless it's accompanied with clear assurances of LUMA performing grid upgrades within a pre-established, reasonable amount of time.

Commented [U13]: Frequency Droop (Frequency/Watt) improves stability of power line frequency of the grid, and is required by IEEE 1547-2018 to be Activated by default.

Commented [U14]: Enter Service is a mandatory part of IEEE 1547-2018. It specifies the conditions of the grid (allowable Voltage & Frequency Range, Delay Rime, and Connection & Reconnection Ramp Rate).

Commented [U15]: Normal Ramp Rate is not defined in IEEE 1547-2018 and, therefore, should be excluded.

2. Smart Inverter Function & Control Mode Settings

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

2.1. Anti-Islanding ~~Settings~~

Smart Inverters shall detect the unintentional island and trip as specified in Table 2-1 per Section 8.1 of IEEE 1547-2018~~.~~

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 ~~Settings~~

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	~~0.16~~Fixed at 1.2	~~Fixed at 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 ~~Settings~~

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

Commented [U16]: This change is needed to align with IEEE-1547.

Commented [U17]: This change simply corrects what was clearly a clerical error in the April 1st document. These two values were inadvertently swapped by LUMA.

This table is not implementable without correcting this.

Commented [U18]: There is no such thing as changeable "Settings" for Voltage Ride-Through; the specifications are clearly defied in IEEE-1547 2018 and aren't changeable.

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

~~Voltage Ride-Through Settings~~	Voltage Range (p.u.)	~~Smart Inverter Response (Operating Mode)~~Operating mode/response	Maximum Response Time (s)	Minimum Ride-Through Time (s)
~~High Voltage 2 (HV2)~~	V ≥ 1.2	Cease to Energize	0.16	N/A
~~High Voltage 1 (HV1)~~	1.1 ≤ V ≤ 1.2	Momentary Cessation	0.083	12
~~Near Normal Voltage (NNV)~~	0.88 ≤ V ≤ 1.1	Continuous Operation	N/A	Infinite
~~Low Voltage 1 (LV1)~~	0.7 ≤ V ≤ 0.88	Mandatory Operation	N/A	20
~~Low Voltage 2 (LV2)~~	0.5 ≤ V ≤ 0.7	Mandatory Operation	N/A	10
~~Low Voltage 3 (LV3)~~	V ≤ 0.5	Momentary Cessation	0.083	1

Commented [U19]: These shouldn't be described as "Settings". The terms in this columns are not used in IEEE-1547 2018.

Commented [U20]: This change aligns the terms with IEEE-1547 2018.

2.3. Response to Abnormal Frequency ~~Settings~~

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 ~~OF1~~ (Hz)	Default Trip/Clearing Time (s)	Adjustable Range for Trip Time (s)
Over Frequency 2 (OF2)	f ≥ 62	61.8 - 66	0.16	0.16 - 1000
Over Frequency 1 (OF1)	f ≥ 61.2	61.2 - 66	300	21 - 1000
Under Frequency 1 (UF1)	f ≤ 58.5	50 - 58.8	300	21 - 1000
Under Frequency 2 (UF2)	f ≤ 57	50 - 57	0.16	0.16 - 1000

Commented [U21]: This fixes what is very obviously a type-o in the document.

Commented [U22]: This is different from the default IEEE 1547-2018 standard. The IEEE 1547-2018 value is 56.5 Hz, and LUMA is proposing 57.

We suggest keeping it at the IEEE 1547-2018 standard of 56.5 Hz unless there is a clear valid reason why 57 Hz is needed for Puerto Rico.

This is one of many issues that would need to be talked through in PREB-overseen workshops in order to be well understood.

2.3.2. Frequency Ride-Through ~~Settings~~

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

Commented [U23]: Again, these are not adjustable "settings"; this Frequency Ride-Through behavior is mandatory as specified in IEEE 1547-2018.

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

~~Frequency Ride-Through Settings~~	~~High~~ Frequency Range (Hz)	~~High Smart Inverter Response~~ (Operating Mode)	Minimum Ride Through Time (s)
~~High Frequency 2 (HF2)~~	f ≥ 62	N/A	N/A
~~High Frequency 1 (HF1)~~	61.2 ≤ f ≤ 62	Mandatory Operation	299
~~Near Normal Frequency (NNF)~~	58.8 ≤ f ≤ 61.2	Continuous Operation	Infinite
~~Low Frequency 1 (LF1)~~	57 ≤ f ≤ 58.8	Mandatory Operation	299
~~Low Frequency 2 (LF2)~~	f ≤ 57	N/A	N/A

Commented [U25]: Delete "High" from column label so that this reads "Frequency Range (Hz)".

This was clearly a type-o in the April 1st draft.

Commented [U24]: This column needs to be removed because it is information not included with the tables in IEEE 1547-2018. Keeping this column as it appears in the April 1st document would give the false impression that ride-through is adjustable as referenced.

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.

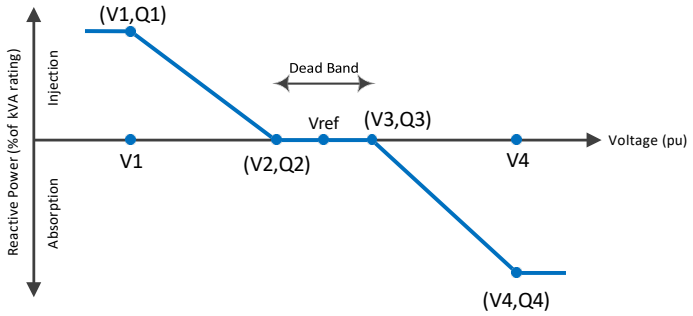

Figure 2-1. Example Volt-Var characteristic

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	102% VN	Vref	Vref + 3%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.

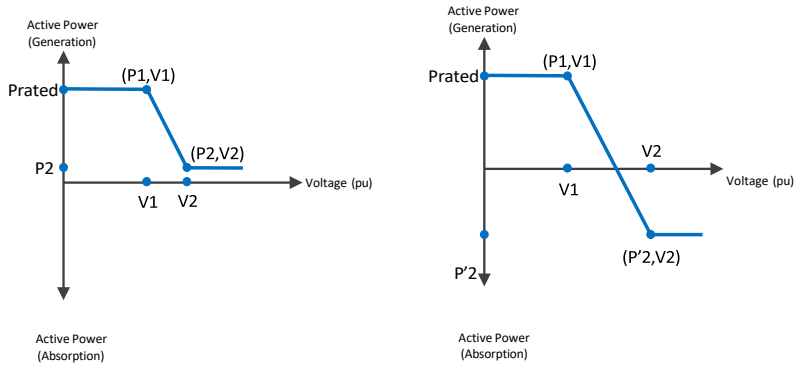

Figure 2-2. Example Volt-Watt characteristics

Table 2-7- Volt-Watt Settings – DEACTIVATED*

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.

* By default, this control mode will be deactivated except where a supplemental study requires it implemented because of high DER penetration to support local distribution equipment upgrades that will be performed in a timely manner. After upgrading the local distribution equipment, this setting may be deactivated upon request with approval from LUMA.

Commented [U26]: Change to DEACTIVATED by default.

Further detail: * By default, this control mode will be deactivated except where a supplemental study requires it implemented because of high DER penetration to support local distribution equipment upgrades that will be performed in a timely manner. After upgrading the local distribution equipment, this setting may be deactivated upon request with approval from LUMA.

Commented [U27]: It's important to understand that when Volt-Watt is activated for an inverter, it means that when the voltage in their neighborhood gets 6% higher than normal (so since normal voltage is 120 Volts, 6% higher is 127.2 Volts), when the voltage reaches 127.2 Volts, then the amount of solar output to the grid starts being reduced ("curtailed"), and that it curtails more the higher the voltage goes. So when voltage reaches 106% of normal, the solar output is reduced by 20%; with voltage is 107% of normal, it's reduced by 40%, when it's 108% it's reduced by 60%, when it's 109% it's reduced by 80%, and when it's 100%, the customer's solar system is not able to export any solar power to the grid at all.

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		Default Setting	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	≤ 1.10 p.u.[2]	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	0 seconds to 600 seconds
Enter Service Randomized Delay		N/A[3]	1 second to 1000 seconds
Enter Service Ramp Rate[1]		50	1 second to 1000 seconds

(1) This corresponds to the time from zero to 100% maximum power. The default value of 50 seconds implements a 2% ramp in active output power that is either linear or stepwise linear per Section 4.10.3 in IEEE 1547-2018. Per Section 4.10.3, the maximum active power increase of any single step during the enter service period shall be no greater than 20% of the Smart Inverter nameplate active power rating.

(2) This setting is outside the allowable settings however it is consistent with the maximum service voltage guaranteed to customers.

(3) Optional feature in IEEE 1547-2018.

~~2.6. Normal Ramp Rate Settings~~

~~The following is the ramp rate requirement during normal and reconnection operation of Smart Inverters, applicable only when the function is activated by mutual agreement between LUMA and the customer:~~

- ~~Normal ramp up rate: 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% and 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%~~

Commented [U28]: "Enter Service Settings" means the ranges within inverters can connect to the grid initially, and re-connect after tripping off to to grid irregularities.

All values in this chart are identical to the defaults of IEEE 1547-2018, except for Applicable voltage within range.

Whereas the standard in IEEE 1547-108 is 91.7% to 105%, we are proposing 88% to 110%, due to the actual reality of Puerto Rico's grid conditions today.

The values we're suggesting cause no harm to the grid, and allow the customer's inverters to function more often given the current reality in Puerto Rico.

Commented [U29]: All relevant content from the April 1st document version of Section 2.6 have been relocated to new section 2.6, "Enter Service Settings".

"Normal Ramp Rate" is not defined in IEEE 1547-2018, and should not be in this document.