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Ratesetting**TO PARTIES OF RECORD IN RULEMAKING 14-07-002:**

This is the proposed decision of Administrative Law Judge Valerie U. Kao. Until and unless the Commission hears the item and votes to approve it, the proposed decision has no legal effect. This item may be heard, at the earliest, at the Commission's January 31, 2019 Business Meeting. To confirm when the item will be heard, please see the Business Meeting agenda, which is posted on the Commission's website 10 days before each Business Meeting.

Parties of record may file comments on the proposed decision as provided in Rule 14.3 of the Commission's Rules of Practice and Procedure.

The Commission may hold a Ratesetting Deliberative Meeting to consider this item in closed session in advance of the Business Meeting at which the item will be heard. In such event, notice of the Ratesetting Deliberative Meeting will appear in the Daily Calendar, which is posted on the Commission's website. If a Ratesetting Deliberative Meeting is scheduled, ex parte communications are prohibited pursuant to Rule 8.2(c)(4)(B).

/s/ ANNE E. SIMON

Anne E. Simon

Chief Administrative Law Judge

AES:mph

Attachment

Decision PROPOSED DECISION OF ALJ KAO (Mailed 12/28/2018)

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to
Develop a Successor to Existing Net
Energy Metering Tariffs Pursuant to
Public Utilities Code Section 2827.1, and
to Address Other Issues Related to Net
Energy Metering.

Rulemaking 14-07-002

**DECISION GRANTING PETITION FOR MODIFICATION OF
DECISION 14-05-033 REGARDING
SOLAR PLUS STORAGE SYSTEM**

Table of Contents

Title	Page
DECISION GRANTING PETITION FOR MODIFICATION OF DECISION 14-05-033 REGARDING SOLAR PLUS STORAGE SYSTEMS	2
Summary	2
1. Background.....	2
1.1. Decision 14-05-033.....	2
1.2. Petition for Modification.....	3
1.2.1. Use Cases That Comport With D.14-05-033 and Options for Compliance	5
1.2.2. Other Requests Included in Petition.....	6
1.3. Responses to Petition.....	7
1.4. Reply to Responses	10
1.5. Ruling Requiring Further Information on Software Option	11
1.6. Original Proposed Decision and Comments	13
2. Issues Before the Commission	16
3. Discussion	17
3.1. Compliance Pathway for “No Grid Charging” and “No Storage Export” Use Cases	17
3.2. Determining System Size of DC-Coupled Solar Plus Storage Systems.....	20
3.3. Other Issues Denied Without Prejudice	20
4. Comments on Proposed Decision	21
5. Assignment of Proceeding.....	21
Findings of Fact	21
Conclusions of Law.....	22
ORDER	23

**DECISION GRANTING PETITION FOR MODIFICATION
OF DECISION 14-05-033 REGARDING SOLAR PLUS STORAGE SYSTEMS**

Summary

This decision partially grants a petition for modification of Decision (D.) 14-05-033, to allow large net energy metering-eligible facilities paired with energy storage using alternating or direct current configurations to take service under a Net Energy Metering Tariff. In D.14-05-033 the Commission declined to consider a possible pathway for direct current configurations, acknowledging such configurations may not be able to accommodate the metering equipment required by D.14-05-033. This decision approves non-metering, power control-based options for ensuring net energy metering credit accrues only the net energy metering-eligible generation, as long as the control configuration is certified to a national standard or a utility-approved interim testing procedure. Power control-based options include the use of equipment, whether firmware-based or software-based, to prevent the storage device from charging from the grid or to prevent the storage device from exporting to the grid. The decision denies an ex-post data verification option. The decision also adopts a means for measuring storage system size in direct current configurations, in order to determine whether size restrictions and metering requirements apply, as specified in Decision 14-05-033. The investor owned utilities shall submit advice letters to effectuate this modification.

This proceeding remains open.

1. Background**1.1. Decision 14-05-033**

In Decision (D.) 14-05-033 the Commission clarified existing policy that net energy metering (NEM)-eligible generating facilities (GFs) may be paired with qualified energy storage (NEM-PS) devices and receive service on a NEM tariff.

For large GFs, defined as GFs with NEM-PS devices that exceed 10 kilowatts (kW) (alternating current (AC)) maximum discharge capacity, D.14-05-033 established certain metering requirements for the purpose of ensuring that NEM bill credits accrue to NEM-eligible (*i.e.*, renewable, on-site) generation as opposed to grid energy.¹ Decision 14-05-033 acknowledged that “certain single inverter large GFs with NEM-paired storage devices may not be able to accommodate the metering requirements” established in the decision, but declined to consider alternative metering requirements for such systems.

1.2. Petition for Modification

On September 1, 2017, the California Solar & Storage Association (CALSSA) filed and served a petition for modification of D.14-05-033 (Petition) in order to facilitate interconnection of both direct current (DC)-coupled and AC-coupled solar plus storage systems.² DC-coupled solar plus storage systems utilize a single inverter instead of one each (*i.e.*, a total of two inverters) for both the NEM-eligible GF and the NEM-PS device. To illustrate the difference between a typical AC-coupled solar plus storage system and a typical

¹ Public Utilities Code Section 2827(b)(4): “‘Eligible customer-generator’ means a residential customer, small commercial customer as defined in subdivision (h) of Section 331, or commercial, industrial, or agricultural customer of an electric utility, who uses a renewable electrical generation facility, or a combination of those facilities, with a total capacity of not more than one megawatt, that is located on the customer’s owned, leased, or rented premises, and is interconnected and operates in parallel with the electrical grid, and is intended primarily to offset part or all of the customer’s own electrical requirements.”

² Rulemaking (R.) 14-07-002 *Order Instituting Rulemaking to Develop a Successor to Existing Net Energy Metering Tariffs Pursuant to Public Utilities Code Section 2827.1, and to Address Other Issues Related to Net Energy Metering*, filed July 10, 2014 (R.14-07-002), *Petition of the California Solar Energy Industries Association for Modification of D.14-05-033 to Allow DC-Coupled Solar Plus Storage Systems*, filed September 1, 2017 (Petition). On February 8, 2018, the California Solar & Storage Association filed a notice of name change from California Solar Energy Industries Association to California Solar & Storage Association, or CALSSA.

DC-coupled solar plus storage system, we include the following excerpt from the Rule 21 Interconnection (Rulemaking 17-07-007) Working Group One Final Report:³

AC-coupling and DC-coupling are the two different methods of combining a solar and energy storage system. An AC-coupled system has an inverter for the storage and a separate inverter for the solar. It is therefore possible to directly meter the AC output of the solar as seen in Figure 1 on the left. DC-coupled systems combine the solar and storage on the DC side of the single inverter. This means any meter on the AC side records both solar and storage as seen in Figure 1 on the right.

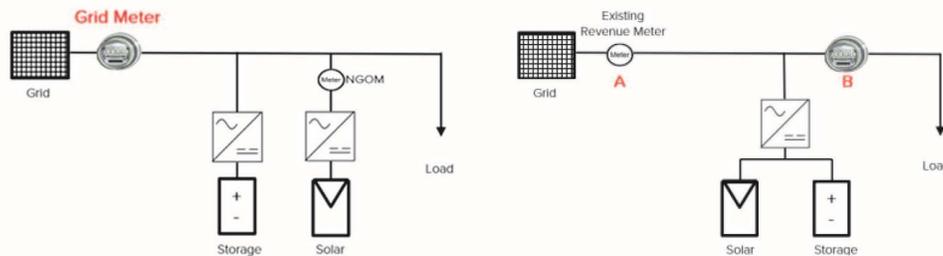


Figure 1 – AC-coupled systems left with a NGOM directly metering the AC output of the solar and DC-coupled system right, where no AC point exists to directly monitor the solar

For the sake of consistency, this decision equates “single inverter large GFs with NEM-PS devices” with “DC-coupled solar plus storage systems” and refers primarily to the latter terminology throughout the remainder of this decision. Similarly and more generally, this decision also equates “GFs with NEM-PS devices” with “solar plus storage systems.” Solar plus storage systems can be either DC-coupled or AC-coupled.

³ Rulemaking 17-07-007 Order Instituting Rulemaking to Consider Streamlining Interconnection of Distributed Energy Resources and Improvements to Rule 21, filed July 13, 2017 (R.17-07-007), Working Group One Final Report, retrieved from <http://www.cpuc.ca.gov/General.aspx?id=6442455170#WG1> on June 19, 2018, at 32 (Issue 2 Appendices, Appendix A).

1.2.1. Use Cases That Comport With D.14-05-033 and Options for Compliance

The Petition describes two use cases – “no grid charging” (*i.e.*, no grid charging to the storage device) and “no storage export” (*i.e.*, no storage exports to the grid) -- for which CALSSA requests Commission authorization to permit interconnection of DC-coupled solar plus storage systems, as well as to expand compliance options for AC-coupled solar plus storage systems, beyond the three options specified in D.14-05-033. On the latter point, the Petition asserts the current typical means of complying with D.14-05-033, which is to install a net generation output meter (NGOM), can increase project costs by \$25,000 and can also increase project timelines by three to six months.

For each use case, the Petition discusses several possible configurations and possible compliance pathways. For the “no grid charging” use case, the Petition discusses a voltage-controlled configuration of DC-coupled solar plus storage, a virtual net energy metering (VNEM) configuration, a NEM Aggregation (NEM-A) configuration, other unspecified configurations, and related configurations for AC-coupled solar plus storage systems. The Petition essentially posits that these configurations would ensure the paired storage device is charged exclusively from the NEM-eligible generator and not from the grid. For the “no storage export” use case, the Petition discusses using an inverter or charge controller “with functionality that prevents the storage device from discharging at times when the customer site is exporting power to the grid or install an external relay that provides the same function.”⁴ The Petition asserts that this approach would prevent storage exports to the grid. For both use cases,

⁴ Petition, at 12.

the Petition notes there may be inadvertent but minor instances of either grid import (in the “no grid charging” use case) or storage export (in the “no storage export” use case), which the Petition argues should not disqualify the customer-generator from continuing to receive service on a NEM tariff.

The Petition also discusses several options for validating or ensuring ongoing compliance with the intent of D.14-05-033’s metering requirements, *i.e.*, to ensure that NEM bill credits accrue only to NEM-eligible generation. These options include (1) a firmware solution, (2) a software-based solution, and (3) an *ex-post* data solution.

1.2.2. Other Requests Included in Petition

The Petition contains several requests beyond the primary request described above (Section 1.2.1). First, the Petition requests the Commission to “leave the door open” for a use case in which NEM-PS systems can also participate in demand response programs, but does not propose a specific metering or billing solution for distinguishing renewable (NEM-eligible) exports from non-renewable (*i.e.*, for demand response) exports for such a use case.⁵ The Petition also requests the Commission to clarify that storage system size for DC-coupled solar plus storage systems should be determined from the continuous output rating of the storage device, rather than the nameplate (AC) rating of the inverter to which the utilities currently refer, for purposes of determining whether a NEM-PS arrangement meets the definition of a ‘small’ or ‘large’ system (*i.e.*, whether the paired storage device exceeds 10 kW (AC) maximum discharge capacity). Lastly, the Petition requests the Commission to

⁵ The Petition also acknowledges such a solution may need to be developed in the Commission’s demand response proceeding, R.13-09-011.

explicitly permit the use of third party-owned metering in lieu of a utility-owned NGOM, in cases where eligible customer-generators opt to install an interval meter directly to the NEM-eligible generator.

1.3. Responses to Petition

On October 2, 2017, California Energy Storage Association (CESA); Energy Freedom Coalition of America (EFCA); and Pacific Gas and Electric Company, Southern California Edison Company and San Diego Gas & Electric Company (together, the electric investor owned utilities (IOUs)) each filed and served a response to the Petition.

CESA and EFCA generally support the Petition, with minor suggested modifications. CESA seeks clarification that future use cases not currently known will be considered for NEM-PS eligibility; they suggest CALSSA's two use cases ("no grid charging" and "no storage export") are simply two options out of many that a single-inverter system could adopt. EFCA suggests three amendments to CALSSA's original proposal: 1) expanded consideration of software controls to verify that a storage system does not charge from the grid or export to the grid; 2) explicit Commission direction to the utilities to allow third-party owned metering to be used to comply with existing metering requirements in the NEM-PS tariff; and 3) modification of the 10 kW threshold calculation methodology to consider the lesser of the rated capacity of the inverter and the continuous output rating of the storage system, rather than only the continuous output rating.

The electric IOUs generally agree with the intent of the Petition, and that the time is appropriate to consider inclusion of large DC-coupled solar plus storage systems as a permissible configuration for interconnection and service on a NEM tariff. The electric IOUs support both the “no grid charging” and “no storage export” use cases discussed by CALSSA so long as each use case can be verified.

For the “no grid charging” use case, the electric IOUs support the firmware proposal but suggest more exploration of the software-based solution is needed; the electric IOUs consider *ex-post* data validation as a problematic alternative to the existing metering requirements, as it relies solely on a customer attestation and storage charge/discharge data after the fact, which would likely introduce new data validity issues and increase administrative costs; the electric IOUs therefore do not support the data validation option. For the voltage-controlled configuration that utilizes a firmware solution, the electric IOUs recommend the Commission require third party certification, such as through Underwriters Laboratory (UL), in order to expedite interconnection review and processing. In these voltage-controlled configurations, the electric IOUs argue that any energy required to power the storage system should be monitored to ensure that it is truly *de minimis* and therefore in compliance with the Renewables Portfolio Standard Guidebook requirements. The electric IOUs argue the solutions CALSSA offers for VNEM and NEM-A tariffs are outside the scope of what D.14-05-033 considers and because, at the time of their response, the Commission

was considering modifications to VNEM elsewhere in the R.14-07-002 proceeding.⁶

For the “no storage export” use case, the electric IOUs argue the Commission should continue to require the use of a non-export relay as currently required by D.14-05-033. However, the electric IOUs also state that certified firmware solutions that provide “equal reliability and security” would be acceptable.⁷ As with the “no grid charging” use case, the electric IOUs argue against using an *ex-post* data approach to validate the lack of export. The electric IOUs argue that the “inadvertent export” allowance under Rule 21 is inapplicable to the “no storage export” use case, where the objective is to ensure that NEM bill credits accrue only to NEM-eligible generation, and ask the Commission to reject any proposal in which inadvertent export is allowed to receive NEM credit under this use case.

The electric IOUs oppose CALSSA’s proposal to change the way in which storage device capacity is measured. The electric IOUs favor the current basis for measuring storage device capacity, *i.e.*, the nameplate capacity of the inverter used by the storage device, over the continuous discharge capacity of the battery that appears on the battery’s specification sheet. They argue the inverter

⁶ R.14-07-002 *Administrative Law Judge’s Ruling Seeking Comment on Use of Energy Storage by Customers on Virtual Net Metering Tariffs*, issued August 14, 2017. The Commission subsequently adopted D.17-12-005, *Decision to Facilitate Virtual Net Energy Metering Generation Paired With a Storage System*, issued December 21, 2017.

⁷ R.14-07-002 *Response of Pacific Gas and Electric Company (U 39 E), Southern California Edison Company (U338E) and San Diego Gas & Electric Company (U 902 M) to the Petition of the California Solar Energy Industries Association for Modification of Decision (D.) 14-05-033 to Allow DC-Coupled Solar Plus Storage Systems*, filed October 2, 2017 (Electric IOUs’ response), at 6.

capacity is simple to understand and not subject to dispute and is therefore a better standard to use.

The electric IOUs also do not support third party metering at this time. They argue it is costly and “extremely complicated” to incorporate data from third party-owned meters in utility billing systems while maintaining established standards for meter and billing accuracy.⁸

1.4. Reply to Responses

On October 20, 2017, CALSSA filed and served a reply to the responses to the Petition (Reply). CALSSA’s Reply asserts there is alignment between the parties on the question of whether the issue needs to be addressed. Therefore, CALSSA represents, the Commission need only “work out some details” to allow single-inverter storage systems to participate in NEM-PS.⁹

On the NEM-A question, CALSSA argues there is no fundamental difference between a NEM-A system and a NEM system, since both systems look to pair with storage units behind a single inverter. CALSSA therefore argues against the position of the electric IOUs that NEM-A solutions are out of scope, and continues to argue that NEM-A should be addressed as part of its Petition. CALSSA’s Reply acknowledges the Commission was, at the time of its Reply, addressing VNEM and paired storage in a different track of R.14-07-002.

On the issue of determining storage device capacity, CALSSA dismisses the electric IOUs’ arguments and agrees to EFCA’s proposed modification that

⁸ Electric IOUs’ response, at 9.

⁹ R.14-07-002 *California Solar Energy Industries Association Reply to Responses to Petition for Modification of D.14-05-033*, filed October 20, 2017, at 2.

the capacity of the storage system be measured by the lesser of the inverter capacity and the storage device's continuous discharge rating.

1.5. Ruling Requiring Further Information on Software Option

On July 19, 2018, the assigned administrative law judge issued a ruling requiring CALSSA to provide supplemental information regarding the software option for the "no grid charging" use case, and inviting other parties to address the same issue.¹⁰ On July 30, 2018, CALSSA, EFCA, PG&E, SCE, and SDG&E filed and served responses to the July 19, 2018 ruling. All parties acknowledge that updating software settings is easier than updating firmware settings; CALSSA and EFCA assert this feature of software settings may allow distributed energy resources such as solar plus storage systems to provide more services in response to future Commission and/or California Independent System Operator (CAISO) initiatives. CALSSA and EFCA identify an additional advantage of a software-based approach, which is that it allows for a single make and model of inverters whereas a firmware-based approach likely necessitates the manufacture and stockpiling of different versions of storage systems to accommodate different requirements depending on the relevant regulatory framework. This greater flexibility, however, is the primary reason the electric IOUs express reservations about the software-based option. That is, the electric IOUs assert that software settings are subject to modification, including in ways that violate Commission policies or requirements. The electric IOUs express concern that, for the "no grid charging" use case, modifications to the software settings may result in system

¹⁰ R.14-07-002 *Administrative Law Judge's Ruling Requiring Supplemental Information Regarding Petition of California Solar and Storage Association to Modify Decision 14-05-033*, filed July 19, 2018.

reliability concerns such as overloads to the service transformers and other equipment. The electric IOUs identify a current inability to monitor solar plus storage systems; monitoring would enable ongoing verification that systems operate according to regulatory requirements. CALSSA, on the other hand, asserts “the battery management system adheres to controls that ensure against concerns such as overheating regardless of charge and discharge timing. Changing the settings for charge and discharge timing to comply with NEM rules will not impact the more fundamental system controls that comply with safety standards.”¹¹ Similarly, EFCA states “the utility would still be able to evaluate the proposed system as if the software or firmware were not operational. That is, the utility, for purposes of assessing safety and reliability, could evaluate the project under the assumption that the storage system would continue to charge from the grid,”¹² under a “no grid charging” use case. Both CALSSA and EFCA emphasize that customers do not have access to software settings, only the installer and the storage provider would be able to access and select settings profiles. Even so, both CALSSA and EFCA indicate it would be acceptable or appropriate to require that any NEM agreement associated with a project that elects an operational constraint in lieu of metering also include an attestation that commits the customer, or the manufacturer or developer on their behalf, to maintain the programming over the life of the NEM agreement.

¹¹ *Response of the California Solar & Storage Association to Ruling Regarding Software Option for Allowing DC-Coupled Solar Plus Storage Systems*, filed July 30, 2018 (CALSSA July 30, 2018 response), at 4.

¹² *Response of the Energy Freedom Coalition of America to the Administrative Law Judge’s Ruling Requiring Supplemental Information Regarding Petition of California Solar and Storage Association to Modify D.14-05-033*, filed July 30, 2018 (EFCA July 30, 2018 response), at 7.

CALSSA points out that “[j]ust as the utilities rely on customers adhering to their contractual commitments under the terms of their interconnection agreement today, they should accept the same assurances when it comes to these operational constraints,” referring to the “no grid charging” and “no storage export” use cases.¹³

1.6. Original Proposed Decision and Comments

On October 5, 2018, the Commission issued a proposed decision that would have approved a firmware-based option and a software-based option, but would have made approval of the software-based option contingent on a Commission determination that the electric IOUs’ communication infrastructures are capable of real-time communication with Phase II and Phase III communication-compliant inverters (original proposed decision).¹⁴ This contingency was based on the original proposed decision’s agreement with the IOUs that real-time monitoring and communication capability is an important and necessary prerequisite to approving the software-based option.

The original proposed decision also would have approved CALSSA’s proposal to measure paired storage device capacity, in DC-coupled systems, as the lesser of the storage device’s continuous output rating and the shared inverter’s nameplate capacity. The original proposed decision would have made one modification to CALSSA’s proposal, specifying that an existing method from

¹³ CALSSA July 30, 2018 response, at 6.

¹⁴ R.14-07-002 Proposed Decision, *Decision Granting Petition for Modification of Decision 14-05-033 Regarding Direct Current-Coupled Solar Plus Storage Systems*, issued October 5, 2018 (original proposed decision), at 12-17.

the Self-Generation Incentive Program (SGIP) should be used to determine maximum continuous output of an energy storage device.¹⁵

On October 25, 2018, CALSSA, CESA, EFCA, PG&E, SDG&E and SCE filed comments. On October 30, 2018, CALSSA, EFCA, PG&E and SCE (jointly), and SDG&E filed reply comments on the original proposed decision.

CALSSA, CESA and EFCA raise concerns with the original proposed decision's requirement that a firmware-based "no storage export" configuration must provide "equal reliability and security as a non-export relay," arguing this introduces an unreasonable degree of subjectivity on the part of the IOUs. These parties note, more generally, that certification standards are being developed at UL that should be able to sufficiently address IOU concerns with either the "no grid import" or "no storage export" use cases, without requiring additional real-time monitoring requirements. SCE also recommends we require a Nationally Recognized Testing Lab (NRTL) using a national standard testing procedure, "equivalent to that which is used to certify smart inverters in California," to certify any system that uses a firmware-based option, and further to clarify that the industry is not foreclosed from using methods other than "voltage control" that may provide the same or better technical results.¹⁶

As for the software-based option, the utilities on the one hand generally advocate that additional issues must be resolved before a software-based solution can be implemented, based on the original proposed decision's

¹⁵ Original proposed decision, at 17-18.

¹⁶ *Opening Comments of Southern California Edison Company (U 338-E) on Proposed Decision Granting Petition for Modification of Decision 14-05-033 Regarding Direct Current-Coupled Solar Plus Storage System*, filed October 25, 2018 (SCE opening comments on original proposed decision), at 2-3.

determination to make approval contingent on a Commission determination that the electric IOUs' communication infrastructures are capable of real-time communication with Phase II and Phase III communication-compliant inverters. As an alternative approach, CALSSA, CESA and EFCA generally assert that approval of *both* the firmware- and software-based options should be based on the certification standard that is nearing finalization by UL. In essence, these parties represent, the distinction between firmware-based and software-based solutions is made less meaningful by the new standard; CALSSA states "if a device meets the standard, it should be accepted."¹⁷ EFCA recommends the Commission rely on "certification to either a UL or IOU-established standard as the means of ensuring that storage systems adhere to any operational constraints, such as prohibitions on grid charging or export, that are deemed necessary to safeguard the integrity of the NEM program. Provided a system meets the standard and the interconnection agreement memorializes the obligation to operate the storage system in a prescribed manner, the Commission and the utilities can be confident that systems will not be used in a way that undermines the NEM program."¹⁸

Multiple parties also raised concerns with the original proposed decision's determination regarding how to measure storage device size in DC-coupled systems. SCE asserts that use of the SGIP methodology to determine system size,

¹⁷ *Comments of the California Solar & Storage Association on the Proposed Decision on NEM Paired Storage*, filed October 25, 2018 (CALSSA opening comments on original proposed decision), at 4.

¹⁸ *Energy Freedom Coalition of America's Opening Comments Regarding Proposed Decision Granting Petition for Modification of Decision 14-05-033 Regarding Solar Plus Storage Systems*, filed October 25, 2018, at 10.

for interconnection purposes, is “apples to oranges,”¹⁹ noting that determination of storage system size for the purpose of determining SGIP incentives is after-the-fact, whereas determining system size for the purpose of conformance with D.14-05-033 is part of the interconnection review process. CALSSA also notes that the SGIP methodology “has proven to be more time consuming than anticipated and is largely unnecessary.”²⁰ SCE recommends that we require the “maximum continuous rating” metric to be included in the technical specification data sheets; if that metric is not included, SCE recommends we direct the electric IOUs to rely on the inverter nameplate rating. Similarly, CALSSA recommends that system size be determined as the lesser of the inverter nameplate and the maximum continuous discharge capacity listed on standard battery specification or “spec” sheets.

2. Issues Before the Commission

The issues before us are whether and how to provide alternative compliance pathways for large NEM-eligible facilities with NEM-PS devices to interconnect and take service on a NEM tariff, which would permit interconnection of both large DC-coupled and AC-coupled solar plus storage systems, in lieu of metering requirements; and whether to specify a different means for determining the size of paired storage devices, which would affect whether such systems are classified as ‘small’ or ‘large’ with respect to the metering requirements that D.14-05-033 imposes for large solar plus storage systems.

¹⁹ SCE opening comments on original proposed decision, at 5.

²⁰ CALSSA opening comments on original proposed decision, at 5.

3. Discussion

3.1. Compliance Pathway for “No Grid Charging” and “No Storage Export” Use Cases

To summarize, we approve power control-based options, for ensuring NEM credit accrues only to NEM-eligible generation in large solar plus storage systems, as long as the control configuration is certified to a national standard or a utility-approved interim testing procedure. Power control-based options include the use of equipment, whether firmware-based or software-based, to prevent the storage device from charging from the grid or to prevent the storage device from exporting to the grid. We will not approve the *ex-post* data validation option at this time.

The Commission in D.17-12-005 directed the electric IOUs to modify their VNEM tariffs in order to facilitate installation of paired storage devices. Specifically, D.17-12-005 directs that both the NEM-eligible facility and the storage device be located behind the same output meter (such that generation from the NEM-eligible facility would not be metered separately from generation from the storage device), which would be required to include a physical non-import relay or a functionally equivalent non-import configuration to prevent grid power from flowing to the storage device. This is essentially the same situation as CALSSA’s proposed “no grid charging” use case for large DC-coupled solar plus storage systems under NEM, in that both situations prohibit grid charging to the storage device. The electric IOUs submitted compliance advice letters to implement D.17-12-005;²¹ those advice letters, approved as of May 25, 2018, describe the electric IOUs’ collaborative efforts

²¹ Advice Letters 5245-E-A (Pacific Gas and Electric Company), 3761-E-A (Southern California Edison Company), and 3199-E (San Diego Gas & Electric Company).

with solar and storage industry stakeholders to identify ways to reliably and consistently ensure that NEM-paired storage devices charge only from the NEM-eligible generator and not from the grid. Although all three electric IOUs stated their preference for a third party-certified configuration, they acknowledged no NRTL at that time provided third party certification for a non-import configuration and instead proposed an interim testing procedure that would remain effective until issuance of a formal UL certification that can replace it. Multiple parties' comments on the original proposed decision now make clear that a Certification Requirements Decision, currently under development to support the 2020 National Electrical Code Section 705.13 (Power Control Systems), is nearing finalization; it is anticipated the national standard will be published in January of 2019 as an addendum to UL 1741.²²

CALSSA, CESA and EFCA's comments suggest the distinction between firmware- and software-based options is not as critical as the fact that both options are control-based, i.e., the use of equipment (whether firmware-based or software-based) to conform to either a "no grid charging" or a "no storage export" use case. We are persuaded by the comments of CALSSA, CESA and EFCA that, in lieu of metering requirements, it is reasonable to approve control-based options that have certified to a national standard or a utility-approved interim testing procedure.

We acknowledge the electric IOUs' concern that a NEM-compliant configuration (*i.e.*, "no grid charging" or "no storage export"), once initially set, might subsequently be changed. To address this concern, the original proposed

²² Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.

decision made its approval of a software-based option contingent on the IOUs being able to verify inverter settings using Phase II and III functions. However, we have subsequently learned that the communication protocol approved in Phase II, IEEE 2030.5,²³ does not have the ability to report information about how a device's settings are configured, nor are there plans to modify the protocol to add that ability.

To ensure device settings are configured correctly at installation and not subsequently changed, we recommend the electric IOUs apply the same methods they use currently to ensure smart inverter settings (*e.g.*, voltage and reactive power (volt/var)) are configured correctly at installation and not subsequently changed. For instance, the electric IOUs may require that the NEM-compliant control configuration appear in a device's configuration file as a non-editable value, such that installers would have to select an entirely different configuration file (*e.g.*, a configuration file applicable to Hawaii as opposed to the one applicable to California) in order to modify the NEM-compliant configuration.

We will not approve the *ex-post* data validation option at this time. We agree with the electric IOUs that this option does not currently provide a sufficient degree of reliability and security for the purpose of ensuring that NEM bill credits accrue only to NEM-eligible generation.

With respect to CALSSA's recommendation that the proposed firmware-based voltage control solution apply to NEM-A, we note that NEM-A is a special condition under the general NEM tariff; therefore, any changes to storage

²³ Smart Energy Profile 2.0 (SEP2, IEEE 2030.5).

requirements under the NEM tariff that are adopted in this decision would necessarily apply to NEM-A because it is part of the NEM tariff.

3.2. Determining System Size of DC-Coupled Solar Plus Storage Systems

We approve CALSSA's proposal, as modified in its comments on the original proposed decision, for specifying the way in which storage system size should be measured in DC-coupled systems.

Customer-generators have the option to install a NEM-eligible facility with a greater capacity than the paired storage device; in such arrangements, and where both the NEM-eligible facility and the paired storage device share one inverter, the inverter's rated capacity may exceed the storage device's capacity. Therefore it is reasonable in such arrangements to measure paired storage device capacity as the lesser of the shared inverter's nameplate capacity and the storage device's maximum continuous discharge capacity listed on the device's technical specifications sheets. If that metric is not included, the electric IOUs may rely on the inverter nameplate rating.

3.3. Other Issues Denied Without Prejudice

We deny without prejudice the remaining issues raised by or in response to the Petition.

First, with respect to potential future participation in demand response programs, given that CALSSA offers no specific metering or billing solution for such a use case, it would be premature to consider this request at this time.²⁴

Second, the Petition's final request, to allow data pulled from third party-owned metering in lieu of an NGOM, does not require a modification to

²⁴ For the same reason, we do not address CESA's request for confirmation that future use cases not currently known will be considered for NEM-PS eligibility.

existing policy as third party-owned metering is not currently prohibited. The electric IOUs raise valid concerns with the use of third party-owned meters, which we encourage solar and storage industry stakeholders to work with the electric IOUs to address.

4. Comments on Proposed Decision

The Commission mailed the proposed decision to the parties in accordance with Pub. Util. Code § 311, and allowed comments in accordance with Rule 14.3 of the Commission's Rules of Practice and Procedure. On _____, _____ filed comments. On _____, _____ filed reply comments.

5. Assignment of Proceeding

Martha Guzman Aceves is the assigned Commissioner and Mary F. McKenzie and Valerie U. Kao are the assigned administrative law judges in this proceeding.

Findings of Fact

1. Decision 14-05-033 defines large NEM-eligible GFs as those with NEM-paired storage devices that exceed 10 kW (AC) maximum discharge capacity.
2. Decision 14-05-033 imposes a size limitation and metering requirements on large GFs for the purpose of ensuring that NEM bill credits accrue only to NEM-eligible generation.
3. Decision 14-05-033 declines to consider alternative compliance options for large single inverter NEM-eligible facilities paired with energy storage.
4. CALSSA's petition for modification of D.14-05-033 proposes several alternative compliance options for large NEM-eligible facilities paired with energy storage, or large solar plus storage systems.

5. D.17-12-005 directs that both the NEM-eligible facility and the storage device be located behind the same output meter, which would be required to include a physical non-import relay or a functionally equivalent non-import configuration to prevent grid power from flowing to the storage device. This is a comparable situation to CALSSA's proposed "no grid charging" use case for large DC-coupled solar plus storage systems under NEM. The Commission approved the electric IOUs' advice letters implementing D.17-12-005 on May 25, 2018.

6. A Certification Requirements Decision is currently under development to support the 2020 National Electrical Code Section 705.13 (Power Control Systems); it is anticipated the national standard will be published in January of 2019 as an addendum to UL 1741.

7. Customer-generators that pair storage with a NEM-eligible facility have the option to install a NEM-eligible facility with a greater capacity than the paired storage device; in such an arrangement, and provided that both the NEM-eligible facility and the paired storage device share one inverter, the inverter's rated capacity may exceed the storage device's capacity.

Conclusions of Law

1. It is reasonable to grant CALSSA's request to provide alternative options for compliance with D.14-05-033's requirements for large NEM-eligible facilities with paired storage devices, pursuant to the power control-based options addressed in CALSSA's Petition, so long as those control-based options have been certified to a national standard or a utility-approved interim testing procedure.

2. It is reasonable to deny the *ex-post* data validation option, for compliance with D.14-05-033's requirements for large NEM-eligible facilities with paired storage devices, addressed in CALSSA's Petition.

3. It is reasonable to measure and determine storage system size in DC-coupled solar plus storage systems as the lesser of the shared inverter's nameplate capacity and the storage device's maximum continuous discharge capacity listed on the device's technical specifications sheets. If that metric is not included, the electric IOUs may rely on the inverter nameplate rating.

4. D.14-05-033 should be modified as set forth in Appendix A of this decision.

O R D E R

IT IS ORDERED that:

1. The Petition for Modification is granted in the following respects:
 - a. We approve power control-based options for ensuring net energy metering (NEM) credit accrues only to NEM-eligible generation in large solar plus storage systems so long as the control configuration is certified to a national standard or utility-approved interim testing procedure. Power control-based options include using equipment that prevents electricity to be exported from the storage device to the grid, and using equipment that prevents electricity imported from the grid to charge the storage device.
 - b. We approve the proposal of the California Solar & Storage Association, as modified in Section 3.2 of this decision, for specifying the way in which storage system size should be determined in direct current-coupled solar plus storage systems.
2. The Petition for Modification is denied in all other respects.
3. Decision 14-05-033 is modified as set forth in Appendix A of this decision.

4. Within 45 days after the issue date of this decision, Pacific Gas and Electric Company (the IOUs), Southern California Edison Company and San Diego Gas & Electric Company must each submit a Tier 2 advice letter modifying their respective net energy metering tariffs and interconnection agreement forms, as applicable, to implement the power control-based options for complying with Decision 14-05-033's requirements for large generating facilities paired with energy storage devices. These advice letters must also specify that direct current-coupled solar plus storage systems' size will be determined as the lesser of the shared inverter's nameplate capacity and the storage device's maximum continuous discharge capacity listed on the device's technical specifications sheets. If that metric is not included, the electric IOUs may rely on the inverter nameplate rating.

5. Rulemaking 14-07-002 remains open.

This order is effective today.

Dated _____, at Sacramento, California.

Appendix A
Changes to Decision 14-05-033

Section 6.2.3 Discussion of Metering Requirements

Starting on Page 21, amend as follows (additions in italics and underlined, deletions in strikeout):

~~Although w~~We recognize that certain single inverter large GFs with NEM-~~paired storage devices~~NEM-eligible GFs paired with storage devices by direct current, or DC-coupled solar plus storage systems, may not be able to accommodate the metering requirements as described above,~~we choose not to provide an alternative metering solution for such configurations at this time. Therefore, all large NEM-paired storage GFs shall conform to the metering requirements described above. For these systems, we will authorize power control-based options for ensuring NEM credit accrues only to NEM-eligible generation in large solar plus storage systems so long as the control configuration is certified to a national standard or utility-approved interim testing procedure. Power control-based options include using equipment that prevents electricity to be exported from the storage device to the grid, and using equipment that prevents electricity imported from the grid to charge the storage device.~~

Small NEM-eligible GFs with paired storage devices (at 10 kW (AC) or less maximum discharge capacity) may, at the system owner's option, adhere to the metering requirements prescribed for large NEM-paired storage GFs when it is technically feasible to do so. In DC-coupled solar plus storage systems, storage device capacity should be determined as the lesser of the storage device's continuous discharge capacity and the nameplate capacity of the inverter that is shared with the NEM-eligible GF. Continuous output of a storage device should be determined by referring to the device's technical specifications sheet. If that metric is not included, the electric IOUs may rely on the inverter nameplate rating.

Findings of Fact

Include new Finding of Fact 16 as follows:

16. Small NEM-eligible GFs, or small solar plus storage systems, are NEM-eligible GFs paired with storage sized at 10 kW or less. Large NEM-eligible GFs, or large solar plus storage systems, are NEM-eligible GFs paired with storage sized larger than 10 kW. In AC-coupled solar plus storage systems, storage device capacity is determined as the (AC) maximum discharge capacity. In DC-coupled solar plus storage systems, storage device capacity is determined as the lesser of the storage device's maximum continuous output rating and the nameplate capacity of the inverter that is shared with the NEM-eligible GF. Continuous output of a storage device is determined by referring to the device's technical specifications sheet.

Conclusions of Law

Amend Conclusions of Law 1, 8, 9, 10, 11, 12, 14 and 15 as follows:

1. NEM-paired storage systems should be configured and/or metered in such a way as to ensure that NEM credit can only be earned by eligible renewable electric generation.

8. NEM-paired storage systems with storage devices sized at 10 kW or smaller, as determined pursuant to Finding of Fact 16, should have no requirement to be sized to the customer demand or the NEM generator.

9. NEM-paired storage systems with storage devices sized larger than 10 kW, as determined pursuant to Finding of Fact 16, should have a maximum output power no larger than 150% of the NEM generator's maximum output capacity.

10. Qualified NEM-paired storage systems should be configured and/or metered in order to ensure that NEM credit can only be earned by the eligible renewable electric generation.

11. It is reasonable to adopt simpler and more cost-effective sizing and metering requirements to ensure NEM integrity for systems sized at 10 kW or less, as determined pursuant to Finding of Fact 16.

12. Small NEM eligible GFs (~~with storage sized at 10 kW (AC) or less~~), as determined pursuant to Finding of Fact 16, should be permitted to use an estimation methodology based on a presumed generation profile of the GF's NEM generator to validate the eligible NEM credits accrued to the GF.

14. Qualifying large NEM-eligible GFs (~~with paired storage systems larger than 10 kW (AC)~~), as determined pursuant to Finding of Fact 16, should be required to: 1) adhere to metering requirements similar to those in the NEM-MT tariff; 2) use equipment that prevents electricity to be exported to the grid from the storage device; or 3) use equipment that prevents electricity to be imported from the grid to charge a storage device to ensure that only NEM eligible generation receives NEM credit. NEM-eligible GFs with storage devices sized at 10 kW or less, as determined pursuant to Finding of Fact 16, should have the option to adhere to the metering requirements prescribed for large NEM-paired storage GFs when it is technically feasible to do so.

15. The NEM Tariff should be modified to incorporate the sizing and metering requirements described in this decision for NEM-paired storage systems, both for ~~systems with storage devices greater than 10 kW (AC) maximum discharge capacity and those sized at or below 10 kW (AC) maximum discharge capacity~~ large NEM-eligible GFs and small NEM-eligible GFs, as defined and determined pursuant to Finding of Fact 16, upon Commission approval of an estimation methodology based on a presumed generation profile of eligible NEM generators. This modified tariff should apply to NEM-paired storage systems interconnected under the NEM Tariff.

Include new Conclusion of Law 26 as follows:

26. For systems interconnecting under net energy metering aggregation (NEMA), electricity exported to the grid from a paired solar and storage system will generate NEM credits for the NEMA arrangement.

Ordering Paragraphs

Amend Ordering Paragraphs 3, 4, 5, 6, 8 and 9 as follows:

3. Net Energy Metering (NEM)-paired storage systems with storage devices sized at 10 kilowatts ~~alternating current~~ or smaller, as determined pursuant to Finding of Fact 16, shall have no requirement to be sized to the customer demand or the NEM generator.

4. ~~For~~ Net Energy Metering (NEM)-paired storage systems with storage devices larger than 10 kilowatts ~~alternating current~~, as determined pursuant to Finding of Fact 16, shall have a maximum output power no larger than 150% of the NEM-eligible generator's maximum output capacity.

5. Small Net Energy Metering (NEM)-eligible generating facilities, ~~those with NEM paired storage devices sized at 10 kilowatts alternating current or less~~ as determined pursuant to Finding of Fact 16, shall utilize an estimation methodology based on a presumed generation profile of the generating facility's NEM generator as adopted by the Commission subsequent to this decision.

6. The Commission shall issue a separate ruling in this proceeding, Rulemaking 12-11-005, describing the process for finalizing the presumed generation profile based estimation methodology for eligible Net Energy Metering (NEM) generators to be incorporated into a revised NEM tariff for small NEM-eligible generating facilities with NEM paired storage devices ~~sized at 10 kilowatts alternating current or less~~, as determined pursuant to Finding of Fact 16.

8. Small Net Energy Metering (NEM)-eligible systems with storage devices sized at 10 kilowatts alternating current or less GFs, as determined pursuant to Finding of Fact 16, may, at the system owner's option, adhere to the metering

requirements prescribed for NEM-paired storage systems larger than 10 kW when it is technically feasible to do so.

9. Large Net Energy Metering (NEM) paired storage systems, those with NEM-paired storage devices larger than 10 kilowatts ~~alternating current~~, as determined pursuant to Finding of Fact 16, shall be required to: 1) install a non-export relay on the storage device(s); 2) install an interval meter for the NEM-eligible generation, meter the load, and meter total energy flows at the point of common coupling; ~~or~~ 3) install an interval meter directly to the NEM-eligible generator(s); 4) use equipment that prevents electricity to be exported from the storage device to the grid; or 5) use equipment that prevents electricity imported from the grid to charge a storage device.

END OF APPENDIX A