



California ISO

Storage as a Transmission Asset:

Enabling transmission connected storage assets providing regulated cost-of-service-based transmission service to also access other market revenue streams

Issue Paper

March 30, 2018

Table of Contents

- 1. Executive Summary 3
- 2. Stakeholder Comments on Issue Paper 4
- 3. Stakeholder Engagement Plan..... 4
- 4. Introduction and background..... 5
- 5. Scope and Identified Issues 8
 - 5.1. Scope of policy examination 8
 - 5.2. Cost recovery mechanism 9
 - 5.3. Market participation rules and limitations 13
 - 5.4. Allocation to high or low voltage 14
- 6. Next Steps 14

1. Executive Summary

In light of advances in incorporating storage and other preferred resources into the transmission planning process, the California Independent System Operator Corporation (“ISO”) is reexamining its consideration of storage resources in the Transmission Planning Process (“TPP”). Developments at both the state and federal levels are driving a more comprehensive and integrated view of storage as a resource that can provide both transmission and market services. In the past, the ISO has considered numerous proposals for storage devices to provide cost-of-service based transmission services in the TPPs, and recently the ISO approved two such proposals. Enabling storage facilities to provide transmission service under a cost-of-service framework, while also participating in the energy and ancillary services markets, can generate additional ratepayer benefits relative to a solely regulated asset. However, this type of hybrid resource introduces unique challenges that must be carefully considered in the policy development process.

The overarching objective of this initiative is to determine a pathway for transmission connected storage assets providing a regulated cost-of-service transmission service to also provide market-based services and access market revenues, thus lowering costs and providing greater flexibility for the benefit of ratepayers. This may include options such as providing additional market-based services, with the resulting market-based revenues ultimately reducing the burden on rate-paying consumers.

In light of this general consideration, the scope of this initiative will focus on (1) transmission-connected storage resources only, and (2) storage resources identified by the ISO as the more cost effective or efficient resources needed to provide reliability-based transmission services.

This issue paper explores the framework and requirements - and allowable mechanisms - for those resources to also access market revenues by providing market-type services that do not conflict with the fundamental reliability purpose for which the ISO selected the specific solution in the TPP. The ISO identifies for discussion the following alternative mechanisms for a storage resource serving as transmission to meet an identified reliability need”:

- 1) As an asset in a Participating Transmission Owner’s (“PTO”) Transmission Access Charge (“TAC”) rate base, or
- 2) Contractual provision of “cost-based” transmission service without becoming a PTO.

Each of these mechanisms has two potential options that the ISO will explore in this initiative. These options include a “wholly in rate base” option that guarantees cost recovery of the resource, and market revenues earned by the resource would reduce the costs recovered through the TAC, and a “partially in rate base” option that would guarantee a portion of the resource’s costs, with the owner at risk - both upside and downside risk - of recovering its remaining costs (and return) from market revenues.

The ISO must establish the necessary market participation rules to ensure that all of the market participation policy objectives identified by the Federal Energy Commission (“FERC”) are addressed. Additionally, the ISO will consider rules that ensure the resource is available to

address ISO reliability as needed. Specifically, the ISO will assess the need for notification time-lines, capability duration needs, and energy and/or cycle limitations necessary to maintain the resource’s life-cycle.

2. Stakeholder Comments on Issue Paper

Stakeholder comments on this issue paper are due April 20 and should focus on the following:

- 1) Proposed scope;
- 2) Feedback regarding identified issues; and
- 3) Specific issues not already discussed in this issue paper that stakeholders believe should be included in the scope of the initiative. Please provide support for new issues that should be included in the scope.

The ISO will address stakeholder comments as part of the straw proposal that is scheduled to be posted on May 14.

3. Stakeholder Engagement Plan

Date	Milestone
Mar 30	Issue paper
Apr 6	Stakeholder call on issue paper
Apr 20	Stakeholder comments on issue paper due
May 14	Straw proposal
May 22	Hold stakeholder meeting on Straw proposal
Jun 5	Stakeholder comments on Straw proposal due
Jun 21	Working group meeting
Jul 9	Stakeholder comments on working group meeting due
Aug 14	Revised straw proposal
Aug 21	Hold stakeholder meeting on revised straw proposal
Sep 4	Stakeholder comments on revised straw proposal due
Sep 24	Draft final proposal
Oct 4	Hold stakeholder meeting on draft final proposal
Oct 15	Stakeholder comments due
Nov 14-15	Present proposal to ISO Board

4. Introduction and background

In past Transmission Planning Processes, the ISO has considered numerous proposals for storage devices to provide cost-of-service based transmission services, and the ISO recently approved two such proposals. Having storage facilities that both provide transmission service under a cost of service framework and participate in the various energy markets introduces unique challenges that must be carefully considered in the policy development process. These challenges and the ISO's interpretation of previous FERC rulings dissuaded the ISO from pursuing the concept further. However, FERC opened the door to revisit this issue by issuing its Policy Statement in Docket No, PL17-2-000 regarding the utilization of electric storage resources for multiple services when receiving cost-based rate recovery.¹

Also in 2005, the Nevada Hydro Company filed a request for rate incentives with FERC for its proposed Lake Elsinore Advanced Pump Storage ("LEAPS") project.² In its filing, Nevada Hydro proposed that LEAPS should be treated as a transmission facility under the ISO's operational control. According to Nevada Hydro, the ISO would serve its ancillary services needs consistently from LEAPS, and Nevada Hydro would consistently bid LEAPS' stored energy into the market at a price of \$0. Nevada Hydro asserted that it had carefully crafted its proposal to avoid market distortions. Specifically, Nevada Hydro proposed to always bid its stored energy at \$0 to avoid market distortions. The ISO was nevertheless concerned that its independence could be comprised because it would have to decide (in all instances) when LEAPS would operate, how much energy it would produce and when it would operate the pumps to store water for future generation.³

In a 2008 order, FERC denied Nevada Hydro's request. FERC found that "the purpose of CAISO's transmission access charge is to recover the costs of transmission facilities under the control of CAISO, not to recover the costs of bundled services."⁴ FERC also shared the ISO's concern that ISO control of a generator participating in the ISO markets would compromise the ISO's independence. Further, FERC found that "allowing LEAPS to receive a guaranteed revenue stream through CAISO's TAC would create an undue preference for LEAPS compared to these other similarly situated pumped hydro generators."⁵

In 2009, Western Grid Development filed a petition for declaratory order with FERC to request a finding that its proposed sodium-sulfur-based energy storage projects were wholesale transmission facilities eligible for cost-based recovery.⁶ Western Grid proposed that its storage projects would only exist to provide voltage support and thermal overload protection, and that

¹ *Utilization of electric Storage Resources for Multiple Services When Receiving Cost-Based Recovery*, 158 FERC ¶61,051 (2017) ("Policy Statement").

² *The Nev. Hydro Co. Inc.*, 122 FERC ¶ 61,272 (2008).

³ *See Utilization of Electric Storage Resources for Multiple Services When Receiving Cost-Based Rate Recovery*, 82 F.R. 9343 at P 3 (Feb. 6, 2017).

⁴ *Id.*

⁵ *Id.*

⁶ *Western Grid Dev., LLC*, 130 FERC ¶ 61,056 (Western Grid), *reh'g denied*, 133 FERC ¶ 61,029 (2010).

they could solve existing reliability problems at a lower cost than traditional transmission upgrades.⁷ Western Grid argued that—unlike with LEAPS—it would manage the charging of its devices to allow the ISO to maintain independence. Western Grid also notified the Commission that it would not arbitrage wholesale energy market prices, and would credit any market revenues it received from charging and discharging back toward its transmission revenue requirement.

In a 2010 order, FERC found that Western Grid's proposal had resolved the issues presented in *Nevada Hydro*, and that Western Grid's project should be eligible for cost-based recovery. FERC found that Western Grid would operate its devices as transmission facilities only, and therefore should recover costs like a transmission facility. FERC also noted that its order was only limited to the issue of eligibility for cost-based treatment, but that:

“the Projects will be subject to review and approval by the CAISO in its transmission planning process. Pursuant to CAISO Tariff section 24.1.1, the CAISO will not approve the Projects if a superior alternative project is proposed or if the Projects do not pass a cost-benefit analysis. Thus, if the CAISO approves the Projects, they would be paid for by ratepayers because the CAISO had found that they were the most efficient solution proposed.”⁸

Ultimately, the ISO never found the Western Grid projects to be needed in the ISO's TPP. Since the *Western Grid* decision, the ISO has studied a number of potential energy storage projects as reliability solutions, ranging from transmission asset models to local resources participating in markets.⁹

There remained uncertainty between the generator-oriented approach rejected in *Nevada Hydro* and the transmission-only approach approved in *Western Grid*. FERC solicited comments and held a technical conference on this issue in 2016. The ISO both submitted written comments and testified at the technical conference.¹⁰ In 2017 FERC issued its Policy Statement. The Policy Statement found “there may be approaches different from *Western Grid's* approach under which an electric storage resource may receive cost-based recovery, and, if technically capable, provide market-based services.”¹¹ FERC was careful to note that its Policy Statement “is not intended to resolve the detailed implementation issues surrounding how an electric storage resource may concurrently provide services at cost- and market-based rates,” which would be decided on a case-by-case basis. Rather, FERC said that the Policy Statement

⁷ *Id.* at P 3.

⁸ *Id.* at P 53.

⁹ The ISO also published a stand-alone paper presenting its methodology for considering non-transmission alternatives in 2013. <http://www.caiso.com/Documents/Paper-Non-ConventionalAlternatives-2013-2014TransmissionPlanningProcess.pdf>. Detailed information on the ISO's most recent consideration of non-transmission alternatives and preferred resources can be found in the ISO's 2015-2016 Transmission Plan, beginning on page 27. <http://www.caiso.com/Documents/Board-Approved2015-2016TransmissionPlan.pdf>.

¹⁰ See FERC Docket No. AD16-25-000.

¹¹ Policy Statement, 158 FERC ¶61,051 at P 9.

is intended (1) “to clarify that providing services at both cost- and market-based rates is permissible as a matter of policy,” and (2) “provide guidance on some of the details and allow entities to address these issues through stakeholder processes and in filings before the Commission.”¹² As such, FERC noted that such as a resource’s participation likely would be subject to these principles:

- Must be cost competitive with transmission
- Must avoid double recovery for providing the same service
- Cannot suppress market bids, and
- Cannot jeopardize ISO/RTO independence.

The TPP includes a comprehensive evaluation of the ISO transmission grid to address grid reliability requirements, identify upgrades needed to successfully meet California’s policy goals, and explore projects that can bring economic benefits to consumers. Although the ISO does not approve non-transmission alternatives in its existing TPP, the ISO promotes opportunities for non-transmission resources such as storage to service as the preferred solution, and the ISO does work to support regulatory approvals for those projects if the TPP identifies them as the preferred alternative. In the context of the TPP, the ISO has studied a number of potential electric storage projects as reliability solutions, ranging from transmission asset models to local resources participating in markets. The former has only recently resulted in energy storage assets moving forward, and the latter has resulted in a number of energy storage projects providing local capacity. In this context, the ISO’s experience reflects that electric storage has more effectively fit within the framework of market resources providing local capacity rather than as transmission assets providing transmission services. Over the past several years, the ISO has studied 27 battery storage proposals and one pumped hydro storage proposal as potential transmission assets. To date only two proposals have resulted in storage projects moving forward, both in the most recent 2017-2018 Transmission Plan.

The ISO acknowledges there may be instances where a dedicated solution is necessary to support local transmission needs with limited or no alternatives, in which case the ISO would consider the storage (as transmission only) option in its planning process. In these instances, it the ISO may need to constrain or define narrowly the operation of the electric storage resource, for example, by requiring it to abstain from market participation and remain fully charged so that it is solely available to meet a transmission contingency need.

¹² *Id.* at P 14. Commission LaFleur dissented from the Policy Statement, noting that she disagreed with “the Policy Statement’s sweeping conclusions about the potential impacts of multiple payment streams on pricing in wholesale electric markets,” and was “concerned about the broad rationale for this approach put forth in the Policy Statement, which . . . is both flawed in its conclusions and premature in its timing.”

5. Scope and Identified Issues

5.1. Scope of policy examination

Developments at both the state and federal levels are driving a more integrated view of storage resources providing both transmission and market services. These developments include:

- 1) Recently approved battery storage projects being advanced as transmission assets in the ISO's most recent TPP,
- 2) The FERC Policy Statement on February 6, 2017, and
- 3) Expansion of market resources largely put in place through California state procurement processes under the California Public Utilities Commission ("CPUC").

Accordingly, the ISO is re-examining its consideration of storage in the TPP.

The scope of this initiative is to enable storage to provide cost-based transmission services and participate in the market and receive market revenues. The overarching objective of this initiative is to enable transmission connected storage assets that are providing a regulated cost-of-service-based transmission service to also access other market revenue streams to provide ratepayer benefits and provide greater flexibility to the grid. The idea is market-based revenues generated from market-based services can reduce the costs of the asset to be recovered under contract, reducing the burden on rate-paying consumers.

In its Policy Statement, FERC refers to "cost-based services" and "cost-based rate recovery" as being separate and distinct from "market-based services" and "market based rates". Further, cost-based services" examples provided in the policy statement are "transmission or grid support services or to address other needs identified by an RTO/ISO." In light of this general consideration, the following issues are considered within the scope of this initiative:

1. **Transmission-connected storage only** – Transmission connected resources are resources that are connected to the ISO controlled grid. This includes connections to both regional (e.g. greater than 200 kV) and local (e.g. lower than 200 kV) ISO controlled grid.
2. **Storage resources identified as needed to provide reliability-based transmission services** – Although a resource may be eligible to access market-based revenue streams, the ISO must determine that the resource is needed to address a reliability need as determined in the ISO's TPP.

Specific issues that are beyond the scope of the current stakeholder initiative are:

- **Storage resources procured or contracted for reasons beyond meeting a reliability need identified by the ISO in the TPP.** This includes following storage resource use/procurement cases:
 - o Other state and FERC initiatives considering other storage options, including distribution connected and customer connected resources

- Exclusively providing market-based services
 - Procured, in whole or in part, through a CPUC-mandated capacity procurement process
 - Addressing an economic need – which in the ISO planning framework largely consists of reducing market service costs or capacity costs
- **The TPP evaluation methodologies.** The ISO is not reexamining the processes that identify the needs and selects the optimal solution(s) to meet identified needs. These issues are appropriately considered in the ISO's annual TPP. If additional clarification of the evaluation process is needed in the future, it will be addressed on a case-by-case basis within the annual TPP or related processes.
 - **The framework for competitive solicitation and the applicability of the ISO's current competitive solicitation framework.** The ISO's current tariff provisions apply to regional storage facilities just as they do for other regional transmission facilities such as reactive support devices. Specifically, projects connected at 200 kV or high will be subject to competitive solicitation unless it constitutes an upgrade to an existing transmission facility, while the incumbent PTO is responsible for projects connected at less than 200 kV.
 - **Cost allocation of the cost-based revenue requirements for rate-based assets.** The ISO's current tariff provisions apply to storage just as they do for other transmission facilities such as reactive support devices.
 - **Resource adequacy value.** The ISO will not consider cost-of-service based storage resources procured through the TPP to count as resource adequacy resources as these resources are already taken into account when determining local capacity area needs.

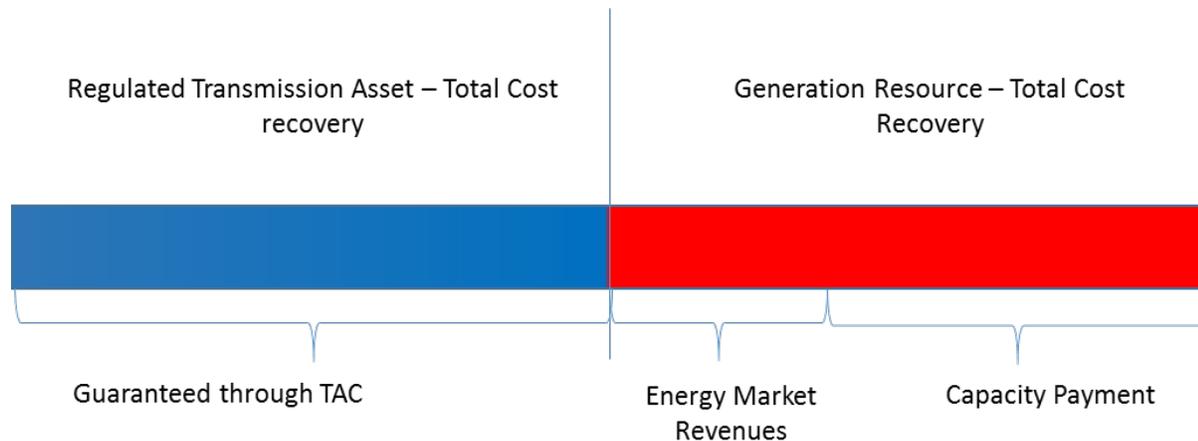
5.2. Cost recovery mechanism

The TPP identifies reliability needs, then examines numerous possible alternatives, including non-transmission options, to determine the more cost-effective or efficient solution to address the identified need. The cost recovery for transmission assets comes solely through the TAC. Allowing storage to act as both as a transmission resource and a market resource means that additional cost recovery mechanisms may now enter the equation. If the ISO facilitates storage resources acting as both a transmission and a market resource, then the ISO must establish rules and policies to determine how to appropriately reconcile multiple revenue streams against the cost of the storage resource.

Historically, the lines between a transmission asset and generating asset were clearly defined. As a result, cost recovery for transmission versus market-based resources was clear and fairly well defined. As shown in Figure 1, The PTO of a transmission asset has traditionally been fully guaranteed and recovered through the ISO's TAC. Alternatively, generation

resources have received cost recovery through a variety of sources, including revenues from capacity and energy payments.

Figure 1: Traditional separation between transmission and market resources



This paper will discuss only those electric storage acting as transmission assets (“SATA”)¹³ resources that provide transmission services, are connected directly to the ISO controlled transmission system and have been identified by the ISO in the TPP as meeting a reliability based need, including mitigating contingency driven thermal overloads and/or providing transmission system voltage support. This paper explores the framework and requirements - and allowable mechanisms - for those resources to also access market revenues by providing market services that do not conflict with the fundamental reliability purpose for which the resource was selected in the TPP. The following alternative mechanisms are set out for discussion purposes:

- 1) Asset in PTO’s TAC rate base, and
- 2) Contractual provision of “cost-based” transmission service without becoming a PTO.

Under both of these options, the ISO would treat the storage resource like other transmission assets, and it would be under ISO operational control. Should the ISO elect to pursue this model, it will need to develop bidding rules that ensure there are no negative consequences to the ISO’s markets. The remainder of this section discussed each of these alternatives is discussed in greater detail.

5.2.1. Asset in PTO’s TAC Rate Base

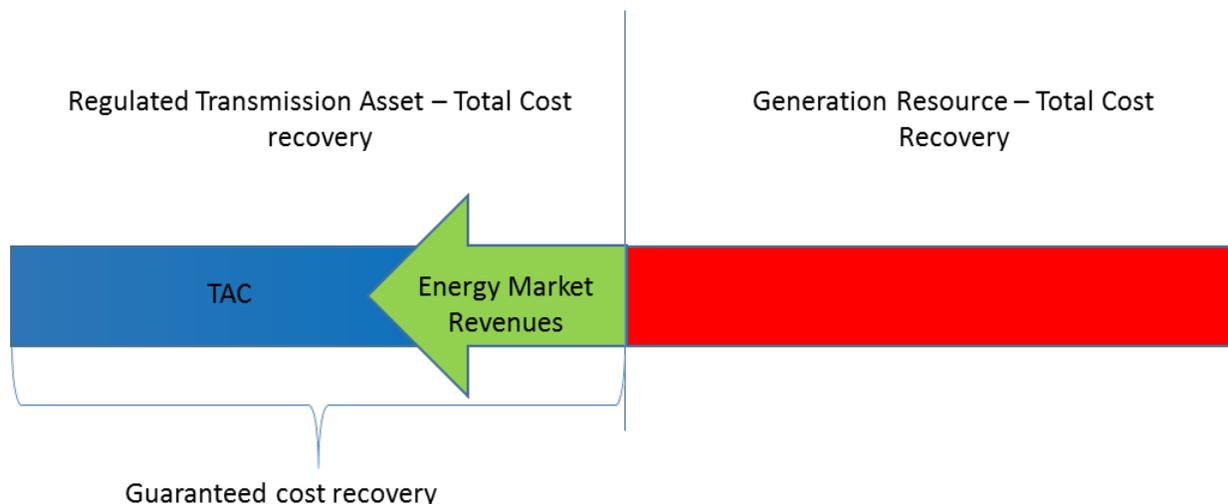
As part of this stakeholder process, the ISO considering two options that rely on maintaining cost recovery through TAC for SATA resources. Specifically, the ISO is exploring the following options:

¹³ The term “storage acting as transmission assets” used to refer to storage resources that are guaranteed cost recovery through TAC or some other predetermined source for providing a regulated transmission service.

- a. Wholly in “rate base” – In this context, any revenue received from market services would be treated as a revenue offset, thus reducing the revenues otherwise required through TAC (high or low voltage) to provide cost-of-service based compensation to the PTO.
- b. Partially in “rate base” – The asset is in rate base, but only a portion of the cost recovery is guaranteed through cost-of-service provisions, and the owner is at risk - both upside and downside risk - of recovering a portion of its costs (and return) from market services.

As shown in Figure 2, below, Option (a) relies on maintaining the clear delineation between transmission and generation assets, at least as it pertains to cost recovery for SATA resources. It ensures that a resource’s total Transmission Revenue Requirement (“TRR”) is covered, but any additional market revenues would reduce the overall TRR recovered through TAC. Establishing a cost recovery framework that ensures all of resources prudent costs are fully covered is that it facilitates an apples-to-apples comparison across all other bids into a request for offers (“RFO”) solicitation. Implementing an option such as this will require additional consideration regarding how and when SATA resources are either permitted or required to participate in ISO markets.¹⁴ Additionally, the ISO would have to establish any necessary settlements protocols to ensure these revenues are properly captured and settled against the cost of the resource.

Figure 2: Option (a) – Guaranteed cost recovery for transmission assets with TAC reduced for market revenues

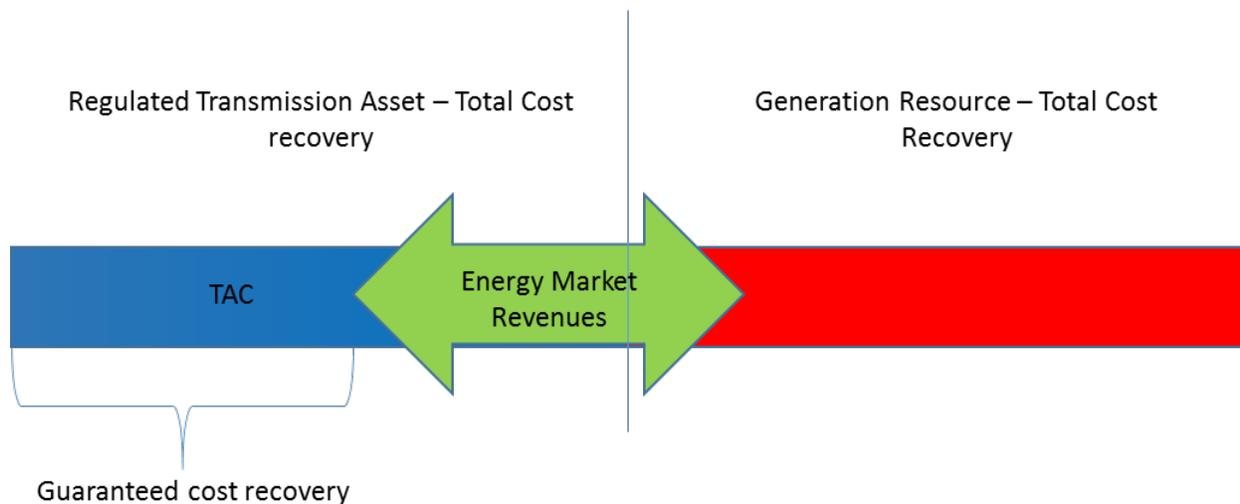


In contrast to Option (a), Option (b) relies on moving away from clearly defined or guaranteed means of cost recovery for SATA resources. In this model, the resource would only have some portion of its TRR guaranteed, with the remainder recovered through market

¹⁴ Many these issues are similar to those facing Reliability Must Run (“RMR”) resources. SATA resources could either have a fully guaranteed cost recovery through TAC, and any market revenues are netted against that regulated cost recovery. This is similar to Condition 2 RMR contract.

revenues.¹⁵ Option (b) is depicted in Figure 3, below. While this option guarantees less of the SATA resource's transmission revenue requirement through TAC, it provides for additional potential upside in that it would not credit ISO market revenues against the TAC recovery. This means that although the project sponsor accepts the risk that it may not fully recover its TRR in a given year, it potentially could receive market revenues that, when combined with the guaranteed portion of the TRR, are greater than a fully guaranteed TRR. This would be a completely new model for transmission assets.

Figure 3: Partially guaranteed cost recovery with potential for market gains or losses



This model creates numerous complexities and risks that must be addressed for the ISO to determine if it is a viable option. Because this model would allow a resource to speculate on what portion of costs could be covered through markets, it adds complexities in assessing resources participating in competitive solicitations and assessing financial risks. For example, the current evaluation method for assessing projects to resolve an identified reliability need considers two things (1) does the project address the identified need, and (2) what is the cost of the project compared to other alternatives. Note that the ISO will first approve the storage resource as the preferred solution, and then either assign the project to an incumbent PTO (local transmission) or award the project through a competitive solicitation process (regional transmission). Allowing project sponsors to submit projects with varying levels of TAC and market revenue would require the ISO to make numerous complex assessments and assumptions to determine if a project would, in fact, address the identified need and which resource is the more cost effective or efficient resource.

The ISO planning decision making process considers inputs, comments, and proposals in making transmission planning decisions. For Option (b) to be viable, the ISO may have to consider the various applicants' ability to manage and access market-based revenues.¹⁶ As such, the ISO is not committing to a particular sponsor's proposal for any project eligible for

¹⁵ Only ISO market revenues could be considered. The ISO will not assess projects seeking funding through both the CPUC procurement and approval in the ISO's TPP.

¹⁶ Cost recovery caps are already built into some applicants' proposals for conventional transmission.

competitive solicitation. Instead, the ISO may consider either “no” assumption of market revenue offsetting the reasonable cost of the storage, a heavily discounted assumption, or some other assumption. The final determination regarding the correct assumptions in the final decision making process will be addressed in the TPP process.

5.2.2. Contractual provision of “cost-based” Transmission service without becoming a PTO

Under the ISO tariff, PTOs are able to recover all or a portion of their TRR through the TAC. Becoming a PTO implies that the resource owner is willing to turn over operational control of the resource over to the ISO operation. However, it is not immediately clear that turning over operational control of the resource and allowing the resource to participate in the other ISO markets are consistent with one another. For example, how can a resource owner bid a resource into the ISO energy and ancillary services markets that is under the ISO’s control? Alternatively, the ISO cannot submit bids into its own energy market on behalf of a resource.

The ISO will explore if modifications or exemptions to the existing PTO agreement are needed and/or feasible or if a completely new agreement is needed for SATA resources that receive energy market revenues. If such modifications are not workable or not suitable for all transmission connected resources, then the ISO will need to develop an alternative agreement for SATA resources. This option would be a cost-based contractual agreement, but would not require that project sponsor become a PTO.

The ISO expects that the two options outlined in section 5.2.1 will provide the primary options for this option. Because these options would not be under the existing PTO rules, any necessary rules, roles, and responsibilities would be developed over the course of the current stakeholder process.

5.3. Market participation rules and limitations

This stakeholder process focuses on electric storage resources that are connected directly to the ISO’s transmission system to fill a reliability based need. These needs include mitigating contingency driven thermal overloads and/or providing transmission system voltage support.

If an electric storage resource seeks to recover its costs through both cost-based and market-based rates concurrently, the following issues, as raised in FERC proceeding, should be addressed:

- 1) The potential for combined cost-based and market-based rate recovery to result in double recovery of costs by the electric storage resource owner or operator to the detriment of the ratepayer;
- 2) The potential for cost recovery through cost-based rates to inappropriately suppress competitive prices in the wholesale electric markets to the detriment of other competitors who do not receive such cost-based recovery; and
- 3) The level of ISO control over the operation of an electric storage resource could jeopardize its independence as the market operator.

As a result, the ISO must establish the necessary market participation rules to ensure that all of the objectives are addressed. Additionally, the ISO will consider rules that ensures the resource is available to address ISO reliability needs as needed. The ISO will assess the need for the following:

- Notification time-lines – Schedules specifying when the ISO would notify a resource that it is not needed for reliability and is permitted to participate in other markets;
- Capability duration needs – Specifications regarding how long the resource could participate in the market before it would have to return to a set point required to provide reliability service; and
- Energy and/or cycle limitations necessary to maintain the resource's life-cycle – Ensures market participation does not reduce the useful life cycle of the resources, which would result in additional replacement costs to maintain reliability.

5.4. Allocation to high or low voltage

The ISO currently has two levels of TAC: high and low voltage. High voltage transmission assets are those that are 200-kV and above resources, while low voltage resources are those that are below 200-kV. SATA resource, however, may be connected to the transmission system at a level that differs from the transmission issue it has been identified to resolve. For example, the ISO may identify a Regional need, but identify a SATA resource connecting at a Local level as the best solution. The ISO plans to maintain the current practice of allocating costs to high or low voltage TAC based on the point of interconnection.

6. Next Steps

The ISO will discuss this issue paper with stakeholders during a stakeholder call on April 6, 2018. Stakeholders are asked to submit written comments by April 20, 2018 to initiativecomments@caiso.com.