STATE OF CALIFORNIA EDMUND G. BROWN JR., *Governor*

PUBLIC UTILITIES COMMISSION
505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298

May 8, 2017

TO: ALL PARTIES OF RECORD IN RULEMAKING 15-03-011:

Decision 17-04-039 is being mailed without the Concurrence of President Picker. The Concurrence will be mailed separately.

Sincerely,

/s/ KAREN V. CLOPTON
Karen V. Clopton, Chief
Administrative Law Judge

KVC/jt2

Attachment

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Decision 17-04-039 April 27, 2017

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to consider policy and implementation refinements to the Energy Storage Procurement Framework and Design Program (D.13-10-040, D.14-10-045) and related Action Plan of the California Energy Storage Roadmap.	Rulemaking 15-03-011 (Filed March 26, 2015)

DECISION ON TRACK 2 ENERGY STORAGE ISSUES

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DECISION ON TRACK 2 ENERGY STORAGE ISSUES

Summary

This decision resolves all remaining issues for Track 2 of the Energy Storage Rulemaking except Multiple-Use Applications. The decision does not expand utility energy storage targets, but sets forth a process for implementing Assembly Bill 2868 which requires the utilities to propose programs and investments up to 500 megawatts of additional distributed energy storage resources. The decision affirms the one percent Energy Service Provider/Community Choice Aggregator energy storage procurement target, but establishes a limiter on that obligation to ensure parity with investor-owned utility energy storage procurement obligations. The decision declines to modify prior decisions on eligibility of certain resource types to count towards utility energy storage procurement targets. The decision adopts rules regarding the treatment of station power for energy storage devices, but defers the adoption of station power rules for behind-the-meter systems until the necessary processes and metering configurations have been further developed.

This proceeding remains open to address issues surrounding Multiple-Use Applications.

1. Background

On March 26, 2015, the California Public Utilities Commission (CPUC) issued an Order Instituting Rulemaking to address enactment and ongoing implementation of Assembly Bill (AB) 2514[1] and to continue to refine policies and program details as required or recommended by Decision (D.) 13-10-040 and

[1] Stats 2010, ch. 469.

D.14-10-045, which established the Energy Storage Procurement Framework and Program (Program) and approved the utilities' applications to implement the Program. This proceeding is the successor to Rulemaking (R.) 10-12-007. This Rulemaking also considers recommendations included in the California Energy Storage Roadmap (Storage Roadmap), an interagency guidance document that was jointly developed by the California Independent System Operator (CAISO), the California Energy Commission (CEC), and the CPUC. The Storage Roadmap identified needed actions, set priorities and defined the responsibilities of each organization to address the challenges. Several of the items identified in the Storage Roadmap are considered in this proceeding.

In D.13-10-040,[2] the CPUC adopted a total energy storage procurement target of 1,325 megawatts (MW), allocated to each of the investor-owned utilities[3] in four biennial solicitations through 2020 (non-utility load serving entities have targets based on one percent of annual peak load by 2020). That decision provided a basis for cost/benefit analysis in several use cases, adopted caps for procurement of storage in various grid domains (Transmission, Distribution and Customer), and allowed for some flexibility across the transmission and distribution grid domains, but not into and out of the customer grid domain. In addition, the decision allowed each utility to utilize its proprietary protocols for assessing and selecting winning energy storage bids but required the utilities to

[2] This accounting of D.13-10-040, D.14-10-045, and D.16-01-032 is meant to be illustrative and not exhaustive. Please see each respective decision for a complete list of policies and programs adopted.

[3] Reference to "utility" or "utilities" throughout the decision means investor-owned utilities, unless otherwise specified. The utilities are Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company.

develop a consistent evaluation protocol (CEP) for reporting/benchmarking and facilitating a consistent comparison across utilities, bids, and use-cases. D.13-10-040 also directed that a comprehensive evaluation of the Energy Storage Framework and Design Program be conducted no later than 2016 and once every three years thereafter.

In D.14-10-045, the CPUC evaluated and approved the utilities' energy storage procurement plans for the 2014 biennial period, with some modifications. In addition, D.14-10-045 approved eligible energy storage technologies and approved the Power Charge Indifference Adjustment (PCIA) mechanism to allow recovery of potential above-market costs associated with departing load for market/"bundled" energy storage projects but denied a request for an extension of the PCIA mechanism for market/"bundled" energy storage contracts beyond 10 years. Finally, the CPUC approved the proposed utility CEPs, with modifications, and directed that these evaluation protocols be used in the December 2014 solicitation requirements and bid materials.

Following the Prehearing Conference (PHC) held on May 20, 2015, the Assigned Commissioner and Administrative Law Judges issued a Scoping Memo and Ruling on June 6, 2015 (First Scoping Memo and Ruling). The First Scoping Memo and Ruling determined that the proceeding would be divided into two tracks.

Track 1 was narrowly scoped to consider issues that required resolution prior to the commencement of the utilities' 2016 energy procurement solicitations and were resolved in D.16-01-032. Among other issues, D.16-01-032 approved the utilities' request for additional flexibility of energy storage targets between grid domains, allowing the utilities to satisfy some of their transmission and distribution domain targets through customer-connected projects, up to a

"ceiling" of 200 percent of the existing customer domain targets; clarified that direct current (DC)-based storage used as part of a DC microgrid is an eligible storage product for purposes of meeting the storage targets but found that Hydrogen-based power-to-gas option (P2G), when injected into the natural gas pipeline system, is ineligible to meet the storage targets established in D.13-10-040 and the requirements of AB 2514; and established that credit for SGIP-funded energy storage projects should be split evenly between an unbundled customer's utility and the community choice aggregator (CCA)/energy service provider (ESP) for purposes of meeting the storage targets.

On January 5, 2016 the Assigned Commissioner and Administrative Law Judge (ALJ) issued a Scoping Memo and Ruling (Second Scoping Memo and Ruling) that sought comments on Track 2 issues. Track 2 was scoped to consider additional issues for the continued development and refinement of the Energy Storage Procurement Framework and Design Program which could not be sufficiently addressed prior to the commencement of the 2016 procurement solicitations. This decision addresses all Track 2 issues except Multiple-Use Applications.

2. Scoping Memo Issues

The Second Scoping Memo and Ruling reiterated that this Rulemaking continues to adhere to the following guiding principles, set forth in D.14-10-045:

1. Optimization of the grid, including peak reduction, contribution to reliability needs, or deferment of transmission and distribution upgrade investments;
2. Integration of renewable energy; and
3. Reduction of greenhouse gas emissions to 80% below 1990 levels by 2050.

The Scoping Memo and Ruling solicited comments on the following Track 2 issues:

1. Eligibility
2. Revision of Energy Storage Procurement Targets
3. Multiple-Use Applications
4. Station Power
5. Community Storage

The following parties filed opening (February 5, 2016) and/or reply (February 19, 2016) comments in response to the Scoping Memo and Ruling: Alliance for Retail Energy Markets and Direct Access Customer Coalition (AReM/DACC); Alliance of Automobile Manufacturers and American Honda Company (Joint Auto); Association of California Water Agencies; Bison Peak Pumped Storage; Brookfield; California Energy Storage Alliance (CESA); California Hydrogen Business Council (CHBC); CAISO; Calpine Corporation (Calpine); CCA Parties – Marin Clean Energy and City of Lancaster; ChargePoint Inc.; Clean Coalition; California Large Energy Consumers Association (CLECA); Eagle Crest Energy; EDF Renewable Energy Inc.; Environmental Defense Fund (EDF); Green Power Institute (GPI); Ice Energy; Independent Energy Producers Association (IEPA); LS Power; MegaWatt Storage Farms (MegaWatt); Natural Resource Defense Council (NRDC); Nevada Hydro; Office of Ratepayer Advocates (ORA); Pacific Gas and Electric Company (PG&E); Powertree Services Inc. (Powertree); San Diego County Water Authority; San Diego Gas & Electric (SDG&E); Shell Energy North America; Sierra Club; Southern California Edison (SCE); Southern California Gas Company (SoCalGas); The Utility Reform Network (TURN); and Western Power Trading Forum (WPTF).

In addition, on September 30, 2016, the assigned Administrative Law Judge (ALJ) solicited comments on whether a new or amended General Order is needed in order for the CPUC's Safety and Enforcement staff to implement a proposed utility-owned energy storage facility inspection protocol. PG&E, SCE, SDG&E, and GPI filed comments on the ALJ Ruling.

We address each of the identified issues with the exception of Multiple-Use Applications. Issues related to Multiple-Use Applications will be resolved in a future decision.

3. Eligibility

Track 2 was to consider whether previously excluded energy storage technologies should be eligible to count towards the established energy storage targets. In particular, the CPUC sought input on the following question:

> What new information and/or evolving circumstances exist such that the Commission should revisit previously excluded energy storage technologies, such as controlled electric vehicle charging or pumped storage projects greater than 50 MW? The Commission will not consider comments that simply restate positions previously offered and addressed in D.14-10-045.

Several parties asked that we reconsider our exclusion of V1G (managed or controlled charging of electric vehicles), pumped hydro storage greater than 50 MW, and hydrogen-based power to gas (P2G) stored in the natural gas pipeline system as eligible storage technologies. We have considered the comments of parties in support and opposition to expanding eligibility to these three technologies, and make no changes at this time. We discuss our analysis for each technology below.

3.1. V1G Eligibility

It is clear that widespread electric vehicle deployment supports the objectives of Senate Bill (SB) 350.[4] However, the question before us today is whether one-way managed or controlled grid charging (V1G) should be eligible to meet energy storage targets and whether any changes have occurred since our prior decision to exclude it as an eligible technology. Sierra Club sums up our thoughts nicely:

> D.14-10-045… made clear that while it understands that electric vehicles have an important role to play in advancing some of the policy goals set forth in D.13-10-040, one of the Commission's primary areas of focus in its storage proceedings is to explore how best to leverage the capacity these vehicles have to support the grid. On a very basic level, V1G or the "controlled charging" of one-way electric vehicles does not provide the type of grid support envisioned by the Commission in this proceeding. This is because the benefit of the capacity from the controlled charging of these vehicles is conferred to off-grid users; specifically, for the sole purpose of powering the same vehicles for later use.[5]

In addition, V1G is already being considered in other proceedings like R.13-11-007, where it is subject to distinct regulatory funding and incentive mechanisms. There are implementation issues unique to vehicles as providers of energy storage, such as the need to clarify the appropriate point of regulation and Vehicle Grid Integration communications standards that would benefit from engagement by transportation planning agencies, automakers, and other electric vehicle experts. While allowing V1G to count towards the energy storage targets

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[4] Stats. 2015, ch. 547.

[5] Sierra Club February 19, 2016 Reply Comments at 8, citations omitted.

might be a positive market signal, there are other mechanisms, like price signals and tariffs, that could also encourage adoption of this resource. A ruling in the recently filed Transportation Electrification applications (Application (A.) 17-01-020, A.17-01-021, and A.17-01-022) noted that formation of a Vehicle Grid Integration working group would be discussed at a PHC on March 16, 2017, and we note that the three utilities all included recommended tariffs to promote electric vehicle adoption. Providing yet another forum to consider V1G issues can create confusion, further undermining the goal of increasing the deployment of two-way storage resources in this proceeding. For this reason, we do not modify our decision to exclude V1G from eligibility to meet the energy storage targets.

3.2. Large Pumped Storage Eligibility

A number of parties advocate that large pumped storage resources (above 50 MW) be eligible to meet the adopted energy storage targets. Commenters focus on the value that large pumped storage could bring to the grid, not on whether there are new circumstances that should cause us to consider revisiting our prior exclusion of pumped storage from counting towards the targets. We review our prior discussion at pages 34-36 of D.13-10-040. There we said:

> We emphasize that our decision to limit the size of pumped storage projects in the decision is not to discourage large-scale pumped storage projects. On the contrary, these types of projects offer similar benefits as all of the emerging storage technologies targeted by this program; it is simply their scale that is inappropriate for inclusion here. We strongly encourage the utilities to explore opportunities to partner with developers to install large-scale pumped storage projects where they make sense within the other general procurement efforts underway in the context of the LTPP proceeding or elsewhere.

On January 16, 2014, CPUC staff hosted a technical workshop on "Understanding the Current State of Pumped Storage," as directed by Ordering Paragraph 9 of D.13-10-040.[6] On November 20, 2015, the CEC and the CPUC conducted a joint workshop to discuss bulk energy storage in California. The workshop included a wide range of speakers from across California's energy agencies, utilities, energy storage developers, and other stakeholders, and focused on topics such as the operations of existing bulk energy storage projects in California, the potential for bulk storage to address grid challenges, and the challenges of planning the electric grid and developing future bulk energy storage projects.[7] In addition, the Integrated Resource Planning Proceeding (R.16-02-007), which opened after the Track 2 Scoping Memo was issued, has as two of its explicit scoping objectives to establish policy guidance on portfolio optimization and implications for specific resource types and guidance on handling long-lead-time resources such as pumped hydroelectric storage.

It is clear that large pumped storage offers many benefits and could be a valuable tool to balance the renewable generation resources needed to meet the SB 350 objectives of 50 percent renewables by 2030. However, the issue before us today is not whether this resource has the potential to bring value to the grid, but whether pumped storage larger than 50 MW should be eligible to count towards the utilities energy storage targets. As determined in D.13-10-040, the sheer size

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[6] A report on that workshop is available at: http://cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work/PPD_Work_Products_(2014_forward)/PPD%20Workshop%20Report%20on%20Pumped%20Storage%20Workshop.pdf.

[7] The workshop report is available here: http://www.energy.ca.gov/2016publications/CEC-200-2016-006/CEC-200-2016-006.pdf.

of a large-scale pumped storage project would dwarf other smaller, emerging technologies, and could inhibit the fulfillment of the market transformation goals of the program.[8] We continue to find that this is the case and that the more appropriate place to evaluate large pumped storage is in the context of Integrated Resource Planning proceeding (R.16-02-007). Further, we are encouraged by the recent enactment of AB 33[9] (Quirk), which requires the CPUC, in coordination with the CEC, to evaluate the potential for long duration bulk energy storage to help integrate renewable generation into the electric grid. Therefore, we make no changes to our prior eligibility determination for pumped storage larger than 50 MW at this time.

3.3. Power-to-Gas (P2G) Injection Into Natural Gas Pipeline Eligibility

In D.14-10-045 we found that a qualifying storage component included with a dairy, agricultural, or food waste biogas project was eligible to be counted towards utility storage targets, but we also found that the natural gas pipeline does not qualify as the storage component of a biogas project. In D.16-01-032 we applied the same framework and found that hydrogen created via a P2G process that is stored in natural gas pipelines is not eligible to count towards a utility's storage targets. In Track 2 comments CHBC and SoCalGas encourage us to revisit this prior decision while Sierra Club, CESA, and ORA support P2G remaining ineligible when injected into the natural gas pipeline system.

SoCalGas distinguishes P2G from biogas stored in a natural gas pipeline because in the biogas example, the project involves no conversion and storage of

[8] D.13-10-040, Finding of Fact 15.

[9] Stats. 2016, ch. 680.

electrical energy. SoCalGas believes that P2G is different because its primary purpose is conversion and storage of electrical energy from the grid or grid-connected resources.[10] SoCalGas cites to a number of recent studies that they argue support a finding that injecting hydrogen created via P2G into the natural gas pipeline system supports decarbonization of the gas grid and the state's greenhouse gas emission reduction goals. CHBC states that storing the converted hydrogen in the natural gas pipeline system is more accurately analogized to any other storage reservoir, like the upper reservoir for pumped hydro, a salt cavern, or compressed gas tank.[11]

Sierra Club counters that injection of hydrogen into the natural gas pipeline system, or injection of methane created in lieu of hydrogen in order to allow increased storage in the natural gas system, takes clean power and converts it into dirty energy because combusting this converted energy will result in an increase of greenhouse gas emissions.[12] Sierra Club argues that while there is not an explicit requirement that a specific storage project will reduce greenhouse gas emissions, one of the overarching goals of this proceeding is to consider reduction of greenhouse gas emissions in reaching our determinations relating to energy storage.

ORA and CESA argue that hydrogen-based P2G should remain ineligible as proposed because the "natural gas grid" is not an eligible storage component. ORA supports this argument by stating that the energy storage definition only includes the "storage component" of a technology, not the transportation

[10] SoCalGas February 5, 2016 Comments at 5.

[11] CHBC February 5, 2016 Comments at 3-4.

[12] Sierra Club February 19, 2016 Reply Comments at 13.

infrastructure attached to it. CESA states that if the existing natural gas pipelines were used as a component of a hydrogen-based P2G system, then the storage system would fail to qualify as "new" or "installed" as defined by §2835(c).

We do not dispute that there are technical differences between P2G and biogas – namely, that P2G involves the *conversion* of electric energy from the grid or grid-connected resources, whereas biogas is simply conditioned and stored as renewable fuel. However, this technical difference does not address the underlying conclusion in D.14-10-045 that the natural gas pipeline system does not qualify as an eligible storage component. Therefore, we make no changes to our prior eligibility determination for P2G when injected into the natural gas pipeline system at this time.

4. Revision of Energy Storage Procurement Targets

D.13-10-040 adopted a target of 1,325 MW to be procured by the utilities in four biennial solicitations through 2020. The storage targets are summarized in Table 1 below. Non-utility load serving entities have targets based on one percent peak load by 2020.

Table 1: Adopted Energy Storage Procurement Targets

Service Territory	Procurement Targets by Domain Customer/Distribution/Transmission			TOTAL BY UTILITY
PG&E	85	185	310	*580*
SCE	85	185	310	*580*
SDG&E	30	55	80	*165*
TOTAL BY DOMAIN	200	425	700	*1325*

The Second Scoping Memo and Ruling sought input on whether to the targets should be revised based on performance in the initial round of energy

procurement solicitations, as well as the various energy-related statewide goals. Specific scoping questions were:

a. Should the Commission increase or revise the adopted energy storage procurement targets for IOUs and/or ESPs/CCAs applicable for the 2018 and 2020 solicitations? What factors should the Commission consider in increasing or revising the adopted energy storage procurement targets?

b. Considering the directive in Senate Bill 350 (De Leon, 2015) to develop an Integrated Resource Planning Process, should the Commission adopt energy storage procurement targets beyond 2020 at this time? If so, what factors should the Commission consider in adopting future targets, and what is an appropriate target?

c. If increased targets are adopted for ESPs/CCAs, what implications are there for PCIA/cost recovery, and how should the Commission balance the storage targets against the level of non-by-passable charges imposed upon ESPs/CCAs?

SCE, PG&E, SDG&E, CCA Parties, AReM/DACC, Calpine, TURN, EDF, Clean Coalition, ORA, and CLECA filed comments urging the CPUC to not increase the storage targets for either utilities or CCAs/ESPs. The common reasons stated by these parties were the lack of cost information, market impact, and also lack of operational experience during this early stage in the procurement process. The same parties also recommended not increasing targets outside the Long-Term Procurement Plan (LTPP) or Integrated Resource Plan (IRP) process. AReM/DACC and WPTF comments indicate their belief that there is misalignment between the current CCA/ESP energy storage targets and the amount these customers are paying in non-bypassable charges.

CESA, Sierra Club, MegaWatt, and GPI filed comments in favor of increasing energy storage targets. Their proposals suggested increases of storage targets up to as much as five gigawatts (GW) spread across varied timelines. These parties believe that higher targets are necessary to continue to push storage to be competitive and part of the mainstream toolkit; to prevent one-off, start and stop procurement cycles; and to address the potential for curtailment of renewables, and the increasing need for fast and flexible ramping resources, under a 50 percent Renewable Portfolio Standard, citing various modeling work and studies undertaken by CAISO, E3, Union of Concerned Scientists, and the Low-Carbon Grid Study.

CAISO, Bison Peak Pumped Hydro, Brookfield, Eagle Crest, EDF Renewable Energy, Nevada Hydro, and CESA also filed comments in favor of increasing the energy storage targets, or establishing a separate procurement track, in order to accommodate bulk storage. These parties argue that bulk storage (and large pumped hydro in particular) is a low cost solution to help support the state's ambitious 50 percent Renewable Portfolio Standard and greenhouse gas reduction goals, but that a clear procurement path is needed due to the high upfront costs and long development times associated with bulk storage. Section 3.2 discussed large pumped storage eligibility.

4.1. Utility Targets

The utilities have made great strides towards fulfilling their energy storage targets, with procurements in the 2014 storage procurement cycle, Local Capacity Requirement (LCR) Requests for Offers (RFO), expedited procurement to support Aliso Canyon, and behind-the-meter storage installations as part of the SGIP. The utilities are integrating storage procurement into their ongoing procurement activities rather than solely relying on results from energy storage

specific procurements: SDG&E intends to fulfill all of its 2014 and 2016 energy storage procurement as part of its ongoing LCR RFO efforts; SCE has already exceeded its 2016 procurement target, but continues to solicit additional energy storage resources.

Utility progress towards the energy storage targets was reviewed and discussed in D.16-09-004, D.16-09-007, and D.16-12-004 and is summarized in Table 2 below. The data in this table reflects contracts that have been reviewed and approved by the CPUC, and does not include the additional procurement expected through the completion of 2016 storage procurement cycle. Accounting for these projects, and assuming that the utilities take advantage of the rules allowing the shifting of MWs between grid domains, would result in a total remaining storage obligation closer to 620 MWs.

Table 2: Energy Storage Procurement to Date (MWs) - Data as of February 2017

Service Territory	Procurement Approved by Commission Customer/Distribution/Transmission			TOTAL BY UTILITY	Remaining Obligation
PG&E	9.63[13]	16[14]	50[15]	*75.63*	504.37
SCE	190.14[16]	52.22[17]	100[18]	*342.36*	257.78[19]
SDG&E	13[20]	43.65[21]	40[22]	*96.65*	68.35
TOTAL BY DOMAIN	192.63[23]	95.87	190	*478.5*	846.5

Some parties argue that the targets should be increased in order to avoid start and stop storage procurement opportunities, noting that SCE has already fulfilled its customer-side grid domain target. However, the segments most at

[13] 6.5 MWs of SGIP/Permanent Load Shifting projects (A.15-12-004, page 1, footnote 2) + 3.13 MWs of 2016 SGIP (PG&E Advice Letter (AL) 4968-E).

[14] 6 MWs (D.14-10-045, Attach A.) + 10 MWs in 2014 procurement (D.16-09-004).

[15] 60 MWs in 2014 solicitation (D.16-09-004) less termination of a 10 MW project as of February 14, 2017 PG&E Update.

[16] 16.34 MW existing (D.14-10-045, Attach A.) + 163.64 MWs in West LA Basin via SCE 2013 LCR RFO to replace San Onofre Nuclear Generating Station's (SONGS) capacity (D.15-11-041) + 10.3 MWs of 2016 SGIP (SCE AL 3521-E).

[17] 13.78 MW existing (D.14-10-045, Attach A.) + 22 MW of ACES storage projects (Resolution E-4804) + 16.3 MWs in 2014 procurement (D.16-09-004).

[18] 100 MWs in West LA Basin via SCE 2013 LCR RFO to replace SONGs capacity (D.15-11-041)

[19] As SCE can only count up to 170 MWs of customer domain resources (200 percent of 85 MW target), the total for "remaining procurement obligation" only considers 170 MWs, and not the actual total.

[20] 0.05 MW of 2016 SGIP credits, per SDG&E AL 3011-E) + 8.29 MWs of SGIP (A.16-03-003, Attachment B) + 4.66 MWs existing (D.14-10-045, Attach A.).

[21] 6.15 MWs existing (D.14-10-045, Attach A.) + 37.5 MWs Aliso Canyon (Resolution E-4798).

[22] 40 MWs existing (D.14-10-045, Attach A.).

[23] Only 170 MWs of SCE customer domain procurement is counted.

risk of full subscription are the customer and distribution domains, which are also the target domains for the potential 500 MWs of new storage programs and investments authorized under AB 2868, as well as the additional Self-Generation Incentive Program funding authorized by AB 1637. In light of these expanded procurement opportunities, as well as the procurement expected to occur through the 2016 energy storage plans, and the remaining MWs under the target, we see little risk of a lack of energy storage procurement in the near future.

Several parties also argue that a higher storage target is needed in order to support the higher penetration of renewables under a 50 percent renewable portfolio standard. Although one of the primary drivers in establishing energy storage targets was to ensure that a market for energy storage resources will be available to support California's renewable procurement targets, we are also cognizant that there are many resources that can support a 50 percent renewable portfolio standard, including, but not limited to energy storage, and that the IRP process is tasked with identifying the optimal resource mix to meet the state's ambitious greenhouse gas emissions reduction goals. We do not lose sight of the market transformation objectives of the energy storage targets, however, and may reconsider whether to increase the targets in a future rulemaking after the results from the 2016 Storage Evaluation process become available. To be clear, while we do not modify the targets, we view them as the minimum cost-effective energy storage resources that the utilities must procure, not the maximum.

4.2. AB 2868 Implementation Process

On September 26, 2016 Governor Brown singed AB 2868 (Gatto), which adds Sections 2838.2 and 2838.3 to the Public Utilities Code.[24] The statute requires that PG&E, SCE, and SDG&E propose programs and investments for up to 500 MW of distributed energy storage systems, distributed equally among the three utilities, above and beyond the 1,325 MW target for energy storage generally. For the reasons stated in the previous section, no additional increase to the existing 1,325 MW target is warranted. Although we do not increase minimum targets, we encourage utilities to pursue cost-effective storage opportunities that meet their integrated resource procurement and greenhouse gas reduction objectives regardless of whether the resource is eligible to count towards the adopted targets.

For purposes of fulfilling this new statute, "distributed energy storage system" is defined as an energy storage system with a useful life of at least 10 years that is connected to the distribution system or is located on the customer side of the meter and an "energy storage management system" as a system by which an electrical corporation can manage the charging and discharging of the distributed energy storage system in a manner that provides benefits to ratepayers. No more than 25 percent of the capacity of distributed energy storage systems approved for programs and investments pursuant to this section may be provided by behind-the-meter systems.

The CPUC has an established procedure to approve utility procurement plans for energy storage resources. After consulting with our state partners, the

[24] Stats. 2016, ch 681. All further references to Sections are to the Public Utilities Code, unless otherwise noted.

California Air Resources Board and the CEC, as required under § 2838.2(b), we believe that the most efficient use of resources is to incorporate the applications for distributed energy storage systems into the existing process and schedule for approving the biennial utility procurement plans under the Storage Procurement Framework and Design Program.

Therefore, we direct PG&E, SCE, and SDG&E to incorporate proposals for programs and investments for up to 166.66 MW[25] of distributed energy storage systems into their 2018 energy storage procurement plans that are due on or before March 1, 2018. In recognition that AB 2868 includes proposals for investments in storage, and not just procurement, the biennial 2018 and 2020 application cycles will now be referred to as the 2018 and 2020 energy storage procurement and investment plans. Consistent with §§ 2838.2 and 2838.3, the proposed programs and investments should prioritize distributed energy storage systems to public sector and low-income customers, and should demonstrate ratepayer benefits, seek to minimize overall costs and maximize overall benefits, reduce dependence on petroleum, meet air quality standards, and reduce greenhouse gas emissions while not unreasonably limiting or impairing the ability of nonutility enterprises to market and deploy energy storage systems. Rather than prescribe how compliance with these criteria will be evaluated, we direct PG&E, SCE, and SDG&E, in consultation with CPUC staff, to host a minimum of two workshops by the end of 2017 for the parties to discuss and develop consistent definitions of terms, proposals for how to evaluate projects against the statutory criteria, and their plans for incorporating the proposed

[25] Because the statutory language requires an equal allocation to each utility but simultaneously establishes a maximum of 500 MW, this allocation will only accomplish 499.98 MW.

programs and investments for distributed energy storage systems into their 2018 energy storage procurement and investment plans.

Particular topics that must be discussed at the workshops include:

- Definitions for the statutory factors;
- What will be an acceptable weighting of the statutory factors for purposes of evaluating projects;
- How to determine whether a distributed energy storage system achieves ratepayer benefits, maximizes overall benefits and minimizes overall costs;
- General applicability of the existing utility-specific propriety protocols that are used to evaluate bids under the existing Storage Procurement Framework and Design Program;
- Proposals and methods for prioritizing distributed energy storage systems for public sector and low-income customers, per Section 2838.2(d)(2);
- Defining attributes of energy storage management systems;
- Details of the role of energy storage management systems, including utility dispatch of storage systems;
- Recommendations for measuring reduced petroleum dependence;
- Recommendations for measuring reduced greenhouse gas emissions and meeting air quality standards;
- Applicability of the Consistent Evaluation Protocol (CEP);
- Changes to the CEP to evaluate distributed energy resources invested in or procured under §§ 2838.2 and 2838.3;
- Reasonable mechanisms for cost allocation and cost recovery;
- Consideration of whether contracts resulting from the approved programs and investments should be approved via application or through an alternative process (such as an advice letter);

- Recommendations for ensuring that the programs and investments do not unreasonably limit or impair the ability of nonutility enterprises;
- Recommendations for how the total program and investment capacity, up to 500 MWs, should be allocated over the 2018 and 2020 applications cycles, or beyond; and
- Coordination with the Distributed Energy Resources Action Plan, Distribution Resources Plan, Integrated Distributed Energy Resources, Integrated Resources Plan, and rate design proceedings, where applicable.

The utilities must host a preview session of their applications in December 2017 to describe their 2018 procurement plan for distributed energy storage systems, with specific emphasis on how feedback from the workshops was incorporated. Quarterly compliance progress reports should be filed in this proceeding and served on the service list until such time as the 2018 energy storage procurement plans are filed.

4.3. ESP and CCA Targets

D.13-10-040 found that ESPs and CCAs should be required to conduct actual storage procurement, equal to one percent of their sales, in addition to paying for a portion of utility storage procurement via non-bypassable charges.[26] AReM/DACC argue that some ESPs are subject to a greater energy storage procurement obligation than the utilities, as a percentage of total load, noting that the combination of storage costs eligible to be recovered via non-bypassable

[26] As described in D.13-10-040, leading up to that decision, several parties argued that ESPs and CCAs should have to share in a portion of utility procurement costs via the non-bypassable charges, and other parties argued that ESPs and CCAs should procure directly and not share in utility procurement costs. D.13-10-040 required ESPs and CCAs to procure 1% of their peak load, but did not modify the obligation of ESPs and CCAs to cover the costs of some utility storage procurement via non-bypassable charges.

charges plus the one percent target imposed on ESPs can exceed a utility's energy storage procurement obligation. To achieve greater equity between bundled and unbundled customers, AReM/DACC propose to prohibit future cost recovery through non-bypassable charges and credit ESPs with any excess storage for procurement that is above what the IOUs are obligated to procure.

AReM/DACC's proposal to prohibit future cost recovery through non-bypassable charges is outside the scope of this proceeding; however, it is within scope to determine whether the CCA/ESP storage targets should be revised. To evaluate whether the CCA/ESP one percent procurement obligation imposes a greater burden on CCAs and ESPs, we reviewed the extent to which the combined one percent procurement obligation and non-bypassable charges assigned to CCAs/ESPs tracks with the utility energy storage obligations, as a percentage of utility load. Tables 3-6 summarize this analysis.

Table 3: ENERGY STORAGE COST RECOVERY (Data as of January 2017)

SERVICE TERRITORY	PG&E	SCE	SDG&E
Storage MW recovered or approved for recovery via non-bypassable charges (to date)[27]	12.5[28]	315.76[29]	48.31[30]
Future (known additional) MW expected to be recovered via CAM	none known	80.5[31]	25[32]
Total MW expected to be recovered via non-bypassable charges	12.5	396.26	73.31

[27] This information reflects Cost Allocation Mechanism (CAM) and distribution charge recovery, and only those contracts that have been approved for recovery to date. Storage projects resulting from the biennial storage solicitations have not yet come on-line, so their above market costs have not been identified, and PCIA costs have not yet been allocated to non-utility Load Serving Entities (LSEs). We do not include a requirement of a forecast of non-bypassable charges as suggested by CCA Parties in comments on the Proposed Decision as we find this too speculative and of limited value.

[28] 6 MW via distribution charge (D.14-10-045, Attach A) + 6.5 MW of customer-sited SGIP/PLS projects (A.15-12-004, page 1, footnote 2).

[29] 13.92 MW via distribution charge + 16.2 MW of SGIP/PLS (D.14-10-045, Attach A.) + 22 MW of Aliso Canyon Energy Storage (ACES) projects (Resolution E-4804 - 5 MW of original 27 MW authorization was cancelled) + 263.64 MW in West LA Basin via SCE 2013 LCR RFO to replace SONGs capacity (D.15-11-041).

[30] 6.15 MW via distribution rates + 4.66 MW of SGIP/PLS (D.14-10-045, Attach A) + 37.5 MW of ACES storage projects (Resolution E-4798).

[31] 20 MW ACES Design Build Transfer project (Resolution E-4791) + Preferred Resources Pilot 2 - 60 MW (A.16-11-002) + 0.5 MW (A.14-11-016 - 2013 LCR RFO – Moorpark).

[32] D.14-03-004 requires SDG&E to procure at least 25 MW of energy storage in its LCR RFO to replace SONGs capacity. The IOU has not yet procured any storage toward this target.

Table 4: DIRECT ACCESS STORAGE PROCUREMENT COST OBLIGATIONS (Data as of January 2017)

SERVICE TERRITORY	PG&E	SCE	SDG&E
Applicable ESP load (GWh)[33]	9,651	11,358	3,498
DA MW share of non-bypassable charges[34]	2	51	10
1% ESP procurement obligation (GWh)	97	114	35
1% ESP procurement obligation (MW)[35]	17	20	6

Table 5: COMMUNITY CHOICE AGGREGATORS STORAGE PROCUREMENT COST OBLIGATIONS (Data as of January 2017)

SERVICE TERRITORY	PG&E	SCE	SDG&E
Applicable CCA load (GWh)[36]	3,486	608	0
CCA MW share of non-bypassable charges[37]	0.4 MW	2 MW	0
1% CCA procurement obligation (GWh)	35	6	0
1% CCA procurement obligation (MW)	6 MWs	1 MW	0

[33] October 2016 data, available at: http://www.cpuc.ca.gov/General.aspx?id=6598. Supplemental Direct Access Implementation Activities Report - Statewide Summary - November 15, 2016.

[34] Direct Access (DA) ESPs are responsible for non-bypassable charges based on load share for CAM and distribution rates. This does not include PCIA for storage. ESPs comprise 12.9 percent of load share, based on the latest Direct Access Implementation Activities Report, published November 15, 2016, accessible at: http://www.cpuc.ca.gov/General.aspx?id=6598.

[35] Assumes 64 percent capacity factor (CF) for ESPs and CCAs. MW= 1000*GWh/(CF*8760)

[36] These totals only include existing CCAs for which data are available – Lancaster, Marin, San Francisco, and Sonoma. Planned CCAs are not included. When additional CCAs report load that load should be reflected in the updates to these tables.

[37] Currently active CCAs comprise 3 percent of forecasted 2020 load in PG&E territory; 0.5 percent of forecasted 2020 load in SCE territory. Percentages are derived from California Energy Demand Update Forecast, 2015-2027. California Energy Commission, accessible at: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=16-IEPR-05.

Table 6: COMPARISON OF UTILITY, DIRECT ACCESS, AND COMMUNITY CHOICE AGGREGATORS STORAGE PROCUREMENT COST OBLIGATIONS (Data as of January 2017)

SERVICE TERRITORY	PG&E	SCE	SDG&E
Storage obligation as % of total 2020 load forecast[38]– Storage Target of 1325 MW	**580 MW ~ 2.7%**	**580 MW ~ 2.6%**	**165 MW ~ 3.7%**
Storage obligation as % of total 2020 load forecast- Storage Target of 1825 MW[39]	**746 MW ~ 3.5%**	**746 MW ~3.3%**	**331 MWs ~7.4%**
ESP Current Share: 1% procurement obligation + non-bypassable charge (MW/% of load)	19 MW ~ 1.1%	72 MW ~ 3.6%	16 MW ~ 2.6%
CCA Current Share: 1% procurement obligation + non-baypassable charge (MW/% of load)	6.4 MW ~ 1.1%	3 MW ~ 2.8%	0

As shown in Table 6, as of January 2017, CCA customers in PG&E, SCE, and SDG&E service territories and DA customers in PG&E and SDG&E service territories do not have cost responsibility for procuring storage at a greater percentage of total load than the utility. DA customers in SCE's service territory currently have cost responsibilities somewhat in excess of the overall utility obligation, largely due to SCE's increased storage procurement to replace power from SONGS and to mitigate local electric reliability concerns stemming from the shutdown of Aliso Canyon. Procurements made by both SCE and SDG&E for these two purposes count toward each utility's energy storage target, and were

[38] 2020 Load Assumptions: PG&E - 21,597 MWs - in 2020; SCE - 22,296 MWs - in 2020; SDG&E - 4,455 MWs - in 2020. Source: California Energy Demand Updated Forecast, 2017-2027. California Energy Commission Draft Staff Report. Docket 16-IEPR. http://www.energy.ca.gov/2016_energypolicy/index.html, December 5, 2016.

[39] Includes procurement under AB 1868.

approved for cost recovery via the Cost Allocation Mechanism in D.15-11-041 and Resolutions E-4804 and E-4791.

We will continue to monitor the relative position of CCA/ESP energy storage cost responsibility vis-à-vis utility energy storage obligations and direct PG&E, SCE, and SDG&E to coordinate to make a consolidated compliance filing annually as a Tier 1 Advice Letter through 2020 to update Tables 3-6 based on the most current procurement information and CCA/ESP load data. Recognizing that any divergence between energy storage obligations by CCAs and ESPs and utilities should be limited and short term, we establish an automatic limiter that proportionately reduces each CCAs/ESPs one percent procurement obligation by the amount that the load serving entity's own procurement plus its customers' share of nonbypassable charges exceeds the utility obligation as a percentage of load. If the limiter is reached, the consolidated utility compliance filing should automatically reflect the reduced CCA/ESP energy storage procurement obligation. Following the evaluation of the energy storage framework (discussed below), we expect that energy storage targets and the limiter will be revisited.

5. Evaluation of the Energy Storage Framework

§ 2836(a)(3) requires that the Commission reevaluate its determinations in establishing the storage target by 2016, and every three years thereafter. In support of this directive, and to facilitate ongoing program evaluation, the Commission in D.13-10-040 established an annual program evaluation budget for Commission staff to hire consultants to oversee the evaluation of the program, and included a number of criteria to include in the evaluation.

In compliance with Section 2836(a)(3), Section 4.1 of this decision considers whether there are any factors that warrant revising the adopted energy storage

procurement targets at this time. Although D.13-10-040 anticipated that consideration of any revisions to the target would coincide with a wider program evaluation, including criteria such as progress towards market transformation and learnings from the collection, analysis, and reporting of energy storage operational data, in practice the majority of the 2014-2015 contracts approved by the Commission are scheduled to come online gradually between 2017-2020, such that the operational data[40] necessary to perform this type of evaluation is just now becoming available. Meanwhile, Energy Division has begun implementing a plan for the 2016 Storage Evaluation process, which includes issuing a Request for Proposals in 2017. We anticipate that the results of this forthcoming evaluation will help inform whether any increase to the targets is warranted in the future, and direct Energy Division to file and serve a compliance copy of the evaluation report in this proceeding or in the successor to this rulemaking.

6. Station Power

The Track 2 Scoping Memo identified treatment of station power in the context of energy storage as less straightforward than for conventional generating assets and asked:

a. What rules or guidelines are needed to distinguish station power from wholesale charging energy taken in by distribution connected storage assets participating in wholesale markets?

b. Are there any rules or guidelines required outside of those developed by the CAISO?

[40] D.13-10-040 at 66.

c. What are the rate implications for station power in the context of energy storage?
d. What other issues must the Commission consider in regards to station power and energy storage projects?

The CAISO also has an ongoing Energy Storage and Distributed Energy Resources (ESDER) stakeholder initiative to enable wholesale market level participation of energy storage systems interconnected to the distribution grid. Resolving the distinction between wholesale charging energy and station power was called out in ESDER 2 and the CAISO and CPUC have been coordinating efforts on this topic. The CAISO and CPUC staff held a joint workshop on May 2, 2016 at the CPUC on station power for storage resources. The April 22, 2016 ruling noticing the workshop included an issue paper prepared by the CAISO and CPUC staff and outlined several objectives for the workshop including:

1. Developing common understanding and background on how station power has been defined for conventional generating resources;
2. Considering similarities and differences for energy storage in comparison to station power for conventional resources;
3. Identifying specific energy uses of storage facilities and hearing alternative views on whether to classify them as components of station power; and
4. Identifying measurement issues associated with the components of station power.

The workshop featured presentations by the CAISO, SCE, Amber Kinetics, CESA, Calpine, LS Power, MegaWatt, Imergy Power Systems (Imergy), and Powertree. Parties filed post-workshop comments on May 13, 2016 and reply comments on May 20, 2016.

The principal issue for energy storage is distinguishing between wholesale charging energy that will be resold and "station power," which is auxiliary onsite load not directly associated with power production, which is provided by LSEs.

Two factual statements generated general consensus at the workshop and in post-workshop comments: (1) energy storage, as it is being procured and used to date, is similarly situated to conventional generation and (2) the current CAISO and CPUC processes focused on storage do not include in scope revisiting station power rules for conventional generation. At the workshop and in comments there is consensus that all electric energy drawn into storage resources for later resale is not station power, and therefore should be purchased according to a wholesale rate, such as the CAISO locational marginal price (LMP). There is also consensus that energy drawn into the storage resource but "lost" due to the efficiency of the resource (efficiency losses) does not constitute station power, and therefore should not be subtracted from the energy drawn into the energy storage device or charged at a retail rate.

Based on the workshops, CAISO and CPUC staff proposed the following rules for treatment of station power for electric storage devices:

1. All energy drawn from the grid to charge energy storage resources, and efficiency losses, for later resale, should be subject to a wholesale rate.
2. For sub-metered behind-the-meter storage resources that are participating in the wholesale market and are subject to a must-offer obligation, the station power rules apply just as they would for resources located in front of the meter, meaning that charging energy and efficiency losses would be charged wholesale rates.
3. All energy that is consumed (and not resold) is station power and inherently retail.

4. The CAISO and CPUC staff recommend the following categorization of specific uses:
    a. Wholesale: charging energy, resistive losses, pumps (flow batteries), power conversion system, and transformer;
    b. Retail (station power): battery management system, thermal regulation, vacuum (for flywheels), information technology (IT) and communications, lighting, ventilation, and safety.
5. Insofar as a storage resource withdraws energy (charges) or injects energy (discharges) subject to a dispatch at a greater capacity than its consumption, that consumption should be able to be netted against the response to the dispatch, just as it is for conventional generators.

On January 10, 2017, an ALJ Ruling sought comments on the aforementioned rules set forth in the Joint Staff Proposal and Report on Station Power for Electric Storage Devices.[41] Comments were filed by PG&E, SCE, SDG&E, IEPA, Calpine Corporation (Calpine), NRG Energy, Inc. (NRG), LS Power, CESA, Tesla Motors Inc. (Tesla), and GPI on January 24, 2017, and reply comments were filed by PG&E, SCE, SDG&E, ORA, TURN, CAISO, CESA, LS Power, and GPI on January 31, 2017.

After review of the comments, we make certain changes to, and reorder, Rules 1-5 as described below. The utilities must amend their existing station power tariffs to reflect this treatment of station power.

[41] The Joint Staff Proposal and Report included two other Rules for comment (Rules 1 and 2). These are the factual agreements (summarized above) that underlie the proposed rules. Because they do not specify how station power is characterized or treated, we need not adopt them as rules. Our discussion of Rules 3-7 proposed in the Joint Staff Proposal and Report have been reordered.

6.1. Proposed Rule 1: All energy that is consumed (and not resold) is station power and inherently retail

CESA, PG&E and IEP generally support this Proposed Rule, and offer edits or request clarifications. PG&E cautions that some end use retail loads are not station power.[42] SCE supports this Proposed Rule. CESA points out that this recommendation could be interpreted to not include efficiency losses, which is contrary to later designation of efficiency losses as wholesale. Thus, CESA recommends that this Proposed Rule be amended as follows:

> All energy that is ~~consumed (and not resold)~~ *used for purposes other than for supporting a resale of energy back into wholesale markets* is station power and inherently retail.[43]

IEP also offers amendments to the Proposed Rule, as follows:

> All energy that is consumed (and not resold) is station power and inherently retail, *subject to the Commission's rules regarding netting of energy consumption*.[44]

Tesla offers neither support nor opposition to the Proposed Rule, but does offer a similar caution as CESA, in that the Proposed Rule appears to not apply to efficiency losses, and could be interpreted to mean that efficiency losses are inherently retail and not wholesale. Tesla offers the same suggestion for amendments to the Rule as CESA.[45]

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[42] PG&E January 24, 2017 Comments at 4.

[43] CESA January 24, 2017 Comments at 11.

[44] IEP January 24, 2017 Comments at 4.

[45] Tesla January 24, 2017 Comments at 7.

NRG[46] and Calpine[47] suggest that clarification is needed, as the word "consumed" as used in this Rule could be interpreted to include loads that are necessary to the operation of the storage device and thus are not station power and should not be charged retail.

We agree with parties that this Proposed Rule should be clarified. Thus, we amend the Rule to incorporate the recommendations of Tesla, CESA and IEP, as follows:

> All energy that is ~~consumed (and not resold)~~ *used for purposes other than for supporting a resale of energy back into wholesale markets, as specified in Rule 2,* is station power and inherently retail, *subject to the rules regarding netting of energy consumption.*

6.2. Proposed Rule 2: All energy drawn from the grid to charge energy storage resources, and efficiency losses, for later resale, should be subject to a wholesale rate

Calpine and SCE state their support for this Proposed Rule in comments. NRG, PG&E, and IEP support this Proposed Rule, with several caveats. NRG supports the Proposed Rule in so far as it does not apply to a storage device located behind the utility meter with on-site retail load and only one meter.[48] PG&E conditions its support for this Proposed Rule on the assurance that the uses of charging energy for wholesale or retail activities are measurable and verifiable.[49] IEP recommends the Proposed Rule be edited, as follows:

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[46] NRG January 24, 2017 Comments at 7.

[47] Calpine January 24, 2017 Comments at 3.

[48] NRG January 24, 2017 Comments at 6.

[49] PG&E January 24, 2017 Comments at 3.

> All energy drawn from the grid to charge energy storage resources for later resale, ~~and~~ including energy associated with efficiency losses, ~~for later resale,~~ should be subject to a wholesale tariff.[50]

We agree with the edits proposed by IEP, as they clarify the intent of the Proposed Rule, and amend this Rule accordingly. We do not deal with measurement and metering within the context of this Rule, despite the comments of NRG and PG&E.

6.3. Proposed Rule 3: Categorization of Specific Uses as Wholesale (charging energy, resistive losses, pumps (flow batteries), power conversion system, and transformer) or Station Power (battery management system, thermal regulation, vacuum (for flywheels), IT and communications, lighting, ventilation, and safety)

SCE requests clarification of the term "thermal regulation" as it applies to different storage technologies. PG&E states that the categorization of loads is generally appropriate, and recommends that the definitional categories be amended to charging-related and station power, instead of wholesale and retail.[51] NRG does not state support or opposition to the rule, but cautions that the configuration of the device itself may make certain loads inseparable from each other.[52] Similarly, Tesla, CESA, and GPI contend that certain loads are more appropriately designated as wholesale, as they are integral to the production of electricity.

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[50] IEP January 24, 2017 Comments at 3.

[51] PG&E January 24, 2017 Comments at 4.

[52] NRG January 24, 2017 Comments at 7.

CESA makes three recommendations. First, CESA recommends that the list of wholesale loads be expanded to include the battery management system, thermal regulation, and vacuum loads. Second, CESA recommends that the any loads integrated on the DC-side of an energy storage device, and thus indistinguishable from each other, should be categorized as wholesale. While CESA does not make this explicit, it appears that the second recommendation would be satisfied if the first were adopted. Third, CESA recommends that if the Commission does not modify its list of wholesale loads as it suggests, then it must adopt an alternative approach to direct measurement – such as the use of estimated percentages – to distinguish wholesale and retail loads, while noting that this approach is less accurate. CESA offers the following revisions to this Proposed Rule:

> a. Wholesale: charging energy, resistive losses, pumps (flow batteries *and pump hydro resources*), power conversion system, transformer, *battery management system, thermal regulation, vacuum (for flywheels), IT, and any energy use that is directly-integrated and essential for the use of the storage system especially if the load occurs on the Direct Current side of the energy storage system where applicable*.
>
> b. Retail (station power): ~~battery management system, thermal regulation, vacuum (for flywheels), IT and~~ communications, lighting, ventilation, and safety.[53]

Tesla comments are consistent with those of CESA, and state that the staffs' proposed division of loads must be revised to include loads that are directly integrated into the battery and essential to its function. Tesla also

[53] CESA January 24, 2017 Comments at 9-10.

discusses how some of the loads are directly connected to the DC side of the battery and are thus inseparable, as a practical matter.[54]

Tesla points out, in the text of its comments as well as a schematic of its "Powerpack" battery storage system, that the battery management system, thermal regulation, and ventilation energy uses are directly-integrated into its storage system, and that no separate point of connection to the grid is available or feasible for these loads.[55] Tesla also states that the Joint Report and Staff Proposal suggest that efficiency losses are end-use load and thus should be charged retail rates. Tesla offers the following two options for amendments to the Proposed Rule:

> Wholesale: charging energy, resistive losses, pumps (flow batteries), power conversion system, ~~and~~ transformer, and any energy use that is directly-integrated and essential for the use of the storage system (even if that includes energy use for battery management systems, thermal regulation, ventilation, or other directly-integrated, essential uses).
>
> Or,
>
> Wholesale: charging energy, resistive losses, pumps (flow batteries), power conversion system, ~~and~~ transformer, and any energy use that is directly-integrated and essential for the use of the storage system (*such as energy uses on the direct current side of battery storage systems* even if that includes energy use for battery management systems, thermal regulation, ventilation, or other directly-integrated, essential uses).[56]

In reply comments, SDG&E reiterates its position that loads that are directly integrated into the storage device should be subject to wholesale rates,

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[54] Tesla January 24, 2017 Comments at 1-2.

[55] Tesla January 24, 2017 Comments at 4.

[56] Tesla January 24, 2017 Comments at 5.

urges a conservative interpretation of "directly integrated," and also argues that the issues posed by Tesla are out of scope.[57]

In reply comments, the CAISO supports designating loads that are essential to the operation of the battery as wholesale, and notes that their "…rate treatment is bifurcated somewhat arbitrarily" in the staff proposal.[58] GPI also states its support for Tesla's proposal and amendments to the proposed Rule.[59]

We are persuaded by the arguments of CESA, Tesla, GPI, and the CAISO that the list of wholesale loads should include elements essential to battery operation – namely the battery management system, thermal regulation, and vacuum (for flywheels). It is not clear from comments why IT is integral to the operation of the storage device, as CESA's proposed amendments seem to suggest, and thus we retain the designation of IT as station power. Thus, we modify the categorization of specific uses as follows:

> Wholesale: charging energy, resistive losses, pumps (flow batteries *and pumped hydro*), power conversion system, ~~and~~ transformer, *battery management system, thermal regulation, and vacuum (for flywheels).*
>
> Station Power: ~~battery management system, thermal regulation, vacuum (for flywheels), IT~~information technology and communications, lighting, ventilation, and safety.

[57] SDG&E January 31, 2017 Reply Comments at 3-4.
[58] CAISO January 31, 2017 Reply Comments at 3.
[59] GPI January 31, 2017 Reply Comments at 3.

6.4. Proposed Rule 4: For sub-metered behind-the-meter storage resources that are participating in the wholesale market and are subject to a must-offer obligation, the station power rules apply just as they would for resources located in front of the meter, meaning that charging energy and efficiency losses would be charged wholesale rates

CESA and IEP state their support for this rule in opening comments. Regarding Energy Division staff's proposal to require a minimum of two meters for behind-the meter storage – one to measure the charge and discharge of the storage device and the other to measure onsite retail load - CESA offers that sub-metering does not always require two meters, and advocates that the rules allow for multiple metering configurations for behind-the-meter resources, as well as a "metering-in-isolation" configuration. CESA advocates that a net generation output meter (NGOM) should not be required for storage resources, as it only measures energy drawn into the storage device and does not net energy discharged onto the grid.[60] In its Reply, SCE rebuts CESA's claim about NGOM meters, stating that they do credit energy placed back onto the grid. SCE urges the CPUC not to adopt specific meters or metering configuration at this time, including prohibiting the use of NGOM meters.[61]

IEP agrees with the intent of the rule. Both Calpine and IEP state that accurate measurement of retail and wholesale loads is key to avoid co-mingling the two.[62]

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[60] CESA January 24, 2017 Comments at 8.

[61] SCE January 31, 2017 Reply Comments at 6.

[62] Calpine January 24, 2017 Comments at 3, IEP January 24, 2017 Comments at 3.

All three utilities oppose this Proposed Rule on the basis that it is premature and should be addressed in conjunction with the CPUC's consideration of multiple-use applications for storage. PG&E recommends that, should the CPUC not choose to defer this Proposed Rule to its decision on multi-use applications, it should reject the Proposed Rule's designation of energy used to charge a storage device as wholesale if that storage device participates in the wholesale market, as the customer will then improperly avoid retail charges.[63] PG&E also points to the proposed requirement that a behind-the-meter storage resource be subject to a must-offer obligation and states its concern that contractual terms, such as a must-offer obligation, are modifiable and the utility may not have visibility into their structure.[64]

SCE also recommends that this Proposed Rule is better resolved in our decision on multiple-use applications. SCE lists actions that the CAISO and SCE would have to undergo in order to enact this Proposed Rule. On this point, SCE states "…the CAISO would need the capability to do the following: (1) receive a request for BTM [behind-the-meter] wholesale charging for a given interval; (2) check the eligibility for wholesale charging; (3) determine whether wholesale charging is allowed; (4) appropriately create the settlement; (5) perform the after-the-fact analysis; and, (6) perform any additional necessary steps if the discharge activity invalidated wholesale charging eligibility."[65] SCE also describes a similar process for the retail LSE, in that the LSE must "…receive the request, check eligibility, and make a determination on eligibility. Then the LSE

[63] PG&E January 24, 2017 Comments at 3.

[64] PG&E January 24, 2017 Comments at 9-10.

[65] SCE January 24, 2017 Comments at 13.

must adjust the retail bill accordingly. This requires an accounting process of subtracting usage in a given time period from the retail bill. SCE's billing systems do not have the ability to execute this kind of transaction without significant manual processes."[66] SDG&E echoes the position that the Proposed Rule is premature, out of scope for station power, and should be delayed.[67]

TURN and ORA both filed reply comments in support the utilities' position that the Commission should delay consideration of station power for behind-the-meter storage resources and take up the issue in conjunction with multiple-use applications. ORA offers that "…if the Commission decides to adopt Proposed Rule 4 now, it should clarify that it is an interim rule subject to future examination."[68]

In reply to utility comments, CESA states that the concerns about the existence of applicable protocols and rules are invalid as current FERC-approved rules already differentiate when behind-the-meter resources are engaged in the market and can be compensated for that participation. CESA advocates that the need for, and timeline of, new utility protocols is not a reason to stop this Proposed Rule moving forward. CESA recommends that the utilities provide implementation timeline information to the CPUC in an Advice Letter. Finally, CESA directly responds to SCE's discussion of jurisdictional issues associated with behind-the-meter resources participating in wholesale markets by pointing to numerous regulatory and FERC decisions that clearly establish jurisdictional

[66] SCE January 24, 2017 Comments at 13.

[67] SDG&E January 24, 2017 Comments at 2-3.

[68] ORA January 31, 2017 Reply Comments at 3.

authority over both station power as well as participation of behind-the-meter resources in CAISO markets.[69]

We do not agree with the suggestion that the multiple-use application referenced in this rule – a behind-the-meter storage resource participating in the wholesale market – needs further discussion of its merits, and also believe that consistent rules should be applied to all systems, regardless of their interconnection point relative to the customer meter. As CESA mentions, this multiple-use application is happening now. Storage resources located behind the utility meter are participating in the market today, both through the Demand Response Auction Mechanism and several contracts resulting from SCE's 2013 local capacity requirement request for offers (LCR RFO). In fact, the CAISO created the metered generator output baseline option in ESDER Phase 1, in recognition of this specific multiple-use application scenario.

That said, we also find merit with concerns raised about the ability for behind-the-meter systems to improperly avoid retail charges, which can only be safeguarded against through further development of protocols, processes, and specific metering configuration options for this scenario. Although we note that appropriate metering configurations may indeed obviate the need for detailed utility protocols, as suggested in the metering-in-isolation configuration filed by CESA, we do not have sufficient information on the record as to the attendant utility protocols, processes, or specific metering configurations to make these determinations now.

[69] CESA January 31, 2017 Reply Comments at 7-8.

Thus, although we prefer consistent station power rules applied across all of the grid domains, we defer action on this Proposed Rule, as well as consideration of specific metering configurations and utility protocols to the discussion of multiple-use applications expected later this year.

6.5. Proposed Rule 5: Insofar as a storage resource withdraws energy (charges) or injects energy (discharges) subject to a dispatch at a greater capacity than its consumption, that consumption should be able to be netted against the response to the dispatch, just as it is for conventional generators

We divide our review of comment into two topics: (1) station power treatment when device is neither charging nor discharging, but also providing a service and (2) appropriateness of allowing netting for station power when device is providing negative generation to the system, as recommended in the staff proposal.

6.5.1. Station Power When Device is Idle – Neither Charging nor Discharging

Several parties point out that the staff proposal does not include a discussion of appropriate station power treatment when a storage device is idle – neither charging nor discharging – but is providing services to the grid, such as ancillary services.

NRG[70] and CESA both argue that the station power treatment for storage devices should be no different if the storage device is idle and subject to a market obligation, or actively charging or discharging. CESA offers the following

[70] NRG January 24, 2017 Comments at 11.

addition to this Proposed Rule in order to both capture station power while charging, as follows:

> *Station Power loads should also be accounted for at wholesale rates during settlement periods of 15-minutes or larger when an energy storage resource is providing or committed to provide any CAISO product, including energy, flexible ramping product, regulation, spinning reserve, or non-spinning reserve.*[71]

SCE replies to CESA's proposed changes with the following two points. First, SCE argues that making a plant available to provide a service is a cost of doing business and, thus, a plant operator should pay retail cost for loads while the storage device is idle. SCE also states this is consistent with other resource types.[72] Second, SCE objects to CESA's suggested amendments to this Proposed Rule, which suggest modifying the 15 minute settlement period, and states that this would mean that station power rules would be applied to storage devices in a different manner than to conventional resources.[73] PG&E's argues there is no physical ability to net station power when no energy production occurs.[74]

In opening comments, the utilities argue that all loads, including inverter loads for a storage device when idle, but subject to a market obligation, should be categorized as station power, and thus charged retail. SCE advocates that "…(c)lassifying energy storage idle-state inverter load as wholesale would be

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[71] CESA January 24, 2017 Comments at 6-7.

[72] SCE January 31, 2017 Reply Comments at 5.

[73] SCE January 31, 2017 Reply Comments at 7.

[74] PG&E January 31, 2017 Reply Comments at 2.

inconsistent with how such loads are currently treated for other inverter-based conventional generators."[75]

Both SDG&E and PG&E agree with SCE in reply comments. In reply, GPI disagrees with SCE and states that any power that is consumed that is necessary for operating the storage system should be paid at wholesale, including load when the device is idling.[76]

6.5.2. Netting During Charging

The staff proposal suggests that, for storage resources that provide energy into the wholesale market, there is a benefit to the grid during times when the storage device is charging, as storage is a bidirectional resource, and it is reasonable to assume that storage devices will charge at times when the CAISO LMP is the lowest, reflective of high supply and low demand on the system. Thus, in instances when a resource withdraws energy or injects energy subject to a CAISO dispatch at a greater capacity than its consumption (station power), the staff proposal states that the station power load should be "netted" against charging load, meaning that all station power is wholesale if the cumulative absolute value of charging plus discharging is greater than station power load, in a 15-minute interval. If the cumulative absolute value of charging plus discharging is less than station power load, in a 15-minute interval, then the station power load is retail.

NRG and CESA agree with this approach. NRG points out that storage is unique when compared to conventional generation in that it charges, and so the

[75] SCE January 24, 2017 Comments at 4.

[76] GPI January 31, 2017 Reply Comments at 1-2.

term "netting" may not be appropriate.[77] CESA refers to the charging activity of a storage resource as "negative generation" and states the importance of extending the station power rules to apply during charging as essential to storage providing flexibility services.[78] CESA further recommends that this Proposed Rule be amended to state that wholesale netting treatment for station power loads be based on the absolute value of charging and discharging across either the 15-minute settlement interval or a larger interval, as follows:

> Insofar as *an In-front of the Meter or Behind-the-Meter energy* storage resource withdraws energy (charges) or injects energy (discharges) subject to a dispatch at a greater ~~capacity~~ *absolute value of energy* than its *station power* consumption, that consumption should be able to be netted against the response to the dispatch *within a fifteen minute or larger settlement period*, just as it is for conventional generators.[79]

SDG&E and PG&E both respond to CESA's requested amendments. SDG&E states that calculating station power based on an absolute value of energy is discriminatory, and would constitute a customer funded subsidy of storage resources.[80] PG&E further recommends that, if the charging and discharging energy are added in the same interval, that the charging energy should be subtracted from discharging energy.[81]

CESA also points out in comments that the energy storage resource is still paying the full wholesale cost of loads, while adding to the overall utility load.[82]

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[77] NRG January 24, 2017 Comments at 5.

[78] CESA January 24, 2017 Comments at 5.

[79] CESA January 24, 2017 Comments at 6-7.

[80] SDG&E January 31, 2017 Reply Comments at 2; PG&E January 31, 2017 Reply Comments at 3.

[81] PG&E January 31, 2017 Reply Comments at 3-4.

[82] CESA January 24, 2017 Comments at 7.

SCE agrees with this statement but points out that the resource is only paying wholesale cost of energy, and thus not contributing to the utilities' cost of service.[83]

LS Power and IEP both support the Proposed Rule. IEP states its concurrence with the Proposed Rule, but notes that the treatment should extend to all generation.[84] LS Power explains that charging energy does have benefit to the grid in that it "… provides bi-directional market services which help flatten the "duck curve," provides ancillary services, promotes competition, and improves grid reliability."[85] [86]

The CAISO Reply Comments make the following points:

- Conventional generators operate at a Pmin[87] well above 0 MW. Once they reach their Pmin plus their station power load, they are able to self-supply generation to meet their station power load, thereby avoiding retail charges at the cost of reduced wholesale settlement for supply. They are thus able to "net" their station power load such that they effectively "pay" a wholesale rate for station power.
- Energy storage resources have a Pmin of 0 MW. Unlike conventional resources, energy storage resources can provide grid services (such as regulation) *well below an output of 0 MW*. A storage resource with smart charging capability could provide

[83] SCE January 31, 2017 Reply Comments at 4.

[84] IEP January 24, 2017 Comments at 4.

[85] As described in footnote 302 in D.15-07-001, the "possibility of shifts in usage periods was dramatized in the famous "duck curve" in 2012 … While historically the state has focused on reduction of the afternoon peak, the duck curve showed that an increasingly steep incline in the evening could soon become a larger problem."

[86] LS Power January 24, 2017 Comments at 2-3.

[87] Pmin is the minimum level at which a generator can operate while it is on and ready to respond to a dispatch.

regulation, for example, by fluctuating between –10 MW and –9 MW. Another storage resource could provide regulation between –2 MW and + 2 MW.

- As the belly of the duck curve continues to grow in California, these negative generation or net 0 MWh dispatches in a settlement interval may be exactly what the grid needs to operate reliably in a given settlement interval.
- Yet because station power load can be subsumed by positive generation, but is additive for negative generation, the former is effectively charged a wholesale rate and the latter a retail rate.
- Thus, without the comparable ability to self-supply like a conventional generator— avoiding retail treatment for station power load—an energy storage resource will be more incentivized to supply energy (positive generation) above its station power load.
- Obviously negative LMP will drive all storage devices to charge. It is the hours where LMP is *approaching* a low or negative LMP (or rising from one) that are the issue. Without wholesale treatment for their station power load, storage resources will continue to discharge as long as possible—so that they can self-supply their station power and avoid higher retail rates—before switching to charging as LMP approaches 0.
- As such, the CAISO favors the comparable ability to "net" station power load during periods of negative generation. So long as the resource is a dedicated, "24/7," wholesale resource, and its positive and/or negative performance are greater than its station power load, that station power load should be charged a wholesale rate. Whether the resource is performing pursuant to dispatch, self-schedule, or under Regulation Energy Management would be immaterial, but the CAISO agrees with NRG that if the Commission approves the general approach in the Joint Report,

> details such as treatment during uninstructed deviation intervals should be addressed.[88]

LS Power, NRG, GPI, and Calpine all request clarification on the tables included in the Staff Proposal.[89] NRG requests that references to "a dispatch" and "response to the dispatch" be defined further or eliminated. NRG does not support conditioning station power treatment on whether or not a resource is actually dispatched by CAISO, and does not "…believe that energy storage station power treatment should be different whether the energy storage device draws or supplies power pursuant to a CAISO dispatch instruction or not."[90]

All three utilities oppose allowing for netting station power load while a storage resource is charging. PG&E points out that the storage device is adding demand to the grid,[91] and station power is additive to the charging energy. As PG&E states, "…(t)hey do not cancel each other in any way."[92] SCE is opposed to the staff's proposal for the following reasons: (1) two negatives (loads) cannot be "netted," (2) netting is not an incentive, (3) not analogous to the treatment of conventional generators, in violation of the Federal Power Act and Public Utilities Code, and (4) it is unnecessary as price signals already exist to drive behavior.[93]

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[88] CAISO January 31, 2017 Reply Comments at 5-6.

[89] NRG January 24, 2017 Comments at 9; LS Power January 24, 2017 Comments at 3; Calpine January 24, 2017 Comments at 4; GPI January 31, 2017 Reply Comments at 4.

[90] NRG January 24, 2017 Comments at 10.

[91] PG&E January 24, 2017 Comments at 4.

[92] PG&E January 24, 2017 Comments at 12.

[93] SCE January 24, 2017 Comments at 6-8.

SCE states that conventional generators must initiate a start-up period in advance of a dispatch, and draws an analogy to charging by a storage device in advance of dispatch. SCE points out that, if retail load increases in the startup phase, the load is considered station power.[94] SCE also questions whether charging actually provides a benefit to the grid, as the staff proposal assumes.[95]

CESA responds to SCE's points noting that, while price signals are important to incentivize behavior, they do not obviate the need for fair station power rules.[96] CESA discusses whether charging provides a benefit to the grid by drawing an analogy to conventional generation: "SCE's points on tying station power rules to 'providing value to the grid' may well suggest station power rules for traditional generators would disallow netting during periods of 'overgeneration,' or perhaps anytime energy prices are negative. Such rules miss the large concepts of market efficiencies through clearing prices, and the fundamental premise of de-regulation and of competitive markets, wherein merchant actors in a competitive environment yield an overall efficient market outcome by individually working to maximize profits through individual decision-making, albeit subject to rules and procedures for efficient market participation and to ensure grid reliability."[97]

Finally, CESA responds to SCE's analogy of charging energy for storage to the startup phase of a generator, and states that the two are fundamentally

[94] SCE January 24, 2017 Comments at 8.

[95] SCE January 24, 2017 Comments at 9.

[96] CESA January 31, 2017 Reply Comments at 5-6.

[97] CESA January 31, 2017 Reply Comments at 6-7.

different and are governed by different rules, thus making it incorrect to conflate the two.[98]

SDG&E says that, per FERC and CAISO policy, energy storage for later use, or charging, is negative generation and not load, but adopts the position that station power should only be netted based on the net positive discharge of a storage device. SDG&E supports that, in any 15-minute interval, the charging and discharging energy be added and station power in the same interval subtracted from the total. If station power is greater than the total, the provider pays retail. If the converse is true, the provider pays wholesale. SDG&E recommends that this Proposed Rule be amended as follows:

> Insofar as a storage resource ~~withdraws energy (charges) or~~ injects (discharges) more wholesale energy during a settlement interval than its station power consumption during the same interval, that consumption should be able to be netted against the injected amount, just as it is for conventional generators.[99]

TURN supports SDG&E's language amendments.[100]

LS Power objects to the position of the utilities, pointing out both that the arguments for only netting station power against positive output ignores the concept of negative generation, which is unique to storage. Traditional generators can only give positive generation, or output, and existing station power rules were written with only positive generation in mind. Storage provides both positive and negative generation to the grid, and thus the station power rules for storage must recognize that. CESA echoes this point, stating that

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[98] CESA January 31, 2017 Reply Comments at 4-5.

[99] SDG&E January 24, 2017 Comments at 4.

[100] TURN January 31, 2017 Reply Comments at 3-4.

rules should align with the capabilities of today's technology.[101] LS Power also refutes the utilities' claim that adding the absolute value of charging and discharging is mathematically incongruous. Finally, LS Power points out that, requiring station power only when device is discharging will increase energy bids, thus distorting market signals.[102]

CESA points to the definition of "Net Output" in Appendix A of the CAISO Tariff, which reads as follows: "(T)he gross Energy output from a Generating Unit less the Station Power requirements for such Generating Unit during the Netting Period, or the Energy available to provide Remote Self-Supply from a generating facility in another Balancing Authority Area during the Netting Period."[103]

CESA recommends that the Commission clarify use of the term 'netting' while a resource is charging, or recommends that the term not be used at all.[104] Finally, CESA advocates that, once adopted, the CPUC direct utilities to revise their existing contracts and contract terms to be consistent with the station power rules for storage.[105] SCE objects to CESA's request as inappropriate and potentially harmful to ratepayers, and urges the CPUC to reject CESA's request.[106]

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[101] CESA January 31, 2017 Reply Comments at 4-5.

[102] LS Power January 31, 2017 Reply Comments at 4.

[103] CESA January 31, 2017 Reply Comments at 2.

[104] CESA January 31, 2017 Reply Comments at 3.

[105] CESA January 24, 2017 Comments at 5.

[106] SCE January 31, 2017 Reply Comments at 3.

GPI suggests that the Commission staff hold a workshop in advance of finalizing the station power rules for storage resources.[107]

ORA recommends that the Commission evaluate the costs and ratepayer impacts of this Proposed Rule to determine the magnitude of any cost shift to retail customers from avoiding bundled charges. ORA also suggests that an examination of station power rules for storage be folded into the evaluation required by § 2836(a)(3).[108]

6.5.3. Discussion

We agree that the station power rules should apply to a storage resource while sitting idle and participating in the market, but are not convinced that the resource should pay wholesale for these loads. It is inconsistent with the netting policy we set forth here to simply allow for all station power to pay wholesale simply because the storage operator cannot self-supply from its own generation, as there is no generation – negative or positive – against which to net station power usage while a device is idle. Further, in our review of the utilities' station power self-supply tariffs, we note that there are multiple options for self-supply of station power loads, including contracting for remote resources, or having other generation on-site. Thus, we concur with the utilities that if a storage resource is idle, its onsite station power load is retail.

With regard to netting station power against charging activity, we retain the treatment in the original proposal. We adopt the amendment proposed by CESA to clarify that station power must be netted against the absolute value of a

[107] GPI January 31, 2017 Reply Comments at 2.

[108] ORA January 31, 2017 Reply Comments at 5.

storage device charge and discharge, thus effectively adding the positive generation and negative generation together in a manner consistent with the intent of the Proposed Rule. In instances where the cumulative absolute value of charging plus discharging is greater than station power load, in a 15-minute interval, then the load is wholesale. If the cumulative absolute value of charging plus discharging is less than station power load, in a 15-minute interval, then the station power load is retail. Under this approach, station power is always charged at either wholesale or retail rates, and is never "free" as asserted by PG&E and SDG&E in their comments on the Proposed Decision.

In comments on the Proposed Decision, SCE and TURN both fear that netting will result in gaming and perverse incentives for energy storage operators. We note that adoption of any rule results in incentives for operators, whose goal is to maximize their revenues, however CESA provided compelling arguments in its reply comments on the Proposed Decision that there are negative operational issues that would occur if the energy storage operator constantly modified their profile in the manner that SCE and TURN theorize. Thus we do not find SCE and TURN's arguments convincing. In comments on the Proposed Decision, SCE also expresses concerns that utilities will not have access to the information necessary to accomplish the adopted netting treatment. If utilities have this concern, they may include a provision in their station power tariffs to ensure an energy storage resource that utilizes a non-utility scheduler provides information to the utility that is necessary to perform the netting established by Rule 5. We anticipate that the results of our forthcoming program evaluation will help inform whether our station power rules should be refined.

This treatment is not in violation of the Public Utilities Code or the Federal Power Act, as suggested by SCE, because "comparable" treatment need not be

precisely the same treatment, particularly when there is good cause to deviate from the precise treatment afforded another resource. Indeed, conventional generation does not possess the physical ability to produce negative generation. Storage and demand response loads are the only resources that can move in both directions, thus creating negative generation. It is well established that there is value to negative generation, and this value will increase as more solar generation is interconnected.[109] The Resource Adequacy rules for calculating qualifying capacity of storage and demand response resources recognize the value of negative generation, or charging load, for storage resources.

Finally, we do not adopt CESA's suggestion to expand the netting period to an interval larger than 15 minutes. We do not have sufficient record to support such a change, and agree with parties that it would be inconsistent with the rules for conventional resources with no clear benefit.

We modify this Proposed Rule as follows:

> Insofar as a storage resource withdraws energy (charges) or injects energy (discharges) subject to a dispatch at a greater <u>absolute value of energy</u> ~~capacity~~ than its <u>station power</u> consumption, that consumption should be able to be netted against the response to the dispatch, <u>within a fifteen-minute settlement period,</u> just as it is for conventional generators.

6.6. Proposal Addressing Measurement of In Front of Meter Storage

The Joint Report and Staff Proposal also offers two options on appropriate measurement and metering of station power for storage devices located in front

[109] Policy forums that recognize the value of negative generation include, but are not limited to: ESDER's examination of rules to allow proxy demand response to provide negative generation, qualifying capacity rules for storage and demand response in CPUC Resource Adequacy policy.

of the utility meter.[110] CPUC staff propose that two meters be required in order to measure wholesale and retail purchases and use or sale, respectively, of station power. CAISO staff, on the other hand, propose that no specific metering configuration be mandated at this time, and that the measurement of station power should be left to the seller and LSE to sort out. The CAISO recommendation also suggests that the CPUC staff be designated to arbitrate any disputes.

PG&E and IEP support the CPUC staff's proposal to require direct measurement of wholesale and retail activities, with the use of an additional meter. PG&E supports the CPUC's proposal for storage resources located in front of the utility meter, and cautions that metering alone may not be sufficient for resources located behind-the-meter that also have on-site retail load, and states that the Commission must develop protocols for delineating retail and wholesale charging.[111] In reply comments, PG&E modifies its position somewhat to state that it supports two meters as a default measurement for retail and wholesale loads, but that the estimation schemes already in station power retail tariffs are sufficient as an alternative measurement in instances where loads are not separable.[112]

IEP states that "(s)eparate meters are essential to ensure comparable treatment of all resources participating in wholesale markets and to maintain a clear jurisdictional divide between retail and wholesale. Estimation or sampling does not provide the precision required for clear jurisdictional boundaries and

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[110] Joint Report and Staff Proposal at 27-29.

[111] PG&E January 24, 2017 Comments at 12-14.

[112] PG&E January 31, 2017 Reply Comments at 5-6.

does not maintain the comparable treatment that should be the hallmark of a competitive wholesale market."[113]

NRG does not explicitly support either approach, but offers three cautions. The first is that the cost of the two-meter approach could be prohibitive for smaller projects. Second, similar to PG&E's position, it is unclear whether wholesale and retail transactions are distinguishable from each other, even using two meters. Third, it is imperative that behind-the-meter resources not be allowed to charge at wholesale and discharge at retail.[114] NRG recommends that if a storage resource chooses to use only a single meter for the storage device and retail load, that all energy – charging or otherwise – transacted through that meter be at retail.[115]

SCE, CESA, and LS Power support the CAISO staff's proposal. SCE bases its support for the CAISO staff proposal on the nascence of the storage market, and supports flexibility in metering storage devices as long as wholesale and retail loads are separable.[116] In Reply Comments, CESA supports SCE's position and states that alternatives to metering are available, thus making a requirement for additional metering an unnecessary cost burden in a new market. CESA reiterates its support for "*some verifiable form of* measurement" for wholesale and retail transactions.[117] LS Power states that other resource types in the United States have been permitted to use a single meter to settle wholesale and retail

[113] IEP January 24, 2017 Comments at 3.

[114] NRG January 24, 2017 Comments at 6.

[115] NRG January 24, 2017 Comments at 2.

[116] SCE January 24, 2017 Comments at 10.

[117] CESA January 31, 2017 Reply Comments at 8-9, emphasis in original.

transactions. LS Power also states that, while it supports the CAISO's proposal that measurement of station power be left to the storage provider and LSE, the storage provider should not be forced to accept metering or settlement that is inconsistent with the rules established by the CPUC.[118] In reply comments, the CAISO reiterates its support for its position, and recommends that the CPUC be "…open to the use of agreed-upon calculations to determine station power load when storage devices charge (e.g., X% of total load, where X can vary depending on station power load related to performance)."[119]

While we support fair and clear rules at the outset, and the use of dispute arbitration by CPUC staff only in the most unique of circumstances, we are convinced that some flexibility is needed at this nascent stage of the market. We also lack sufficient information in the record regarding the potential impact of metering costs to smaller systems, the impacts of specific metering configurations to different storage system designs, as well as alternative measurement approaches, and therefore defer these issues to our future decision on multiple-use applications. Until such direction is provided in a future decision, the utilities and sellers must negotiate measurement terms and the utilities must clearly explain their approach and how it is consistent with these station power rules in their requests for contract approvals.

[118] LS Power January 24, 2017 Comments at 3.

[119] CAISO January 31, 2017 Reply Comments at 2-3.

7. Community Storage

In R.10-12-007, we issued a staff report that established our definition of Community Storage as a distribution energy storage resource.[120] Community Storage is typically associated with a cluster of customer load, whether residential, campus-like complexes, or commercial development. Battery capacity may be combined to serve the load in aggregate, or may be dispersed through a residential or commercial development, and may serve the following functions:

- Providing storage capacity for excess output from small-scale renewable energy sources;
- Providing smoothing and power quality regulation for intermittent resources;
- Providing back-up power capability during outages.

In this proceeding, the CPUC sought to understand the status of existing and planned distribution-level community storage pilot programs; any barriers to developing distribution-level community storage; and what policy options, if any, should be pursued to further address the barriers identified.

In comments SCE identified four different discrete applications that could be considered community storage:

1. Storage located at a distribution feeder that is interconnected directly to the utility distribution grid… and operated by the utility for the purpose of distribution reliability.
2. A series of small batteries interconnected [behind the meter] as several customer locations within the same local area, aggregated together and operated (in at least some hours) by the [utility

[120] http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M042/K157/42157799.PDF, Attachment A at 11-12.

distribution company]. These batteries may be operated to provide customer bill management as well as to provide services to the local distribution grid.

3. Storage interconnected [in front of the meter] within a community, and operated to provide services to local customers…
4. Storage interconnected [behind the meter] on a large campus or military base in which the campus is served via a single meter.[121]

SCE notes that community storage can currently participate in energy storage solicitations and it appears all the types of applications described by SCE, except application type 3, are being pursued either through pilots or standard procurement processes. Although parties suggest that a common definition of community storage would be helpful, it does not appear that one is necessary to allow the exploration of novel applications through pilots or the ability to participate in energy storage solicitations or the wholesale markets. Participation in the third application is hindered by the lack of program rules, but the current record does not provide a basis to adopt rules at this time. As noted by SCE, the issues raised by this type of application are sufficiently complex to warrant discussion in an informal workshop setting. To this end, we direct SCE to convene a working group, via notice to the service list for this proceeding, to identify the issues that must be addressed to reduce barriers to the provision of storage services to local customers, including those in disadvantaged and low-income communities, via installation of storage in front of the meter. The Working Group should prepare a summary of the issues, and note any consensus that is reached to resolve the issues identified, and transmit the

[121] February 5, 2016 Comments at 18.

Working Group Report to Energy Division no later than October 15, 2017. We will consider whether to take up this issue again in a future rulemaking.

8. Safety Standards

D.16-01-032 directed the Safety and Enforcement Division (SED) to convene a working group to develop and refine an energy storage inspection plan and protocol for the CPUC based on expertise from the Investor-Owned Utilities, codes and standards development organizations, energy storage developers, and other interested parties. SED completed the inspection checklist, which is meant to apply to utility-owned energy storage facilities, and the checklist was attached to an ALJ Ruling seeking comments on whether a new or revised General Order is needed to allow SED to implement the checklist. Comments were filed on October 24, 2016 by PG&E, SCE, SDG&E, and GPI, and reply comments were filed on November 7, 2016 by SCE and SDG&E.

The commenting parties are unanimous in their recommendation that no formalization through adoption or amendment of a General Order is required to allow SED staff to utilize the checklist as an inspection guide. Some parties indicated that the checklist should be expanded to cover storage resources at non-utility locations, others opposed this expansion, and suggested that if an expansion were to occur, additional procedural steps would be required.

We agree with the parties that no new or revised General Order is needed to allow the SED staff to utilize the checklist in their energy storage inspection duties at utility-owned sites. We commend the parties for their work to provide input to the checklist, and we look forward to a report at a future date on SED's implementation of their new inspection protocols for energy storage.

9. Outstanding Procedural Matters

On February 14, 2017 PG&E filed a motion requesting permission to enter updated information into the record in this proceeding regarding the status of PG&E's progress toward meeting its 2014 energy storage targets. That motion is granted. On April 3, 2017 SCE filed a motion to withdraw a January 26, 2017, Petition for Modification. That motion is granted. On April 13, 2017 Peninsula Clean Energy Authority filed a Motion for Party Status. That motion is granted. The CPUC affirms all rulings made by the assigned Commissioner and assigned ALJ. All motions not previously ruled on are deemed denied.

10. Categorization and Need for Hearing

The January 5, 2016 Scoping Memo and Ruling of the Assigned Commissioner and Administrative Law Judge affirmed the categorization of this proceeding as quasi-legislative and determined that no hearings would be necessary for Track 2 of R.15-03-011.

11. Comments on Proposed Decision

The proposed decision of Commissioner Peterman in this matter was mailed to the parties in accordance with Section 311 of the Public Utilities Code and comments were allowed under Rule 14.3 of the Commission's Rules of Practice and Procedure. Comments were filed on March 16, 2017 by AReM/DACC, CCA Parties (City of Lancaster, Marin Clean Energy, Silicon Valley Clean Energy Authority, and Sonoma Clean Power Authority) CESA, Eagle Crest Energy Company, GPI, IEPA, Joint Parties (NRDC, California Coalition of Utility Employees, EDF, Alliance of Automobile Manufacturers, and American Honda Company), NRG Energy, Inc., PG&E, San Diego County Water Authority, SCE, SDG&E, Shell Energy North America, Tesla, Inc., and TURN, and reply comments were filed on March 21, 2017 by AReM/DACC, CCA

Parties, CESA, GPI, ORA, PG&E, SCE, Sierra Club, and TURN. Minor changes have been made throughout to address comments and improve clarity.

We call out only one topic from the comments here. In its comments on the Proposed Decision, SCE argues that the CPUC should wait to implement the Station Power rules until the CAISO station power tariff changes are implemented. We decline to await action on the CAISO tariffs to implement these rules, which were the result of joint efforts between the CPUC and CAISO. Energy Division will determine the effective date when reviewing the proposed tariffs and will assess the timing based on the best information available at that time.

12. Assignment of Proceeding

Carla J. Peterman is the assigned Commissioner and Michelle Cooke is the assigned ALJ in this proceeding.

Findings of Fact

1. V1G is being considered in R.13-11-007 where it is subject to distinct regulatory funding and incentive mechanisms.
2. R.16-02-007 has as two of its explicit scoping objectives, to establish policy guidance on portfolio optimization and implications for specific resource types and guidance on handling long-lead-time resources such as pumped hydroelectric storage.
3. Large pumped storage may be a useful tool to balance the renewable generation resources that are required to meet the SB 350 objectives of 50 percent renewables by 2030.
4. P2G's primary purpose is conversion and storage of electrical energy from the grid or grid-connected resources.

5. One of the overarching goals of this proceeding is to consider reduction of greenhouse gas emissions in reaching our determinations relating to energy storage.

6. D.13-10-040 adopted a total energy storage procurement target of 1,325 MW.

7. Utilities have made great strides towards fulfilling their energy storage targets, with procurements in the 2014 procurement cycle, LCR RFO, expedited procurement to support Aliso Canyon, and behind-the-meter storage installations as part of the SGIP.

8. PG&E fell four MW short of its 2014 goal.

9. SDG&E accomplished all of its 2014 energy storage procurement as part of its ongoing procurement efforts.

10. SCE has already exceeded its 2016 procurement target, but continues to solicit additional energy storage resources.

11. Sections 2838.2 and 2838.3 adopt a requirement that PG&E, SCE, and SDG&E propose investments and programs totaling no more than 500 MW of distributed energy storage systems, distributed equally among the three utilities, above and beyond the 1,325 MW target for energy storage generally.

12. The CPUC has an established procedure to approve utility procurement plans for energy storage resources.

13. ESPs and CCAs are required to conduct actual storage procurement, equal to one percent of their sales, in addition to their customers paying for a portion of utility storage procurement via non-bypassable charges.

14. As of January 2017, CCA customers in PG&E, SCE, and SDG&E service territories and DA customers in PG&E and SDG&E service territories do not

have cost responsibility for procuring storage at a greater percentage of total load than the utility.

15. As of January 2017, DA customers in SCE service territory currently have cost responsibilities somewhat in excess of the overall utility obligation.

16. Electric energy drawn into storage resources for later resale is not station power.

17. Electric energy drawn into storage resources but "lost" due to the efficiency of the resource (efficiency losses) does not constitute station power.

18. Electrical energy that is used for purposes other than for supporting a resale of energy back into wholesale markets is station power and inherently retail.

19. Elements essential to battery operation – namely the battery management system, thermal regulation, and vacuum (for flywheels) – are wholesale loads, not station power.

20. There are multiple options for self-supply of station power loads, including contracting for remote resources, or having other generation on-site, thus, if an energy storage resource is idle, its onsite load is retail.

21. Policy forums that recognize the value of negative generation include, but are not limited to: ESDER's examination of rules to allow proxy demand response to provide negative generation, qualifying capacity rules for storage and demand response in CPUC Resource Adequacy policy.

22. There is not a common definition to describe the community storage service, its components, technical merit, and economic benefits of community storage.

23. It does not appear that a definition of community storage is necessary to allow the exploration of novel applications through pilots or the ability to participate in energy storage solicitations or the wholesale markets.

24. Commenting parties are unanimous in their recommendation that no formalization through adoption or amendment of a General Order is required to allow SED staff to utilize the Energy Storage Inspection Checklist as an inspection guide.

Conclusions of Law

1. The utilities should pursue cost-effective storage opportunities that meet their integrated resource procurement and greenhouse gas reduction objectives regardless of whether the resource is eligible to count towards the adopted targets.

2. We should not modify our decision to exclude V1G from eligibility to meet the energy storage targets.

3. We should make no changes to our prior eligibility determination for pumped storage larger than 50 MW.

4. We should not allow hydrogen injected into the natural gas pipeline system that was created via P2G to be counted against the utility energy storage targets.

5. The adopted energy storage targets set the minimum energy storage resources that the utilities must procure, not the maximum.

6. In light of the new utility investments and programs authorized by AB 2868, no additional increase to the existing 1,325 MW target is warranted.

7. The utilities should host workshops and an application preview to allow discussion of AB 2868 implementation.

8. An automatic limiter that ensures that the energy storage procurement and cost recovery obligation of the customers of CCAs and ESPs does not exceed the utility bundled customer obligation should be adopted.

9. All electric energy drawn into storage resources for later resale is not station power, and therefore should be purchased according to a wholesale rate such as the CAISO locational marginal price.

10. Energy drawn into the storage resource but "lost" due to the efficiency of the resource (efficiency losses) does not constitute station power, and therefore should not be subtracted from the energy drawn into the battery or charged at a retail rate.

11. The value of negative generation will increase as more solar generation is interconnected.

12. We should not adopt a more refined definition of community storage at this time.

O R D E R

IT IS ORDERED that:

1. Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company must each incorporate utility programs and investments of up to 166.66 MW of distributed energy storage systems into their 2018 energy storage procurement and investment plans that are due on or before March 1, 2018, in a manner that prioritizes procurement or investment that provides such systems to public sector and low-income customers, demonstrates ratepayer benefits, seeks to minimize overall costs and maximize overall benefits, reduces dependence on petroleum, meets air quality standards, and reduces greenhouse gas emissions while not unreasonably limiting or

impairing the ability of nonutility enterprises to market and deploy energy storage systems.

2. Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company, in consultation with California Public Utilities Commission staff, must host a minimum of two workshops by the end of 2017 for the parties to discuss and develop consistent definitions of terms, proposals for how to evaluate projects against the statutory criteria, and their plans for incorporating distributed energy storage systems into their 2018 energy storage procurement and investment plans. A list of topics that must be discussed is set forth in Section 4.1 of this decision.

3. Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company must host a preview session of their 2018 applications in December 2017 to describe their 2018 procurement and investment plan for distributed energy storage systems, with specific emphasis on how feedback from the workshops was incorporated.

4. Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company must file quarterly Assembly Bill 2868 Implementation compliance progress reports in this proceeding beginning August 1, 2017, and serve them on the service list until such time as the 2018 energy storage procurement and investment plans are filed.

5. Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company must coordinate to make a consolidated compliance filing annually as a Tier 1 Advice Letter through 2020 to update Tables 3-6 based on the most current Community Choice Aggregator and Energy Service Provider load data and utility investment and procurement information, with the first compliance filing due no later than August 1, 2017.

6. An automatic limiter that proportionately reduces each Community Choice Aggregator's and Energy Service Provider's one percent procurement obligation by the amount that the load serving entity's own procurement plus its customers' share of non-bypassable charges exceeds the utility bundled customer obligation as a percentage of load is adopted. If the limiter is reached, the consolidated utility compliance filing shall automatically reflect the reduced Community Choice Aggregator/Energy Service Provider energy storage procurement obligation.

7. Energy Division shall file and serve a compliance copy of the evaluation report in this proceeding or the successor to this rulemaking.

8. No later than 30 days after the effective date of this decision, Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company must file advice letters to establish energy storage station power tariffs to:

- Confirm that all energy used for purposes other than for supporting a resale of energy back into wholesale markets is station power and inherently retail, subject to California Public Utilities Commission rules regarding netting of energy consumption;
- Confirm that all energy drawn from the grid to charge energy storage resources for later resale, including efficiency losses, should be subject to a wholesale rate;
- Define wholesale uses as charging energy, resistive losses, pumps (flow batteries and pumped hydro), power conversion system, transformer, battery management system, thermal regulation, and vacuum (for flywheels);
- Define Station Power uses as information technology and communications, lighting, ventilation, and safety; and
- Allow consumption to be netted against the response to the dispatch within a fifteen-minute settlement period, when a

storage resource withdraws energy (charges) or injects energy (discharges) subject to a dispatch at a greater absolute value of energy than its station power consumption.

9. Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company may include a provision in their station power tariffs to ensure an energy storage resource that utilizes a non-utility scheduler provides information to the utility that is necessary to perform the netting established in Ordering Paragraph 8.

10. Should Pacific Gas and Electric Company, Southern California Edison Company, or San Diego Gas & Electric Company sign contracts as part of their 2016 storage Request for Offers, or any other procurement, in advance of final determinations on metering configurations and measurement, to which the adopted station power rules would apply, Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company must adhere to the policy statements in Ordering Paragraphs 8 and 9 and negotiate specific measurement and metering arrangements with the storage provider.

11. Southern California Edison Company shall convene a working group (Working Group), via notice to the service list for this proceeding, to identify the issues that must be addressed to reduce barriers to the provision of storage services to local customers via installation of storage in front of the meter. The Working Group shall prepare a summary of the issues, and note any consensus that is reached to resolve the issues identified, and transmit the Working Group Report to Energy Division no later than October 15, 2017.

12. The February 14, 2017, April 3, 2017, April 13, 2017 motions of Pacific Gas and Electric Company, Southern California Edison Company, and Peninsula Clean Energy Authority, respectively, are granted.

This order is effective today.

Dated April 27, 2017, at San Francisco, California.

MICHAEL PICKER
President
CARLA J. PETERMAN
LIANE M. RANDOLPH
MARTHA GUZMAN ACEVES
CLIFFORD RECHTSCHAFFEN
Commissioners

I will file a concurrence.

/s/ MICHAEL PICKER
President