UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Request for Comments Regarding Rates, Accounting, and Financial Reporting for New Electric Storage Technologies	)))))	**Docket No. AD10-13-000**

COMMENTS OF
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

The California Independent System Operator Corporation (ISO) respectfully submits these comments in response to the June 11, 2010 request of the Commission's Office of Energy Policy and Innovation to address issues regarding rates, accounting, and financial reporting associated with services provided by electric storage technologies.

I. Introduction and Summary

Technological innovation frequently precedes modification of the regulatory structures necessary to effectively take advantage of the enhanced technology. This misalignment can inhibit adoption of new technologies. Accordingly, the ISO commends the Office of Energy Policy and Innovation for proactively examining questions of how to categorize and compensate storage services to ensure rate policies that appropriately accommodate the operational flexibility of storage.

The request for comments tests the premise that the traditional Commission rate recovery mechanisms that treat grid assets as either generation or transmission inadequately compensate storage technologies because a single

storage facility may fill both roles. The request for comments operates under the premise that, by treating storage as either generation or transmission, but not both, the value of storage to investors is depressed by the inability to obtain a revenue stream for the entirety of the benefits the resource provides, thereby preventing storage from competing against currently lower cost conventional generation, demand response, or transmission solutions.

To determine if the contention is correct, the request for comments properly asks the foundational question whether circumstances exist in which a storage facility should be classified and allowed to receive compensation as a transmission asset. The appropriate classification of a particular asset as generation or transmission should rest on how that asset operates in the context of the market structures to which it is interconnected. This requires focusing on whether the asset competes with, or performs functions similar to, other clearly categorized assets and, in doing so, influences market outcomes in more than a purely passive manner. Resources that perform similar functions should be treated similarly in order to maximize the benefits of competition and accurate price signals. Policies to accommodate new technologies in a market context should therefore promote fair competition and non-discrimination, and should avoid skewing market forces and price signals through subsidization or other differential treatment.

Under the foregoing "functional" standard, and notwithstanding the Commission's recent decision in *Western Grid Development, LLC* (Western

Grid),[1] the ISO believes virtually all currently practical applications for storage technologies in ISO markets should be classified and treated in accordance with the cost recovery rules associated with generation assets (including market-based demand response). The ISO bases this conclusion on the observation that the identified applications and operating behavior of storage devices are essentially the same as those of, and performed by, generation and market-based demand response. As such, the operator of the storage device – whether the transmission owner to whose transmission system the device is attached, the merchant owner of the device, or the ISO – would be required to either make market-based operating decisions on a daily basis, which in turn inappropriately affect market prices and economic dispatch results, or avoid such decisions and thereby artificially constrain operation of the device below its full capability to participate in the market.

The ISO believes that, whenever possible, the Commission should seek to facilitate the entry of new technologies through transparent and technology-neutral market-based rate regimes. As noted above, a market-based approach is not only consistent with the technical characteristics and operation of storage facilities, it leads to a more efficient use of capital, provides more equitable allocation of risk between investors and ratepayers, minimizes potential market distortions and avoids undue discrimination. In this regard, the ISO recently opened a stakeholder initiative to assess the need for new market products and

[1] *Western Grid Development, LLC,* 130 FERC ¶ 61,056 (2010), wherein the Commission found, under the specific circumstances presented, that storage devices offering to provide voltage support constituted wholesale transmission facilities.

procurement mechanisms to support renewable integration.[2] The intended approach is to define needed services and performance characteristics, rather than identify specific technologies. By specifying these features, market-based procurement mechanisms can be developed that avoid artificial selection of "winning" technologies and incentivize developers and investors to compete to fulfill grid requirements efficiently and effectively.

Notwithstanding the foregoing, the ISO recognizes that in some limited and largely experimental instances, a storage device may be operated in a manner that justifies its classification as a transmission asset. In these potential circumstances, the storage facility would be constrained to serve a transmission function only. Existing transmission planning processes are well suited in those situations to identify, on a case-by-case basis, the best alternative for addressing the reliability need and to authorize cost-based rate recovery for that alternative. The circumstances under which storage could be evaluated solely as a transmission asset are described below in response to the specific areas of inquiry.

The ISO recognizes that storage devices today may not be economically competitive when viewed solely as a transmission or generation asset and understands the rationale that, if a storage device can properly be deemed to provide dual functions, it might be desirable to consider a hybrid category whereby the storage device may receive a limited amount of compensation as a transmission asset and the balance of its revenues from the energy and capacity

[2] Renewable Integration Product and Market Review at http://www.caiso.com/27be/27beb7931d800.html.

markets. The ISO believes, however, that it will be extremely difficult to develop an objective method to properly value the transmission asset portion of the cost of the device. As a result, the hybrid approach will in the end amount to little more than a means to subsidize the investment cost of the storage device to make its market participation more competitive with other generation and demand market participants.[3]

The one experience the ISO has with such hybrid approaches– the Reliability Must Run contract, where a resource earns some revenues through the cost-based RMR contract and other revenues through participation in the ISO's markets – bears out this concern, as that structure places severe limits on the ISO's operation of the facility to minimize any potential market impacts.[4] Thus, the Commission should be guided by the overarching objective to implement cost recovery structures that recognize the benefits of storage and other beneficial new technologies to the maximum extent practical without distorting investment decisions and the efficient operation of competitive electricity markets.

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[3] To the extent providing a subsidy is deemed desirable from a policy perspective to accelerate deployment of storage technologies, the ISO encourages the Commission to do so explicitly and in a manner that does not distort competitive market forces and price signals. Strained interpretations or artificial distinctions, even when used with the best intentions and to achieve a salutary objective, have a greater likelihood of enduring beyond their practical need.

[4] Moreover, in the current California market structure that includes both the state's resource adequacy (RA) program and the ISO's locational marginal pricing-based markets (LMP), the RMR construct which predated these structural changes is both inferior to RA procurement due to RMR's extremely limited offer obligation, and less useful due to the incorporation of practically all operational transmission constraints into the LMP market models. Thus, as discussed further below, the LMP market structure with its emphasis on the operating incentive effects of accurate locational prices is in fact a key reason why significant market impacts of storage device operation would be hard to avoid under a transmission-asset paradigm.

II. Response to Specific Areas of Inquiry

a. When, if ever, should storage be classified and compensated as a transmission asset?

The appropriate characterization of storage or any other technology for rate recovery purposes should rest on several considerations: (1) the function served by that technology and how it operates within the context of the applicable market structure, (2) whether the storage facility is competing with other non-transmission technologies in the provision of those functions, and (3) whether its operation will affect the market outcomes associated with existing products or commodities in more than a passive way. Under this test, the question of when, if ever, a storage facility should be classified as a transmission asset and allowed to receive rate-based cost recovery through transmission rates should be considered apart from the evaluation of when storage applications benefit the transmission grid. In 2008, the Electric Advisory Commission outlined potential uses of energy storage for transmission and distribution systems separate and apart from generation uses.[5] Those applications included:

Application	Benefit	Quantification	Power Requirements	Duration
1. Transmission capacity factor for renewable resources	Capture renewable production and deliver when transmission available	20-50% of renewable capacity	20-30% of renewable peak production	6-12 hours
2. Transmission congestion relief	Generalized application of above	Potentially large in local areas	Equal to typical congestion on path	Hours

[5] *Bottling Electricity: Storage as a Strategic Tool for Managing Variability and Capacity Concerns in the Modern Grid,* Electricity Advisory Committee (Dec. 2008) at p. 11. [http://www.oe.energy.gov/eac.htm]. It should be noted that most of the uses require discharge capability on the order of hours (last column of the table). Generally, the storage technologies capable of charging or discharging meaningful capacity over such a long period of time are traditional pump-hydro or compressed air devices.

3. Transmission reliability limit relaxation	Specialized technical version of congestion relief relying on very fast storage	$10M to > $100M	0 to 1000 MW	Cycles to minutes
4. Transmission capital deferral	Relieve short-term congestion	1 to several years carrying costs		Hours
5. Substation peak load/backup	Defer transformer upgrades due to peak load growth	$M per state for 2-5 year deferral	2-10 MW	Hours
6. Voltage Support	Storage can provide local real power at high power factor	Economics need analysis	Varies	Varies
7. Reliability Enhancement[6]	Provide down-circuit supply while outage are restored	Outage costs vary greatly depending on duration and consumer	2-10 MW	Hours

The foregoing may or may not constitute an exhaustive list of potential benefits or uses offered by storage to the transmission or distribution grid. However, it does serve to illustrate the close alignment of these identified transmission services with the services that can be provided by generation or market-based demand response, and thus highlights the need for care in identifying the factors that should inform whether a particular technology may be characterized as generation, transmission or both.

Several of the benefits (# 1, 2 and 4) fall within the general category of congestion mitigation under normal operating conditions. The ISO manages congestion through its Security Constrained Unit Commitment (SCUC) and Security Constrained Economic Dispatch (SCED), which perform unit commitment and economic dispatch, respectively, in the ISO's day ahead and real time markets. Among other things, SCUC and SCED utilize algorithms that

[6] The reliability enhancement described in this item is a distribution function and therefore will not be addressed as beyond the scope of the request for comments.

enforce transmission constraints by adjusting generation, load resources, and import and export schedules based on market participant economic bids, preferences, or other established market rules. By honoring binding transmission constraints through the redispatch of available supply and demand resources, the ISO markets create a congestion component for locational marginal prices (LMP) generated for specific points on the ISO's system. Thus, in the context of how the ISO markets manage transmission congestion, storage devices would be providing services in direct competition with generation and demand response resources, including pumped storage, and would directly influence the locational marginal prices. The ISO is unaware of any mechanism that could prevent undue distortions to its market outcomes or preserve its independence (if the ISO were to operate the device) where a storage device is operated as a transmission asset to manage congestion.

Moreover, with LMP price signals, the benefit of increasing the capacity factor (not transfer capacity) of the transmission facility by capturing renewable production and delivering the energy at a different time when transmission capacity is available is functionally indistinguishable from market-based congestion management, energy arbitrage or, if performed on behalf of another generation owner, a means to enhance the value of that generation. The request for comments properly classifies these benefits as associated with generation assets.

As illustration, the ISO notes that in its 2009 request window, Western Grid submitted eight battery storage projects as transmission to provide specific

services to address reliability needs on PG&E's system. In the same request window, a different project sponsor submitted two new generation projects as transmission to provide the same services as the battery storage units in order to address reliability needs on different portions of the PG&E system. Because generation resources are not treated as transmission under the ISO tariff and the costs of such facilities are not recoverable in the ISO's transmission access charge, the ISO could not treat the generation resources as transmission although they were proposed to provide the same reliability services and meet the same types of reliability needs as WGD's battery storage resources which the Commission found were to be treated as transmission.[7] This illustrates the competitive distortion that would arise were the Commission to adopt policies that favor specific resource types or accord different rate treatment to different resource types that provide the same reliability service and meet the same reliability need. In that instance, the generation resources would have to meet the reliability need through participation in the ISO's markets, whereas the battery storage resource could meet the identical need through rate-based transmission operations with guaranteed recovery of its costs, yet both types of resource would have comparable impacts on market prices and dispatch results. The ISO believes that because both resources were providing services typically provided by generators in the ISO's market framework, both types of resources should have been treated as generation.

[7] Ultimately, none of these projects were the best solutions for meeting the identified reliability needs.

The Electric Advisory Commission also listed deferment of transformer upgrades needed due to peak load growth as a transmission application (#5). Although a storage device would provide this benefit by injecting real power into the grid in a location effective to relieve the loading on the transformer, a generator or demand management resource at the same location could provide similar benefits. Indeed, as discussed above, the two generation projects submitted into the 2009 request window as transmission would have provided this same service, but they could not be treated as transmission. Any preferential treatment accorded storage but not offered to other similarly situated technologies could potentially trigger a request for fundamental reassessment of the market cost recovery mechanisms for generation or load, as these resources could reasonably argue that they provide the same transmission services as storage. The ISO submits that this category of activity does not provide a basis for classifying storage as transmission, and encourages the Commission to avoid any such debate by not adopting strained or purely policy-driven distinctions.

In *Western Grid*, the Commission concluded storage devices providing voltage support (#6) could be classified and obtain rate recovery as a transmission asset under the specific facts of that case. Factors pertinent to the Commission's decision were that the storage facility would be used to provide voltage support at the direction of the ISO, that the storage owner, not the ISO, would dictate when to charge the battery, and any incidental market revenue would be an offset under the transmission rate tariff.[8] These same rules potentially could be applied to a generation unit if it were to seek a declaratory

[8] *Western Grid* at PP. 46-47.

order from the Commission. Case in point, the two generation projects submitted into the 2009 request window as transmission also would have provided voltage support but could not be treated as transmission assets. The ISO protested the requested treatment in *Western Grid,* and continues to assert the merit of its arguments in that proceeding. At a minimum, the Western Grid precedent should be strictly limited to the precise facts presented in the request for declaratory order. Accordingly, storage devices could be eligible for treatment as transmission assets in the provision of voltage support under similar factual situations and only so long as the applicable transmission planning process determines that storage constitutes the most cost effective option to resolve the reliability criteria concern. Even then, however, the Commission would need to address the issue whether generation resources that agree to provide only the exact same reliability services under comparable operating arrangements could be treated as transmission assets. Under these circumstances the line between transmission and generation will be blurred.

The third category identified by the Electric Advisory Commission is where storage permits the relaxation of a reliability limit (#3). Under this circumscribed scenario, storage may warrant classification as a transmission asset. This can occur when the transfer capacities of a line are not limited by the physical capacity of the path, but rather by reliability limits arising from post-contingency loading or stability conditions. For example, under certain circumstances system dynamic and transient stability limits could impose restrictions on power flows that are less than the physical thermal limits of the path. Post-contingency

voltage conditions can also limit transfer capability below the otherwise applicable thermal ratings. In these circumstances, very fast storage has the theoretical potential to relieve these reliability limitations. It would do so by responding to a contingency in a period of power system cycles through its inverter or electrical interface with the grid. Allowing the transmission circuits to be loaded to full thermal limits would increase the rated transfer capability and the increase the economic value of the transmission path. The concept is that by increasing the transfer capability of the transmission path, the storage facility operates as a traditional transmission infrastructure upgrade or addition.

While promising, the potential of storage to serve this function is largely untested and unproven at this point and must be validated by the industry. It is years away from being capable of evaluation and possible adoption through a transmission planning process.

b. Under what circumstances, if any, can a storage project be permitted to receive compensation as transmission and also receive compensation for enhancing the value of merchant generation or providing ancillary services?

In *Western Grid* and in *Nevada Hydro Company, Inc.*[9], the ISO detailed the potential threat to market efficiency and ISO independence resulting from the categorization of storage facilities as transmission assets subject to ISO operational control. The request for comments acknowledges these concerns. Except in the limited conceptual application discussed above, these concerns are intrinsic to the identified applications of storage. For this reason, the ISO supports refining market rules and products as the preferred means to

[9] *Nevada Hydro Company, Inc.* 122 FERC ¶ 61,272 (2008).

compensate storage for the value of the services they provide to the grid. The ISO further submits that the concerns over market distortions and ISO independence are accompanied by other complexities where a storage device is allowed to receive compensation as both transmission and generation. The ISO, therefore, urges the Commission to proceed cautiously and with due deliberation prior to any expansion of the classification of storage as transmission beyond the facts and in the manner authorized in *Western Grid* to include a dual classification.

The operational complexity and need for coordination between transmission operator and storage operator increases where dual functions are permitted. To the extent the storage device must be in a certain state of charge or discharge to fulfill its transmission function, the accompanying market functions must not impede the storage device's ability to supply the transmission operator with the necessary reliability services when needed. Simply put, uncertainty whether or not the storage facility will operate as directed by the transmission operator because of competing economic priorities creates an unacceptable reliability risk and conflicts with the premise of cost-based rate recovery. To avoid this risk and ensure ratepayers received the value of their transmission investment, potential limitations on the storage facility's operation may be imposed. The potential limitations on the storage device's operations are likely to be highly case-specific, varying by the service provided, location within the grid topology, and changing operational conditions.

Given this complexity, the ability to estimate both the transmission value of the device and the expected revenue contribution from restrained market services will be more uncertain and probably more arbitrary, further complicating the ability of the transmission planning process to assess the appropriateness of potentially including a share of the storage facility's costs in rate-base. As noted above, transmission planning processes are generally ill-equipped to estimate the potential contribution from merchant functions as a means of comparing the cost of storage to be assigned as a transmission asset in comparison to other transmission alternatives.

Unless properly structured, the operation of the device under the hybrid rate model creates the possibility of allocating greater risk to ratepayers than can be justified based on the estimated value of the intended transmission application. For example, an objective or potential benefit of a hybrid rate structure is for investors to assume the risk of cost recovery for the merchant portion of the storage facility's costs. However, because of the reliance by the transmission provider on the installed storage device to ensure reliable system operation consistent with mandatory reliability standards, the transmission provider cannot permit suspension or termination of operations due to poor financial revenues from market participation. To maintain the device in operation, ratepayers would likely be required to cover a much greater share of, if not the entire capital costs of the storage device at least until an alternative transmission solution can be implemented. Alternatively, if the operation of the

device is suspended and replaced by another solution, the prior investment in the storage device would be stranded.

As noted above, the ISO appreciates the desire to enhance the economic competitiveness of storage technologies when compared against alternative transmission, generation and demand management assets. However, before the Commission considers adopting a hybrid category whereby the storage device may receive a limited amount of compensation as a transmission asset and the balance of its revenues from the energy and capacity markets, effective solutions to these complexities should be further developed.

c. Should the creation of a stand alone contract be considered and in particular, the possibility that a storage provider would provide only the service of electricity storage and leave it to customers to determine how to use their contracted share of the storage device?

The request for comments postulates whether there is value in adopting the regulatory model applicable to interstate natural gas storage facilities for electric storage technologies. Under the natural gas storage structure, the facility operator sells storage service, but does not hold title to the gas or buy or sell the gas commodity. The customer determines how to "operate" its portion of the storage capacity such that the arbitrage gains or losses on moving the stored gas accrue to the customer, not the gas storage operator. The gas storage service is sold at either cost-based or market rates.

The ISO supports the creativity of this proposed solution and encourages its continued evaluation and development. As the request for comments indicates, the owner and operator of the storage device could have multiple

customers, including both energy market participants who want to arbitrage electricity prices and participating transmission owners who want to contract with the storage operator to provide a transmission function in lieu of an alternative reliability solution. In addition to the potential financial barrier the request for comments recognizes, the ISO sees potential operational complexity that must be resolved. In particular, the storage operator will have to develop methods to manage the potentially conflicting needs of two types of customers contracting for the services of the same device. Thus a key question for further investigation is whether the contractual storage service business model mitigates some of the complexities and potential problems associated with a decision to simultaneously treat an electric storage facility as both generation and transmission. In this regard, the examination should focus on, among other things, the ability of the transmission planning process to accurately value the reliability benefits of contracted storage service with a multi-use device, the effect of such transmission planning evaluation on the investment decision and timing, the effect on the investment decision generally, the effect on the administrative efficiency of the transmission planning process, the effect on market operations, and the effect on transmission operator independence.

The ISO has not fully evaluated the concept of a contractual storage service or its implications. As such, the ISO's impressions are necessarily preliminary and do not represent an adopted position of the corporation on this matter. Notwithstanding that disclaimer, the ISO offers the following considerations:

- **Market based or cost based service**. Establishing either prior to consideration in a transmission planning process may be problematic. Under a cost-based approach, the respective value of the storage device's operational capability for transmission and merchant usage would have to be determined. For simplicity, it could be equal on a per unit basis, but this may not accurately value the respective services. The transmission value relates to viable alternatives, which would likely be specific to the circumstance and location of the reliability problem and must be established through a transmission planning process. In either case, the transmission provider's purchase of the capability would require approval by the transmission planning entity.

- **Service may not reduce operational complexity**. Under any hybrid approach, whether contractual or otherwise, ensuring coordinated operation of the storage facility remains critical. The storage operator must still be in direct contractual relationship with the transmission operator similar to any other transmission owner. Moreover, can the relationship between the transmission usage and the generation owners be properly established in advance as part of the respective terms of service? Given the general reliability justifications underlying the transmission usage, it is assumed that the capacity and operational requirements to execute that service would take precedence over the provision of merchant functions. Without fully understanding the specifics of the transmission need, it may be difficult to establish the respective rights and value of the merchant function.

- **Market distortion and independence issues remain.** So long as the transmission service requires frequent charging and discharging of the storage device, the potential to distort market outcomes exists. When performed under the discretion of the storage operator, it would be necessary to ensure its independence from other market participants that may benefit from its decisions. If the storage device is operated at the direction of the ISO, the ISO's independence both "in reality and perception" is threatened. Some of these issues may be mitigated to the extent the original agreement between the ISO and storage operator is highly prescriptive and approved by the Commission.

III. Conclusion

The ISO fully supports the Commission's efforts to promote innovative technologies such as advanced storage devices. The ISO believes the most appropriate avenue to do so is by ensuring market rules continue to evolve to

properly recognize the value of new resource capabilities in a manner consistent with eliciting the most effective and efficient technologies to meet specified system needs, including those necessary to reliably integrate variable renewable generation, rather than by identifying the preferred technologies to meet those needs and unbalancing the playing field to benefit them.

Nevertheless, in determining whether a storage device or other innovative technology should be treated as a transmission or generation asset for rate recovery purposes, the ISO believes the test should be whether the asset competes with, or performs functions similar to, other clearly categorized assets and, in doing so, influences market outcomes in more than a purely passive manner. If so, the asset should be subject to technologically neutral market-based rules. If not, the asset may be viewed as potentially serving a transmission function eligible for cost-based rate recovery for some or all of its revenue requirements. In the latter case, the methods for calculating the proper value of any particular asset's transmission services require considerable further discussion and development. Ultimately the application of any Commission-sanctioned functional test and rate-based cost recovery mechanism should be made on a case-by-case basis through applicable transmission planning processes.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, California this 9th of August, 2010.

/s/ Jane Ostapovich

Jane Ostapovich