Opinion on
Extended Day-Ahead Market (EDAM) Congestion Revenue Allocation

The Market Surveillance Committee of the California ISO[1]
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1. Introduction and Summary

The Market Surveillance Committee (MSC) of the California Independent System Operator (CAISO) has been asked to comment on the CAISO's proposal for allocating congestion revenue in the Extended Day-ahead Market (EDAM) arising from parallel flows in Balancing Authority Areas (BAAs) that arise from schedules originating and sinking in other BAAs. In this Opinion, we frequently refer to three versions of this proposal, which are the Draft Final Proposal (DFP)[2] the Revised Draft Final Proposal (RDFP),[3] and the Final Proposal (FP).[4]

These proposals address the following problem. The FERC-approved EDAM design at the present time would have the BAA where the congested network constraint is located retain the congestion revenue from its network flows (flow from EDAM schedules times constraint shadow price), no matter which EDAM BAAs are the locations of the source and sinks of those schedules. Thus, due to parallel flows (also called "loopflows"), there will be congestion costs collected from market parties for schedules sourced or sunk in one set of BAAs, while other BAAs, where the resulting parallel flows occur and have caused congestion, will be paid for that congestion under the present design. Without a congestion revenue right mechanism that would redistribute that revenue among BAAs in way that would allow market parties to secure rights to those revenues so that they can hedge the congestion charges they pay for their net injections, the result will be (1) redistribution of congestion revenues among BAAs and (2) a potential inability for BAAs who have distributed firm transmission rights under OATT (Open Access

[1] The participation of Dr. Bushnell, Dr. Harvey, and Dr. Hobbs in this Opinion were as paid consultants for the California ISO. All opinions expressed and implied in this document are solely those of the authors and do not represent or reflect the views of their employers.

[2] CAISO, *Revised Draft Final Proposal: EDAM Congestion Revenue Allocation*, April 16, 2025, https://stakeholdercenter.caiso.com/InitiativeDocuments/Draft-Final-Proposal-EDAM-Congestion-Revenue-Allocation-April-16-2025.pdf.

[3] CAISO, *Revised Draft Final Proposal: EDAM Congestion Revenue Allocation*, May 19, 2025, https://stakeholdercenter.caiso.com/InitiativeDocuments/Revised-Draft-Final-Proposal-EDAM-Congestion-Revenue-Allocation-May-19-2025.pdf .

[4] The Final proposal differs from the RDFP in its clarifications of certain points, and not in any fundamental features (CAISO, *Final Proposal: EDAM Congestion Revenue Allocation*, June 6, 2025, https://stakeholdercenter.caiso.com/InitiativeDocuments/FinalProposal-EDAMCongestionRevenueAllocation-June62025.pdf .

Transmission Tariff) and network integration transmission service (NITS) rules to cover all of the congestion costs associated with those rights.

As a result, there is a conflict between two of the fundamental objectives of the EDAM design, which are to provide congestion revenues to the BAAs where congestion and its costs occur, while at the same time allow BAAs to retain their systems of OATT firm transmission rights that help recover fixed network costs and provide hedges against transmission congestion costs. The DFP, RDFP, and FP address this conflict by proposing an interim and partial reallocation of parallel flow congestion revenues from BAAs experiencing congestion to BAAs that have sold long-term firm OATT rights to market parties whose schedules contribute to that congestion. In Year 1 of EDAM operation, the CAISO proposes to arrange such a reallocation only for parallel congestion revenues associated with monthly or longer term balanced firm point-to-point (PTP) or Network Integration Transmission Service (NITS) rights sold under a BAA's OATT that have (a) been pre-registered with the CAISO, (b) self-scheduled the operation of the resources using that transmission, and (c) provided their contract reference number (CRN). A transfer of congestion revenue will then occur which the BAA(s) in which the sources and sinks are located will then receive the congestion revenue associated with the parallel flow and congestion in other BAA(s). The receiving BAA will then decide how to reallocate that congestion revenue among its OATT rights holders and other market participants.

Although not part of the design that the Boards are being asked to consider approving at this time, the FP also proposes consideration for possible implementation in future years of congestion allocation designs under which balanced transactions economically scheduled by EDAM would also be eligible for such transfers of congestion revenues. The proposals do not describe a final market design to resolve the competing objectives of the EDAM market design, but instead outline a possible three year transition process for the consideration and implementation of interim and final designs.

In this Opinion, we discuss both the FP's Year 1 proposal that the Boards are considering at this time, as well as the possibilities offered by the FP for Year 2 and afterwards which are not being decided upon by the Boards now.

The CAISO proposal for reallocating EDAM congestion revenues associated with parallel flows have been a focus of two MSC public meetings. The MSC has previously written opinions commenting on the ISO's EDAM proposal and the related Day-Ahead Market Enhancements proposal.[5] During general session meetings of the MSC on March 28, 2025 and May 5, 2025,[6]

[5] James Bushnell, Scott Harvey, and Benjamin F. Hobbs, MSC Final Opinion on Extended Day-Ahead Market, Market Surveillance Committee of the CAISO, https://www.caiso.com/documents/mscfinalopinionon extendedday-aheadmarket.pdf, Jan 27, 2023; James Bushnell, Scott Harvey, and Benjamin F. Hobbs, Opinion on Day-Ahead Market Enhancements, Market Surveillance Committee of the CAISO, May 3, 2023,https://www.caiso.com/documents/marketsurveillancecommitteefinalopinionon day-aheadmarketenhancements-may3-2023.pdf.

[6] The agendas and presentations for these meetings may be found at www.caiso.com/meetings-events/topics/market-surveillance-committee

general issues and specific proposals for congestion revenue reallocation during the EDAM transition period have been discussed with staff and stakeholders.

The opinion is organized as follows. Section 2 gives a brief overview of general goals of allocating congestion revenues, and identifies four issues that arise in considering Year 1 and Year 2 proposals to manage parallel flow congestion revenues in EDAM consistent with those goals. Section 3 presents analyses of each of those four issues in turn in Sections 3.1-3.4, respectively. Finally, Section 4 offers conclusions, four of which we briefly summarize now:

- We believe that a well designed and implemented EDAM has the potential to bring large economic benefits in the form of more cost-effective dispatch across the West, as we described in our Jan. 2023 EDAM opinion (op. cit.). Moreover, the EDAM design necessarily has a number of unique elements that have not been tested in other markets. It is therefore important for the market to go live sooner rather than later so the process of adjustment and refinement of the market design and operating practices can begin. Nevertheless, the CAISO should not initiate EDAM market operations with known and potentially material problems for which it has not developed a resolution.
- However, we have significant reservations about the Year 1 congestion cost allocation approach described in the Final Proposal, especially about incentives it will likely provide to self-schedule. These incentives potentially reduce the benefits of coordinating unit commitment and dispatch across multiple balancing areas that EDAM is intended to provide and potentially result in material unintended cost shifts. The potential negative consequences we describe may not be material, particularly in Year 1 given the limited scope of EDAM, but we have not seen enough empirical evidence for us to conclude that this will definitely be the case.
- That said, we understand that there are other important considerations regarding the timing of this proposal and EDAM implementation. At the very least, prior to a decision to commence actual EDAM market operations, there are important data and analyses, described below, that are needed to increase confidence that negative consequences would not be substantial.[7]
- The RDFP and FP describe a possible expansion of recovery of parallel flow congestion costs that could be considered for implementation in Year 2 to include schedules resulting from flexibly bid units, but still linked to registered transmission rights. This expansion may reduce the incentive to self-schedule in some circumstances but will, in our opinion, incent more below-cost offers. Therefore, this alternative shares some of the incentive problems of the Year 1 proposal. We have even more significant concerns about this proposed Year 2 direction. However, we have been told this alternative is not being considered for approval by the Boards at this time, but is to be considered

[7] Such analysis should include quantification of the risks of distortion of dispatch and market prices that could arise from self-scheduling incentives created by proposed Year 1 management of congestion costs arising from parallel flows. In particular, the ability of some EDAM participants to self-schedule and exercise firm PTP and NITS transmission rights under the proposal can reduce the net congestion costs paid for by their BAA to other BAAs as a result of loop-flows arising from such self-scheduling, and potentially result in market inefficiencies and unintended cost shifts. It is also important to assess ahead of time under what conditions recourse actions might need to be triggered to prevent or limit operational or market problems.

alongside other alternatives to modify the Year 1 loop-flow congestion cost allocation design that the Boards are to decide upon in June 2025. We believe the time spent after Year 1 towards modifying congestion cost recovery would be best utilized focusing on alternative frameworks. Later in this Opinion, we describe one such framework, structured around the concept of financial flowgate rights.

2. Goals and Issues of Concern

An ideal congestion allocation design would have several properties. Compromises may be necessary to balance achieving all of the goals, but these goals should be understood and broadly accepted by stakeholders. In evaluating alternative market designs, tradeoffs among the goals should be quantified and carefully considered.

A. *Promote economically efficient and reliable operations* by providing incentives consistent with resource participation in the day-ahead and real-time dispatch and supporting offers that are cost-reflective, rather than incenting self-scheduling and distorting bidding incentives. This applies especially to resources that could be dispatched either up or down up or down to manage transmission congestion.
B. Facilitate *provision of valued congestion hedges* while ensuring full funding and revenue adequacy, thereby *avoiding uplifts and or payoff adjustments* that erode hedging value. These objectives are generally furthered by providing hedges that are reasonably consistent with the transfer capability of the transmission grid.
C. Enable balancing areas to *preserve the rough overall benefit of the bargain* for the parties to existing transmission contracts, and *avoid undue cost shifts* among market participants.

In our analysis of alternative approaches to allocation of congestion costs associated with parallel flows, we have identified four sets of major issues and design choices that could affect the ability of EDAM to achieve the above objectives. We address each set separately in subsections 3.1-3.4 in Section 3, below. These issues include:

1. Incentives to self-schedule and distort resource bids. This affects the ability to achieve Goal A, short-term market efficiency and reliability.
2. Uncapped exposure to congestion cost shifts, which impacts Goal C concerning distribution of benefits and avoiding cost shifting.
3. Asymmetric impacts of congestion cost reallocations, which is of concern in achieving Goal C.
4. Impacts on CAISO CRR settlements. This is relevant to Goals B and C, especially the hedging value of those CRRs in the face of EDAM nodal prices that will reflect congestion external to the CAISO BAA.

The Year 1 design creates incentives for resources to self-schedule in order to receive the congestion rebate. Other ISOs use financial rights designs to hedge congestion to avoid similar self-scheduling and below-cost bidding incentives. We recommend that the CAISO seek to transition to financial congestion hedges for future years. How material these self-scheduling

incentives and impacts will be during near-term Year 1 EDAM operations with PacifiCorp is uncertain.

These impacts will be impacted by empirical factors that CAISO should seek to assess in the coming months such as:

- The number of hours over the quarter with material and predictable congestion charges on external constraints impacted by firm transmission schedules;
- Whether the hours with material congestion charges on external constraints would largely be hours in which transmission limits between PacifiCorp East and West[8] would be binding, with the consequence that self-scheduling of PacifiCorp generation could only impact PacifiCorp prices, and not the level of flows on external constraints;
- How material self-schedules could or would potentially impact the MW amount of EDAM cleared schedules and flow impacts on constraints in other balancing areas;
- The likely magnitude of the impact of increased prevailing flows due to self-scheduling on congestion charges and market prices relative to WEIM experience; and
- The degree to which the design would likely cause the output of additional resources to be self-scheduled, or would likely largely result in resources that would be self-scheduled in any case being designated with the CRN tag.

These impacts will be impacted by empirical factors such as how often these incentives would exist, how much they could or would potentially impact the MW amounts of EDAM schedules and flow impacts on constraints in other balancing areas, and the magnitude of the impact upon market prices of schedule changes resulting from self-scheduling. These are all questions to which we do not have answers. We recommend that the CAISO seek to answer these questions in coming months, not after go-live, and take them into account in assessing whether there is a need to adjust elements of the FP design in some manner prior to go-live.

With respect to potential cost shifts from the differential treatment of counterflow and prevailing flow schedules, questions to assess in coming months would include:

- What is the amount of monthly and long-term firm transmission service sold by PacifiCorp sinking in locations that have historically provided counterflow to the impact of PacifiCorp E to PacifiCorp W schedules on CAISO constraints materially impacted by PacifiCorp prevailing flows?
- How many hours during a typical quarter would these counterflow schedules receive payments for flows on CAISO constraints materially impacted by PacifiCorp prevailing flows?

For initial operation, this issue only concerns PacifiCorp counterflows because there will not be any congestion rebates on the dispatch of CAISO balancing area generation to meet CAISO balancing area load. Hence, the issue involves a very limited number of constraints internal to the CAISO balancing area that are materially impacted by PacifiCorp E to PacifiCorp W

[8] Note: for brevity we henceforth refer to those subareas as PacifiCorp E and W.

schedules, so it appears to us that it would be workable for the CAISO to make this assessment in coming months and determine whether there are any concerns that need to be addressed prior to go-live.

A separate issue with respect to counterflow pricing that we discuss below is the potential for firm transmission customers to attach CRN tags to offsetting generation schedules that result in counterflow payments with no charges for prevailing flows. We believe the CAISO should develop clear rules addressing this type of behavior prior to go-live and not simply rely on general manipulation standards that might or might not be found to be applicable. This clarity would also enable use of the proposed design for legitimate hedging of congestion costs.

A third concern is the potential for EDAM schedules of California ISO balancing area generation to meet California ISO balancing area load to incur large congestion charges on flow impacts on PacifiCorp constraints on which the CAISO balancing area would not be entitled to a rebate under the FP design. As discussed in detail below, our review of the WEIM congestion component data published by the California ISO Department of Market Monitoring leads us to conclude that these impacts should be zero or at least extremely small for the initial EDAM footprint. However, because there is a potential for materially increased shadow prices on constraints in PacifiCorp E as a result of the congestion rebate design for PacifiCorp, we think it is important that in the coming months the CAISO confirm that under the EDAM model and reference bus, a combination of CAISO generation located in the southern portion of the CAISO balancing area and load in the northern portion of the CAISO balancing area would have a shift factor on the PacifiCorp E constraints that would be truncated to zero or have a very small difference.

It is quite possible that a little empirical analysis will support a clear conclusion that none of these issues are likely to be material in which case nothing needs to be done and EDAM participants will not have to focus attention on trying to plan for adverse impacts. However, if empirical analysis suggests that some of these issues could have material impacts, the CAISO would have time to make minor adjustments to reduce adverse impacts--rather than trying to address possible issues after go-live, at which time there will likely be other unforeseen issues that will need CAISO attention.

3. Issue Analysis and Recommendations

3.1 "Use It Or Lose It" Incentives for Self-Scheduling

In this section, we first discuss the incentives of the DFP and FP for uneconomic but financially profitable self-scheduling, and the factors that will influence the size of any inefficiencies that result (Section 3.1.1). We then discussion how those economically undesirable incentives would be eliminated in a financial congestion revenue rights system (Section 3.1.2).

3.1.1 Incentives under the Proposals

The first of the goals we articulated above (Goal A) was to incentivize efficient resource participation in both the day-ahead and real-time markets. Under the original EDAM proposal for congestion cost allocation, congestion costs collected through each BAA's LMPs would be distributed to the BAAs whose transmission bore the impact of the congestion. In this way the external cost of imposing congestion on a neighboring BAA would be captured in the LMPs and an efficient pricing signal would be provided to each resource at its location.

The FP dilutes, and may eliminate, this congestion price signal by making the recovery of congestion charges on constraints in other balancing areas contingent on the use of monthly or longer term firm transmission rights to incur these congestion changes. Even more concerning to us is that the FP limits, at least in the first year, this reallocation of congestion costs to resources that (a) self-schedule their transaction in the EDAM[9] and (b) link that schedule to a registered transmission contract (CRN). In other words, firm transmission customers that rigidly self-schedule their resources in the day-ahead market can recover the external congestion costs of those schedules, while units that bid flexibly would not be eligible for this treatment if they are dispatched to meet load. This creates an obvious potential bias toward self-scheduling that not only limits the ability of the EDAM market engine to economically dispatch EDAM resources but could lock in transactions that are privately profitable only because they are linked to the congestion cost recovery.

For example, consider a resource with a cost of $35/MWh located in a balancing area in which the LMP prices are $20. If a second balancing area has a price of $50/MWh, the congestion cost between the $20 and $50 areas would be $30, and would not support operation of a resource with a $35 offer price in the spot market when the clearing price at its location is $20. But that $35 resource would find it economic to self-schedule its operation and exports to the second area if the resource had use-it-or-lose-it firm transmission rights that rebate all congestion costs, contingent on the resource being self-scheduled. This would be the case even if the self-scheduling of the resource caused the price at its location to drop to zero or below, because the congestion charges would be returned to it in the rebate, if its $20 competitors did not have such rights. In that case, the cost of meeting load with the resource with a cost of $35 would be $35, as opposed to a situation in which the resource participated in the economic dispatch, in which case it would be dispatched down and the firm transmission customers would have to buy power at a cost of $50. If many market participants have such incentives, the LMP price in the constrained-down region could be materially depressed relative to the actual cost of meeting load.

The current Base Schedule WEIM design does not create such self-scheduling incentives because resources do not need to self-schedule to follow base schedules in order to receive a congestion hedge. Base schedules in WEIM provide a financial flow entitlement on constraints in other balancing areas. The FP design is therefore a step backward from this perspective. On

[9] We recognize that some entities may initially self-schedule transactions in EDAM after go-live until they have confidence that the market is operating as intended, but our concerns go to a continuing and possibly increasing incentive to self-schedule resources as a result of the incentives created by the congestion allocation design.

the other hand, unlike the FP, the WEIM design may provide a congestion hedge to some base schedules that are supported by non-firm or short-term rights.

Moreover, while one might read the discussion of wheel-through and export transactions in the FP[10] to indicate that these transactions could be self-scheduled as in the WEIM, while allowing balancing area resources to be dispatched economically in EDAM, we understand now that this is not what is proposed in the RDFP. Instead, not only the export or wheel-through schedule must be self-scheduled in the EDAM, but the resources located in EDAM supporting these schedules must also be self-scheduled in EDAM in order to receive the congestion hedge. That is not the case in the WEIM, as, for example, there can be an export schedule whose supporting resources are dispatched down in RTPD and replaced with WEIM transfers. Indeed, there has been much discussion in the past of the potential for CAISO exports to be supported by WEIM transfer imports in real-time in the context of the resource sufficiency evaluation. This is the case more generally in the WEIM, and balancing area base schedule exports could supported in the base schedule by generation resources that are dispatched down in the real-time dispatch (FMM and RTD) with the export schedules actually supported by WEIM transfer imports. The FP design is a step backward in this respect as well.

The adverse impact of these self-scheduling incentives are likely to be confined to market inefficiencies in the EDAM day-ahead market, as under the FP design these resources would not be required to self-schedule in the WEIM real-time market in order to receive the congestion rebate. This absence of a self-scheduling requirement (or incentive) in real-time is a desirable feature that we support, as it should reduce the potential reliability problems that could arise in real-time from self-scheduling.

Beyond Year 2, the DFP and FP suggest the possibility of expanding the congestion recovery treatment from balanced self-schedules to balanced schedules of resources that bid flexibly. While this would eliminate the *requirement* to self-schedule, it would not eliminate or perhaps even reduce the *incentive* to self-schedule to support schedules that are expected to incur congestion charges in the day-ahead market. Moreover, it would expand the set of resources exposed to the self-scheduling and below-cost bidding incentives created by linking congestion cost recovery to the dispatch (and hence offer prices) of resources. The efficiency implications will depend upon how individual unit costs correlate with the parallel flow impacts. As noted above, these Year 2 design options are not a formal proposal that the Boards are being asked to consider or approve at this time, but we are concerned that in our view the CAISO's vision for the future does not address our concerns but instead would likely make the issues worse.

The concern with this approach would be that a $30/MWh unit that has such rights might create $10/MWh in (recovered) congestion cost in meeting load but still might be financially attractive to be dispatched to meet a load obligation instead of using a $25/MWh resource without such rights. From a system efficiency standpoint, the $25/MWh unit would meet load at a lower cost, but from the private perspective of an owner of the $30/MWh unit with firm transmission service, self-scheduling the more costly unit would actually be more profitable because the

[10] California ISO, Final Proposal p. 19.

owner would be rebated the congestion cost, reducing its net cost to $20/MWh. If below-cost bidding and self-scheduling by others drove the price at its location down to zero, and the congestion charge up to $40, it would still be economic for the resource to bid below the clearing price at its location in order to be scheduled. If being dispatched only entitled the resource to a congestion rebate on some constraints, the below cost bidding incentive would be limited. But with PacifiCorp also tying the rebate of internal BAA congestion charges to self-scheduling or dispatch, there would be an incentive to submit price-taking bids as long as the price at the sink of the transaction was higher than the cost of the resource being bid low or self-scheduled as a result of transmission congestion.

It is important to recognize that replacement of economic offers with self-schedules will not only reduce dispatch flexibility, it will likely increase congestion costs relative to those observed in the WEIM. This increase in congestion charges has the potential to incent even more self-scheduling and magnify the cost impacts on BAAs that are not able to self-schedule their generation, prefer to participate in the economic dispatch, or lack capabilities to reliably predict congestion patterns. This could result in a positive feedback loop in which increased self-scheduling worsens congestion, which in turn increases incentives to self-schedule, further exacerbating the problem. If congestion costs significantly increase for this reason, the benefits of more efficient EDAM dispatch will be less apparent, perhaps jeopardizing the success of EDAM.

While it is easy to identify the incentive problems with the Year 1 proposal, it is more difficult to quantify just how severe an impact these adverse incentives could have. We are not aware of a comprehensive attempt to quantify the potential magnitudes of these problems, although such a task is not unreasonably burdensome.

The materiality of the impact of these incentives will depend upon several factors.

a) The quantity of transmission rights potentially eligible for congestion cost recovery (CCR) because it has an eligible contract reference number (CRN).
b) The magnitude of parallel flows created by the transactions enabled by those rights (i.e., shift factors).
c) The costs of relieving the congestion created (or relieved) by parallel flows (i.e., shadow prices on constrained lines).
d) The amount of generation that would be self-scheduled absent the incentives created by the congestion allocation design (e.g., resource minimum load blocks, run of river hydro, intermittent resource output and low cost thermal generation).
e) The frequency of material congestion charges on parallel constraints. In the near term, we refer specifically to the number of hours in which PacifiCorp E generation has a material impact on binding CAISO constraints when dispatched to meet PacifiCorp W load, and vice versa.
f) The frequency with which inter-balancing area constraints between PacifiCorp E and W would be binding in hours in which the incentive to self-schedule exists. If this constraint would be binding absent the self-schedules, the self-schedules would not

change the level of exports and should have only minor impacts on the level of flows on CAISO constraints.[11]

g) The sinks of firm transmission rights sourcing in PacifiCorp E held by entities other than PacifiCorp.

We elaborate on the importance of these factors in Sections 3.1.1a-g below.

3.1.1a. Transmission Right Quantities. With regards to the first factor, the quantity of transmission rights, the FP reports values for firm PTP and NITS long-term rights outstanding as of 2024 in PacifiCorp territory. The RDFP reports that PacifiCorp Merchant controls 1955 MW of PTP rights and other transmission customers control 1654 MW. By contrast the RDFP suggests that 95% of the roughly19,000 MW of NITS rights are held by PacifiCorp Merchant.[12]

We are not sure of the significance of the NITS calculations. The 19,000 MW figure is based largely on the amount of PacifiCorp resource capacity, not PacifiCorp load. Its current resource plan indicates a peak load forecast of only 11,300 MW for 2025.[13] Moreover, the comments of The Energy Authority leave us unsure of the meaningfulness of the CAISO figures for NITS service held by entities other than PacifiCorp.[14]

The quantity magnitude of the self-scheduling problem, therefore, depends in part upon how PacifiCorp Merchant will utilize its firm transmission rights when serving PacifiCorp customers. If these ownership shares are reflective of the situation in other future EDAM BAAs, a similar observation applies to those BAAs.

A key limitation of the transmission quantity data described by the CAISO is that this information does not provide any insight into the magnitude of the potential impacts of these schedules on CAISO constraints.

3.1.2b. Parallel Flow Impacts. The most readily available piece of information relating to the question of impacts is the magnitude of parallel flow created by various transactions. The full network model's "shift factors" specify the amount of flow over a given transmission path that is created by an injection or withdrawal at a given location. It would be helpful to see the shift factors of major PacifiCorp generating units or generation locations relative to PacifiCorp W load on significant CAISO transmission constraints such as 6110 COI S-N, 6110 COI N-S, 30040 Tesla 500 30050 LOSBANOS 500 BR 1 1; 30055Gates 500 30060 MIDWAY 500 BR 1

[11] Self-scheduling of particular resources could potentially change the dispatch within PacifiCorp E and this could result in scheduling generators with different shift factors on CAISO constraints but this would be a second or higher order impact and should not be a concern.

[12] See California ISO, Final Proposal, pp. 19-21

[13] See PacificCorp 2025 Integrated Resource Plan (Draft) Volume I - December 21, 2024, Table 6.1

[14] See Comments of The Energy Authority, June 2, 2025, Note 4.

1, 30050 LOSBANOS 500 30055Gates1 500 BR 1 2, 6410 CP1 NG, and ML RM12 NS.[15] We are not aware of such data being made available.

We suspect that for most BAAs it will be the case that internal transactions, where the injection and withdrawal are contained within that BAA, would not impose large amounts of parallel flow on constraints located in the CAISO. It is our understanding that transactions between PacifiCorp E and W would be covered by PacifiCorp NITS service, while historical congestion component data from WEIM indicates that these transactions would materially impact a number of constraints in the CAISO when there is south-to-north congestion in the CAISO and WECC. However, sending power from Idaho to western Oregon could have some non-trivial impacts on constraints located in other balancing areas.

Another type of flow data that would provide important insights into the impact of self-scheduling incentives would be the historical flow impact of PacifiCorp balancing area base schedules on internal CAISO constraints. We think this is very important for the CAISO to examine in combination with actual flow impacts because in the WEIM design, base schedules provide a financial hedge for congestion and do not incent self-scheduling. Hence, actual PacifiCorp induced real-time flows on internal CAISO constraints in the WEIM dispatch could be much lower than base schedule flows and also well below flows in EDAM if resources were self-scheduled to follow base schedules.

If actual real-time PacifiCorp flows on CAISO constraints are materially lower than base schedule flows, because the PacifiCorp resources respond to dispatch instructions, there is a potential for much larger flow impacts on CAISO balancing area constraints under EDAM with the self-scheduling incentives created by the CAISO design. Higher price-taking flows could also increase congestion charges, providing stronger incentives for self-scheduling, potentially creating the feedback loop of increasing self-scheduling we hypothesized above.

3.1.3c. Transmission Shadow Prices and Congestion Components. The CAISO Department of Market Monitoring provides information on the most significantly congested transmission paths in the EIM footprint in its quarterly market reports. The DMM reports the quarterly impact of congestion from specific transmission constraints on overall LMPs in the CAISO and EIM balancing areas in the fifteen minute market (FMM). These data are quarterly averages and therefore may understate the magnitude of the self-scheduling incentives and the number of hours in which these incentives would exist. Moreover, these are BAA level data, so the reported congestion components might be inaccurate for resources at particular locations, particularly resources that are modeled as within a particular BAA but are electrically distant.

From these tables, it is clear that in the first quarter of 2024, when extreme prices were experienced in the Pacific Northwest, several internal CAISO constraints such as COI S-N and Tesla/Los Banos increased prices in the Pacific Northwest relative to the prices in PacifiCorp E by an average of around $11/MWh over the quarter. These values stem from the product of a

[15] Note that the net effect upon flow through a transmission element of a balanced schedule in the linearized DC load flow model is the difference between injection node's and withdrawal node's shift factors. A single node's shift factor by itself is not useful to calculate parallel flow impacts.

shift factor (contribution of a schedule to flow over a line) and the constraint's shadow price (congestion cost of flow over the line). The shadow prices on these binding south-to-north constraints were very large during many hours during January 2024, so even relatively modest shift factors created economically significant impacts, which in general would be increased prices in PacifiCorp W as well as potentially decreased prices in PacifiCorp E.

These Quarter 1 (Q1) 2024 results are idiosyncratic in the sense that these average impacts were several times larger than other quarters. However, as discussed below in Section 3.3.2, there were material impacts of PacifiCorp E generation dispatched to meet PacifiCorp W load in some other quarters. These values again represent overall averages and we suspect that the south-to-north flow and congestion may be correlated with solar production in California and Arizona, meaning that the actual south-to-north congestion costs may be higher once possibly offsetting evening hour north to south congestion charges are netted out.

Another factor in assessing the materiality of these congestion costs in EDAM is that the WEIM data reflect the dispatch of generation that is exposed to congestion charges at the margin. That generation is therefore incented to participate in the economic dispatch and be dispatched down when congestion charges rise, such that prices fall at the generation source and rise at the load. Congestion charges could be much larger if generation in PacifiCorp E is incented to self-schedule when transmission congestion is expected under the proposed CAISO DFP design.

3.1.3d. Normal Self-scheduled Generation. The concern with the incentives to self-schedule generation associated with the congestion rebate design is that the self-scheduling incentive would cause dispatchable generation to be self-scheduled. There would be no reduction in efficiency if the resources self-scheduled with a CRN tag would have been self-scheduled in any case, such as the minimum load blocks of one-line generation, price-taking intermittent resource output, or price-taking run-of-river hydro. We note this caveat but we also observe that there is no data on the amount of generation in PacifiCorp E or W that would be self-scheduled in any case, and no data on where that generation is located with respect to constraints within PacifiCorp E or the CAISO.

Hence, this might be a reason that the self-scheduling incentives created by the FP might have less impact on market efficiency than would otherwise be the case, but we do not know how material this consideration might be.

3.1.3e. Frequency of Material Congestion On Parallel Constraints. If there is only material congestion on parallel flow constraints during, say, 50 or 60 hours a year when the congestion is clearly predictable, then the impact of the self-scheduling incentives on the efficiency of the EDAM market would be limited to those few hours. However, the CAISO has not compiled any hour-by-hour data on congestion charges that would enable us to assess whether the impact of these incentives would be so limited. If there is material south-to-north congestion between PacifiCorp E and W during most of the high solar hours over the year, than the self-scheduling incentive could impact market efficiency in a large number of hours.

There is a hope expressed at times that the impact of self-scheduling incentive due to the FP design would be limited in time, but no data has been compiled and published in this stakeholder

process that either supports or contradicts such a prediction. If there was a lot of self-scheduling of generation that otherwise would be dispatched down in favor of low cost solar output in the CAISO BAA or the Southeast during the high solar hours, this could result in materially lower prices in the CAISO BAA and Southwest for that solar output as well as inefficient dispatch of other resources. Because no data has been compiled from relevant experience or simulations, we do not know how this would play out. We do not think it is enough to monitor how this plays out after go-live, the CAISO's options to deal with the issues would be very limited at that point unless contingency plans have been made that recognize what problems might arise. We recommend that the CAISO use the next 6 months or to assess whether any of these possibilities have the potential to be serious issues and prepare to address those issues in case they are serious.

3.1.3f, The Frequency with which Inter-balancing Area Constraints between PacifiCorp E and Would be Binding in Hours in which the Incentive to Self-schedule Exists. The self-scheduling of PacifiCorp E generation when there is south-to-north congestion would have minimal impacts on CAISO constraints if constraints on PacifiCorp E to W transfers are typically binding in the periods when there is south-to-north congestion in the CAISO. We do not have any data showing that is the case, but this could be determined.

3.1.3g. The Sinks of Firm Transmission Rights Sourcing in PacifiCorp E Held by Entities other than PacifiCorp. We know that there are flows of power from PacifiCorp E to PacifiCorp W that would create prevailing flows on CAISO constraints when there is south to north congestion in the CAISO. However, we know nothing about the sinks of PTP transmission service held by other entities and hence cannot assess the extent to which self-scheduling by those entities would increase prevailing flows on CAISO constraints, or alternatively have no impact or even might create increase counterflows. The more entities other than PacifiCorp that have transmission rights whose use would create prevailing flows on CAISO constraints, the more potential there is for a cycle of increasing self-scheduling over time potentially driven by increasing congestion charges on CAISO constraints.

3.1.2 Contrast to Incentives under Congestion Revenue Rights

This discussion of the negative incentive impacts of the FP highlights a key advantage of financial transmission rights (or congestion revenue rights). The transition from physical to financial transmission rights has been one of the core aspects of electricity market reforms over the last 30 years. One key difference between the two types of rights is that the payments associated with financial rights are not linked to the bidding or scheduling behavior of their owners, whereas physical rights possess "use it or lose it" characteristics. Typically, the value of physical transmission rights can only be realized if tied to a schedule to deliver the power from one location to another. This feature can introduce distorted incentives in a market based on economic dispatch, because the value of the physical transmission right will not be realized under the use-it-or-lose-it rules of physical rights if the generation schedule is dispatched down. Resources that would otherwise not be economic to operate might become so (from the perspective of its owner) if their operation is bundled with the congestion value of a transmission right.

While the security constrained economic dispatch of generation can bring large efficiency benefits, these benefits can only be realized if participants make their resources available through cost-reflective offers. Without flexible bidding, there is little scope over which the market software can optimize. The incentive distortions go beyond an incentive to self-schedule, however. Any system that makes congestion payments contingent on the operation of specific resources will distort the bidding incentives of those resources.

Just as physical transmission rights can make a resource owner numb to the negative congestion costs it might create, they also dilute the incentive to provide counter-flow. The right to ship power from point A to point B "for free" is not valuable if that the congestion cost of this shipment is negative, and therefore "free" undervalues the payment that is otherwise deserved for providing counter-flow.

At a high level then, the attempt to accommodate and even potentially expand the use of physical transmission rights is an overarching concern with all the CAISO proposals that have emerged from this process. For many of the EDAM entities, these distortions may not be highly material to the extent that the bulk of the local resources are used to serve local load and their dispatch has no significant flow impact on transmission constraints in other balancing areas.

Given this, we believe that for the EDAM congestion revenues allocation system to be durable and beneficial in the long-run, it will need to break the direct link between the division of congestion revenues and the bidding (or scheduling) behavior of individual resources. Most large ISOs have accomplished this by adopting congestion revenue rights (also known as financial transmission rights). We believe this is likely to be the best long-run option for EDAM. However, it may be possible to that a model using OATT based transmission rights could be sustainable, as long as the use of those rights does not impose a direct endogenous shift in congestion revenue from other BAAs.

3.2. Uncapped Exposure of BAAs to Congestion Parallel Flows

The lack of any cap on either unpriced constraint flows --or their resulting congestion cost transfers among BAAs--on parallel paths under the DFP and FP congestion rent allocation design may increase the level of uncompensated flows over binding transmission constraints for balancing areas participating in EDAM and thereby increase the cost of meeting balancing area load. We can think of at least three reasons why this might happen.

1. One possible reason for an increase in unpriced flows is that all of the possible firm transmission schedules entitled to not paying congestion charges on EDAM constraints might not be simultaneously feasible in combination with balancing area use of network service to meet balancing area load.

   This possibility exists in the WEIM today. As the CAISO has noted,[16] the DFP and FP exemption from congestion charges on flows on transmission constraints in other balancing areas should be more limited than the current exemption applicable to base

[16] California ISO, Final Proposal, pp. 3, 17.

schedules. This element of the DFP/FP design should tend to result in smaller amounts of uncompensated flows over binding balancing area transmission constraints under the EDAM design than under the current WEIM design.

However, there is a major uncertainty regarding impacts upon EDAM schedules because of the lack of analysis of historical data by the CAISO. The base schedules in WEIM are financial congestion hedges, and generation in base schedules is often not self-scheduled in the FMM or RTD. Hence, the actual flow impacts on constraints in other balancing areas in FMM and RTD may be much lower than the impact of the base schedules would have been because WEIM resources would be dispatched down below their base schedule when there was substantial congestion.

This would not be the case in EDAM if there is an incentive to self-schedule resources in order to receive a congestion rebate. Hence if the same resources and interchange schedules were submitted as self-schedules in EDAM as were submitted as WEIM base schedules, there could be much larger flows on constraints in other balancing areas and much higher congestion than is the case in WEIM. These potential impacts could be evaluated by examining the extent to which the impact of PacifiCorp base schedules on CAISO constraints exceeded the impact of the actual PacifiCorp dispatch, or alternatively calculating the flow impact of the change in resource schedules. As noted above, self-scheduling by some market participants would tend to increase congestion charges and possibly induce a vicious cycle of increasing self-scheduling by increasing the economic incentive of other market participants to self-schedule. If a material incentive to self-schedule exists in many hours over the year, the impact of the proposed design on balancing areas with constraints affected by parallel flows could be larger than the CAISO discussion anticipates.

2. A second, long run concern with the DFP and FP congestion charge rebate design with respect to the level of unpriced flows over binding transmission constraints is that these designs insulate participating BAAs from the congestion charges associated with locating new resources where they create material flows on already binding transmission constraints in other balancing areas. This will not be a Year 1 or likely Year 2 EDAM issue, but it is a long run concern with this design.

3. A third and potentially much more important reason for expecting greater BAA exposure to uncompensated flows over binding transmission constraints under the DFP and FP is that these designs would pay for counter-flow firm transmission schedules that do not use a CRN for scheduling, while not charging for prevailing flow transactions that use a CRN. This is not the case with WEIM base schedules, as prevailing and counter-flow flow congestion are treated symmetrically: base schedule prevailing flows are not charged for congestion nor are base schedule counter-flows paid for relieving congestion. This change in the EDAM design in the DFP and FP to pay for counter-flow provided by firm transmission customers that do not use a CRN, while not charging for prevailing flows by firm transmission customers that use a CRN, could have major impacts on the level of uncompensated flows over the constraints of some BAAs.

There are several ways that the change in the treatment of counter-flow could impact the level of uncompensated flows.

1. First, suppose there is a net firm transmission schedule of 1000 MW from balancing area A to B that creates 50 MW of prevailing flow on a constraint in BAA C. If A has 1000 MW of load and 2500 MW of generation, under the DFP and FP there could be, for instance, 2000 MW of prevailing flow firm transmission schedules out of balancing area A to balancing area B that use a CRN, while at the same time there are 1000 MW of counter-flow schedules from balancing area B to A that create counter-flow on the external constraints and do not use a CRN (because the schedules would be paid for providing counter-flows). The net flows would still be 1000 MW but the unpriced flows over the constraint would rise from 50 to 100 MW.[17]

   If the same entity scheduled the counter-flow and prevailing flow the CAISO could perhaps address this outcome with rules that net the prevailing PTP flow and counter-flow regardless of the CRN designation.[18] However, no such rules have been proposed to date, in fact the DFP design explicitly does not net flows with and without a CRN. The DMM has discussed its view of such scheduling in its comments.[19] We think there should be explicit rules to address the selective use of CRN scheduling within an hour. While the FP correctly notes that some of these types of actions might violate FERC manipulation rules and the ISO tariff, we recommend that the CAISO develop specific rules that can be reviewed by FERC so there is more certainty that these issues will be addressed while enabling the intended use of CRN tagging to hedge congestion.

   Moreover, such a netting approach to limiting the impact of offsetting EDAM schedules would not be very workable if the prevailing flow and counter-flow transactions involved different entities.

2. Another way that the treatment of counter-flow in the FP could increase the level of unpaid flows over binding constraints is by some firm transmission schedules creating prevailing flows over binding transmission constraints in other balancing areas while at the same time other schedules create counter-flows. For example, as Salt River Project (SRP) noted in its April 7 comments, it had procured firm transmission service to wheel power through PacifiCorp E to SRP's load.[20] While we do not know the exact location of source generator, the CAISO congestion component data published by DMM indicate that PacifiCorp E to PacifiCorp W transaction schedules would on average have paid around $11.25/MWh in congestion charge for impacts on CAISO constraints during Q1

[17] We believe this is the same concern DMM expressed in their comments.

[18] Another outcome might be that the seller does not submit PTP counter-flow schedules, but simply offers its generation in the constrained up area into the EDAM dispatch, knowing it will be dispatched. However, we assume that to pass the EDAM self-sufficiency test, the resource owners would need to use PTP transmission to meet the resource sufficiency test for BAA A.

[19] See DMM comments, June 2, 2025.

[20] See Salt River Project comments, April 7, 2025 item 2.

2024 because of the large south-to-north congestion during January 2024.[21] Meanwhile, at the same time, a PacifiCorp E to Salt River Project transaction was paid nothing for providing counter-flow in the WEIM, but would have been paid $11.75/MWh for counter-flow on CAISO constraints under the FP design.[22]

3. A third example type of potential cost shifts due to the differing treatment by the DFP and FP of prevailing flow and counter-flow transactions involves firm transmission schedules that are prevailing flow or provide counter-flow at different times of year or day. For example, CAISO congestion component data published by DMM show that PacifiCorp E to PacifiCorp W transmission schedules on average provide counter-flow during the 3rd quarter of the year when there is North to South congestion but often would create prevailing flows in other periods.[23] Under the DFP and FP, PacifiCorp could submit CRN schedules during the hours when it expects it PacifiCorp E to PacifiCorp W schedules to incur congestion charges, and not submit a CRN in the hours when they expect their schedules to provide counter-flow. This would tend to increase the level of shortfall in congestion charges in other balancing areas over these constraints over the year. The CAISO congestion component data published as quarterly averages by DMM may materially understate the potential shortfall in congestion charges from the different treatment of prevailing and counter-flows because there are likely offsetting flows within many quarters, with south-to-north congestion during the day when there is high solar output in California and the Southwest, while north-to-south congestion occurs after the sunset. If this is the case, the potential shortfall in congestion charges on CAISO constraints in EDAM relative to the WEIM could be much larger than indicated by the average quarterly data. Because the CAISO has not tabulated congestion components on impacted constraints by hour of the day, we do not have a basis for assessing how large these impacts might be.

Hence, absent some change in the FP design or rules, there is a potential for increased uncompensated flows on balancing area binding transmission constraints under the FP design. This could be a result of the differential treatment of prevailing flows and counterflows for congestion charges. To be clear, this differential treatment is largely a matter of cost shifts, not market efficiency impacts. Moreover, we do not propose an alternative treatment of counterflow schedules. Within a design that bases congestion rebates on schedules, alternative rules for counterflow would also introduce complications and would have more potential for unintended consequences that might impact reliability as well as market efficiency and cost shifts.

As discussed in Section 3.3 below, the dispatch of generation in northern California to meet CAISO load in southern California, or vice versa, does not appear to impact transmission

[21] See California ISO, Department of Market Monitoring (DMM), Q1 2024 Report on Market Issues and Performance, Table 1.4. Note, for brevity, we will cite DMM reports on market issues and performance below simply as "DMM Q*n y*", with "*n*" being the quarter number and "*y*" being the year.

[22] Ibid., Table 1.4

[23] See discussion in Section 3.3.2 below.

constraints in PacifiCorp. As a result, PacifiCorp should not be materially impacted by this FP change relative to the WEIM, but it could have a material impact on the CAISO.

PG&E and SDG&E have noted that these congestion rebates are related to the revenue adequacy of CRRs. While the CAISO has promised to work on better modeling of parallel flows in the CRR auctions,[24] this will not be simple. The CAISO has been modeling parallel flows in the IFM for a number of years, but they are not accurately reflected in the CRR allocation and auction, this is not going to suddenly become easy. There are two issues:

1. First, there are existing questions about the loop-flow modeling in the IFM and why either loop-flows or TOR and ETC flows on some constraint appear by themselves to exceed the transmission limit. Since these problems have not been resolved since first identified discussed in 2018 period, it is optimistic to assume issues with IFM modeling of these flows will be resolved in the next few months without a substantial and sustained commitment.

2. Second, it is not clear that it will be workable to reflect parallel flows that reverse over the peak hours of the day in CRR allocation and auction modeling because CRR awards do not have sufficient granularity over the day to account for intra-day changes in congestion patterns. This is related to the issues discussed in the June 2, 2025 comments of DC energy and at the March 28, 2025 MSC meeting regarding the temporal definition of CRRs. The on-peak off-peak granularity that was workable when FTRs in PJM, NYISO and MISO were used to hedge the output of nuclear plants, coal plants and baseload hydro is not necessarily workable in the WECC today with congestion patterns driven by solar output levels.

Moreover, the issue is not just CRR revenue adequacy but the degree to which the transfer capability of the CAISO grid is unavailable to be used to meet CAISO load because of loop-flows. One suggestion to partially reduce the incentive to self-schedule and prevent switching back and forth between avoiding prevailing direction congestion charges and receiving counter-flow payments has been to require that a decision to schedule a firm transmission right be in effect for at least a minimum length of time, such as a day or month. However, we do not think it is consistent with the nature of PTP firm transmission service to require that it be scheduled in the same direction over a day, month or year, particularly with the evolving WEIM/EDAM resource mix and varying solar output levels and congestion over the day.

In general, these future and near-term congestion rent shortfall risks associated with offsetting schedules discussed above would not exist with a financial flow entitlement design. This is because the fundamental characteristic of flow entitlements is that they would be fixed, and not impacted by changes in scheduling, thereby eliminating the problematic incentive to self-schedule simply to exercise firm transmission rights in order to reduce payments for parallel flow congestion.

[24] California ISO Final Proposal, pp. 26-27.

On the other hand, there would still be complexities in a financial rights design in arriving at a set of entitlements relating to prevailing flows and counterflows that avoids undue cost shifts.

3.3 Asymmetric Impacts Across BAAs

3.3.1 General points

There are potentially asymmetric impacts of the DFP/ FP design for rebates of parallel flow congestion charges on differently situated balancing areas. In particular, balancing areas that for one reason or another are not able to self-schedule generation to utilize firm transmission rights would not be entitled to any rebates of congestion charges on parallel flows.

One reference point for comparing impacts is the current EIM framework. Stakeholders and the CAISO have pointed out that under the DFP and RDFP there is a potential for an increase in congestion charges on firm transmission usage that has congestion impacts on adjacent balancing areas relative to the WEIM, in the case of BAAs that are unable to self-schedule resources that have flow impacts on constraints located in other balancing areas. We expect that in many cases, balancing areas will be able to designate some resources as self-scheduled to support firm transmission usage simply by self-scheduling the minimum load block of on-line generation, run of river hydro, or low cost incremental generation (including intermittent resource output).

Moreover, for most EDAM BAAs, we expect that the dispatch of a balancing area's generation to meet that area's load will, except in unusual cases, have little if any impact on constraints in distant balancing areas. However, there may be instances of some balancing area resources whose dispatch has a material impact on constraints in adjacent balancing areas. One example is PacifiCorp where generation in PacifiCorp E is dispatched to meet load in PacifiCorp W using network service.

We understand that dynamically scheduled intermittent resources would be able to self-schedule their output into the CAISO and thereby could be entitled to a congestion charge rebate from the balancing areas from which they purchased transmission service for congestion charges for any impact on constraints located in other balancing areas.

3.3.2 Potential impacts on PacifiCorp

We do not have the ability to assess how material these factors would be for PacifiCorp. CAISO data published by the Department of Market Monitoring show that there would have been material congestion charges on PacifiCorp E to W flows on constraints internal to other BAAs (mostly those internal to the CAISO) on average during Q1 2024 as a result of south-to-north congestion. There would have been even larger congestion charges on PacifiCorp E to W parallel flows on constraints in other BAAs (mostly on constraints internal to Arizona Public Service) during Q4 2022 (which included Winter Storm Elliott).[25] Furthermore, there would also

[25] See DMM Q4 2022, March 2023, Table 1.4.

have been large congestion charges during Q4 2023,[26] Q2 2024,[27] and Q4 2024[28] (mostly congestion on internal CAISO constraints). There would have been smaller but positive average quarterly charges on these flows in some other quarters, such as Q1 2023[29] and Q2 2023.[30] In the third quarter, there has tended to be more north-to-south congestion, and these PacifiCorp E to W flows have been counter-flow on average over the quarter Q3 of 2023[31] and 2024.[32]

These data are quarterly averages and likely reflect in some quarters a mixture of days and hours with south-to-north congestion together with days and hours with offsetting north-to-south congestion. The shift to net average south-to-north congestion during the spring quarter in recent years likely reflects the impact of low cost solar exports from California and the Southwest during the high solar hours. PacifiCorp did not necessarily incur congestion charges on a material about of PacifiCorp E generation in all of the hours in which there was south-to-north congestion because exports of California and Southwest solar generation might have depressed prices in PacifiCorp W below the cost of most PacifiCorp in some of these hours. In those hours PacifiCorp would have found it cheaper to meet its PacifiCorp W load with imports than with PacifiCorp E generation.

In any event, under the DFP and FP, PacifiCorp could hedge themselves against these congestion charges by self-scheduling particular resources in PacifiCorp E to meet its PacifiCorp W load when it expects material south-to-north congestion in EDAM. Similarly, entities purchasing long-term firm transmission service from PacifiCorp could hedge themselves against congestion charges by self-scheduling generation using the firm transmission service when they expect transmission congestion to affect prices. This will be a somewhat uncertain hedge because it requires that PacifiCorp and other entities be able to forecast when there will be material transmission congestion in EDAM affecting their schedules. This uncertainty might incline firm transmission customers to more broadly self-schedule and use the CRN tag even when there is not congestion, but uncertain congestion patterns might also discourage use of the CRN tag because of the risk of incurring charges on schedules that unexpectedly turn out to be counterflow in EDAM.

Another asymmetry would be that self-scheduling of thermal resources in the day-ahead market would likely also require self-committing the resources over their minimum run times, which might exceed the period with material congestion. In this circumstance the self-scheduling design might provide a better congestion hedge to market participants with resources that do not have minimum run times, but might also distort the unit commitment over a broader set of hours as a result of self-commitment decisions driven by the congestion allocation rules. Because the CAISO had not provided any data on the time pattern of south-to-north congestion in recent

[26] See DMM Q4 2023, April 2024, Tables B14 and B15.

[27] See DMM Q3 2024, November 2024, Table 1.4.

[28] See DMM Q4 2024, March 2025, Table 4.2.

[29] See DMM Q1 2023, Sept. 2023, Table 1.4.

[30] See DMM Q2 2023, November 2023, Table 1.4.

[31] See DMM Q3 2023, February 2024, Tables B11 and B12.

[32] See DMM Q3 2024, December 2024, Table 4.2.

years, we cannot assess how easy it would be for PacifiCorp and others to predict periods of significant congestion. We have noted above the potential for self-scheduling by individual firm transmission customers to increase the level of congestion charges, which would in turn increase congestion charges for other transmission customers that do not self-schedule and use the CRN tag. These uncertainties and risks would not exist under a design based on financial congestion rights or entitlements of some type. We also do not know if there are enough resources in PacifiCorp E with significant minimum load blocks or other must-run resources that could be self-scheduled to earn the congestion rebate under DFP and FP rules without self-scheduling dispatchable resources.

3.3.3 Impacts on BAAs that cannot self-schedule or have no incentive to do so

One set of such balancing areas that might not be able to self-schedule generation so as to be entitled to congestion rebates could be areas that want to participate in the EDAM dispatch to the extent possible, and at the same time are unable to accurately predict when there would be parallel flow congestion. Another example of such balancing areas might be those that have restrictions on the self-scheduling of resources. A third set of areas would be those in which the entities controlling generation scheduling lack an incentive to self-schedule generation because they would not benefit from the rebate of congestion charges on parallel flows. The CAISO is an example of this type of situation, and will be discussed in detail.

The good news is that the balancing areas that lack the ability or incentive to self-schedule dispatchable generation in EDAM, for whatever reason, would contribute to economic efficiency by reducing the level of self-scheduling of dispatchable resources in EDAM. This would reduce the potential for day-ahead market schedules that are less efficient than WEIM base schedules and help to achieve the greater efficiency made possible by the EDAM design. The bad news, however, is that this otherwise desirable behavior could lead to cost shifts. These BAAs could be impacted by a degree of parallel flows for which they would not be compensated due to the application of the FP cost recovery design to the self-schedules of other balancing areas. Yet these same BAAs could not simultaneously receive rebates of the congestion charges it paid for flows on transmission constraints located in other balancing areas because they did not engage in self-scheduling. Conversely, BAAs that might engage in a non-trivial amount of self-scheduling could enjoy the benefits of this asymmetry.

Moreover, as noted in several connections above, increased self-scheduling of dispatchable resources by some firm transmission customers could increase congestion cost charges borne by other firm transmission customers that do not self-schedule or use the CRN tag. Inflated EDAM congestion changes relative to the FMM (when firm transmission customers need not self-schedule their resources) would tend to reduce participation in the EDAM economic dispatch on days when substantial congestion is expected.

CAISO resources and loads have no incentive to self-schedule, as they are hedged against congestion by their CRR ownership. The CAISO currently is hedged on congestion charges on WEIM transmission constraints by its IFM schedules, which serve as CAISO base schedules for the purpose of calculating congestion charges. However, under the DFP and FP, the CAISO

could potentially be more exposed to congestion charges on constraints in other balancing areas than is the case today with CAISO participation in the WEIM. This is because under EDAM the CAISO would pay congestion charges for the flow impacts of its EDAM schedules on binding constraints in other balancing areas and would not initially be eligible for congestion cost reallocation because its generation would not be self-scheduled. This issue has been raised by a variety of market participants and acknowledged by the CAISO.[33]

In most cases it is unlikely that resources dispatched to meet load within the same balancing area will have material congestion impacts on transmission constraints located in other areas because the difference in congestion components for most balancing area's resources and loads on electrically distant constraints are typically small. However, there may be instances across the EDAM in which these congestion charges would be material.

The CAISO is one such a case because the CAISO balancing is so large. We consider the CAISO case in detail in the next section.

3.3.4 Detailed Analysis of Potential Materiality of CAISO Impacts

As just mentioned, due to the size of the CAISO system, there is a potential for the dispatch of generation in southern California to meet load in northern California or vice versa to have material impacts on transmission constraints in other balancing areas and thereby incur transmission charges when those constraints are binding.[34] However, for reasons discussed above, resources within CAISO balancing area (unlike other EDAM BAAs) will not be able to self-schedule and exercise firm transmission rights that would make the CAISO BAA eligible to receive congestion rebates for any parallel flow congestion that resource incurs in other BAAs.

However, whether this possibility should be a near-term concern depends on how material these congestion charges on external constraints would be.

We have undertaken some further but still preliminary examination of the potential for CAISO effects on flows and congestion costs in other BAAs, which we now describe. We not been provided shift factor data for individual generators or the DLAPs on binding WEIM constraints. However, we have been able to review the 15 minute market congestion component data for California regions on binding constraints in the WEIM over the Q4 2022-Q4 2024 period. In order to assess the potential impact on constraints in other BAAs resulting from CAISO dispatch to meet load in the north with generation in the south (and vice versa), we focus our review on congestion components for non-California constraints arising from schedules between two within-California non-CAISO BAAs: BANC in the north and LADWP in the south.[35] The reason we separately examine the congestion component of prices in northern and southern

[33] California ISO Final Proposal, p. 27.

[34] These congestion charges would be reflected in the LMP congestion components at the generation source and relevant pricing point for load.

[35] There are a number of caveats to relying on these data as discussed elsewhere. CAISO staff have also indicated that the congestion data in some past quarters may have been impacted by modeling issues that have since been resolved.

California on internal WEIM constraints is that the effect of California load as a whole could cancel out but congestion charges would be collected on generation dispatched in the south to meet load in the north, and vice versa, if the congestion impact of load or generation in the north or south was non-zero.

It appears to us that. based on the CAISO congestion component data published by DMM, the dispatch of CAISO generation to meet CAISO load would rarely incur any congestion charges on external constraints. In particular, over the period Q4 2022 through Q4 2024, the CAISO would only have incurred significant amounts of such congestion charges during Q4 2022 (which included winter storm Elliott).

CAISO data for Q4 2024 show that schedules between BANC and LADWP would average net congestion impacts of around $0.05/MWh on an internal BPA constraint and an even smaller $0.02/MWh on an Idaho Power constraint.[36] Multiplying such amounts by ~2000 hours/quarter by, say, a flow of 1000 MW, could amount to as much as $100,000, which although not large could be of some concern.

The following is a tabulation of other per MWh impacts based on shift factors times constraint shadow prices:

- Table 4.2 in the Q3 2024 report shows that BANC and LADWP have no impact on any WEIM constraints.[37]
- In Q2 2024, BANC and LADWP had non-zero congestion components on two constraints in BPA. Their congestion components differed by around 3 cents/MWh on one constraint and were the same on the other.[38]
- The data published in the DMM market report for Q1 2024 shows that the real-time prices in BANC and LADWP are not impacted by congestion on internal constraints in other balancing areas in the Southwest or mountain states. The only impact is on internal constraints in BPA and Portland General Electric in Q1 2024. The congestion components are identical on the Portland General constraint and on one of the BPA constraints. The congestion component differs by $0.18/MWh on the other BPA

[36] See California ISO, Department of Market Monitoring, Q4 2024 Report on Market Issues and Performance, March 2025, Table 4.2.

[37] See California ISO, Department of Market Monitoring, Q3 2024. Report on Market Issues and Performance, p. 50, Table 4.2. We have determined, working with the CAISO, that Table 4.2 is not completely accurate for Q3 2024. In addition to omitting balancing areas with congestion components less than $0.01/MWh for constraints located in other balancing areas, the Table omitted PacifiCorp E and LADWP constraints with impacts well above $0.01/MWh. However, based on the complete data compiled by the CAISO for the MSC, neither BANC nor LADWP have congestion components of $0.01/MWh or more on any EDAM transmission constraints in 3Q 2024. The same pattern of no impact is seen for the SCE, PG&E and SDG&E LAPs during Q3 2024 in Table 4.3.

[38] See California ISO, Department of Market Monitoring, Q2 2024 Report on Market Issues and Performance, Table 1.4, November 2024.

constraint.[39] During Q4 2023, BANC and LADWP had non-zero congestion impacts on a BPA constraints that differed by 1 cent/MWh.

- In Q3 2023, BANC and LADWP only had congestion components on an external constraint in BPA. Since the reported congestion components were almost the same, the congestion charge on flows would have been around 1 cent/MWh.
- BANC to LADWP schedules in Q2 2023 would have had a few cents of congestion charges on constraints in the Idaho Power BAA.[40] However, we note that the data published by DMM for LADWP include $0.81 of congestion charges on "other" constraints. This may reflect a reporting error of some type.
- In Q1 2023, BANC to LADWP schedules would have had no impact on constraints in BPA and around 2 cents/MWh on constraints in AZPS.[41]
- In Q4 2022 (which included winter storm Elliott), LADWP had a several dollar impact on constraints in Arizona Public Service, while BANC had almost no impact, for a net congestion charge of around $4/MWh on generation dispatched in LADWP to meet generation in BANC. Meanwhile, BANC and LADWP had a differential impact of around 2 cents/MWh per constraint in PacifiCorp E.[42]

Overall, the data published by DMM suggests that CAISO load and generation have little or no impact on WEIM constraints, while power flows between the CAISO LAPS would also have no material impact on WEIM transmission constraints other than in Q4 2022. Moreover, none of the congestion charges were on constraints in PacifiCorp E or W. It therefore appears that a lack of self-scheduling by California generators would generally not adversely impact California transmission customers because they are generally not impacted by congestion on internal constraints on parallel paths in the WEIM and have not been impacted by congestion in PacifiCorp balancing areas. In a nutshell, they do not need a hedge for congestion charges they do not pay.

This might not hold during extreme but rare conditions, when the total dollars involved might be material. For instance, we do not have information on the particular circumstances prevailing during 4Q 2022 (which included winter storm Elliot), nor in the various periods in which small congestion charges were incurred in other quarters. There may be some congestion impacts as other balancing areas join EDAM, but there should be time to implement a better design.

It is possible that more constraints might be modeled in EDAM than in the WEIM. However, this would only impact congestion charges incurred in dispatching California generation to meet California load in the CAISO if these constraints were binding at the margin in the EDAM

[39] See California ISO, Department of Market Monitoring, 2024 Q1 Report on Market Issues and Performance, p. 45, Table 1.4. In addition, Table 1.3 shows the congestion component composition for the PGE, SCE and SDGE DLAPs for Q1 2024 and no WEIM constraints are listed.

[40] See California ISO, Department of Market Monitoring, Q2 2023 Report on Market Issues and Performance, Table 1.4, November 2023

[41] See California ISO, Department of Market Monitoring, Q1 2023 Report on Market Issues and Performance, Table 1.4, September 2023

[42] See California ISO, Department of Market Monitoring, Q4 2022 Report on Market Issues and Performance, Table 1.4, March 2023

dispatch, rather than just binding in the unit commitment and resolved once particular units are committed at minimum load.

There are, however, some risk factors despite the favorable historical data. Because the PacifiCorp congestion charge allocation design for internal constraints is based on self-scheduling, internal PacifiCorp EDAM congestion charges could be materially higher than those observed in WEIM. This will not matter if CAISO generation and load have no impacts on internal PacifiCorp constraints, but this potential makes it even more important that the information on constraint impacts compiled by DMM that we have relied on in assessing the potential for congestion charges on the dispatch of CAISO balancing area generation to meet CAISO balancing area load be accurate and not impacted by some element of the processes used to compile the quarterly data. It would therefore be prudent for the CAISO to undertake direct assessment of resource and DLAP shift factors on internal PacifiCorp constraints and confirm that they are all within the 2% deadband and that this will remain the case relative to the EDAM distributed reference bus.

This assessment of generally little or no impact of the dispatch of California generation to meet California load on EDAM constraints, and particularly on those in PacifiCorp should be further tested during market trials by calculating congestion components of the CAISO generation and DLAPs on PacifiCorp constraints in separate test cases with north-to-south congestion and south-to-north congestion between the CAISO and the Pacific Northwest. If these test cases find no impact, that would confirm the lack of an urgent need to address this issue at the time of EDAM start up.

The data published by DMM indicate that the lack of impact that is likely for CAISO will potentially not be the case for other balancing areas that might join EDAM. Furthermore, other WEIM entities with firm transmission that for one reason or another would not be able to self-schedule their generation in EDAM also might be adversely impacted by the DFP self-scheduling requirement. This would need to be assessed for each EDAM participant.

Because CAISO south-to-north or north-to-south CRRs could cause some amount of loop-flows with significant congestion costs on transmission elements in other balancing areas in exceptional circumstances, an alternative to avoid the problem of California CRRs covering external congestion that the CAISO would not receive revenue for is to not issue such CRRs in the first place. In particular, if the CAISO applied a simultaneous feasibility test in the CRR allocation that did not allow flows on these external lines, no such CRRs could be allocated except in conjunction with CRRs that created matching counterflows. However, it would be challenging to exactly match all counterflows.

In summary, in practice it appears from the data published by DMM that CAISO CRRs generally would usually not create flows on binding EDAM constraints and even more rarely on PacifiCorp constraints, so such flows may not be a problem that arises in Year 1. Nevertheless, it might be a significant a problem that emerges over time and as EDAM grows. Therefore, we recommend that a financial flow entitlement design be developed soon, and its applicability should not be restricted to the CAISO BAA.

3.4 CRR Settlements

There has been discussion of a CAISO plan to separate congestion charges on CAISO constraints that are the result of CAISO schedules, from those that are attributable to EDAM schedules that are not entitled to rebates, for the purpose of CRR settlements.[43] The practical effect on CAISO CRR settlements would be to increase the problem of revenue inadequacy at times that flows implied by CRRs on CAISO lines plus parallel flows are simultaneously infeasible.

This is a bad design from a market design standpoint and it would be much more difficult to implement than a good design.

Market Design. The congestion charges for flows on binding CAISO constraints attributable to the dispatch of EDAM generation or to meeting EDAM load should go to fund CRRs. These charges are for flows over a congested internal CAISO constraint over which the CAISO will have sold CRRs. An incremental MW flow of an EDAM participant attributable to resource dispatch or load over a congested constraint within CAISO would necessarily displace a MW of other flows, reducing the congestion charges collected from others. This must be the case if the constraint is congested.

These charges on parallel flows are likely small in most cases, because the parallel flows on CAISO constraints should mostly be small. But at times they might not be small because the EDAM market engine could dispatch EDAM generation in a way that creates material flows over CAISO constraints, displacing flows from CAISO generation that meet CAISO load, and the congestion charges on these constraints needs to be collected and used to fund CRR payments.

Including these charges in CRR settlements, rather than separating them into an account distributed to all load, is consistent with the MRTU design and with the design of other LMP-based markets and would avoid unwarranted congestion rent shortfalls. We understand that the CAISO intends to shift to such a design that would be determined in a separate process, and we agree with that intent. We note our concern so that there is clarity of the need for such an approach.

Implementation Complexity. Moreover, such a design based on calculating overall EDAM flow impacts on CAISO constraints so they can be accounted for separately and rebates netted would be challenging to implement. This would require calculating the flow impact of the non-CAISO EDAM dispatch on these constraints. Perhaps it is intended that the CAISO multiply all non-CAISO injections and withdrawals times the congestion component at their location associated with these constraints. If so, this would potentially overstate the congestion charges due to EDAM flows for two reasons:

1. First, this calculation does not account for losses. If there were south-to-north congestion between the CAISO and the PacifiCorp (net) west, some of the losses would occur in the south, reducing the flow impact on the south-to-north constraints.

[43] Reference (proposal, page number)

2. Second, net injections by EDAM entities in the south could be meeting CAISO load rather than flowing north. Hence, the congestion rent allocation calculations would need to somehow account for the impact of imports to the CAISO on losses, or the calculation could greatly overstate the actual impact of EDAM generation on CAISO constraints.[44]

These issues could probably be resolved in some manner, but the calculations would not be trivial, and there is no need for them.

Recommendation for CRR Settlements. The approach of not trying to back out EDAM flows on CAISO constraints in the CRR settlement process is a better market design because it is simpler, easier to implement, and more effective at maintaining the hedging value of CRRs.

4. Summary of Analysis and Conclusions

4.1 General Conclusions

As we described above, there are three broad objectives to consider when determining a system for distributing congestion rents:

- Incentivize efficient resource participation in the day-ahead and real-time dispatch through efficient price signals.
- Enable the provision of congestion hedges that are reasonably consistent with the capabilities of the network.
- Enable balance areas to preserve the overall "value" of existing transmission contracts, and avoid undue or "unfair" cost shifts among market participants.

Of the options that have been considered, the original EDAM tariff provides the best short-term incentives since each resource faces the full cost of the congestion it creates (or relieves). However, consideration is now being given to implementation (during a defined transition period) of an approach to distributing congestion rents arising from parallel flows on one BAA that arise from schedules in another BAA. The motivation for considering this alternative arises from the original EDAM tariff approach not addressing the facts that (1) some non-CAISO BAAs have agreed, under their OATT, to provide hedges to holders of firm transmission rights, and (2) in order to fully fund these hedges, BAAs in which schedules source and sink would, in general, need to retain parallel flow congestion revenues that under the original EDAM tariff should instead accrue to the BAA where the congestion takes place. The possibility that the need to hedge congestion charges on parallel flows would potentially be material was not considered in developing the original EDAM proposal. If individual BAAs were of the belief that external congestion charges on parallel flows would come close to balancing out (e.g. the negative versus the positive, or being balanced by internal congestion due to other BAAs), or come close to doing so,[45] the individual BAAs could probably provide full hedges for their OATT rights with a

[44] The distributed load bus in EDAM is not the same as the CAISO load center.

[45] This cancelling out might occur because parallel flow congestion charges within the BAA due to other BAAs' schedules might roughly balance charges associated with parallel flows elsewhere caused by the first BAA's schedules. In addition, prevailing flow charges and counter-flow payments could possibly even out over time.

modest risk of revenue inadequacy, in expectation, from them under normal market conditions. However, under stressed conditions such as January 2025 or winter storm Elliott, this might not be true.

The original issue paper proposal[46] provides poor short-term incentives by masking the cost of congestion imposed on neighboring BAAs, but allows for more robust funding of hedges for parallel flow congestion charges. The distribution of rents is arguably "less fair" because BAAs do not pay for the external congestion costs imposed on others, but may be no less fair than historical practice.

The proposal introduces new and potentially significant incentive issues by expanding the incentive to self-schedule beyond third party OATT rights holders to EDAM entities themselves who hold network integration transmission service (NITS) firm rights and can submit balanced schedules. It is framed as a compromise that splits the congestion rent allocation between the original EDAM tariff and the issue paper proposal, but it is not clear this is a correct characterization. Under current practice neither negative ("flow") and positive ("counter-flow") congestion impacts on neighboring BAAs are explicitly paid for. Under the FP it is possible that entities can avoid paying for negative impacts, but still collect counter-flow payments through the strategic self-scheduling of their resources.

The RDFP and FP introduce a possible expansion of congestion cost recovery that would be considered for implementation in Year 2 to include schedules resulting from flexibly bid units, but still linked to registered transmission rights, may reduce the incentive to self-schedule in some circumstances but will incent more below-cost offers, and therefore shares some of the incentive problems of the issue paper proposal. We have been told this alternative is not being considered for approval by the Boards at this time, but is to be considered alongside other alternatives modification of the Year 1 proposal that the Boards are to decide upon in June 2025. Based on our analysis, we are concerned that implementation of such an expansion in Year 2 modifications could arguably introduce *worse* incentives and a *less fair* distribution of congestion rents than either of the first two proposals or even current practice. Under that Year 2 alternative suggested by the RDFP and FP, firms would have a strong incentive to supply counter-flow, but at the risk of potentially large congestion rent transfers between BAAs. There are many issues that need to be carefully analyzed before a decision to adopt that or any other expansion of the Year 1 congestion cost recovery system is adopted. We recognize that the Boards are not considering Year 2 alternatives at this time, but that the proposal introduces them to promote stakeholder consideration of possible modifications later in the EDAM transition period. Therefore, we summarize our concerns about Year 2 possible extensions in Section 4.2, below.

In short, none of the explored options fully achieves our three stated objectives for congestion cost allocation. Indeed, it is likely that for a framework that deploys substantial physical

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However, whether this is likely to be even approximately the case needs to be assessed by analysis of past WEIM congestion patterns, schedules, and costs, complemented by market simulations considering a range of conditions.

[46] CAISO, *Issue Paper—Extended Day Ahead Market Congestion Revenue Allocation,* March 17, 2025.

transmission rights, no such option exists, and tradeoffs will be necessary among the objectives. The original EDAM tariff approach arguably comes closest to meeting those objectives, but has proved controversial because of the difficulties with providing full hedges for firm transmission rights holders.

We have significant reservations about the approach described in the FP, including the Year 1 alternative that the Boards will consider in June, 2025, and the possible Year 2 expansion described in the RDFP and FP. It is possible the incentive problems discussed here will not be too economically significant in the context of PacifiCorp and the CAISO, and would be outweighed by the other benefits of an expanded EDAM. But there is no assurance this will be the case. It is also possible that the incentive problems, or the congestion rent transfers, would become very economically significant and seriously erode EDAM benefits during the proposed three year transition period. We are not able to fully assess the likelihood of either scenario.

The CAISO has promised to monitor developments with an eye towards the problems we have discussed, but it is not clear what recourse CAISO will have if monitoring does indicate there are serious problems. During the first year, we believe it would be prudent to have a more concrete "fall back" position that can be implemented in days or weeks, not years, in the case problems are significant.

One solution applied in other ISOs to congestion charges on parallel flows has been the negotiated division of flow entitlements over a set of transmission constraints that are anticipated to be most impacted by parallel flows. We describe this approach in more detail below. An example is the system used for congestion on transmission lines between MISO and PJM. For instance, PacificCorp might receive the rights to X% (or X MW) of congestion costs related to Tesla/Los Banos. This would limit the exposure of each BAA to external congestion cost, and provide a relatively accurate sense of how many firm transmission rights a BAA could sell before exposing itself to parallel flow congestion. We suggest that this approach be combined with the original EDAM tariff proposal, where congestion costs would be first allocated to the BAA experiencing the congestion, and then redistributed according to pre-negotiated financial flow rights. These amounts would be negotiated in advance and not contingent upon hourly or even monthly dispatch results.

Our final general conclusion concerns proposals for "carve-outs". We do not support the concept of somehow carving out transmission capacity linked to firm transmission service and moving it outside the EDAM dispatch. Such an approach would not preserve the benefit of the bargain involved in firm transmission contracts. Moreover, it would put the market operators (CAISO) in the position of either economically withholding unused capacity in the day-ahead market or scheduling use of transmission capability that might not be available for use in real-time. The CAISO should not be engaged in the development of market designs that facilitate the withholding of transmission nor of undermining system reliability. To the contrary, the CAISO should be moving forward to assess the impact of the TOR and ETC construct developed many years ago and how it is actually performing, its actual impact on transmission usage and congestion rent shortfalls, its impact on reliability during stressed system conditions, and how

the CAISO modeling of these rights in the CRR auction, the IFM and HASP, RTPD and RTD perhaps needs to be changed to reflect current conditions.

4.2 Year 2 Design Goals and Possible Changes

We have specific, and serious, reservations, summarized below, about the possible "Year 2" directions described in the FP. We understand that no action by the Boards is being requested on Year 2 alternatives. In particular, the ISO's purpose in providing this description is not to make a Year 2 proposal for adoption at this time, but rather to offer concrete possibilities in order to begin discussions with stakeholders for how EDAM's system to allocate parallel flow congestion revenues during the transition period might evolve to accommodate new EDAM participants and further address the goals.

We believe, however, that given the extra time, effort should focus on a more stable and durable solution. In particular, we believe that as soon as Year 2, there should be a goal of eliminating the FP design and replacing it with a financial flow entitlement design before balancing areas in addition to PacifiCorp and Portland General join EDAM.

We understand that the CAISO proposes to address the issue of managing parallel flow congestion charges associated with balancing areas joining EDAM after PacifiCorp and Portland General with changes implemented a year or so after EDAM go-live. We understand that the nature of these changes would be to extend the rebate of congestion charges on constraints located in other balancing areas to generation that is dispatched in accord with its firm transmission service, rather than self-scheduled.

We believe that this is a bad design and a bad use of CAISO resources. We recommend that there should be a goal of eliminating the FP design and replacing it with a financial flow entitlement design prior to the time when BAAs in addition to PacifiCorp and Portland General join EDAM. Overall, a financial flow entitlement design would avoid inefficient self-scheduling incentives, cap the foregone congestion revenues and be far simpler to implement for both the CAISO and balancing areas, as CAISO settlements would simply entail multiplying the entitlement times the constraint shadow price and balancing areas would not need to guess which generators to designate, self-schedule or underbid in order to receive the congestion credit.

4.2.1 Issues with Extending Parallel Flow Congestion Charge Rebates to BAAs Joining Later

There are three core issues associated with extension of rebates for parallel flow congestion charges to BAAs joining after PacifiCorp and Portland General:

1. This design will incent self-scheduling, or below cost offers, of resources impacting binding constraints to avoid being dispatched down;

2. Absent caps on unpriced flows, the proposed changes would increase the exposure of EDAM balancing areas to congestion rent shortfalls.

3. This design will have implementation complexities and may consume more resources than better resolutions such as financial flow entitlements

These three issues motivate our conclusion above, and we discuss each of these in turn below.

1. Self-scheduling and Below-cost Offer Incentives. While this design will not require that resources self-schedule in order to not pay congestion charges associated with parallel flows in other BAAs, resources that are not dispatched when there is congestion would not receive the rebate of congestion charges. Tying receipt of the congestion rebate to the dispatch of generation would incent both below-cost generation offers and self-scheduling. These incentives were explained in Examples 2 and 3 presented by Dr. Harvey during the May 2, 2025 MSC meeting.[47] This design risks completely unwinding the EDAM economic dispatch—and thus EDAM's anticipated short-run efficiency games—for those balancing areas that have resources that materially impact constraints in other balancing areas.

Presumably, this congestion rebate design would only apply to EDAM (day-ahead market) schedules, so resources would still be dispatchable in real-time, but these incentives to bid below cost or self-schedule could eliminate a material portion of potential EDAM benefits. Resources would like only be incented to offer somewhat below cost during periods with normal congestion, but would be motivated to self-schedule on days on which extreme congestion is expected, such as during January 2024, *because* the value of the rebate would dwarf generation costs. Hence, we expect that EDAM will have a significant probability of producing inefficient, operationally problematic day-ahead market schedules during precisely those periods in which the efficient and operational feasibility of day-ahead market schedules would be most important.

Moreover, if the CAISO congestion rebate design for parallel flow congestion charges is combined with a similar congestion rebate design based on either market or self-schedules for internal constraints, then the combined designs could incent extreme negative bids and inflated congestion even when congestion charges are moderate. This would be the case because the clearing price for the resource would not matter. No matter how low the resource bid, and no matter how low the LMP at the resource's location, it would net the price at the load/transaction sink so the only issue would be whether the resource's cost is lower than the expected price at the sink/load. With this kind of bidding behavior, the EDAM market would have very little value and might well be worse than nothing.

2. Uncapped Exposure to Congestion Rent Shortfalls. The proposed Year 2 changes would do nothing to limit congestion rent shortfalls due to parallel flows and counter-flow schedules. On the contrary, the extension of the CRN schedule to all EDAM generation would increase exposure to congestion rent shortfalls as a result of offsetting

[47] Scott Harvey, "Congestion Rent Allocation," Market Surveillance Committee Meeting, May 2, 2025.

prevailing flows and counter-flows.[48] Moreover, expanding the self-scheduling and below-cost bidding incentive to more resources impacting constraints in other balancing areas would increase the likelihood that the displacement of flows of CAISO balancing area generation to meet CAISO balancing area load would be greater than under the WEIM.

This might not happen in other balancing areas in which BAA resources also offered supply at the bid floor. But it would happen to the extent that BAA resources participated in the market when there was congestion.

3. ***Implementation Complexity.*** The implementation of this design would only require that the CAISO multiply the congestion component of generation by its EDAM scheduled output and sum this over generation up to a possible maximum for the amount of cleared balancing area load. However, because balancing areas would not know ahead of time how much of their non-self-scheduled generation would clear in EDAM, a BAA might designate 3000 MW of generation with a CRN, expecting that 2500 MW might clear to meet 2500 MW of load. Suppose that 2800 MW cleared and load was 2500 MW. The question then is: which 2500 MW should be used to calculate the congestion rebate entitlement? The CAISO would need rules to determine the sequence in which individual resources were used to calculate rebates.

   Rules that simplify this calculation for the CAISO could turn the rebate into more of a guessing game for balancing areas. For example, a prorated reduction could be applied to all of the resources with the CRN tag, and would be workable for the CAISO. However, such a rule would change rebates and impact transmission customers' incentive to offer resources for dispatch rather than self-scheduling them. Transmission customers might prefer rules that used resources to calculate rebates in the sequence that maximized rebates. But such an approach would be much more complicated for the CAISO, and potentially completely unworkable.

   Mechanically, the financial flowgate approach is much simpler to implement than the FP. It only requires a stakeholder process to reach agreement on the appropriate flowgate shares, based for instance on historical WEIM base schedule flows. This process, of course, could itself be time consuming, even if conceptually simple. Integration into market settlements would be straightforward. The EDAM settlements would merely multiply the constraint shadow price times the flow entitlement. An only slightly more complex design that would still be easy to implement could prorate the flow entitlement for derates, equivalent to defining the financial flow entitlement in percentage terms. Given the initial lack of information, the size of financial flows that are implied by historical congestion, it would be reasonable to revisit these amounts after some period of time, but the negotiated amounts should not be too closely tied to ongoing dispatch results.

[48] The exposure would not increase as much if the design shifted to calculating the congestion charge rebate based on net flows (i.e., the difference between counter-flow and prevailing flow), but such a design could disincent the offering of generation able to provide counter-flow and create even worse problems.

4.2.2. Other Possible Year 2 Approaches to Parallel Flow Congestion Cost Allocation for the CAISO

With respect to the Year 2 design for the CAISO, Slide 14 of the May 27, 2025 presentation states the following regarding near-term enhancements.

> "For the CAISO balancing area – which does not offer PTP and MITS products – parallel flow congestion revenue allocation is based on affected CRRs by the external constraint located in an EDAM balancing area."[49]

This statement suggests that the CAISO envisioned a financial flow entitlement design which would be a good long-run plan.

However, the description in the Final Proposal is actually radically different and a bad idea. The Final Proposal states that "to ensure symmetry and comparability in allocations, the CAISO balancing area would retain parallel flow congestion revenues resulting from a transmission constraint in a neighboring EDAM balancing area with effectiveness on CAISO day-ahead energy and imbalance reserve schedules in order to provide the necessary congestion hedge for annual and monthly CRRs affected by the binding transmission constraint. Remaining parallel flow congestion revenues which accrue in the CAISO balancing area, beyond what is needed to provide and support full funding of CRRs affected by the constraint, will be allocated to the EDAM balancing area where the transmission constraint is located."[50]

We interpret "with effectiveness on CAISO day-ahead energy and imbalance reserve schedules" to mean that CAISO balancing area settlements will receive a rebate of congestion paid by CAISO balancing area EDAM schedules. This will not operate as intended to support CRR payments. If CAISO balancing area generation is dispatched down because of very high shadow prices on these external constraints (shadow prices that would be inflated by self-scheduling of PacifiCorp balancing area generation), there will be reduced or no congestion charges on actual schedules to rebate but there will be CRR payments due on transmission rights, which haven't been curtailed.

This is a very different design than appears to be described in the CAISO's presentation.

This potential for inflated shadow prices on constraints in other balancing areas due to self-scheduling will hopefully will not be a problem for PacifiCorp as it does not appear, based on data published by DMM, that CAISO generation or load impacts PacifiCorp constraints.[51] However, this design would be a poor idea for the future when CAISO generation or load may impact constraints in other balancing areas. If generation in other BAAs self-schedule or bid

[49] https://stakeholdercenter.caiso.com/InitiativeDocuments/Presentation-EDAM-Congestion-Revenue-Allocation-Presentation-May-27-2025.pdf

[50] California ISO, Final Proposal p. 33.

[51] But as noted above it is very important that the CAISO verify that this will be the case.

very low to receive a congestion rebate on local constraints in the other balancing area, the constraint shadow price could rise under EDAM, perhaps a lot, and CAISO generation having an impact on those constraints would be dispatched down in EDAM. There would be no money to fund CRR payments due on these constraints when the generation is not dispatched. And the constraint shadow prices could get very high. This is a poor future design.

This issue also highlights the importance of the CAISO verifying that CAISO generation and load do not impact constraints located in the PacifiCorp balancing areas because if they do, the inflated congestion charges due to self-scheduling could have a material and surprising impact on prices for California generation and load. This is not a problem the CAISO wants to be dealing with in real-time after EDAM start-up.

4.2.3. Year 2 Approaches to Parallel Flow Congestion Cost Allocation Based on Financial Flow Entitlements.

We are not proposing a specific Year 2 and thereafter design. We outline below two variations on a flow entitlement design, both of which would materially reduce self-scheduling incentives and some which would also avoid or at least cap unintended costs shifts.

One approach would be to establish financial flow entitlements defined as options for each EDAM's balancing area's impacts on significant constraints located in other EDAM balancing areas. These entitlements would not need to be defined for every constraint, just for those materially impacted by parallel flows associated with monthly and longer-term firm transmission service. The payments to the option when there was congestion could be used by the balancing area receiving the payment to fund congestion rebates in general or the balancing area could choose to assign specific MW amounts to particular firm transmission contracts. The option MW amount would reflect the net of expected counterflows and prevailing flows.

This design would eliminate self-scheduling incentives because the payment would not depend on the scheduling of transactions. This design would also inherently cap the free use of balancing area transmission by other balancing areas. Because this design is implemented as a financial right that is received without regard to schedules, the MW amount should be set at less than the maximum flow impact. This amount would need to be negotiated based on past experience.

A second approach would be to establish a flow entitlement cap for each EDAM's balancing area's impacts on significant constraints located in other EDAM balancing areas. These entitlements would not need to be defined for every constraint, just for those materially impacted by parallel flows associated with monthly and longer-term firm transmission service. Because this would be a physical flow entitlement, the exemption from congestion charges would still incent self-scheduling until the cap was binding. This approach would operate efficiently for the CAISO balancing area in which there are many generators, with the result that generation pricing would not be impacted by balancing area level rebates. However, this design could continue to incent some degree of self-scheduling in balancing area with congestion allocation arrangements

that had a link between generator schedules and congestion rebates when the flow entitlement cap was not binding.

Overall, a financial flow entitlement design would avoid inefficient self-scheduling incentives, cap the foregone congestion revenues and be far simpler to implement for both the CAISO and balancing areas, as CAISO settlements would simply entail multiplying the entitlement times the constraint shadow price and balancing areas would not need to guess which generators to designate, self-schedule or underbid in order to receive the congestion credit.

A more general issue running through the stakeholder discussions has been tension between allowing each balancing area to work out a congestion rent settlement design reflecting the various types of contractual relationships within its balancing area and an overall design for EDAM. We understand the concerns with a balancing area by balancing area approach but also understand the complexity of trying to work out a global agreement for all potential EDAM balancing areas, including balancing areas that may never join EDAM.

A middle ground might be for the CAISO to assist EDAM balancing areas by using its market design expertise to develop a generic design that would be workable for the EDAM and could be adapted to meet individual balancing area needs.

In the event that there are some EDAM participants that strongly prefer a self-schedule-based congestion rent allocation design for their balancing area, if the CAISO accommodates them, we recommend that the CAISO also develop a financial entitlement design that other balancing areas could choose. One such balancing area would be the CAISO, and if the option is extended to the CAISO balancing area it should be extended to other balancing areas that prefer that approach.

We understand from the CAISO that some EDAM participants do not want a design that involves financial rights. If that is the case, the CAISO should consider allowing the flexibility for other BAAs to choose a financial flow entitlement approach to congestion rent rebates rather than appearing to mandate that all balancing areas use a design that will incent self-scheduling and impose uncapped cost shift risks.