**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)

REPLY COMMENTS OF THE CALIFORNIA ENERGY STORAGE ALLIANCE ON MULTIPLE-USE APPLICATION JOINT STAFF PROPOSAL AND WORKSHOP

Donald C. Liddell
DOUGLASS & LIDDELL
2928 2nd Avenue
San Diego, California 92103
Telephone: (619) 993-9096
Facsimile: (619) 296-4662
Email: liddell@energyattorney.com

Counsel for the
CALIFORNIA ENERGY STORAGE ALLIANCE

June 30, 2017

TABLE OF CONTENTS

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)

REPLY COMMENTS OF THE CALIFORNIA ENERGY STORAGE ALLIANCE ON MULTIPLE-USE APPLICATION JOINT STAFF PROPOSAL AND WORKSHOP

In accordance with Rules of Practice and Procedure of the California Public Utilities Commission ("Commission"), the California Energy Storage Alliance ("CESA")[1] hereby submits these reply comments on the *Multiple Use Application Administrative Law Judge Ruling Seeking Comments on Joint Staff Proposal* issued by Administrative Law Judge Cooke on May 18, 2017 ("Proposal"), and on the related workshop held at the CPUC on June 2, 2017.

I. INTRODUCTION.

CESA believes work on Multiple Use Applications ("MUAs") will enable a better electric system through more affordability from better resource utilization, competition and system efficiency, more reliability through use of modern capabilities, solutions and tools, and

[1] 8minutenergy Renewables, Adara Power, Advanced Microgrid Solutions, AES Energy Storage, AltaGas Services, Amber Kinetics, Bright Energy Storage Technologies, BrightSource Energy, Brookfield, Consolidated Edison Development, Inc., Customized Energy Solutions, Demand Energy, Doosan GridTech, Eagle Crest Energy Company, East Penn Manufacturing Company, Ecoult, ElectrIQ Power, ELSYS Inc., eMotorWerks, Inc., Energport, Energy Storage Systems Inc., Enphase Energy, GE Energy Storage, Geli, Green Charge Networks, Greensmith Energy, Gridscape Solutions, Gridtential Energy, Inc., Hitachi Chemical Co., IE Softworks, Innovation Core SEI, Inc. (A Sumitomo Electric Company), Johnson Controls, LG Chem Power, Inc., Lockheed Martin Advanced Energy Storage LLC, LS Power Development, LLC, Magnum CAES, Mercedes-Benz Energy, National Grid, NEC Energy Solutions, Inc., NextEra Energy Resources, NEXTracker, NGK Insulators, Ltd., NICE America Research, NRG Energy, Inc., OutBack Power Technologies, Parker Hannifin Corporation, Qnovo, Recurrent Energy, RES Americas Inc., Sharp Electronics Corporation, SolarCity, Southwest Generation, Sovereign Energy, Stem, Sunrun, Swell Energy, UniEnergy Technologies, Wellhead Electric, and Younicos. The views expressed in these Reply Comments are those of CESA, and do not necessarily reflect the views of all of the individual CESA member companies. (http://storagealliance.org).

through better integration of renewable energy, for which energy storage is uniquely well-situated.

CESA's reply comments focus on clarifying the goals of a MUA authorization from this proceeding and detailing how CESA's 'Checklist Approach' provides a more flexible set of authorizations for MUAs to compete in all roles and service areas of the grid while allowing for nuanced considerations of where MUAs may need guidelines. CESA also addresses key points on MUAs that seek to allow for wholesale rate treatment for behind-the-meter resources.

II. THIS PROCEEDING SHOULD YIELD A STRUCTURE THAT ENSURES MUAS CAN COMPETE TO PROVIDE SERVICES, DIRECTS MULTIPLE-USE APPLICATIONS CONSIDERATION IN OTHER PROCEEDINGS, AND RECOGNIZES THAT SERVICE-SPECIFIC PROCEEDINGS MAY DIRECT ADDITIONAL PARTICIPATION AND ELIGIBILITY GUIDANCE.

The Staff Proposal approaches MUA authorizations by making a list of possible services which are categorized and then governed by rules. This approach seeks to allow for any combination of MUA services to conceivably be considered and authorized or not, based on the applicable rules also included in the proposal. CESA refers to this approach as the 'matrix approach', in reference to the table provided in the Joint Staff Proposal.

Most commenters responded to this matrix approach and sought to provide helpful clarity to where MUAs should be allowed or not. These reply comments highlight how the matrix approach's attempt to pre-authorize specific configurations of MUAs is challenging and may either over-restrict or under-restrict MUAs. While the over-restriction of MUAs could disallow valuable and helpful resources from providing services, the under-restriction of MUAs raises concerns from some parties regarding the potential for bad actors, inappropriate double payments, or reliability risks. Further, the matrix approach may at times lack key details which makes it less helpful. For instance, without a definition for a time-period of the service offering, one cannot always reasonably assess whether a MUA is feasible or not.

The difficulties with the matrix approach ultimately highlight how CESA's Check-list Approach may be a more helpful and appropriate framework for authorizing MUA. The Check-list approach could direct the eligibility of all MUAs subject to certain controls. This approach avoids the pitfalls of inflexibility and of over or under-restricting MUAs. The approach also provides necessary and helpful guidance to other proceedings or service-areas for considering MUAs. For instance, the Resource Adequacy ("RA") proceeding (R.14-10-010) could benefit from a Commission determination that MUAs should be eligible to compete to provide services subject to certain checks. The Commission can then know it must allow competition from MUAs subject to certain checks, and could determine the time period for RA services (which are done in monthly increments) to determine if a resource is available for the services needed. In the near-term, CESA believes the Checklist Approach could explicitly authorize MUAs and provide further consideration of participation structures for MUAs in the following key Commission proceedings and California Independent System Operator ("CAISO") stakeholder initiatives: Distributed Resources Plan Proceeding, Resource Adequacy Proceeding, Integrated Resources Planning Proceeding, Energy Storage and Distributed Energy Resources Phase 3 Initiative, Transmission Planning Process Non-Wires Alternatives Consideration Initiative, and Frequency Response Initiative. The Checklist approach will inevitably inform other proceedings and initiatives too.

The Check-list Approach also provides latitude for cases where the provision of multiple reliability services in different time-periods is clearly allowed. Consider a case where distribution deferral is needed in Santa Monica *in the winter* when lighting loads can stress distribution feeders. Deferral service, in this example, is not needed in the summer since many Santa Monica customers do not need air-conditioning. A storage device located at a customer premise could then provide the deferral service (if so determined through the appropriate process or proceeding) in the winter while then providing valuable 'local RA' in the summer. Restricting this device to provide only one or the other would be inefficient. The Check-list approach ensures the benefits of MUAs are available subject to key controls which can be reviewed.

Finally, the Checklist Approach provides helpful benefits in other ways. First, the broad authorization of the Checklist Approach can help avoid the need for excessive 'one-off' determinations. The Checklist Approach addresses the concerns raised by Southern California Edison Company ("SCE") that lead SCE to recommend that resources only be allowed to provide more than one reliability service on a case-by-case basis.[2] The check on performance measurement and on wholesale-retail integrity from the Checklist Approach[3] addresses key concerns about metering requirements across proceedings and across jurisdictions.

III. PERFORMANCE REQUIREMENTS, BEHAVIORAL AND OPERATIONAL SIGNALS, AND CONSEQUENCES FOR SERVICE DELIVERY FAILURE ARE THE BEST TOOLS FOR DIRECTING MULTIPLE-USE APPLICATION BEHAVIORS AND ENSURING RELIABILITY.

Comments by some parties misunderstood the concept and benefits of 'marketized' approaches to directing MUAs.[4] The purpose of a marketized approach is to provide helpful and important signals to resources so that services can be delivered. This philosophical approach differs from the Joint Staff Proposal's approach which is more prescriptive. The marketized approach is not, of course, designed to allow resources to create reliability risks or avoid responsibilities, as some parties appear to have misinterpreted.[5]

CESA has emphasized that MUAs can respond well to performance requirements, behavioral and operational 'signals' and to consequence for service-delivery failures. Further,

---

[2] *Comments of Southern California Edison*, p. 6.

[3] *Comments of the California Energy Storage Alliance*, pp. 3-11.

[4] *Comments of Calpine Corporation*, p. 3, and *Comments of Pacific Gas & Electric Company ("PG&E")*, p. 23.

[5] *Ibid,* p. 23.

CESA has emphasized how this 'marketized' approach is standard practice in many service-areas of the grid such as the CAISO's markets. These points are important because they show such market practices can work and because they show how existing service providers may not face hurdles or potentially discriminatory barriers being considered for MUAs.

Advancing reliability is part of CESA's mission.[6] CESA's efforts to highlight the fact that some resources are operated with an expectation of service but no financial or other consequence for a service-delivery failure should highlight the need to avoid discriminatory hurdles for MUAs. In mentioning this example, CESA does not intend to trivialize reliability concerns.

To help the Commission consider where and how marketized approaches to authorizing or directing behaviors by MUAs, CESA has noted the different planning approaches and service-delivery expectation from various jurisdictional areas of the grid.[7] Whereas, T&D services may be planned for failure, the illiquid nature of these 'service markets' has led to circumstances where service-delivery failures have not faced consequences. Alternatively, where liquid replacements of services can be provided, it has been deemed efficient to allow such replacements and 'buy outs'.

CESA supports efforts to 'marketize' and direct MUAs through price signals. We recognize, however, that in some cases fungible 'products' for services may not be available yet. The development of performance rules, contractual requirements (including posting of security deposits), testing and penalties for non-performance could be set such that a developer know how and where to deliver services.

---

[6] *See*, www.storagealliance.org.

[7] *Comments of California Energy Storage Alliance*, pp. 6-10.

IV. AUTHORIZATION OF AN ARRAY OF PERFORMANCE MEASUREMENT SOLUTIONS IN THIS PROCEEDING WOULD ENSURE THE BEST FIT PERFORMANCE MEASUREMENT SOLUTION CAN BE USED FOR EACH PURPOSE.

Some parties assert that MUAs need special designated metering configurations.[8] Some parties also commented on where and how estimation methodologies, baselines, or 'set-asides' are used to satisfactorily measure electricity activities.

Presumably, parties in favor of a metering requirement see this as important for accurately tracking the activities of the MUA so as to differentiate and account for wholesale versus retail activities. While CESA supports the goal of maintaining integrity in tracking wholesale versus retail activities, CESA suggests an array of performance measurement solutions should be authorized, so long as they do the job. As noted by SCE, estimation methodologies, a.k.a. 'set-asides' are used in some instances and so this estimation methodology should not be de-authorized for its potential use in MUAs.[9] San Diego Gas & Electric Company ("SDG&E") also shows interest in set-asides.[10] It could be unreasonable and discriminatory if rules allow set-asides for some customers but not for others, so long as accurate tracking of electric activities are met. CESA's Checklist Approach provides direction while allowing flexibility for more stringent metering consideration, if so determined in other proceedings (*e.g.* the CAISO can determine the performance measurement solutions that it deems workable for its jurisdictional areas). Likewise, Distribution Resource Plans ("DRPs) can determine what performance measurement requirements if any it requires of distributed resources providing distribution services.

---

[8] *Comments of Independent Energy Producers ("IEP"),* p. 6, *Comments of PG&E*, pp. 14-16, and *Comments of SCE*, p. 2.

[9] *ibid*, p. 13.

[10] *Comments of SDG&E*, p. 7.

Similar to the problems with the prescriptive nature of the 'matrix approach', prescriptive requirements for meters are overkill for some MUAs. Instead of using a prescriptive and costly approach, CESA has recommended broad authorization of multiple approaches subject to checks to see if performance measurement solutions are sufficient. CESA thus sees flaws in the comments IEP and others, who imply that separate meters should be required, and that such meters are financially immaterial to install and require of projects.[11] CESA's approach provides important authorization while allowing for more stringent performance measurements to be applied if so determined in a particular service's proceeding.

V. WHOLESALE-RETAIL BILLING INTEGRITY CAN BE ENSURED THROUGH A REQUIREMENT FOR A WHOLESALE SCHEDULE.

CESA's comments and workshop presentations have focused on ensuring integrity in accounting for wholesale versus retail energy. CESA continues to support integrity on these important billing constructs. An array of performance measurement solutions can support these efforts.

A key need for clarity on these matters, however, arose mostly in discussion of customer-sited resources providing retail and wholesale services. CESA emphasized how, for these MUA purposes, resources should only attain wholesale rate treatment based on wholesale schedules, be they day-ahead *or real-time* schedules. To acquire a wholesale schedule, a resource must make choices in advance of the scheduling period. This would eliminate the 'free option' concern raised by SCE.[12]

---

[11] The costs of metering can be material to many projects. The 1% level mentioned in the 6/2 workshop may be being misinterpreted in some comments. The 1% estimate is not applicable to BTM resources in most cases. *See*, comments of IEP, p. 6, Comments of PG&E, pp. 14-16, and Comments of SCE, p. 2.

[12] SCE mentioned this concept in the June 2nd workshop, and in conjunction with 'look-back' issues in its Comments.

While this was clear in CESA's comments,[13] CESA's views were potentially not clear in the materials appended to CESA's previous comments. CESA has therefore appended amended materials to these reply comments to clarify the need for an up-front schedule in order to receive wholesale rate service for behind the meter ("BTM") MUAs. The purpose of these examples is to illustrate how wholesale-retail integrity can be preserved under an array of circumstances and different metering configurations.

Any wholesale schedule, including a real-time schedule, should be allowed for granting BTM MUAs with plans to export access to wholesale rates. This access should not result only from a Day-Ahead Market schedule. SCE notes that a Day-Ahead market schedule should be sufficient because this schedule is done in advance, but this principle is also addressed through real-time market participation which requires a commitment and plan to participate 75 minutes in advance of the operating hour and that a BTM resource schedule its capabilities incremental to its retail needs (which will be reflected in the CAISO markets through the scheduling of load which is managed by the CAISO in the real-time markets).

The wholesale schedule, as emphasized by CESA at the June 2nd workshop, provides many important roles in the evaluation of rate treatment and of service-delivery obligations for MUAs. The wholesale schedule allows for reconciliation with any CAISO or utility settlement systems so duplicative payments or billing are avoided. The schedule also substantiates the activities that warrant wholesale rate treatment. Finally, the schedule provides an important price signal and directive for delivering the wholesale service.

These reasons and others show how it is important to require a wholesale schedule. The activities involved in acquiring a wholesale market schedule ensure a resource with excess capability for market participation does so economically or via a self-schedule. CAISO

---

[13] *Comments of CESA*, pp. 18-19.

settlement rules have ensured that such capabilities from wholesale resources are *incremental and distinct* from the conventional retail activities of such resources. The act of acquiring a schedule ensures that an LSE is not placed in a *de facto* role as a scheduling coordinator for this incremental distributed energy resource ("DER"), even though the LSE is the *de facto* scheduling coordinator for the retail load service in the Day-Ahead Market and the CAISO is the *de facto* scheduling coordinator in the real-time market. While LSEs may desire to provide this scheduling service, it is important to differentiate the LSE's scheduling *obligation* from the separate role of scheduling on behalf of a direct market participant, *e.g*. a proxy demand resource ("PDR") seeking to provide an energy service.

With the requirement for a wholesale schedule, the Commission should definitively re-affirm wholesale rate treatment for exporting BTM resources in this proceeding. The following table may be helpful to clarify when wholesale rate treatment is authorized.

It is important that for exporting resources, efficiency losses for the charging energy later discharged are treated at wholesale. In some cases, this can be accomplished through metering, but set-asides or estimations may be useful for these purposes too. For instance, when reconciling a wholesale scheduled discharge (export) from a BTM resource, the total discharged amount will be less than the wholesale charged amount based on the efficiency losses. This efficiency loss provision should inform the rules needed to corroborate exported energy against charging energy pursuant to wholesale schedules. For these deemed efficiency losses, CESA recommends a default assumption of 66.5% Round Trip Efficiency which is the efficiency 'floor' used in the Self-Generation Incentive Program ("SGIP"), as the Commission has already vetted this number based on expectations of meeting SGIP goals and of discharge patterns expected for BTM energy storage.[14]

Consideration of corroboration to a wholesale schedule also highlights why additional IT, schedule reconciliation, and 're-billing' systems might be needed by a utility. The Commission should direct consideration of how best to address these system upgrade needs. The CAISO systems currently authorize and adjust for wholesale schedule demand reductions, and CAISO initiatives are actively contemplating systems and enhancements for increasing customer side loads in response to wholesale market schedules.[15]

Finally, CESA observes that SCE's comments may be misinterpreted in at least one instance. SCE states that "only when the amount of discharge is in excess of the on-site load should the customer be compensated for any provision of energy."[16] Presumably, SCE intends this statement to refer to the application of wholesale rates to an amount of BTM charging energy. It is important that the Commission not require an export for the receipt of a wholesale energy payment. Today, PDRs frequently drop load pursuant to wholesale schedules and receive wholesale payments. These resources do not discharge in excess of on-site load, and CESA believes the Commission should ensure the basic participation structure for PDRs is not disrupted by this proceeding.

---

[14] See, *Decision Revising the Greenhouse Gas Emission Factor to Determine Eligibility To Participate In The Self-Generation Incentive Program Pursuant to Public Utilities Code Section 379.6(b)(2) As Amended By Senate Bill 861*, D.16-06-055, issued November 18, 2015.

[15] *CAISO Energy Storage and Distributed Energy Resources Phase 2 Draft Final Proposal*, pp. 24-27. This proposal includes plans for consideration of and load consumption PDR product.

[16] *Comments of SCE*, p. 9.

VI. <u>CHANGES TO WHOLESALE DISTRIBUTION ACCESS TARIFFS OF COMMISSION JURISDICTIONAL UTILITIES IS OUT OF SCOPE OF THIS PROCEEDING BUT THE DIRECTION FORM THE CPUC TO JURISDICTIONAL UTILITIES ON MULTIPLE USE APPLICATIONS SHOULD INFORM EFFORTS TO MODERNIZE SUCH TARIFFS.</u>

SCE commented on the role that wholesale distribution tariffs ("WDATs") play in collecting revenues for distribution system costs and how the directive for wholesale rate treatment for some MUAs might not align with WDAT expectations and cost recovery goals. As A WDAT is primarily designed to reflect the study needs and 'wheeling costs' of routing power through a distribution system to the wholesale grid. Ultimately, these WDAT costs are reflected in the bids of resources participating via WDAT in the wholesale market, e.g. a transmission-system level market. WDATs are not needed for demand response (non-exporting) configurations or net energy metering ("NEM") resources.

These cost-recovery concerns by SCE are out of the scope of this proceeding. WDATs are FERC-jurisdictional and SCE's showings to FERC on its WDAT rates should reflect expectations of distribution system usage and retail-rate recoveries of costs. As mentioned by CESA and discussed at the June 2nd workshop, WDAT designs have been cited as a barrier to MUAs. CESA believes the Commission should provide guidance to its jurisdictional LSEs on how WDATs should not be used to unreasonably limit deployments of MUAs. Further, the Commission should signal its expectations for jurisdictional utilities to review and take action to address problematic aspects of WDATs. This would not impinge on FERC's authority over WDATs but would help utilities to consider how to modernize their WDATs.

VII. FURTHER CONSIDERATION OF SEQUENTIALLY PROVIDED MULTIPLE USE APPLICATIONS SHOULD NOT DELAY PROGRESS IN TIS PROCEEDING.

PG&E comments that the Commission has not provided sufficient consideration for MUAs where services are provided sequentially.[17] CESA presumes PG&E's comments express a concern that a MUA may need to take action in time increment A in order to be ready for the promised service in time increment B, assuming B immediately follows A. While CESA cannot ascertain the exact nature of PG&E's concern, CESA believes further consideration of the point Commission is not necessary at this time.

PG&E's apparent concern can likely be addressed through accurate market signals, contracts, or other tools, *e.g.* accurate accounting for wholesale versus retail energy usage. CESA's Checklist Approach also addresses these concerns by broadly authorizing MUAs but allowing for further checks to ensure key performance, wholesale-retail accounting, or reliability concerns are avoided.

VIII. CONCLUSION.

CESA appreciates the opportunity to submit these reply comments and looks forward to working with the Commission and stakeholders as this proceeding progresses.

Respectfully submitted,

Donald C. Liddell
DOUGLASS & LIDDELL

Counsel for the
CALIFORNIA ENERGY STORAGE ALLIANCE

Date: June 30, 2017

---

[17] *Comments of PG&E*, pp. 4-5.

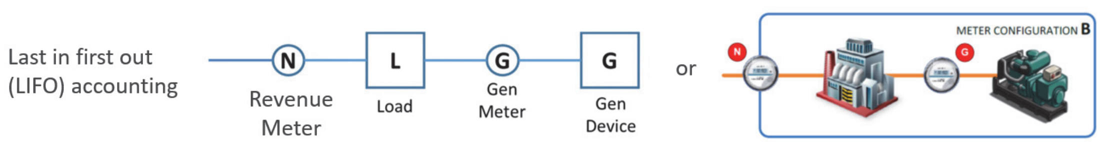
APPENDIX A

CESA'S CHECK-LIST APPROACH EXAMPLES AND METERING STRUCTURE REVIEW

For BTM resources that are exporting to the grid pursuant to a wholesale schedule, these configurations highlight that it is possible to capture and separate retail and wholesale energy, and how station power rules can be applied. These are not prescribed methods and any arrangement that meets the checklist approach, discussed in the above reply comments, should be considered. CESA also cautions that these are illustrative examples and may not represent configurations that are workable in every foreseeable instance. CESA welcomes further feedback, enhancements, or expansions on these examples.

Configuration 1:

This configuration will assume the customer has a wholesale market schedule and will show that in each scenario, the wholesale and retail energy can be distinguished. The example shows how the established metering setup from ESDER[18] is sufficient, with the existing retail meter and one sub-meter as seen below.



Source: ESDER ER16-1735

Scenario 1	2pm	3pm	4pm	5pm	6pm
Meter N	10	10	-9	-9	5
Meter G	10	10	-9	-9	0
Load	0	0	0	0	5
Wholesale (N)	10	10	-9	-9	0
Retail (N-G)	0	0	0	0	5

Scenario 2	2pm	3pm	4pm	5pm	6pm
Meter N	15	15	1	1	5
Meter G	10	10	-9	-9	0
Load	5	5	10	10	5
Wholesale (N)	10	10	-9	-9	0
Retail (N-G)	5	5	10	10	5

Scenario 3	2pm	3pm	4pm	5pm	6pm
Meter N	15	15	-4.5	-4.5	5
Meter G	10	10	-9	-9	0
Load	5	5	4.5	4.5	5
Wholesale (N)	10	10	-9	-9	0
Retail (N-G)	5	5	4.5	4.5	5

In each scenario, the customer has a schedule to charge at 10 kW from 2:00 pm to 4:00 pm and discharge from 4:00 pm to 6:00 pm at 9 kW. This schedule takes into account a 90% round-trip efficiency for simplicity. In the above comments, a more substantiated efficiency ration of 66.5% is recommended. It will be important storage is allowed to receive schedules that reflect their efficiency losses to ensure the energy that is lost (pursuant to a wholesale export plan) is paid for at the wholesale rate and not retail, as per station power rules. An established efficienty proxy, such as the SGIP efficiency floor of 66.5% is recommended at this time, although an

[18] *See, CAISO Energy Storage and Distributed Energy Resources Phase 1 Draft Final Proposal*.

alternative efficiency factor, established at the time of interconnection, through manufacturer data or testing, or via a signed attestation, could also be an appropriate method to manage this.

Scenario 1. In this scenario, the customer follows the schedule and meter G confirms the wholesale charging between 2:00 pm and 4:00 pm and the wholesale discharging between 4pm and 6:00pm. The retail eligible component is given by meter N – meter G. In this scenario, each time interval should have a retail rate of zero. In practice, the retail meter is meter N and will require an adjustment, (meter N – meter G) for these time intervals.

Scenario 2. In this scenario, the customer defaults on the discharging to the grid. The metering configuration still ensures integrity. Meter G confirms wholesale charging between 2pm and 4pm and wholesale discharging between 4:00 pm and 6:00 pm. In this case, note that, while this energy did *not* go to the grid, the metering configuration shows that the full wholesale schedule amount is apparently met, *i.e*. 9kW are seen on the wholesale measurement from 4:00 pm to 6:00 pm. From the CAISO's perspective, the customer appears to have met the schedule. However, the customer must pay for the energy they consume at the retail rate and the same adjustment ensures this. Meter N – Meter G will capture the retail energy consumed between 4:00 pm and 6:00 pm, even though there was wholesale charging. Note this adjustment will be at the current (time of consumption) TOU rate, not the TOU at the time of charging because the consumed energy was designated for the current time interval through the CAISO schedule. TOU arbitrage needs to be performed when not participating in the wholesale market. Other solutions for how to address this effective *non*-delivery may be considered, *e.g.* configure meters to show the CAISO schedule was not delivered while retail costs were incurred at that time. In this latter case, a failure to deliver on a CAISO schedule would be settled through buy 'buying out' of the position at the real-time price. Additionally, the initial wholesale rate settlement (for charging) earlier could be unwound through a wholesale-retail settlement corroboration IT system.

Scenario 3. In this scenario, the customer provides half the stored energy to the grid and consumes half the stored energy. This is a likely scenario as a customer will likely always have some local retail load and will not export all the stored energy to the grid. The metering configuration still ensures integrity. Meter G confirms wholesale charging between 2:00 pm and 4:00 pm and wholesale discharging between 4pm and 6pm. Note, while this energy did not go to the grid, the resource is measured to have offset the full schedule amount, 9 kW (load + export) from 4:00 pm to 6:00 pm. Under this configuration, from the CAISO's perspective, the customer has met the schedule. However, the customer must pay for the energy they consume at the retail rate and the same adjustment holds. Meter N – Meter G will capture the retail energy consumed between 4:00 pm and 6:00 pm, even though there was wholesale charging. Note this adjustment will be at the current (time of consumption) TOU rate, not the TOU at the time of charging because the consumed energy was designated for the current time interval through the CAISO schedule. TOU arbitrage needs to be performed when not participating in the wholesale market. Again, the purpose here is to show how basic metering configurations can preserve wholesale-retail integrity.

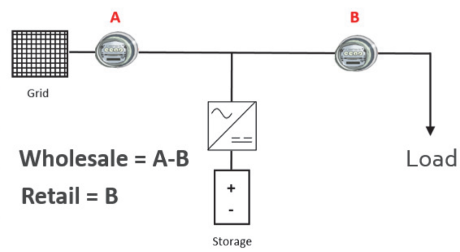
Any other scenario should be treated consistent with any other resource's failure to meet market requirements. The above shows that it is possible to protect against customers consuming wholesale energy with retails loads.

Configuration 2:

This figure shows it is possible to meter the energy flows to maintain wholesale and retail integrity in cases where a BTM resource seeks to charge energy and later export it to the grid pursuant to a wholesale schedule.

If a customer is participating in the wholesale market, meter A minus meter B captures all energy into the battery and meter B captures all retail load.

	Scenario 1	Charge/Discharge (Good Actor)			
	Meter A	Meter B	A-B=Wholesale	B= Retail	
Time interval 1	10	0	10	0	Pay 10kWh at wholesale rate
Time interval 2	-9	0	-9	0	Earn 9kWh at wholesale rate
	Scenario 2	Default on Discharge (Bad Actor)			
	Meter A	Meter B	A-B=Wholesale	B= Retail	
Time interval 1	10	0	10	0	Pay 10kWh at wholesale rate
Time interval 2	0	9	-9	9	Earn 9kWh at wholesale rate but pay for all 9kWh consumed at retail rate*
	Scenario 3	Split Discharge (Combo)			
	Meter A	Meter B	A-B=Wholesale	B= Retail	
Time interval 1	20	0	20	0	Pay 20kWh at wholesale rate
Time interval 2	-9	9	-18	9	Earn 18kWh at wholesale rate but pay for all 9kWh consumed at retail rate*



* May need to adopt highest TOU price if it can't be distinguished when retail energy was charged.

Scenario 1 (Good actor) This customer charges the battery with 10 kWh in time interval number 1. Assuming a 90% round trip efficiency they then discharge all 9kWh to the grid in time interval number 2. This will see them pay for 10 kWh at the wholesale rate in time interval number 1 and earn 9 kWh in time interval number 2. The 1 kWh that is lost is paid for at the wholesale, time interval number 1 rate as appropriate.

Scenario 2 (Bad actor) This scenario sees the same charging behavior in time interval number 1 but in time interval number 2 they consume the energy with retail loads rather than export the energy. This results in the reversal of the wholesale payment (9 kWh) and the recording of 9 kWh of retail usage. They pay for 10 kWh at the wholesale rate in time interval number1. They earn 9 kWh at the wholesale rate in interval number 2 (they are offsetting 9 kWh) but pay for the full retail consumption at the retail rate. The 1 kWh station power losses are settled at the wholesale rate in interval number 1. It may be appropriate to apply the highest TOU rate for the retail consumption as noted in the figure, if the time that the retail power was charged from the grid cannot be established.

Scenario 3 (Combination) This scenario sees 20 kWh of energy charged in interval number 1 and in interval number 2, half is discharged to the grid (9kWh) and half is consumed by retail loads (9 kWh). Again, the customer will pay for 20 kWh of energy in time interval one at the wholesale rate and in interval number 2 they will get paid 18 kWh at the wholesale rate (9 kWh to grid and offsetting 9 kWh of load) but they will also pay for the 9 kWh at the retail rate for the retail consumption. Of the 2 kWh that are lost in the efficiency losses of charging the device, it may be appropriate to resettle some amount of these wholesale losses at retail. This potential resettlement is not reflected in this example, where the 2 kWh that were lost are settled at wholesale in time interval number 1.

An important aspect regarding this metering set up is it allows wholesale market participation, but precludes the use of the energy storage for operation in the retail domain. Since the resource is functionally 'exposed' to wholesale settlement all day, even if not intending to participate in wholesale markets, this example highlights why it is important that the non-generator resource ("NGR") model allow resources under this configuration to exit the market settlement system in intervals where no wholesale schedule is established. This will allow this metering setup for wholesale participation but, whilst the system is not in the wholesale market, it can revert to a true BTM system where the retail meter at point A captures all retail usage and site demand management, TOU arbitrage and other customer domain services can be performed.