



Pseudo-Ties of Shared Resources

Final Proposal

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1. Executive Summary

This initiative proposes a limited tariff change to enable pseudo-ties of shared resources outside of the CAISO balancing authority area. With regards to resources in EIM Entity balancing authority areas and load in the CAISO balancing authority area, this initiative will minimize conflict with the accounting for energy transfers between balancing authority areas in the EIM by providing an option for shared resources to pseudo-tie to the CAISO balancing authority area. Currently the CAISO tariff only allows pseudo-ties with resources for which the full output is dedicated into the CAISO balancing authority area. This policy initiative addresses the rule changes needed to remove that current tariff-based restriction. A more comprehensive stakeholder process of enhanced functionality to address current market limitations for shared resources will be addressed in the Joint Owned Unit Model initiative.

Most of the requirements as they apply to the operation of pseudo-ties generally will also apply to such shared resources. Any special provisions as they apply to shared resources will also be reflected in the CAISO tariff and it will be necessary to document additional implementation details in separate business practice documents. The CAISO anticipates that the following requirements will also apply to pseudo ties of shared resources:

- A Logical Metering Settlement Quality Meter Data Plan, as currently required by the CAISO tariff for Scheduling Coordinator Metered Entities; and
- A Shared Resource Allocation Protocol, which would include establishing the shared pseudo-tie's operating characteristics, commitment costs, bid cost recovery for associated start-up and minimum-load costs, outage coordination, and other aspects of coordination when there are multiple Scheduling Coordinators bidding in the CAISO markets.

This final proposal contains the proposed framework of these elements, describes the applicability of other tariff requirements, and outlines the process for completing this phase of the stakeholder process.

2. Background

Several balancing authority areas (BAAs) that participate in CAISO's energy imbalance market (EIM Entities) have joint ownership shares of EIM participating generation resources, which are transferred between BAAs using pseudo-ties.¹ CAISO's EIM implementation has accommodated these arrangements as pseudo-tied resources. The CAISO has also continued to allow dynamically transferred resources coming into CAISO's BAA separate from the EIM transfers, *i.e.*, dynamic scheduling (which is also effectuated through dynamic transfers). Dynamic schedules and pseudo-ties are very similar, with the primary distinction being that dynamic schedules remain part of the host BAA's resource portfolio

¹ Some other ISO/RTOs also support market participation by pseudo-tie resources representing less than the entire output of the generating facility, including resources providing capacity for resource adequacy. *See, e.g.*, PJM Manual 12, Balancing Operations, Version 41, Attachment F, Dynamic Transfers, pgs. 100-106 (March 26, 2020) (providing for partial unit transfers).

while pseudo-ties become resources under the CAISO's control as a BAA. This distinction has different implications for real-time interchange accounting. In the case of dynamic schedules the real-time interchange accounting can cause data conflicts affecting market pricing and dispatch when the source is in an EIM Entity BAA. These data conflicts do not affect dynamic schedules if they are self-scheduling or are variable energy resources whose dispatch is based on their telemetered output. These options will continue to be available for dynamic scheduling from EIM Entity BAAs. However, economic bidding in real-time by dynamic schedules from EIM Entity BAAs can cause these conflicts with EIM's real-time operations, which do not occur with pseudo-ties, as Section 2.1 describes.

The implementation of pseudo-ties in EIM has been workable for transfers of existing EIM participating generation resources between non-CAISO EIM Entities, with limitations in modeling some resource characteristics. However, some BAAs that are in the implementation process are hosts for resources that are currently dynamically scheduled into CAISO's BAA or will require improved modeling of resource characteristics.² Therefore, this stakeholder initiative develops options for using pseudo-ties to bid and schedule these and other similarly situated resources, to avoid the data conflicts.³

² Plans for currently-identified resources are as follows:

- Sutter Energy Center is currently an EIM participating generation resource for the Sacramento Municipal Utilities District as a utility within the Balancing Authority of Northern California, up to half of the plant's capacity. CAISO sought FERC's approval of a split resource participation agreement for the remaining half of Sutter's capacity for delivery into the CAISO BAA, as a regulatory contract in FERC Docket No. ER20-1702. Sutter is interconnected to Western Area Power Administration – Sierra Nevada Region, in the Balancing Authority of Northern California. FERC approved this contract on June 29, 2020.
- Los Angeles Department of Water and Power will join EIM in Spring 2021, and currently is the balancing authority for the Intermountain Power Plant (IPP), which is the source for several dynamic schedules into the CAISO BAA. EIM modeling will require the generating facility to be modeled as pseudo-ties for portions of the plant. Since some recipients of power from IPP are in the CAISO BAA, this will require the tariff change that is proposed in this stakeholder process.
- The LADWP BAA also contains the Magnolia power plant, which is partially owned by entities in the CAISO BAA, but Magnolia is located in the City of Burbank, which does not plan to initially be an EIM participant when LADWP joins EIM. Thus, continuing the dynamic scheduling of Magnolia is consistent with EIM modeling requirements.
- The LADWP BAA also has dynamic transfers from Milford unit 1 and Copper Mountain unit 3, but similar to Magnolia, additional changes are not needed at this time.
- Public Service of New Mexico's (PNM) Luna power plant and San Juan units 1 and 4 are jointly owned with Tucson Electric Power. Joint ownership modeling will not be needed when PNM joins EIM in Spring 2021 since Tucson will not join EIM until Spring 2022. A comprehensive joint ownership modeling policy initiative is currently in the roadmap for a stakeholder initiative in 2022, for implementation in 2023. Gaining experience by handling PNM's and Tucson's need as a pilot project, using functionality to be implemented in Fall 2021 for Tucson's EIM entry in Spring 2022, will be a valuable foundation for ultimately offering enhanced modeling to other market participants.

³ Among the options needed to preserve flexibility of pseudo-ties is that existing procedures allow resources with dynamic schedules to use 15-minute scheduling for capacity that is not dispatched by CAISO. However, pseudo-ties are subject to Appendix N (Pseudo-Tie Protocol), section 1.2.1.9, which limits off-system sales (also known as lay-off energy) to not exceed the resource's scheduled output for the respective hour. CAISO proposes to delete the term "respective hour" or replace "hour" with a term such as "scheduling interval".

As new entities join the EIM, dynamic schedules of resources that will economically bid resources between EIM Entity BAAs would face these disadvantages because the energy prices may not be consistent with resource dispatch. As Section 2.1 describes, the issue as new EIM Entities become active is that dispatchable dynamic schedules of resources between BAAs within the EIM Area could conflict with EIM's accounting of BAA-level transfers between these BAAs, which uses dynamic schedules between BAA-system portfolios of all resources within these BAAs. Essentially, a dynamic schedule would become a parallel dynamic transfer that could be priced differently from the implicit price of the regular EIM Transfer System Resource (ETSR)'s dynamic schedule, which reflects the bids of all EIM participating generation resources in the EIM BAA. This could result in inconsistency between dispatches and bids for the dynamically scheduled resources. Converting these dynamically scheduled resources to a pseudo-tie will avoid the market inefficiency that could otherwise materialize if the resource continues to dynamically schedule. Therefore, CAISO recommends pseudo-ties rather than dynamic schedules between EIM Entity BAAs of resources with economic bids, and will work with the affected EIM Entities and market participants to convert these dynamic schedules to pseudo-ties.⁴

The key issue being addressed in this initiative is to create an option for real-time economic bidding by removing a current tariff-based limitation to only allow pseudo-ties from resources whose entire output is dedicated to the CAISO BAA and does not serve load in the native BAA.⁵ The CAISO dynamic transfer stakeholder process in 2010-2011 covered a number of topics, including clarifying the treatment of dynamic schedules in which there can be multiple dynamic or hourly schedules from the same physical resource. At that time, though, CAISO's metering requirements required generation, including pseudo-ties, to be CAISO Metered Entities because CAISO required direct polling. This meant that only full physical resources could be pseudo-ties because the resource itself was physically metered at the generation boundary and thus could not be split into multiple entities. Since the dynamic transfer stakeholder process in 2010-2011, the CAISO has modified its tariff to broaden the opportunity for generation scheduling coordinators within the CAISO BAA to provide metering using mechanisms other than direct polling of meters by CAISO.⁶ This change did not address metering for pseudo-ties, but did create processes that can enable the modeling of multiple shares of a physical resource as pseudo-ties.

⁴ This inconsistency in modeling would apply between any BAAs in the EIM area. The conflict with dynamic schedules between a BAA in the EIM Area and a non-EIM BAA does not have this issue because there is no ETSR for a non-EIM BAA. Similarly, conflicts with a resource's bids and dispatch does not occur with self-scheduled resources or resources whose dispatch is driven by telemetry instead of economic dispatch, because these resources do not have economic bid prices. The concern that can make economic bidding by dynamic transfers inconsistent is that (1) duplication of dynamic schedules would affect real-time interchange accounting if not modeled correctly and (2) differences in modeling could affect prices and dispatches. Thus, the issue cannot be resolved through post hoc accounting adjustments.

⁵ CAISO Tariff, Appendix N, Sections 1.2.1.2 and 1.2.1.10 require the total output of a pseudo-tie generating unit to be telemetered to CAISO, through a pre-determined intertie where it competes in the market's congestion management.

⁶ CAISO Metering Rules Enhancements initiative, available at <http://www.caiso.com/StakeholderProcesses>. FERC filing ER17-949 filed 2/8/2017, approved 3/31/2017 and 12/15/2017. CAISO tariff section 10.3, Metering For Scheduling Coordinator Metered Entities, establishes the applicable eligibility and processes.

This draft final proposal addresses the minor tariff change needed to enable the modeling of multiple shares of a resource as pseudo-ties into the CAISO BAA.⁷ This initiative is not anticipated to require system changes to enable dynamic transfers into CAISO, because it will utilize the market functionality that CAISO has previously developed for pseudo-ties between EIM Entities.

CAISO proposes to model each share of a partially pseudo-tied resource as a separate market resource, which would consist of a simple generator with a non-negative minimum load, start-up and minimum-load costs, and a single operating range (as the similar EIM participating generation resources are modeled).⁸ This initiative does not address related issues of modeling the physical characteristics of multiple pseudo-tied shares (for example, configuration changes in combined cycle generators), or jointly owned units within the CAISO BAA.⁹ CAISO's market initiatives roadmap includes consideration of a comprehensive modeling solution that will more accurately align the market model with the operation of jointly-owned resources, to alleviate some of the potential operational challenges, and also consider and address potential settlement implications of modeling jointly-owned resources. This initiative is included on the market initiatives roadmap in the 2021-2022 timeframe, to be implemented by 2023.¹⁰

2.1. Issues of Modeling Dynamic Schedules from EIM Entity BAAs

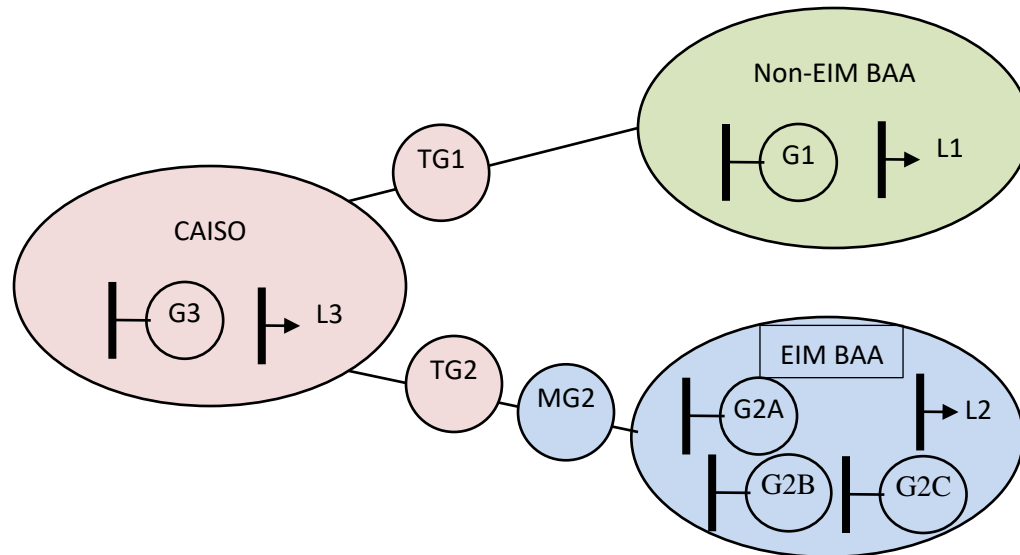
This subsection describes further the sub-optimal impacts that dynamic schedules that remain part of the host EIM BAA's resources may have on real-time interchange accounting, and the data conflicts these can have on market pricing and the dispatch of dynamic schedules, which can be avoided through the use of pseudo-ties. The figure below depicts the difference between dynamic schedules from EIM versus non-EIM BAAs:

⁷ CAISO considered and rejected alternatives of (a) including a provision in the EIM Entity Agreement for an affected BAA to permit partial pseudo-ties to the CAISO, or (b) requiring an affected EIM Entity to assume responsibility for all imbalances of the jointly owned generation. Option (a) would still require FERC approval of the agreement, would be inconsistent with other EIM Entity Agreements (which are not intended to deal with issues between CAISO and market participants within the EIM Entity), and would require non-conforming pseudo-tie agreements between CAISO and the resource owners. Option (b) would alter existing agreements between the affected EIM Entity and resource owners.

⁸ Except for requirements due to crossing BAA boundaries, pseudo-ties are treated like internal generation, including eligibility to be certified to provide ancillary services, and CAISO carrying the associated operating reserve obligations and receiving credit for frequency response (thereby reducing requirements for which CAISO has needed to contract with other BAAs for responsive capacity).

⁹ While it may appear that the issues addressed in this stakeholder initiative could assist joint owners of resources within the CAISO BAA with existing contractual issues, the range of these issues has not been identified yet but the known issues would be time-consuming to resolve. Thus, CAISO is unable to extend this initiative to internal resources before new EIM Entities become active in 2021, but can be considered under the future jointly-owned unit (JOU) policy initiative.

¹⁰ The CAISO Final Policy Initiatives Roadmap 2020, page 20, is available at <http://www.caiso.com/Documents/2020FinalPolicyInitiativesRoadmap.pdf>.



A dynamic schedule from generator G1 in the non-EIM BAA is subject to an intertie scheduling constraint across the CAISO boundary, which is modeled as part of the non-EIM sources flowing through Tie Gen 1 (TG1). The EIM BAA has a more complete representation, recognizing that in addition to a dynamic schedule from generator G2A, the BAA also contains other generators, represented as G2B and G2C. Collectively, G2A, G2B, and G2C form a default generation aggregation point (DGAP), which is used for some functions in EIM and whose LMP in EIM market results is a weighted average of the LMPs at individual resources. Schedules to CAISO from generators in the EIM BAA and other sources wheeled through the EIM BAA are subject to an intertie scheduling constraint at TG2. Resources in the EIM BAA are modeled at their locations within the EIM BAA and count as supply in the EIM BAA, but since part of this supply supports exports from the EIM BAA, a “mirror” resource at MG2 accounts for the export to match TG2’s modeling of imports to CAISO.

The schedules modeled at both TG1 and TG2 are part of the calculation of CAISO’s net scheduled interchange (NSI), while those modeled through MG2 are part of the EIM BAA’s NSI. Since the non-EIM BAA is not part of CAISO’s market, CAISO does not model its NSI. In addition to the intertie scheduling constraints and the physical transmission limits that apply throughout the market area, EIM transfers between BAAs are subject to ETSR limits. If the ETSR between CAISO and the EIM BAA limits the transfers between these BAAs, the BAAs’ power balance constraints affect the locational marginal prices (LMPs) of all resources within their areas.

To illustrate how this works in practice, an example uses the following bid prices, dispatches, and LMPs. This example is derived from actual market results to illustrate a dynamic schedule from an EIM Entity BAA, which this example illustrates as generator G2A, with the actual prices and dispatches being altered as part of masking the resource’s identity for confidentiality, but still illustrating the relative direction of the prices and dispatches. As a dynamic schedule to the CAISO BAA, G2A’s market participation begins in the day-ahead market, even though EIM is limited to real-time. Although the hour-ahead scheduling process (HASp), 15-minute real-time predispatch (RTPD), and 5-minute real-time

dispatch (RTD) market runs contain multiple intervals per hour, this example uses hourly averages for simple comparisons to the day-ahead market (DAM). (A result of hourly averaging is differences among the intervals' LMPs and dispatches, such that the averages are not at the ends of a bid range. An example is averaging across the 4 RTPD intervals to the hourly values. In RTPD, underlying the hourly values, the resource is dispatched to the self-schedule (70 MW) in 3 of the 4 intervals, and to the top of the bid range (90 MW) in one interval, when the LMP exceeds the bid price. The average dispatch of 75 MW is between the self-schedule and the top of the bid range, and the average of interval LMPs is slightly lower than the bid price.)

Dispatch (MW)	Market Run			
	DAM	HASP	RTPD	RTD
Generator G2A	90	85	75	70

Bid Prices and LMPs (\$/MWh)	Market Run			
	DAM	HASP	RTPD	RTD
G2A Resource Bid Price	45.00	45.00	45.00	45.00
G2A Resource LMP – Total	50.00	46.00	43.00	40.00
G2A Resource LMP - Congestion	2.00	1.00	7.00	5.00
EIM Entity DGAP LMP - Congestion	N/A	0.85	6.50	4.50
CAISO DGAP LMP - Congestion	N/A	-0.02	-0.80	-0.50

This example illustrates the impacts that can occur when dynamic schedules have sources in EIM BAAs. First, changes in system conditions led to changes in dispatch of generation within a BAA, and need to be tracked in the EIM Entity's base schedules and NSI. When base schedules are submitted 75 minutes before the start of an operating hour, G2A's base schedule may be set at 90 MW based on its day-ahead schedule, which is matched by 90 MW of exports to be included in the BAA's base interchange schedule. The HASP results are available before the EIM Entity's final base schedule at 40 minutes before the hour, show a reduction in G2A's dispatch to 85 MW, but the HASP results are advisory, not binding. The 15-minute market's RTPD dispatch has a further reduction to 75 MW as the system conditions continue to change, with the 5-minute RTD dispatch having a further change to the resource's self-schedule at 70 MW. (This table shows hourly averages, while the changes are occurring in intervals within the hour.) The EIM Entity receives the market dispatches as they are issued, and CAISO sends updates to the BAA's NSI, but unless the EIM Entity monitors these changes to ensure tracking of its NSI (possibly by automating its monitoring systems), its settlements may have imbalance energy.

Differences in resource versus DGAP pricing may occur since a dynamic schedule can be for a portion of the resource capacity, in contrast to a pseudo-tie being an amount of capacity that is dedicated to the attaining BAA instead of the native BAA. In this example, as system conditions change, G2A's LMP decreases between the market runs, going from \$50 in DAM to \$46 in HASP, \$43 in RTPD, and \$40 in RTD, even though the EIM Entity's BAA has become constrained for transmission capacity in meeting its load, has increasing congestion prices, and must run more expensive internal generation instead of

being able to import from other EIM Entities. With all transmission limits combined, the congestion cost for G2A was small in DAM and HASP (\$2 and \$1, respectively), but increases in RTPD and RTD (\$7 and \$5, respectively). When the dynamic schedule's share of a resource's capacity is variable and not known before the market optimization, G2A, G2B, and G2C must all be included in the DGAP, which has slightly lower congestion costs. The difference between LMPs for G2A and the DGAP may affect settlements. (In contrast, the CAISO DGAP is not affected by the congestion into the EIM BAA and has a lower congestion cost.) If a dynamic schedule from G2A had dedicated capacity for all or part of its capacity, that capacity could be excluded from the EIM BAA's primary DGAP (such as being its own DGAP), similarly to how G2A would not be part of the EIM BAA's DGAP if it were a pseudo-tie.

These differences in modeling do not affect dynamic schedules if they are self-scheduled because self-schedules can be represented in base schedules and are not dispatched through EIM, or are variable energy resources whose dispatch uses forecasts based on their telemetered output that can be tracked in the BAAs' NSI. However, if the market dispatches economic bids by a dynamic schedule from an EIM BAA to CAISO and the dynamic schedule remains part of the BAA's resources that are accounted for at MG2 and TG2, the EIM Entity may need to do manual interventions to adjust its ETSR transfers to match CAISO's dispatch and keep its NSI in balance, and modeling differences can affect settlements.

When a resource participates in the market as a pseudo-tie instead of a dynamic schedule, these issues do not occur because the pseudo-tie becomes part of the attaining BAA instead of its native BAA. A pseudo-tie is subject to the physical transmission limits and intertie scheduling constraints, but not the EIM BAA's ETSR limit. This avoids the need for the EIM BAA to account for the pseudo-tie in its NSI. Because the pseudo-tie is not subject to the ETSR, the ETSR does not affect its dispatch and settlement price.¹¹

This stakeholder initiative has not proposed to limit the ability of market participants to dynamically schedule resources from EIM Entity BAAs, but CAISO recognizes that economic bids by dynamic schedules from an EIM Entity BAA could create issues for both the market participant and the EIM Entity. Because pseudo-ties do not have the same issues, CAISO recommends pseudo-ties as the preferred way to implement dynamic transfers from EIM Entity BAAs, and this initiative creates options to facilitate pseudo-ties for shared resources.

3. Changes Since Draft Final Proposal

CAISO published the Issue Paper and Straw Proposal in this stakeholder initiative on May 7, 2020, discussed the Issue Paper and Straw Proposal in a stakeholder webinar on May 14, published the Draft Final Proposal on July 10, and discussed it in a stakeholder webinar on July 17. Stakeholders submitted

¹¹ A pseudo-tie to CAISO must have firm transmission between its source and CAISO's scheduling point, so its transmission capacity would not be included in the EIM BAA's ETSR.

comments on each document. CAISO appreciates these comments, and has incorporated changes to the extent possible. CAISO will review this Final Proposal in a stakeholder meeting on August 21, 2020.

The Draft Final Proposal's review of the initial comments resulted in two areas of changes to the substance of this proposal. First, it clarifies that this initiative proposes broadening the options for market participants to use pseudo-ties, and has not proposed to limit the ability of market participants to dynamically schedule resources from EIM Entity BAAs. Given the disadvantages of using dynamic schedules for resources that wish to use economic bids, CAISO believes that market participants will find pseudo-ties to be the more flexible option and recommends this option. Second, this document identifies the Scheduling Coordinator for each part of a shared resource as having the responsibility for submitting metering and outage data, which the Protocol Administrator can assist in calculating. While the Scheduling Coordinator ultimately has the responsibility for these data, CAISO provides existing options through which the Scheduling Coordinator who has this responsibility can designate other entities to submit and receive data on its behalf, as described in CAISO's Access and Identity Management (AIM) User Guide.¹²

This Final Proposal has two material updates in response to stakeholder comments on the Draft Final Proposal: (1) Section 2.1 (Issues of Modeling Dynamic Schedules from EIM Entity BAAs) adds an example of how dynamic schedules from an EIM Entity BAA may result in pricing issues, and (2) Section 4.3 (Outage Management and Reporting) requires that if a Shared Resource Allocation Protocol identifies conditions that could lead to disproportionate outages, its description of how outages and derates will be allocated must include the formula for calculating the outage allocation among the shares.

4. Requirements for Shared Resource Pseudo-Tie Implementation

In the near-term, creating multiple shares of a pseudo-tie raises additional issues than when a single owner has responsibility for all operational and financial consequences of operating the pseudo-tie resource. When there are multiple owners of a generator, the modeling is more complex, although it can be facilitated when a single entity can act as a coordinator or operator among the multiple owners. This draft final proposal describes the requirements for a Shared Resource Allocation Protocol to be developed among the joint owners, and expects that the joint owners will designate one of their

¹² The Access and Identity Management (AIM) process of creating an Access Control List (ACL) and providing access to the direct and/or endorsed users is documented at https://www.aiso.com/Documents/AccessandIdentityManagement_AIM_UserGuide.pdf. One Scheduling Coordinator can submit meter data for another Scheduling Coordinator as long as they are listed in the Meter Service Agreement as the Scheduling Agent. For outage data, a generator can have multiple participants, with one Scheduling Coordinator coming from the CAISO Master File and others coming from AIM applications where they set up access. An ACL is the resource level access control group.

Scheduling Coordinators as the coordinator and operator for the overall resource's protocol.¹³ This draft final proposal calls this entity the Protocol Administrator.¹⁴ In that case, many of the technical details are consistent with the implementation for a single-owner resource.¹⁵ This proposal uses these terms (Shared Resource Allocation Protocol, and Protocol Administrator) for simplicity in description, and CAISO understands that these types of designations would already be in place as operating agreements for existing resources with multiple owners. CAISO will not require the existing arrangements to use the same titles, and anticipates that the existing operating agreements probably already contain the required content, which can subsequently be translated into documents to be shared with the CAISO.¹⁶

By establishing a resource with shared ownership or rights, requirements for additional metering and telemetry processes and the establishment of an outage allocation procedure are key requirements imposed upon the shared resources. Other issues are also affected by these, such as allocation of start-up and minimum load costs for bid cost recovery. Each generating unit will remain subject to all CAISO tariff requirements, contractual terms, and business practices that are applicable to generating unit participation in the CAISO markets. The fundamental principles are further outlined in the following sections, including in summary:

¹³ Designating the Protocol Administrator from among the Scheduling Coordinators, as the representative for the set of owners, will maintain the chain of responsibilities to follow the CAISO tariff that existing agreements provide. The designation of the Protocol Administrator must be stable over time, although CAISO recognizes that major changes in ownership can lead to changes in this designation.

¹⁴ The Protocol Administrator role will be a Scheduling Coordinator function performed by the Scheduling Coordinator designated by agreement among the owners. Like other resource owners, the designated Scheduling Coordinator will have its Scheduling Coordinator agreement, which is a pro-forma agreement available to ensure compliance with the CAISO tariff. The tariff will describe the responsibilities as developed in this stakeholder process, instead of needing other agreements. The Shared Resource Allocation Protocol is developed among the resource owners, which may in essence already exist as a joint operating agreement. CAISO is not a party to this agreement, but may incorporate its terms in a CAISO operating procedure. CAISO does not anticipate that there would be added financial implications imposed by the CAISO Tariff for the Protocol Administrator beyond the regular settlements for Scheduling Coordinators, except for any separate commercial terms among the set of owners.

¹⁵ Implementation of a pseudo-tie requires agreements among multiple entities, including agreements between the resource owner and its balancing authority and transmission provider, and a coordinated operating procedure between CAISO and the native BAA to facilitate continued delivery to the desired delivery points. (Reference: CAISO tariff, Appendix N (Pseudo-tie Protocol), section 1.2.1.14.) In the case of dynamic schedules, the tariff's Appendix M (Dynamic Scheduling Protocol), section 1.5.12, requires that only one Dynamic System Resource may be associated with any one physical generating resource, unless CAISO approves an implementation plan to establish multiple Dynamic System Resources for that generating resource. The Shared Resource Allocation Plan discussed in this document may serve the role that an implementation plan serves for dynamic schedules.

¹⁶ The CAISO does not intend to make individual Shared Resource Allocation Protocols public as they would likely include confidential information, and will administer matters related to the Shared Resource Allocation Protocol according to its current procedures for handling confidential information. Instead, CAISO anticipates that the Dynamic Transfer Balancing Authority Operating Agreement and Pseudo-Tie Participating Generator Agreements can contain sufficient description of the shared resources to satisfy the requests in stakeholder comments for project descriptions to be public. Specifically, these agreements must identify key attributes including telemetry, metered output, minimum output levels, minimum load costs, start-up costs, and maximum output levels.

- Shares of a resource that are associated with an owner within the CAISO BAA will be registered as CAISO area resources that are pseudo-tied to the CAISO BAA, and represented by a Scheduling Coordinator. They will be modeled within the CAISO BAA, separately from the shares of the native or EIM Entity BAA where the physical resource is interconnected and any other shares. Scheduling Coordinators for owners within CAISO will submit schedules and bids using the existing market mechanisms as a pseudo-tie resource.
- The host EIM Entity will register its share of a shared pseudo-tie resource as an EIM Resource, as will other EIM Entities who have shares of the shared pseudo-tie resource. (This would not be necessary for a native BAA not participating in the EIM.) An EIM Resource may or may not be an EIM Participating Resource, but only EIM Participating Resources are eligible to submit bids in the market. Different resource owners may make separate decisions about whether and when to register as EIM Participating Resources.
- The EIM Entity's operations will see separate resources at the shared pseudo-tie resource's modeled location.
- The Protocol Administrator, on behalf of the Pseudo-Tie PGA owners, will provide telemetry signals to CAISO that represent separate output values for each Pseudo-Tie PGA owner, and will coordinate a logical metering procedure, discussed in section 3.2.
- The Pseudo-Tie PGA owners' Scheduling Coordinators will submit separate outage cards for their shared pseudo-tied resource, following an outage management procedure discussed in section 3.3.
- The Shared Resource Allocation Protocol must be reviewed and approved by CAISO prior to market participation of any split resource subject to that protocol.

An initial example for implementing shared-resource pseudo-ties is the Sutter Energy Center, which has a single owner but arrangements for sales to two BAAs that are both EIM Entities, through separate Scheduling Coordinators: the SMUD portion of BANC which participates in EIM, and the full CAISO market.¹⁷ Like CAISO's arrangements with Sutter Energy Center, a shared resource Pseudo-Tie PGA Owner will execute the *pro forma* Pseudo-Tie Participating Generator Agreement contained in Appendix B.16 to the CAISO tariff.

4.1. General Issues

General requirements for full participation as a pseudo-tie in the CAISO market include the host EIM Entity's execution or updating of the Dynamic Transfer Balancing Authority Operating Agreement, and any other associated agreements. Appendix N of the tariff (Pseudo-Tie Protocol) and various other tariff sections state further requirements. These agreements ensure incorporation of all tariff requirements associated with generating unit participation in the CAISO markets. This section describes the aspects of

¹⁷ See FERC Docket No. ER20-1702.

these agreements and tariff provisions that will need particular attention for shared pseudo-tie resources.

The Pseudo-Tie PGA must be executed prior to registering shared pseudo-tie generating units in the CAISO systems. Separating the resources prior to registration allows each independent resource to be individually treated as a generating unit according to the rules applicable to the markets in which it will participate. In the case of a resource that has multiple owners, more details must be addressed in the operating procedures than may be necessary when an entire physical generator becomes a pseudo-tie.

A Scheduling Coordinator must represent each share of the resource that participates in EIM or other CAISO markets, as required by the CAISO tariff for its participation. During the process for implementing each share of the resource, CAISO will review, among other things, the logical metering calculation for each shared pseudo-tie resource to confirm meter data accuracy for settlement purposes consistent with the requirements for Scheduling Coordinator Metered Entities.

Each Scheduling Coordinator for a Pseudo-Tie PGA owner representing an ownership share that participates in CAISO markets must assume the financial and operational responsibility, and compliance with the tariff rules, for operating its share of the pseudo tied resource, in accordance with the Shared Resource Allocation Protocol among the resource owners. CAISO may issue dispatch instructions to each share of the resource participating in EIM and separate dispatch instructions to each share that participates in the CAISO real-time market, which together require the resource to transition through what would otherwise have been a forbidden region, or a configuration change for a multi-stage generator.¹⁸ Because CAISO does not propose enhancements as part of this iteration that allow for modeling of joint ownership or multi-configurations of the shared resources, should this circumstance arise, the Protocol Administrator must ensure that the resource output is consistent with the CAISO dispatch instruction separately issued to each share of the resource, and CAISO will settle each share according to the resource's response to the dispatch instructions. CAISO cannot currently model the resource's forbidden regions and will therefore not specifically address operation within the forbidden region for the resource as a whole.¹⁹ If the shared pseudo-tied resource has uninstructed deviations, CAISO's share of the uninstructed energy will be limited to a proportional share based on the resource's total instructed energy, as it would be for a dynamic schedule with multiple dynamic or non-dynamic schedules.²⁰

¹⁸ The Protocol Administrator can simultaneously receive each share's dispatch instruction using existing functionality that allows a Scheduling Coordinator to designate multiple recipients for copies of a resource's dispatch instructions. Owners of a resource could choose to include this in their protocol.

¹⁹ Although CAISO will be unable to manage operating parameters such as forbidden zones or configuration changes until a future stakeholder process to establish the associated modeling and settlement rules, the driver for the current initiative is the necessary conversion of shared resources from dynamic schedules to pseudo-ties. CAISO does not anticipate that this conversion would alter the current practices for operating these resources.

²⁰ Appendix B.9 of the CAISO tariff (Dynamic Scheduling Host Balancing Authority Operating Agreement), section 6.4 (Delivery of Megawatts) states that the CAISO and the Host Balancing Authority will share in the real time

4.2. Metering and Telemetry

The Protocol Administrator, on behalf of the Pseudo-Tie PGA owners, will provide CAISO with separate telemetry data for the entire resource and for each share of the resource, in addition to any other telemetry data that may be required for CAISO market participation. The parties will test and confirm the transmission of the specified data points, prior to the shared resources participating in CAISO markets, including ongoing testing and validation that the CAISO tariff requires for all supply resources.

The Protocol Administrator, through the Pseudo-Tie PGA owners, will establish a Logical Metering Settlement Quality Meter Data Plan through existing CAISO processes, which will be subject to approval by CAISO using the requirements for Scheduling Coordinator Metered Entities. The host EIM Entity will directly report its meter data for market settlements, along with the telemetry data for each shared resource owner, and e-tags will report the hourly production for the other shares for interchange accounting. Meter data for other participants' shares will use the "logical metering" process documented in their SQMD plan. The Protocol Administrator may assist in computing the meter data for each SC, which the SCs will report as the meter data for their shares to CAISO.

The existing CAISO processes and requirements for Settlement Quality Meter Data Plans by Scheduling Coordinator Metered Entities are detailed on the Metering and Telemetry section of the CAISO web site, at <http://www.caiso.com/market/Pages/MeteringTelemetry/Default.aspx>, particularly in a set of CAISO Operating Procedures including Operating Procedure 5750, "Settlement Quality Meter Data (SQMD) Plan –Submission & Approval Process". In addition to demonstrating that the SQMD Plan will ensure that the sum of the calculated logical metering shares of a resource will match its total output and conform to CAISO's published metering standards, it should reflect an expectation for partial resources that metering will reflect and follow the dispatch instruction to the extent feasible, clearly explain how deviations will be handled, and account for the outage allocation methodology outlined in the next section.²¹ The uninstructed deviations assigned to shares delivered to the CAISO BAA should not exceed a pro-rata allocation proportional to instructed energy in each settlement interval, consistent with existing CAISO market rules and processes.

4.3. Outage Management and Reporting

If the partially pseudo-tied resource experiences an outage or derate, the Pseudo-Tie PGA owners' Scheduling Coordinators will be required to report an outage of each shared resource according to the CAISO tariff's outage reporting requirements, including resource adequacy substitution and availability

deviations from the dynamic, non-regulation ancillary services and energy from the dynamic System Resource, for which the CAISO's maximum responsibility will be on a pro rata basis.

²¹ The SQMD Plan should account for the outage allocation methodology, but the outage allocation methodology itself is not part of metering and should be in the Shared Resource Allocation Protocol.

requirements, which participation as pseudo-ties does not change.²² Any allocation of planned and forced outages between each share of the resource may necessarily be complex because it must account for the specific generating unit's operational characteristics and pre-existing contractual obligations. The CAISO tariff will provide a default outage allocation methodology as stated below, but specific details may need to be developed by share owners in their Shared Resource Allocation Protocol, which would identify conditions that could lead to disproportionate outages, and describe how outages and derates will be allocated in these conditions, including the formula for calculating the outage allocation among the shares. By default, CAISO anticipates that outages and derates will be shared proportionally (pro-rata based on each owner's share of plant output at the time of the outage) between the proposed shared resources whenever possible (i.e., not otherwise required by operational characteristics such as infeasible dispatches, or by pre-existing contractual obligations). Each share of the resource will be subject to Section 9 of the CAISO Tariff for all matters regarding the submission and approval of outages. In addition, the Shared Resource Allocation Protocol must define the procedure for the allocation of outages between the shares, which will be subject to agreement by CAISO and each owner participating in CAISO markets, prior to participation of any shared resource in the CAISO markets. For calculating the pro-rata allocation, the Shared Resource Allocation Protocol should use the MAX_GEN of each share over the total cumulative MAX_GEN of all shares using the MAX_GEN values defined in the Pseudo-Tie Participating Generator Agreements, the host EIM Entity's Dynamic Transfer Balancing Authority Operating Agreement, and the EIM Participating Resource Agreement. An illustrative formula for this preferred default allocation for maintenance and forced outages is:

$$\text{Outage allocation to Split Resource}(n) \text{ in MW} = \frac{\text{Split Resource}(n) (\text{MAX_GEN})}{\sum_1^n \text{Split Resource}(n) (\text{MAX_GEN})}$$

Where MAX_GEN values are identified in Schedule 1, Section 1 of the Pseudo-Tie Participating Generator Agreement, and EIM Participating Resource Agreement

The protocol should not duplicate resource changes that would normally be recorded as master file revisions, such as long-term changes to resource capabilities. Any modifications proposed to the Shared Resource Allocation Protocol shall only be effective following approval by CAISO. Operational experience may lead to revisions to the Shared Resource Allocation Protocol, CAISO will maintain the effective version of the Shared Resource Allocation Protocol, and the Pseudo-Tie PGA owners and Protocol Administrator shall maintain copies of the approved protocol. Among other functions, the protocol will form the basis of any necessary after the fact review or monitoring of the outage reporting. The CAISO shall have the right to require the Pseudo-Tie PGA owners or Protocol Administrator to submit documentation to demonstrate compliance of the combined resource with the Shared Resource

²² Each share's outage data must be reported separately by its SC. Each share will be a separate resource with its own resource ID, and aspects such as resource adequacy apply to each share separately based on its characteristics and the requirements of the CAISO tariff. CAISO's outage management system records outage data based in individual resource IDs, and does not currently have functionality for reporting based on the overlying physical resource.

Allocation Protocol, with each Pseudo-Tie PGA owner and Scheduling Coordinator being individually and jointly responsible for complying with the Shared Resource Allocation Protocol.

For efficiency of the associated business processes, it will be preferable for an enforcement mechanism to include an auditable self-monitoring compliance mechanism, such as submitting a report to CAISO twice per year noting how all outages have been allocated and reported, including explanations of any non-proportional allocation of outages between the shares. Shared Resource Allocation Protocols may propose alternative reporting mechanisms (for example, including allocations in individual outage reports) to manage the complexity in their reporting without adding to CAISO's workload, while maintaining CAISO's authority to audit outage reports.

Through the Shared Resource Allocation Protocol, the Pseudo-Tie PGA owners and Protocol Administrator will need to be responsible for ensuring that the sum of the resource shares has a maximum capability that is not beyond the physical capability of the plant, and the sum of the ramp rates and any other operational characteristic of each shared resource is not beyond the capability of the plant.

4.4. Treatment of Minimum Load and Start-up Costs

Bid cost recovery ensures that market revenues over the course of a day provide at least the revenue that the resource owners would receive if they were settled at their submitted bids. Factors that can cause a revenue shortfall include changes in real-time market conditions from the time when a start-up instruction is given, or when the most optimal solution in the market optimization does not fully compensate start-up and minimum load costs when settlements are at marginal energy prices. When a shared resource's operating conditions are like single ownership pseudo-tie arrangements, existing tariff rules are expected to provide the needed bid cost recovery. Bid cost recovery will apply separately to each pseudo-tied share as a separate resource, based upon each share's resource characteristics and costs, commitment, and bid in costs. If unique circumstances affect the allocation of the overall resource's costs, they should be described in the Shared Resource Allocation Protocol developed among the resource owners and submitted for CAISO approval.²³ Start-up and minimum load costs should be equitably allocated among the owners based on their shares' proportion of costs, these proportions must be documented in the Shared Resource Allocation Protocol, the sum of the shares' costs should not exceed the total costs that would be represented if the shared resource were participating in the market as a single resource, and the protocol must identify how compliance will be monitored and verified in comparison to the resource's overall costs.

²³ The cost allocation may be relatively simple in a case like two owners with equal shares of a 2x1 combined cycle generator. A different instance could be a generator where one owner has 10% of its capacity, another owns 90%, and the minimum load is 20% of the total capacity. The owners would agree and document between themselves how to allocate the start-up and minimum load costs, with a potential allocation being 100% to the majority owner and the minor owner being unable to bid unless the generator is already running.

CAISO recognizes that there are concerns that the allocation of start-up and minimum load costs can be implemented in a manner designed to benefit the participants, but also recognizes that cost responsibility among owners can vary considerably and does not wish to inefficiently impede EIM and CAISO market participation by unnecessarily constraining commercial agreements among market participants. Following CAISO acceptance of a Shared Resource Allocation Protocol, if the pseudo tied resource(s) Scheduling Coordinator(s) do not follow its protocol, either repeatedly or on any occasion that significantly affects market outcomes, the CAISO may revoke the shared pseudo-tie arrangement and require the resource(s) to be dynamically scheduled, including any restrictions imposed on dynamic schedules from shared resources. Similarly, CAISO may revoke or modify the shared pseudo-tie arrangement if there is evidence of owner(s) using the shared resource allocation protocol or SQMD plan to exploit the bid-cost recovery mechanism to benefit the resource owner(s) or to inequitably allocate bid cost recovery between BAAs.

5. EIM Governing Body Role

This initiative proposes to modify tariff rules governing resources that are pseudo-tied into the CAISO balancing authority area to enable CAISO to establish pseudo-ties to only a portion of the resource's capacity. CAISO staff believes this initiative should be classified as hybrid, with the primary driver being EIM-specific. Accordingly, before filing the tariff amendment, staff would seek approval from both the EIM Governing Body and the Board for the entire initiative.

This initiative would result in tariff amendments that are not severable, meaning that there would not be separate tariff provision for bidding into the day-ahead market as opposed to the real-time market. Rather there would be one set of tariff rules, primarily in Appendix N, that govern both market time frames.

To the extent the tariff revisions affect the real-time market, the EIM Governing Body has primary authority, because the primary driver for the initiative is an issue that is specific to EIM balancing authority areas.²⁴ Namely, when balancing authority areas join EIM, resources with shared ownership may not be able to continue their dynamic scheduling arrangements into the CAISO balancing authority area. The goal of this initiative is to resolve that issue, which applies only if the balancing authority area is joining EIM.

²⁴ The EIM Governing Body has primary authority over a proposed tariff rule change if either the rule is EIM-specific or, even if the rule is generally applicable, if the primary driver for the change is an issue that is specific to EIM balancing authority areas. This initiative satisfies the latter test. The new tariff rules would not be EIM-specific, because the pseudo-tie capability would apply to resources coming into CAISO from all outside balancing authority areas, whether or not the balancing authority area had joined EIM.

The proposed changes also affect participation in the day-ahead market, and the EIM Governing Body cannot have primary authority over changes to day-ahead market rules. The Board of Governors must approve those changes, which means the initiative is hybrid.

Because the primary driver for the initiative is to resolve an issue specific to EIM, the following rule applies: “The whole policy initiative goes first to the EIM [G]overning [B]ody for approval and then the ISO Board would consider the entirety of the proposal on a non-consent agenda basis; in other words, both bodies would need to approve the initiative” Charter for EIM Governance, § 2.2.1.

This proposed classification reflects the current state of this initiative and may change as the stakeholder process moves ahead. We encourage stakeholders to submit comments on this proposed classification and, if they disagree, to include an explanation of which classification would be more appropriate.

6. Stakeholder Engagement, Implementation Plan & Next Steps

The CAISO is committed to stakeholder engagement and has developed the following plan to ensure stakeholders are involved in the development of this proposal. To ensure that any implementation issues are addressed before board approval, CAISO will develop draft language *before* taking the final proposal to the Board of Governors and EIM Governing Body.²⁵ This process change is reflected in the following table:

²⁵ The tariff changes involved in Phase 1 of this initiative do not appear to require a technology implementation, since EIM implementation has already enabled shared resources to be pseudo-tied between BAAs.

Stakeholder Engagement and Implementation Plan

Date	Milestone
Issue Paper and Straw Proposal	
Paper Posted	May 7, 2020
Stakeholder Call	May 14, 2020
Comments Due	May 29, 2020
Draft Final Proposal	
Paper Posted	July 10, 2020
Stakeholder Call	July 17, 2020
Comments Due	July 31, 2020
Draft Tariff Language and Final Proposal	July-August 2020
Draft Tariff Language Posted	August 6, 2020
Final Proposal Posted	August 14, 2020
Stakeholder Call	August 21, 2020
Comments (Final Positions) Due	September 4, 2020
EIM Governing Body & CAISO Board of Governors	November 2020
Finalize Tariff Language and File Proposal	Q4 2020
Implementation	Q1 2021

The CAISO will discuss this final proposal with stakeholders during a stakeholder call on August 21, 2020. Stakeholders are asked to submit written comments by September 4, 2020 to initiativecomments@caiso.com. A comment template will be posted on the CAISO's initiative webpage, located here: <http://www.caiso.com/StakeholderProcesses/Pseudo-ties-shared-resources>.