

Stakeholder Comments Template

Submitted by	Company	Date Submitted
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Please use this template to provide your comments on the presentation and discussion from the California Energy Storage Roadmap workshop held on October 13, 2014.

Submit comments to EnergyStorage@caiso.com
[Comments are due October 27, 2014 by 5:00pm](#)

Presentation materials and background information discussed during the October 13, 2014 workshop may be found at:

<http://www.caiso.com/informed/Pages/CleanGrid/EnergyStorageRoadmap.aspx>

Please provide your comments regarding each of the actions listed below that were discussed during the workshop. In particular, please direct your comments towards refinements needed to each action and any additional actions that may not have been identified or discussed. Also, please provide feedback on the priority of the proposed actions.

Actions and venues to address barriers

a. Actions to advance revenue opportunities

- i. Defining and communicating grid needs will clarify gaps in existing markets and help identify new products**

Action ¹	Venue(s)
Describe and clarify operational needs at the transmission level, and the operating characteristics required of storage and other resources, connected at either the distribution or transmission level, in order to meet these needs.	CAISO
Describe and clarify operational needs at the distribution level, and the operating characteristics required of storage and other resources connected at the distribution level in order to meet these needs.	CPUC
Facilitate clarification by IOUs of operational constraints that would limit the ability to accommodate storage on the distribution system and behind the customer meter.	CPUC

PG&E commends the CAISO, California Energy Commission (“CEC”) and California Public Utilities Commission (“CPUC”) for coordinating the Storage Roadmap and appreciates the opportunity to provide comments.

Comments:

The CAISO and the CPUC have worked together under the CPUC’s Long-Term Procurement Planning (LTPP) process to identify, on a long-term forward looking basis, operational needs to support the CAISO grid. That process, which is currently active, should continue, and should be the primary vehicle for identifying the need for incremental resources to support the operation of the CAISO grid.

PG&E agrees that the identification of new products that may be provided by energy storage should follow from operational need, whether at the transmission or distribution level. The reliance upon operational need as the basis of storage products would identify the most valuable operating characteristics for energy storage procurement and facilitate the valuation of offered products.

Specifically with respect to storage resources that might be a substitute for a transmission asset, the CAISO’s Transmission Planning Process (“TPP”) provides the appropriate venue for determining whether storage facilities can play such a role.

At the distribution level, on an ongoing basis, PG&E conducts studies to identify the operational needs for the distribution-system’s safe and reliable operation. For this initial 2014 Energy Storage procurement cycle, PG&E has identified five locations and the minimum required operating characteristics for energy storage projects (“ESPs”) to defer a distribution-system upgrade². PG&E also recognizes the efforts underway at the CPUC in the Distributed Energy Resources (“DER”) proceeding. Work done here may provide further clarification and refinement to the distribution-system studies and identification of operational needs.

¹ WDAT and Rule 21 are addressed under section 2.C.i

² http://www.pge.com/includes/docs/pdfs/b2b/wholesaleelectricssuppliersolicitation/Energy_Storage/Information_DistributionDeferralESS.pdf.

ii. Clarify existing wholesale market product opportunities for storage

Action	Venue(s)
Clarify existing energy and AS market products and requirements for energy storage to participate in the ISO market	CAISO
Clarify roles of storage in an evolving RA framework	CPUC

Comments:

There is no specific need to clarify existing energy and AS market products. Storage bids should be evaluated based on the existing wholesale market benefits a storage project may provide, including benefits such as voltage support, black start, congestion relief, etc.

The CAISO continuously refines its market processes to enable more efficient operation of the grid. That ongoing process should continue, and should take into account the operating capabilities that might be provided by storage facilities.

There are preliminary requirements for a generator to be able to participate in the CAISO markets. For example, as a general rule, in order to deliver energy to the grid, each generator must agree to comply with the CAISO Tariff by executing a Participating Generator Agreement; each generator’s communications are handled through a Scheduling Coordinator; and generators are subject to Operating Procedures and other CAISO rules.

From PG&E’s perspective, storage facilities should likewise be required to comply with similar CAISO Tariff obligations in order to participate in the CAISO markets. The CAISO has already adopted certain rules and frameworks that apply to storage, such as the rules for Non-Generating Resources. Since storage is analogous to, but not identical to typical generation, the rules governing a storage resource’s participation need to be clarified and/or revised to account for these operating differences. The CAISO Tariff would have to identify, for example, the relative priority of self-scheduled storage charging, which PG&E anticipates would be lower than the priority of self-scheduled end-use load.

The role of energy storage in the RA framework is being addressed in the ongoing RA rulemaking at the CPUC. The CAISO has a role in the RA framework, and ongoing stakeholder proceedings are considering the role of energy storage as well. The CPUC rulemaking and the CAISO stakeholder processes should continue to move forward to ensure that the RA framework appropriately captures the RA value of storage resources.

iii. Refine existing and add new wholesale market products to meet grid needs

Action	Venue(s)
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Identify gaps and consider changes or additions to existing wholesale market products that would better meet grid needs and improve revenue opportunities for resources such as storage that can provide those needs.	CAISO
Further examine and clarify the role of storage in deferring or eliminating the need for transmission or distribution upgrades	CAISO, CPUC
Consider revising the ISO's procedure for testing and certifying resources for ancillary services	CAISO
Streamline rules for aggregations of distributed storage units to participate in CAISO markets, including participation via use of the NGR model.	CAISO
Evaluate the need and potential for the development of distribution level grid services and products that provide new revenue opportunities for distribution connected storage resources.	CPUC

Comments:

As noted above, the CAISO continuously refines its market processes to enable more efficient operation of the grid. That ongoing process should continue and should take into account the operating capabilities that might be provided by storage facilities. Changes to the CAISO market structure should be predicated on a determination that they can be expected to have overall benefits to the operation of the grid and its customers. Changes should not be made simply for the sake of enhancing the cash flows to storage facilities. Creating new products and services that do not improve the markets' efficacy and efficiency would adversely affect customers by increasing procurement costs.

As also noted above, the CAISO's TPP will consider whether storage resources can cost-effectively defer investment in more traditional transmission assets and evaluate storage against more traditional alternatives during the planning process.

With respect to deferral of investments of more traditional distribution assets, for this initial 2014 Energy Storage procurement cycle, PG&E has identified five locations and the minimum required operating characteristics for ESPs to defer a distribution-system upgrade. The outcome of this process will help to inform future steps with regard to considering the use of storage to defer investment in more traditional distribution assets as a means of maintaining distribution system reliability.

PG&E agrees that the CAISO should consider the extent to which it can enable aggregation of distributed storage units to participate in CAISO markets, to the extent that the effort is likely to result in improvement in the efficiency of the CAISO market. PG&E does not support aggregation for aggregation's sake. As part of its consideration the CAISO should evaluate whether the costs incurred to enable aggregation of storage resources are likely to exceed the benefits that the CAISO markets would see from the participation of these additional aggregated resources.

Evaluation of the “need and potential for the development of distribution level grid services,” appears to have the potential to be a very complex, controversial process. Consistent with PG&E’s recommendation above, changes to the framework of how the distribution grid is operated should be predicated on a determination that the changes can be expected to improve the overall operation of the grid. Changes to how the distribution grid is operated, including the “development of distribution level grid services and products,” should only be made based on the ability of those developments to improve grid operations.

iv. Identify gaps in rate treatment and identify existing rules that could address issues

Action	Venue(s)
Clarify rate treatment for the charging mode of grid-connected or distribution-connected storage participating in the wholesale market under current ISO market settlement rules.	CAISO, CPUC
Clarify existing tariffs for Behind the Meter storage devices that are paired with NEM generators	CPUC
Consider new proceeding for stand-alone Behind the Meter storage devices to address rates for charging and exporting power	CPUC

Comments:

Clarification on the rate treatment for storage facilities is PG&E’s highest priority issue for quick resolution. In this context, there are two fundamentally different types of storage applications that need to be clearly differentiated: storage for later injection back to the grid and storage that uses energy to time-shift end use load, typically in Behind the Meter (BTM) configurations. The appropriate rates to be applied to this first category of storage resources connected at the transmission and distribution levels that are not serving end use load should be the first issue addressed by the appropriate regulatory agencies.

Storage for Later Injection Back to the Grid

A storage resource whose purpose is to charge from the grid, and later discharge back into the grid, places two types of demand on the grid, which PG&E recommends be treated differently for ratemaking purposes:

- **Charging Energy:** The energy used to charge the energy storage system from the grid. Because energy storage devices are not 100% efficient, Charging Energy will include energy that is returned to the grid and potentially some conversion or other losses. PG&E recommends that Charging Energy be procured in FERC-jurisdictional transaction out of the CAISO day-ahead and real-time markets.

- **Station Load:** The energy that is used on site to power auxiliary load such as heating, ventilation, and air conditioning (“HVAC”), lighting, security systems, etc. This is analogous to the station load at a generating facility, and like the station load at a generating facility, this energy should be procured in a CPUC-jurisdictional transaction at an appropriate retail rate.

While it is simple to generally describe the two types of energy and the different ratemaking treatment that PG&E recommends for each, additional work is necessary to draw a clear delineation and definition between Charging Energy and Station Load.

Additionally, with respect to a storage facility interconnected at the transmission level, a decision is needed with respect to whether a wholesale transmission rate component should be incurred in connection with Charging Energy. With respect to a storage facility interconnected at the distribution level, a decision is needed with respect to whether a wholesale transmission and/or distribution rate component should be incurred with respect to Charging Energy. Finally, a decision is needed with respect to whether Charging Energy should generally be included in the Gross Load (a term defined in the CAISO tariff) used to determine the transmission Rates and Charges associated with Section 26 of the CAISO tariff.

PG&E recommends that the discharge back into the CAISO grid be treated as a FERC jurisdictional transaction in the CAISO day-ahead and real-time markets, and that there not be any wholesale transmission or distribution rate component associated with the discharges back into the CAISO grid.

Storage Energy Serving To Time-Shift End Use Load

BTM storage used to time-shift end-use load should be charged an appropriate CPUC-jurisdictional retail rate.

BTM Storage Intended To Both Time-Shift End Use Load And To Store Energy From the Grid For Later Injection Back Into The Grid

A second rate-related priority would be to establish a feasible plan in the near term to develop BTM rate policy for resources that are intended to not only time-shift end-use load, but also to store energy from the grid for later injection back into the grid. Rates for storage charging and exporting power from BTM storage is an area in need of policy development, and PG&E requests that the CPUC, IOUs, the CAISO and other stakeholders fully evaluate use cases for BTM storage. Revenue allocation rules must be applied consistently, such that retail rates are paid for retail services.

CESA and other industry stakeholders have suggested creating rates for BTM storage that intends to participate in the wholesale market, and rules for subtractive metering. It is possible that these proposals may not be technically feasible, and/or may be unacceptable for CAISO settlements purposes. In order to enable this dual use of BTM storage, it will be necessary for the resulting metering and billing impacts to be fully evaluated and addressed.

Finally, to echo comments made by the CPUC during the October 13 Energy Storage Workshop, PG&E believes that the appropriate tariff to apply to Behind the Meter storage paired with NEM generators is the NEMMT tariff. Rules are under development to ensure that NEM credit is awarded to energy generated from the NEM generator only, whether exported by the generator itself or by the storage device. The rate policy for storage charging not covered by NEM is an area for potential policy development.

Next Steps

It is critical to clearly differentiate between transmission and distribution grid-connected energy storage whose purpose is to charge from the grid in order to later discharge back into the grid, on one hand, and BTM storage applications to time-shift end-use load, on the other, in order to avoid any unintended consequences that might occur if the two uses are conflated. PG&E urges that the CPUC should take the lead by issuing an order directing the IOUs to participate in an effort led by the Energy Division (1) to resolve the open issues listed above, and (2) to work with CAISO to address the metering, telemetry, and interconnection requirements for ES resources. The Energy Division should report results of the working group to the CPUC for an appropriate regulatory solution.

v. Define multiple-use applications of storage to facilitate development of models and rules

Action	Venue(s)
Define and develop models and rules for multiple-use scenarios of storage where feasible.	CPUC, CAISO

Comments:

PG&E urges the CAISO and the CPUC to focus on the issues raised in PG&E’s comments on Section iv, above.

vi. Determine hybrid storage configurations to enable prioritization and development of requirements

Action	Venue(s)
Identify and develop clear models of use cases for hybrid energy storage sites, and prioritize them for purposes of facilitating their participation	CAISO, CPUC, IOUs
For the use cases of greatest interest or greatest likelihood of near-term development, clarify the requirements and rules for participation.	CAISO, CPUC, IOUs

Comments:

PG&E urges the CAISO and the CPUC to focus on the issues raised in PG&E’s comments on Section iv, above.

vii. Assess existing methodologies for evaluating storage and identify or develop a preferred common methodology

Action	Venue(s)
Prepare report or summary of efforts underway to develop publicly available models for assessment of energy storage	CEC
Consider refinements to the evaluation methodologies used by IOUs for to support CPUC decisions on storage procurement	CPUC, CEC

Comments:

As stated in previous comments, PG&E supports the CEC’s EPIC Proposal PON-13-302 (Funding Initiative S8.1) to develop a public model for optimizing energy storage systems by location, size and type. The models developed as part of this proposal are anticipated to be available in the 2015-2016 timeframe.

While the models developed under that initiative will not incorporate portfolio-specific impacts, and therefore should not be used to evaluate RFO submissions, they would provide an open, public model that could be used by all parties to evaluate and help fine-tune storage technologies and projects. The process for developing these public models should incorporate a technical working group that includes the IOUs and other entities procuring significant amounts of energy storage.

While a public model developed through a stakeholder process may be very useful to the storage community, the assumptions used in models are greater drivers of computed value than the specifics of the models themselves. Publicly-available scenarios of prices and required quantities for day-ahead, real-time energy prices and ancillary services products beyond the single snapshot considered for the Consistent Evaluation Protocol will also help to inform the community. The modeling community would also benefit from a publicly available methodology for estimating degradation of available storage technologies under various use cases, as degradation characteristics can be a significant driver of total costs.

Allowing the IOUs to incorporate portfolio-based impacts in their evaluations will protect customer interests and prevent storage providers from selectively modifying their offers to optimize their offer evaluations. Therefore, the IOUs’ proprietary models should continue to be used by the IOUs to support

their decisions on storage procurement. These models must remain proprietary, as they are for evaluations in RPS and other solicitations.

b. Actions targeted at cost reduction

i. Review metering requirements for opportunities to reduce costs

Action	Venue(s)
Establish the value of and develop a regulatory and policy framework under which the ISO and UDC can share metering and/or meter data.	CPUC, CAISO
Establish rules for resource owners to submit settlement quality meter data	CAISO
Establish rules for UDC subtractive metering for BTM wholesale resources	CPUC
Establish rules for certifying sub-metering and third-party meter data collection and VEE	CPUC
Complete the Expanding Metering and Telemetry Options Phase I and II initiatives – “expand scenarios for SC metered entities”	CAISO

Comments:

Metering requirements for energy storage are complex. It is necessary to ensure that energy is being metered appropriately and accurately. Metering of certain storage system configurations may be more complex than others in order to adhere to the tariff requirements and ensure accurate measurement and visibility. In general, PG&E supports the simplest metering configurations with the fewest meters, as long as the storage systems’ performance can accurately be assessed and be fairly compensated for the services they are providing.

PG&E looks forward to working with developers and regulators in advancing the operational capabilities through telemetry protocols and the various policies and programs storage will operate under for any potential to streamline metering requirements.

ii. Review telemetry requirements for opportunities to reduce costs

Action	Venue(s)
Evaluate CAISO telemetry requirements for smaller resources	CAISO
Evaluate KYZ, increasing 1-minute requirement, 10 MW limit	CAISO
Evaluate value of common telemetry framework for California	CAISO

Complete the Expanding Metering and Telemetry Options Phase I and II initiatives – definition and support for “data concentrators”	CAISO
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Comments:

Development of appropriate telemetry protocols will be necessary for the operational needs of energy storage systems. Adherence to telemetry protocols will ensure the safe and reliable deployment of energy storage to the grid. Based on observations of the development of various communication media, ranging from CAISO interfaces to telecommunications capability, it appears that a common platform for communication may have the potential to enhance the development of energy storage as a useful energy resource. A common interface standard for communication between energy storage providers, the IOUs, and CAISO could reduce cost uncertainty and potentially reduce the testing needed to bring a facility on-line. It could also eliminate an item for negotiation between the IOU and seller. Establishing the proper communications protocol at the early stages of energy storage deployment may be beneficial to the IOU, CAISO and the storage resources.

iii. Assess codes and standards to identify gaps and best practices

Action	Venue(s)
Review existing fire protection codes for various energy storage technology and applications and identify best practices	CEC
Determine applicability and scope of UL and other certifications for stationary storage systems	CEC

Comments:

PG&E agrees that this is an important topic to be addressed, and supports the identified venue.

iv. Review interconnection process for small distribution-connected resources to reduce costs

Action	Venue(s)
Address certification process for integrated device metering	CPUC
Address fees for interconnection of non-exporting resources	CPUC

Comments:

The CPUC is currently exploring potential refinements to the Rule 21 interconnection process, and enhancements from this proceeding can carry over into potential corresponding changes to utility WDT tariffs. Interconnection costs vary depending on the impact of the interconnected resource, and resources with smaller capacities often do not benefit from the same economies of scale as larger resources when upgrades are needed. Whatever cost reduction opportunities are identified, it is essential to maintain the utilities’ abilities to perform the necessary analysis to identify and install potential upgrades needed for grid reliability.

c. Actions focused on process and timing improvement

i. Clarify interconnection processes to make it predictable and transparent

Action	Venue(s)
Clarify existing interconnection processes, including developing process flow charts and check lists	CAISO, CPUC
Coordinate between Rule 21 and WDAT to streamline queue management processes	CPUC, IOUs
Evaluate the potential for a streamlined or ‘faster track’ interconnection process for storage resources that meet certain use-case criteria	CAISO, CPUC, and IOUs

Comments:

PG&E looks forward to working with stakeholders to clarify the interconnection processes and help develop materials to make the processes more understandable. PG&E is open to consider more streamlined processes for projects that meet certain criteria, but would like to reiterate the need for sufficient analysis to ensure that the reliability of the grid is maintained.

Since the WDT is specific to each utility, efforts to coordinate between Rule 21 and WDAT to streamline queue management processes should include the IOUs in addition to the CPUC.

d. Identify interdependencies and determine priorities to minimize delays

During the workshop the Roadmap team highlighted the importance of identifying interdependencies among the actions. Correctly prioritizing actions and selecting the ones that currently either prevent other actions from being productive or directly prevent storage contracts from being signed will enable

the CPUC, the CAISO and the CEC to maximize progress in removing roadblocks to storage. Please provide comments on important interdependencies among actions that should be factored into the roadmap.

Comments:

PG&E reiterates that clarifying the rates and costs of energy for various storage configurations is a top priority that needs to be addressed as quickly as possible. Clarification of rates and tariffs could inform potential refinements to metering and telemetry requirements and the interconnection processes, but such refinements will be contingent on the resolution of the rates and tariffs to be applied to the various storage configurations.

In general, PG&E supports a strategic and systematic approach to address challenges and/or barriers that are hindering storage from being deployed, while also monitoring the effects that storage coming online will have on existing operations, policy objectives, and open proceedings. PG&E commends the CAISO, the CEC and the CPUC for coordinating the Storage Roadmap to map out the strategy and venues for addressing identified issues, and appreciates the opportunity to participate in this effort.

Applicability to Storage Configuration and Use Cases

The Roadmap team presented an early draft of a “matrix” that seeks to convey what actions will support each identified use case or storage configuration to come online and contribute to grid stability. Please provide comments and suggestions on how such a matrix can be made the most useful to stakeholders. If applicable, please provide examples.

Comments:

At this point, PG&E recommends that the focus be on the issues and priorities identified in these comments. It is not clear that any further development of the matrix will provide additional value.