# Opinion on
# Market Enhancements for Summer 2021 Readiness: Export, Load, and Wheeling Priorities

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## 1. Introduction and Summary

The Market Surveillance Committee has been asked to comment on elements of the summer readiness initiative.[1] The initiative is in response to the events of August 2020,[2] and its purpose is to implement changes to market rules and procedures that are practical to implement in the near-term to help ensure grid reliability during the upcoming summer high load period.[3] The initiative is recommending changes to several features of the ISO markets. In previous opinions we have commented on changes to such elements as scarcity pricing, resource sufficiency evaluation, and management of battery storage.[4] In this opinion we focus on the last remaining major issue: the treatment of export and wheel-through transactions in the CAISO balancing authority area during extreme operating conditions through adjustments to load scheduling priorities.

In preparation for this Opinion, the MSC held public meetings that included agenda items addressing the heat wave events of August 2020 on October 9, 2020 and November 13, 2020. The MSC then reviewed the elements of the Summer 2021 readiness initiative with stakeholders and ISO staff in a public meeting held on February 11, 2021.

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[1] *Market Enhancements for 2021 Summer Readiness: Final Proposal.* California Independent System Operator. March 19, 2021. http://www.caiso.com/InitiativeDocuments/FinalProposal-MarketEnhancements-Summer2021Readiness.pdf

[2] See California Independent System Operator, California Public Utilities Commission, and California Energy Commission, *Root Cause Analysis, Mid-August 2020 Extreme Heat Wave, Final Report*, January 13, 2021 www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf

[3] See https://stakeholdercenter.caiso.com/StakeholderInitiatives/Market-enhancements-for-summer-2021-readiness

[4] J. Bushnell, S. M. Harvey, and B.F. Hobbs, *Opinion on Market Enhancements for Summer 2021 Readiness*, Market Surveillance Committee of the California ISO, March 8, 2021, www.caiso.com/Documents/MSCOpinionon MarketEnhancementsfor2021SummerReadiness-Mar8_2021.pdf; J. Bushnell, S. M. Harvey, and B.F. Hobbs, *Opinion on Resource Adequacy Enhancements Phase I: Minimum State of Charge Requirements*, Market Surveillance Committee of the California ISO, March 23, 2021, www.caiso.com/Documents/FinalMSCOpinionon resourceadequacyenhancementsphase1MSOC-Mar23_2021.pdf

In the next section, we provide background on the proposal, including discussions of issues concerning prioritization of transactions by an individual CAISO, inconsistencies in transmission capacity allocation among different BAs, how CAISO energy market bid caps and inadequate scarcity pricing can exacerbate problems in transmission allocation, and finally a discussion of challenges faced in crafting this proposal. Then in the following sections, we discuss specific issues addressed in the proposal concerning two types of transactions: exports from internal resources (Section 3) and self-scheduled wheel-throughs (Section 4). A summary concludes this Opinion.

## 2. **Background**

Transfer capability for imports and exports among balancing authorities (BAs) in the western North America markets is a scarce and often valuable resource. Over time, a complex set of administrative rules and market-based methods have evolved to allocate this capacity among competing uses. The complexities of implementing these rules to prioritize capacity among different uses sometimes leads to unanticipated and inefficient consequences within a BA, while different rules in different markets leads to contradictions and concerns about inconsistent treatment across BAs. In particular, in the CAISO in August 2020, prioritization among classes of exports and CAISO load may have contributed to the need to curtail CAISO loads. The multiple and sometimes contradictory sets of rules among different BAs have made it difficult to propose CAISO rule changes that are consistent with precedent and practice throughout the rest of the west and the philosophy of open access and can also be implemented prior to summer 2021. In this section, we first discuss each of these two general issues. We then also point out how certain features of the CAISO markets, in particular its bid cap and the incomplete nature of its present scarcity pricing mechanisms, exacerbate the problems that can arise from unclear prioritization within the CAISO and inconsistences among BAs. Finally, this section closes with a brief summary of the general thrust of the ISO proposal and the objectives it needs to balance.

We consider first the general issue of potential unintended effects of within-CAISO prioritizations of imports, exports, and wheel-throughs. This prioritization is implemented through explicit rules as well as implicitly through constraint violation penalties in the market scheduling procedures. One contributing factor to stressed system conditions in August was the relatively high level of exports that cleared the day-ahead market and as a consequence, under the rules in place at the time received priority above real-time load. An appreciable portion of these exports were not explicitly supported by non-RA resources within the CAISO. Department of Market Monitoring calculations, portrayed in Figure 3.38 of the DMM report, indicate that gross exports during hour ending 19 and 20 on August 14 exceeded 3000 MW. In the evening peak hours studied by DMM over the period August 12 through 17, DMM concludes that the majority of exports were supported by spot purchases in the IFM, while 1000 MW or less of the exports were linked to resources without any resource adequacy (non-RA) obligations to CAISO Load Serving Entities (LSEs) and hence might have been supported by the output of a resource under contract to another BA.[5] Changes in RUC and subsequently in real-time bidding rules, which were implemented before the September heatwave, appear to have largely eliminated the

[5] See CAISO Department of Market Monitoring, *Report on System and Market Conditions, Issues and Performance: August and September 2020,* pp. 47-51, particularly Figures 3.38 and 3.39.

risk of the export of power bought in the IFM but supported by CAISO RA resources that were needed to avoid shedding CAISO load, while allowing exports supported by the resources of other BAs located within the CAISO footprint, during the heatwave ending September 6.[6]

Concerning the second general issue of the multiplicity of approaches among BAs for allocating inter-BA transfer capability, the rules and market procedures that each BA uses reflects their history, resource mix, and location, within the constraints of FERC open access requirements. Each set of rules strikes a balance between meeting the reliability needs of native load and the potential benefits to load resulting from greater transmission sales or sales of excess generation at market-based rates.

The CAISO is in a somewhat different position because it does not have a generation affiliate that can make firm power sales at market-based rates, and its transmission rate design does not provide for long-term sales of firm transmission at regulated rates per megawatt over a month or year. Instead, the CAISO tariff charges for transmission use on a per megawatt-hour basis, when it is actually used. The CAISO needs to take measures that better ensure that customers of CAISO LSEs gain access to the reliability benefits provided by the generation and transmission capacity owned or contracted for to meet Resource Adequacy (RA) requirements, while also enabling resources--either those located within the CAISO or those in other BAs wanting to use ISO transmission capability--to sell power to LSEs located in other BAs. Conversely, LSEs within the CAISO benefit from being able to buy power and enter into resource adequacy contracts with resources located in BAs external to the CAISO. Moreover, the data indicates to us that there is much more CAISO RA capacity located outside the CAISO than there is RA contracted to other BAs located within the CAISO, so CAISO LSEs enjoy substantial benefits from the application of FERC open access requirements to the West.

As we discuss below, there are important differences between the paradigms and time horizons used by CAISO for planning and marketing both transmission and generation and those paradigms adopted by other western BAs. The seams between these paradigms were tested in August 2020, and the experiences of that week exposed the need to reconcile the two systems as much as possible as quickly as possible.

LSEs within the CAISO should recognize the important short and long-term benefits of the CAISO being seen as a reliable and consistent trading partner within the western grid. When a BA blocks the use of generation or transmission resources under contract with neighboring BAs, it undermines the ability of all BAs to rely upon resources located within another's footprint to diversify resource portfolios and reduce reliability risks, and could violate FERC open-access principles. BAs outside of the CAISO should recognize that CAISO entities have in many ways gone farther in making their full network resources available to all western grid participants than any other BA in the West. Load within CAISO, like the load of other western BAs, is entitled to use its transmission system to deliver power from designated resources to network load using network transmission service. The CAISO, in proposing these measures, seeks to remain faithful to the principle of providing open access to its transmission system while retaining its ability to use its transmission system and designated network resources to meet local planning and

[6] Ibid, pp. 53-55.

reliability needs. Unfortunately, any transition in the management of CAISO resources will create a conflict between the benefits of any adjustments, no matter how justified, and the reasonable expectations of stakeholders who have been making resource plans under the current protocols.

The third general issue concerns CAISO market rules that can compound difficulties in securing needed imports. It is important to recognize the economic incentives that underpin the demand for both energy imports and exports in the CAISO system. A key element is the level of the CAISO's bid cap and associated scarcity values applied to its pricing.[7] During the August 2020 heatwave, prices of some bilateral transactions reached levels above the CAISO bid cap, implying that buyers outside of the CAISO were willing to pay more for power than the CAISO market's maximum prices. When these high load conditions arise, it creates demand to both export power from the CAISO system and to wheel power from lower priced regions (in this case the Pacific northwest) through the CAISO to higher priced regions such as the desert southwest. As long as it is possible for LSEs outside of California to substantially outbid LSEs in California for scarce power, there will be unavoidable additional pressure placed on both the energy supply and the transmission capacity of the CAISO system. The measures developed in this initiative seek to better assure that energy from resources with RA contracts to CAISO LSEs does not get implicitly or explicitly exported if those exports would require shedding of CAISO firm load. However, it should also be recognized that any benefits of low settlement prices during CAISO scarcity conditions come at the expense of being potentially unable to attract sufficient resources to ensure reliable supply, especially if those needs exceed RA capacity. The relatively low level of the CAISO scarcity prices will also limit the effectiveness of some of the proposed changes relating to wheel-throughs if CAISO RA resources offer supply into the CAISO market at economic prices. The need for special wheel-through rules for constrained import interfaces would be greatly reduced if CAISO prices, and as a consequence the congestion cost of wheels, rose to higher levels during load shedding or near load shedding conditions.

Turning to the CAISO proposal, it modifies the effective priorities of various categories of price taking export and wheel-through transactions relative to using energy or transmission to meet CAISO load. Mechanically this is accomplished through changes to the penalty parameters used in the scheduling run of the market software used to schedule wheel-throughs, imports, and exports. If demand for supply or transmission exceeds the available capacity at the bid cap, penalty parameters are applied to allocate the available capacity across categories of price-taking transactions. Transactions with lower penalty parameter costs will be cut before those with higher penalty parameter costs, after adjustment for the transactions' relative impact on the binding constraints. The proposal also tightens the criteria required for certain export transactions to qualify as priority price-taking exports (PT exports) and creates a new category of high priority price-taking wheel-through transactions (PT wheels). There is no analogous market-based process in other western BAs as they do not clear a day-ahead market in a market engine, but instead enter into firm energy sales on a discretionary basis at market-based rates.

[7] For a detailed discussion of penalty values and their role in determining prices during scarcity see J. Bushnell, S.M. Harvey, and B.F. Hobbs, *Opinion on Revisions to Import Bidding and Market Parameters for Compliance with FERC Order 831*, Market Surveillance Committee of the CAISO, September 9, 2020, www.caiso.com/Documents/MSC-OpiniononFERC831ImportBiddingandMarketParameters-Sep9_2020.pdf.

As we discuss below, the CAISO's challenge in this process is to identify the transmission and generation resources necessary to provide reliable service to its network load, and those transmission resources that can be made available for use by other BAs to transmit economy energy transactions without degrading expected network reliability. The task is further complicated by the extent to which neighboring BAs have assumed a continuation of current protocols when planning for their own resource needs. In the context of generating capacity, a reasonable principle would be that CAISO treat exports from its internal resources contracted as RA (or equivalent) to outside BAs equivalently to how it expects outside BAs to treat capacity under California RA contracts that is located outside of California. One difficulty in applying this principle is defining what types of contracts and arrangements should be viewed as the equivalent of California RA capacity. Unlike transmission operators in other BAs, the CAISO does not have a merchant arm that enters into long-term sales of firm power at a market-based price that is in excess of incremental cost. Within the CAISO BA, such long-term sales of firm power can only be made by individual generation owners with generation located within the CAISO BA that they do not show to meet CAISO RA requirements. Any exports cleared in the CAISO day-ahead market supported by CAISO RA are necessarily spot sales made at incremental cost, not discretionary long-term sales of capacity at negotiated market-based prices.

Identifying the class of generation resources to be granted high priority for export is indeed difficult, but we note that the current proposal would give not allow *any* export transaction, other than those associated with legacy transmission ownership or contract rights, to have priority over serving California load, but would put serving exports supported by non-RA capacity on par with serving California load.

The CAISO's general challenge in the context of transmission products is to provide a reasonable framework for external BAs to make use of the CAISO transmission system during extreme operating conditions despite not having requested or paid for firm transmission service on the CAISO system, within a CAISO transmission pricing design that does not have provisions for such payments. While the current CAISO approach can be construed as far more "open" than that found in neighboring BAs, it is an approach that has been in place for over a decade and commercial practices have adapted to it. Other than the carve-out for ETC and TORs, the CAISO system has not had a process for identifying and allocating the available transmission capacity (ATC) between native load, and the amount it can reliably market as firm transmission service for use by other BAs outside the day-ahead and real-time market processes. Moreover, the CAISO design does not establish a framework for defining a capacity benefit margin, a measure that is typically developed in the determination of ATC.[8]

In the following two sections, we discuss in turn the detailed issues associated with managing exports from internal resources (Section 3) and self-scheduled wheel-throughs (Section 4).

[8] See, for example, the discussions of ATC calculation, capacity benefit markets and transmission reliability margins on the PJM OATT (www.pjm.com/markets-and-operations/etools/oasis/atc-information); see also PJM Manual 2 Transmission Service Request, March 29, 2021. We have not reviewed the OATTs of the many transmission providers participating in this stakeholder process, but we expect they have similar provisions for taking account of firm imports in calculating ATC and have procedures for setting a capacity benefit margin.

### 3. Exports from Internal Resources

The ISO and CPUC have devoted enormous attention to the long-term forecasting of native load, counting of internal resource capacity, and policy regarding imports in developing the ISO's Resource Adequacy (RA) framework. The experiences in August exposed that the system lacked sufficient mechanisms to guarantee that resources contracted for, and shown, to meet the RA requirement, even if available as planned, would be reserved for use to serve CAISO load during extreme operating conditions such as those on August 14 and 15, 2020, and not used to support economic exports to neighboring control areas during times of times of extreme system stress when the CAISO is shedding load.

Outside of the CAISO, other western BAs make important distinctions between energy transactions considered firm and those that are non-firm. Export sales are subject to relatively strong screening criteria before being made as firm sales at market-based rates, rather than at incremental generating cost. Several transmission providers commented that they would not, as a general business practice, curtail firm exports to prevent a shortage of energy serving native load, even though standard contract terms and NERC procedures appear to give them the authority to do so.[9] However, other BAs also make non-firm economy energy sales that are subject to curtailment. By contrast, the CAISO has no mechanism for making discretionary firm energy export sales at market-based rates. The CAISO is a transmission provider but does not have an affiliated generation arm able to make such market-based sales. Any firm power sales from resources within the CAISO need to be made by the resource owner, supported by capacity that has not been shown as CAISO RA. This reflects the historical evolution of transmission capacity allocation, where the firm/non-firm distinction is a legacy of pre-Order 888 and 2000 systems that have evolved over decades, while the CAISO system is based on the open access/spot market-based allocation championed by FERC in its standard market practice/wholesale market platform initiatives.

At present, the penalty parameters the CAISO applies in its market software when different types of transactions are curtailed establish relative priorities for those transactions when balance between supply and demand in the energy market cannot be achieved in the solution, even at the price cap (e.g., there are more price-taking transactions than can be scheduled without violating transmission or energy balance constraints) as can be the case during periods of system stress.

Prior to the August heatwave, the CAISO real-time interchange scheduling software placed high priority on transactions clearing its day-ahead integrated forward market (IFM) when demand exceeded supply at the price cap. The software changes implemented after the August heatwave provided that only export transactions clearing the Residual Unit Commitment (RUC) process would receive a higher priority than CAISO load in the real-time market. The new proposal would confine priority export status to day-ahead exports linked to specific non-RA resources. It would define the priority of exports from units within the CAISO that are under contract to an LSE in another BA to have a priority status equivalent to native load.[10]

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[9] See Comments of Select EIM Entities on the CAISO's Market Enhancements for Summer 2021 Readiness Initiative January Stakeholders Workshops. January 20, 2021. https://stakeholdercenter.caiso.com/StakeholderInitiatives/DownloadFile/f9cbde71-08ca-4f84-b2dc-241217c93943.

[10] *Final Proposal*, p. 17.

Exports cleared in the CAISO's day-ahead market, but not supported by non-RA capacity, are essentially equivalent to non-firm economy energy sales. They are financially firm, and the CAISO will commit and dispatch generation at a cost of up to its bid cap to enable a price taking export to flow in real-time, but they are subject to curtailment if the CAISO does not have enough capacity to meet ISO load at the price cap, $1000/MWh (or $2000/MWh under some conditions). This appears to us to be consistent with, or superior to, the practices of other BAs with respect to non-firm energy sales that they choose to make on a discretionary basis.

Differences arise with respect to firm energy sales. Some non-CAISO BAs state that they assign a higher priority to firm exports than even to their native load as a matter of business practice, although they are not under contractual obligation to do so.[11] However, none of these non-CAISO BAs appear to claim that they assign such a priority to non-firm economy energy sales. As explained above, the CAISO has no mechanism to make long term sales of firm power at market-based rates, since it is a transmission provider not a generation owner. Such long-term firm sales at market-based rates would have to be made by individual resource owners within the CAISO that have capacity that has not been shown to meet CAISO resource adequacy obligations, and is therefore available for sale on a long-term firm basis. The changes proposed by the CAISO would reduce the priority of exports backed by non-RA resources to be equivalent to, rather than higher than, the priority of CAISO load in both day ahead and real-time markets. This change appears to align CAISO standards with the contractual requirements, but not the more generous stated business practices, of other BAs. The change, by keeping priority exports equivalent to load, is also consistent with principles previously approved by FERC for the CAISO.[12]

Note that with the proposed changes, CAISO load, as reflected in its HASP and RTD forecasts, will receive higher priority than spot export energy purchased in the IFM that is not explicitly backed by an internal non-RA resource. This defines spot purchases made in the IFM to have "firmness" consistent with economy energy sold by other BAs.

It is conceivable that the CAISO's ability to curtail non-firm energy sales could somewhat reduce the incentive of CAISO LSEs to purchase their full load requirements in the IFM if they exceed what they have contracted with RA or internal non-RA resources. However, the risk of load shedding provides little incentive for individual LSEs to purchase power at high prices because responsibility for load shedding within the CAISO is not tied to the net short position of individual LSEs. Indeed, some LSEs may know that they will not be called upon to shed load no matter how short they are in real-time. Under the proposal, shifting load from the IFM to the

[11] "It is the general practice across the West that entities do not curtail firm exports as a result of lack of supply." Comments of Select EIM Entities. January 20, 2021, p. 1. https://stakeholdercenter.caiso.com/Common/DownloadFile/62696ceb-02aa-4078-8fec-cff65f5ca7e1.

[12] The FERC order states that "We accept the modifications proposed by the CAISO, to treat export demand the same as CAISO demand, if that export demand is not served by capacity reserved for resource adequacy or RUC use." *California Indep. Sys. Operator Corp.*, 116 FERC, ¶ 61,274 at P 1282 (2006). http://www.caiso.com/Documents/September21_2006OrderConditionallyAccepting2_9_06MRTUfilinginDocketNos_ER06-615-000andER02-1656-027_etal_.pdf.

real-time markets would no longer reduce the priority attached to that internal load, and so might weaken incentives to CAISO LSEs to procure their full load requirements day-ahead.

The changes to the current design implemented by this proposal seek to ensure that internal resources that have not contracted to serve the load of an external buyer will not be used to support exports when the system is under stress and there is insufficient supply to meet both CAISO load and price-taking exports at the bid cap. This change reduces the possibility that CAISO load would be shed at the same time that internal RA resources support export transactions.

The proposal therefore is designed to limit high priority exports to transactions supported by CAISO internal capacity with some form of advanced agreement with external load. This concept presents implementation challenges. While several approaches for the validation of non-RA resources used to support exports prior to, or during, the operation of the IFM were considered, CAISO staff concluded that such approaches could not be implemented prior to summer 2021, and so are not part of the present proposal. Therefore, the main mechanisms to prevent exports supported by internal RA resources under the proposed summer 2021 design are first, the requirement that resources identified to support priority price-taking export transactions (PT exports) participate in the RUC process day-ahead[13] and, second, that the scheduling coordinators (SC) managing the non-RA resources that would be used to support exports attest that these resources have been "forward contracted" with an external LSE entity and their forecast or dispatchable output must be sufficient to support the full amount of the export schedule.[14] If the resource supporting an export is not scheduled to operate (e.g., not needed) in the RUC process, a non-RA resource must be declared and participate in the real-time market for this export (which would have received a RUC schedule) to maintain its native-load-equivalent priority.

These requirements should eliminate the potential for CAISO RA resources to be used to support high levels of exports to other BAs during extreme operating conditions, as appears to have happened at times during the August and September heat waves. These rules would enable some amounts of energy from resources that might have some kind of contract with California LSEs (including retail access suppliers) but was not shown as CAISO RA to be sold as RA capacity to another BA and used to support exports. This is consistent with the ability of resources located outside the CAISO to enter into contracts to sell RA to CAISO LSEs as long as they have not sold their RA capacity to some other BA.

One benefit of the RUC participation requirement is to ensure that there is some *real* resource identified and able to support the export, and to avoid potential double counting of resources that might otherwise have been implicitly used to support both native load and an export. In this sense it is an important "reality check" that has not been in place up until now, but it does not significantly change the short-term financial incentives for export transactions. The implicit

[13] This ensures that the resource could be committed if needed to support the export transaction.

[14] The CAISO will revise the tariff to include a rule stating that "by allowing the resource to be designated, the scheduling coordinator of the resource attests the generation has been forward contracted with an external load-serving entity." *Draft Final Proposal,* p. 18.

energy market penalty for non-performance by a non-RA resource used to support an export would therefore not be much different than those faced by a convergence bid and would be capped at $1000/MWh (or $2000/MWh if the Order 831 process is triggered). [15]

In addition to owing imbalance costs if scheduled, the other main deterrent to a RA or underperforming resource providing support for PT exports under the interim design for Summer 2021 would be an implicit attestation, reflected in the CAISOs resource master file, that the resource had enough output to support the export that would be implicit in declaring that resource for the export.[16] As we understand it, the designation of "forward contracted" would be applied to a resource's designation in the CAISO's unit master-file, where changes can be made to a resource's characteristics with a five-day notice. Therefore, transactions that might change a unit's status from ineligible to eligible for supporting PT exports would need to be contracted for no less than five days prior to the need for that export. Since RA capacity must be shown 45 days before the month it will be relied upon, these mechanisms should prevent capacity that is shown as RA from supporting a PT export. Doing so would contradict the implicit attestation.

Conditions where CAISO prices may be below those paid for power outside of CAISO, combined with the policy of curtailing CAISO load irrespective of which LSE does not have enough resources to cover its load during shortage events, can still create incentives potentially detrimental to CAISO reliability. For example, if prices outside of California were high enough, a non-RA resource may find it lucrative to reach a single or multiday agreement in advance of a series of stressed days to allow for export declaration. Even if such a resource were under a longer-term (non-RA) contract with a California-based load-serving entity, that LSE may also find it lucrative to allow such an export arrangement if it does not need that capacity to meet its CAISO RA requirement. The inability of California to be able to effectively compete with external markets as a result of the price cap in such circumstances could create reliability issues if resource needs exceed the procured RA capacity.

Thus, absent an increase in the CAISO scarcity-pricing parameters to allow prices to rise above $1000/MWh (or $2000 if FERC Order 831 is triggered), there will at times be incentives to export power supplied by non-RA resources from the CAISO system when scarcity conditions extend outside the CAISO. The most robust solution is not to erect rule-based barriers to prevent such exports, but for LSEs to contract for sufficient resources to meet their RA requirements and for the California market to institute full scarcity pricing and other measures so that its prices during stressed conditions better reflect the value of that power. Fully addressing this would require longer term changes to the CAISO scarcity pricing design.

Overall, the measures proposed by the CAISO should reduce, but not completely eliminate, any remaining possibility that the output of resources procured by California LSEs to meet their RA requirements would be exported during scarcity conditions. There would be a direct

[15] Moreover, there were periods in August when ISO load was armed for shedding yet the price of exports was far below $1000/MWh. Changes recently adopted by CAISO should raise prices to the bid cap whenever load is armed for shedding in the future. *Final Proposal,* p. 31.

[16] *Final Proposal*, p. 19. The master file designation is being applied here as a short-term measure given that CAISO feels it does not have the time to develop more complex designs that could make direct checks of resource capability. For example, exports could be capped at the projected RTPD output of the resource.

identification of which resources were supporting PT exports and if those resources had previously been contracted to support the load of a CAISO LSE. The measures also consolidate and clarify the priorities given to export purchase out of the CAISO's day-ahead market by reserving priority exports self-attested to be backed by non-RA resources. The measures provide a process through which energy from non-RA resources can be freely marketed throughout the western grid. No export transaction, however, would receive a priority higher than CAISO load.

In the longer run, it would be beneficial for CAISO and neighboring BAs to reach agreements for reciprocal treatment of RA (and RA-equivalent) resources. To the extent that CAISO and its LSEs expect that their imports from external RA resources should not be cut, except for transmission congestion, such agreements would help to clarify the appropriate priority status and penalty values for exports from the CAISO system.

### 4. Wheel-Through Self Schedules

A closely related issue to the export of energy from CAISO under stressed conditions is the treatment of wheel-through transactions under similar conditions. A wheel-through transaction consists of a pair of transactions combining an import into one part of the CAISO system and an export from another part. Under stressed conditions, various constraints can limit both the CAISO's ability to allow imports over congested intertie transmission, or to accommodate wheel-through flows on congested internal transmission constraints such as Path 26, and its ability to accommodate exports without shedding native load. From a reliability standpoint it doesn't matter whose power is flowing into the CAISO over a congested intertie, but it does matter whether that imported energy will be exported rather than used to meet native load. Therefore, there can be direct competition for scarce transmission between wheel-through transactions and native load during such stressed system conditions.

Under open-access principles dating back to FERC Order 888, transmission owners must accommodate transmission service requests in a non-discriminatory manner, as long as those transmission facilities can reliably accommodate such a request. As we understand it, open access principles do not in practice require transmission-owning utilities to market transmission that has been reserved on a planning basis to meet their own native load. Thus, available transmission capacity (ATC) would not include the transmission reserved to meet native load. In traditional vertically integrated utilities, these transmission transactions play out over relatively long-term time horizons, allowing for impact studies and even opportunities to expand grid capacity, if necessary, before physical transmission access rights are sold.

Within the western grid, however there is a clash of paradigms with regards to how transmission rights are nominated and awarded to meet native load. In particular, the CAISO does not require that transmission service be purchased in advance and does not have rules governing the purchase of firm transmission service, instead charging for transmission usage by internal and external load on a per megawatt hour basis to recover embedded costs (TAC) and charging for redispatch costs in the LMP prices. The CAISO therefore has never calculated an ATC that accounts for the transmission reserved to accommodate firm imports (RA imports serving native load) or provide a capacity benefit margin. Nor does the CAISO have rules that allow LSEs in external BAs to purchase firm transmission service. These features of the CAISO transmission

service design have apparently not been an issue in the past. Nevertheless, the proposed changes in curtailment of spot market exports for summer 2021 could result in external BAs making more use of wheel-through transactions than they have in the past, particular during extreme high load conditions when there is a potential for exports not supported by non-RA capacity to be curtailed. Within the current paradigm, there is no mechanism for reserving physical priority access to CAISO transmission in advance of the daily market.

The implication of the CAISO's transmission service design is that in the CAISO's IFM and real-time intertie scheduling processes (HASP and RTPD), native load competes for all transmission capacity, not just the capacity remaining after the capacity needed to meet native load is reserved. In this sense, short-run CAISO transmission access has been far more "open" than in non-ISO BAs. Over the longer term there are several options for defining entitlements to use the CAISO transmission system within the CAISO's market structure. One approach that would make the CAISO approach more analogous to neighboring areas would be to grant scheduling priority, applicable only as a "tie-breaker" when the market does not resolve congestion, to financial transmission rights that are awarded or purchased through the CAISOs CRR process. Another option would be to establish prices for the purchase of firm transmission service and calculate ATC on each intertie and across internal CAISO constraints, taking account of the transmission capacity used to support resource adequacy needs and a specified capacity benefit margin. To the extent that ATC is available, external LSEs would be allowed to purchase firm transmission and gain priority access for the transactions using this newly established firm transmission service (in the case tie-breaking is required) over other transactions, such as wheel-through transactions, that are bidding to use the same capacity at the same price. This second option would require a significant market design effort as well as a FERC filing to establish the charge for the purchase of firm transmission service over external interfaces.[17]

The CAISO staff's position is that changes along these lines would be beneficial but could have unintended consequences and would be too complex to fully vet through proper stakeholder and testing processes as well as receive FERC approval prior to implementation this summer. As things currently stand, all day-ahead self-scheduled wheel-through transactions would have the highest priority for access to the CAISO system, despite not having purchased firm transmission service. Absent changes in this design, the penalty prices used to schedule wheels in the IFM and HASP could cause imports serving native load to be reduced before any self-scheduled wheel transaction would be curtailed.[18] The potential degradation of local reliability to

[17] The ISO is starting a new Maximum Import Capability initiative to address this and other issues https://stakeholdercenter.caiso.com/StakeholderInitiatives/Maximum-import-capability-enhancements.

[18] ~~Wheels currently enjoy priority because the import leg of a self-scheduled wheel in IFM has a penalty value of -$650 and the export leg has a penalty of $1450. By contrast a self-scheduled import (not linked to an export) currently has a penalty price of -$450. The penalty for not meeting load is $1450. Therefore the "cost" of curtailing an import that results in cutting load is 450+1450 = $1900 and the cost of curtailing a self-scheduled wheel is 650+1450 = $2100.~~ There have been several changes in the documented CAISO penalty prices over the past 9 months and some since the opinion was posted. Based on the penalty prices recently documented in PRR 1345, and absent the adoption of the proposal to establish two wheeling priority levels, wheels self-scheduled in the IFM market would gain priority in RUC or HASP over serving CAISO load at any market-based supply bid. Only load that is served by a self-scheduled import would enjoy a priority equal to a self-scheduled wheel in the IFM. First, in the RUC process, a self-scheduled wheel would have the same 1600 $/MWh penalty as CAISO load associated with

accommodate short-term wheel-through transactions goes further than what is expected under open access principles as we understand them.

Therefore, for the coming summer the CAISO proposes to create two classes of wheeling transactions, a "priority wheel" (PT wheel) self-schedule, defined below, and a low-priority (LPT wheel) self-schedule.[19] The proposal would adjust the penalty values applied to the new LPT wheel-through transactions in the scheduling run of the IFM and HASP. The priority of the export half of a LPT wheel-through would be the same as for a LPT export and the import half of a wheel-through would be treated as a zero-priced economic import bid. These two halves of the transaction would be linked in the optimization.[20] These changes would reduce the priority of LPT wheels to a lower level than both PT wheels and serving native load. The optimization would therefore consider the combination of cutting a self-scheduled import and curtailing load more costly than cutting a self-scheduled LPT wheel-through transaction.[21] We believe this is consistent with the treatment of non-firm transmission rights by other BAs.

This change provides more security for native load in the CAISO BA to use the transmission system to deliver the output of network resources to load by eliminating the previous priority that *all* day-ahead wheel-through self-schedules enjoyed over native load for use of the CAISO's transmission. Note that the changes to the LPT wheeling penalty does not guarantee that all imports serving native load would receive a higher priority than even LPT wheel-through transactions. Economically-bid import transactions would likely be offered at prices above $300 during stressed system conditions and therefore would be displaced in the market software by a self-scheduled LPT wheel-through.[22] This change does, however, create a mechanism for California LSEs/RA importers to prioritize import transactions serving ISO load by self-scheduling import energy, or bidding its import at prices below $300.

The core problem that would require longer run changes in the CAISO scarcity pricing design is that the $1000 price cap limits the LMP-based congestion cost of wheel-throughs during extreme

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its export leg, plus a penalty of -1350 associated with the import leg. In contrast, under the rules and penalty prices documented in PRR 1345, RA imports and generation would be bid into RUC at a price of zero. Therefore the "cost", or lost benefit, of not scheduling the RA import to serve load in RUC would be at most 1600 - 0 = 1600, while the cost of cutting a wheel in RUC would be 1600 - (-1350) = 2950, and the wheel would have priority. Second, any load shortfall in RUC would then roll into the HASP process, where cutting the wheeling transaction that was scheduled in RUC would result in a penalty of 2650, while cutting even a self-scheduled import to serve CAISO load would be penalized at 2550, meaning that the self-scheduled wheel would receive priority in HASP.

[19] *Final Proposal*, p. 21.

[20] In the IFM, this change would have the effect of applying a zero penalty to cutting a LPT wheel-through import and a $1150/MWh penalty to cutting the LPT wheel export, for a combined $1150/MWh penalty. The penalty for cutting the import leg of self-scheduled PT wheels and non-wheel imports would be $400. The penalty price for load and the export leg of PT wheels would be $1450.

[21] *Final Proposal. Appendices,* p. 44

[22] Since the penalty for not meeting load is $1450 and the penalty for a LPT wheel is $1150, the optimization would interpret the net benefit of an import preventing load shed as the difference between $1450 and the supply cost of that import. If the import price is above $300, this net benefit will be lower than the "cost" of cutting the LPT wheel.

operating conditions. The demand for wheeling transactions could exceed the CAISO's entire transfer capacity if the price differential between Pacific Northwest hubs and southwestern hubs exceeds the maximum potential congestion cost of the wheel in the CAISO. The only way to balance the available capacity with the demand for wheels would be to allow the transmission costs of those wheels to rise to the level of the financial benefits of those wheels.

Wheeling transactions that are designated as PT wheels would maintain the same combined penalty level, and would have the same implied curtailment penalty of $1850 (1450 + 400) in the IFM scheduling pass as an import that is self-scheduled to meet native load if the market software does not clear at the price cap. These transactions would therefore receive a priority commensurate with imported RA intended to serve California load. As we understand the proposal, PT wheeling transactions, unlike RA imports, would not be required to bid into the day-ahead market. The CAISO should consider aligning these requirements by placing a day-ahead must-offer requirement in order to qualify for PT Wheeling status.[23]

Ideally the total available transmission capacity that could be potentially assigned to PT wheels would be limited to the network capacity available after accounting for the RA transmission needs of CAISO LSE's. However, there is not currently a system in place that reconciles the transmission accounting in the CAISOs Maximum Import Capability (MIC) used for import RA and the Congestion Revenue Right (CRR) allocation process with other measures of available transmission capacity.[24] It is therefore not currently practical to calculate the transmission capacity that could be reliably marketed for wheel-through transactions on a forward basis, although one ad-hoc approach could simply limit available capacity to the difference between current capacity and the amount needed to accommodate RA imports.

In recognition of the fact that some outside BAs may have made forward arrangements for summer 2021 supply before the above changes were proposed, the CAISO is proposing for this summer to link PT wheeling status to purchases of firm transmission in neighboring BAs. The proposal would require a scheduling coordinator to notify the CAISO 45 days in advance of the MW quantity of the wheel and provide evidence of supporting the purchase of firm transmission capacity from the BAs supporting the import and the export of the wheel. This requirement for firm transmission capacity should restrict the ability of wheeling parties to submit inflated PT wheel-through schedules when they expect their schedules to be prorated down since firm transmission up to the CAISO's border is limited and costly. If the import RA contracts entered into by CAISO LSEs were also combined with firm transmission, then the PT wheel requirement would ensure that the combined capacity of PT wheels and RA imports were physically able to reach the CAISOs borders. However, firm transmission is not a requirement for an RA showing in California, so LSEs may not have procured it. Therefore, it is possible that even with these

[23] Under the current proposal there is a risk that the RUC may be feasible only because PT Wheels were not present in the day ahead schedule. Economically bid RA imports that do not clear the IFM will not receive RUC schedules if the RUC solution is feasible. If a substantial amount of PT Wheels arrives in HASP, they could displace the imports assumed by the RUC solution and gain a higher proportion of the post HASP pro-rata allocation than if those PT Wheels were bid in the day ahead market and as a consequence triggered a RUC infeasibility.

[24] The Maximum Import Capability (MIC) is used to determine the amount of maximum amount of import capacity that can reliably be depended upon to support resource adequacy imports.

restrictions., the combined capacity of PT Wheeling transactions and RA imports could exceed total transfer capability on a given intertie.

When running its day-ahead market, the CAISO will grant equal priority to wheel-through transactions and self-scheduled imports needed to meet native load. Not all RA imports would be expected to self-schedule, however.[25] At least some imports and all internal RA resources would be expected to offer at prices reflecting their costs. In order to provide equal priority for California RA resources, the proposal would modify the Residual Unit Commitment (RUC) process so that all RA resources receive a RUC schedule when RUC is unable to meet the CAISO load forecast, even if the RA resource did not clear in RUC.[26] This adjustment is proposed to ensure that all RA units receive a priority equivalent to PT wheels when RUC is infeasible (and therefore in a scarcity condition).

With these changes, the intertie transmission capacity needed to accommodate the combination of import schedules, PT wheels, and RA schedules all emerging from RUC could exceed the capacity available in the Hour Ahead Scheduling Process (HASP). In such cases the proposal will apply a pro-rata adjustment after the HASP process that would allocate limited transmission capacity proportionately to the levels of PT Wheels and RA imports that were scheduled in RUC, where, again, RUC schedules may include RA resources that did not clear the original RUC solution.[27]

The proposal would also apply the same pro-rata rationing approach to the internal north to south Path 26 constraint. This would reduce the likelihood that wheel-through transactions might prevent northern California RA resources from supplying southern California load.
As we understand it, internal RA resources in northern California as well as imports and wheeling transactions would all factor into this allocation, although we agree with commenters that more detail on how this would be implemented should be provided.

Stakeholders are divided on the wheeling issue along two lines. Comments from many BAs argue that the requirements to qualify for PT wheeling status are stricter than those applied to the RA contracts signed by California LSEs.[28] They argue that such differences constitute violations

[25] A CPUC decision from June 2020 requires that non-resource specific RA imports either self-schedule or offer at a negative or zero price. However, such requirements apply only to non-resource specific resources, and only during availability assessment hours (AAH). While the availability assessment hours are likely to be the hours with import constraints during load shedding conditions, this is not guaranteed. Moreover, these rules do not apply to dynamically scheduled and pseudo-tied RA imports, which we understand will also compete with wheel-through transactions for capacity on congested interties (PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA, DECISION ADOPTING RESOURCE ADEQUACY IMPORT REQUIREMENTS, D.20-06-028, in Rulemaking 17-09-020, https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M342/K516/342516267.PDF).

[26] Final Proposal, p. 44. Such a circumstance could arise if congestion prevents an RA import or unit from being chosen in the RUC solution.

[27] An update to the proposal limits the pro-ration to only PT Wheels and RA imports, rather than the higher of RUC imports and RA imports. This change was made to reflect a comparable priority status between RA import needs and PT Wheels.

[28] Powerex, for example, highlights the PT wheel requirements for firm transmission, energy contracts, and other elements that are not required of RA contracts, https://powerex.com/sites/default/files/2021-04/2021-04-

of non-discriminatory open-access principles.[29] Comments from California stakeholders point to the fact that no long-term purchase or payment of CAISO transmission is required to qualify for PT wheel status and argue that this, combined with other dimensions of the proposal, grant what is effectively firm access to use CAISO transmission to wheel power through the CAISO on more generous terms than could be found elsewhere in the WECC.[30]

The fundamental issue at the root of these disagreements is whether open access principles require that transmission providers make all of their transmission capability for sale or only require that it market the available transmission capability in excess of the transmission needed to meet network load. This is somewhat distinct from the transition issues discussed above, which could justify additional accommodation of wheeling arrangements on a transitional basis. On these points we largely agree with the perspective of CAISO DMM that the CAISO's proposed solution still grants access to the CAISO transmission system on terms that are more "open" than those typically found outside the CAISO. Our understanding of the principle of open-access is that it recognizes that transmission owners have a right and obligation to reserve the network capacity needed serve their own retail load as part of its existing transmission commitments (ETC), and that non-discriminatory access must be provided for any transmission capacity that is available *after* accounting for these local reliability needs (ATC).[31] Access truly comparable to what some BAs are requesting of the CAISO would require that those BAs market *all* of their transmission capacity on a daily basis and treat those transactions with the same priority as their own load. This is clearly not the standard practice outside of CAISO. The CAISO, unlike other BAs, is proposing to provide high priority wheeling access without requiring a long-term commitment to pay for a higher level of firm access. Even the least "firm" of wheeling transactions, low-priority wheels scheduled in real-time could still crowd out real-time imports to serve CAISO load if those imports are priced above $400. Thus, CAISO load may have to be curtailed in order to accommodate real-time low priority wheeling transactions.

The fact that wheel-through transactions might have to demonstrate commitments (such as firm transmission purchases) reflecting an intent to rely on firm transmission through the CAISO that are different than the entitlement of CAISO load to use the transmission system to deliver power from designated (external RA) resources to load does not strike us as particularly relevant. To our knowledge, other western BAs are not required to align their procurement practices to serve their native load with those of firms purchasing transmission service on their systems. What is

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02%20Powerex%20Comments%20on%20CAISO%20Summer%20Readiness%20-%20Wheeling%20Priorities.pdf. At the time of this writing, changes to the specific requirements were being considered.

[29] See April 2, 2021 comments by BPA, Portland General Electric Co., NV Energy, Powerex, Seattle City Light, Southwest Load Serving Entities, and the Western Power Trading Forum. https://stakeholdercenter.caiso.com/Comments/AllComments/10a75479-324d-491f-b688-16d98711e742#org-236e0c64-cb5a-41c9-9e54-265368bb04f7

[30] See April 2, 2021 comments by PG&E, SCE and the California Public Utilities Commission. https://stakeholdercenter.caiso.com/Comments/AllComments/10a75479-324d-491f-b688-16d98711e742#org-236e0c64-cb5a-41c9-9e54-265368bb04f7

[31] Department of Market Monitoring, California ISO. Comments on Market Enhancements for Summer 2021 Readiness Final Proposal. http://www.caiso.com/Documents/DMM-Comments-on-Summer-2021-Readiness-Final-Proposal-Apr-2-2021.pdf.

relevant is whether the *magnitude* of RA requirements, and their related transmission needs, are a reasonable interim measure of native load transmission requirements.

It is notable that external parties already need to meet a different set of criteria than internal LSEs in order to qualify for the allocation of CRRs, the main form of transmission rights currently in place in the CAISO system.[32] These requirements, including prepayment, or a commitment to pay, the wheeling access charge in the amount of MWs of CRRs nominated, are more extensive than those being proposed for qualification for PT Wheeling access.

The conditions for PT wheel status have been proposed as an ad-hoc method of identifying existing needs for firm wheel-through transactions, in the absence of any purchase of firm transmission service by those seeking to use the CAISO transmission system on a firm basis. It is a short-term measure intended to accommodate neighboring BAs who have been relying upon access to the CAISO system for their reliability needs this coming summer. While the CAISO should do everything within reason to accommodate these needs, it also needs to balance those needs with those of its own internal load. The proposed method would enable third-party use of the CAISO transmission system while hopefully maintaining the CAISO's ability to use its transmission system to meet network load using its designated capacity resources. While the CAISO has not explicitly calculated ATC on each tie taking into account RA import entitlements and a capacity benefit margin, retaining capacity to deliver power from designated capacity resources to meet network load is a very conservative definition of the highest priority entitlement to use of the transmission system, as noted by Morgan Stanley in their comments.[33] California's RA requirements are a minimal measure of the entitlement of CAISO load to the use of the CAISO transmission system Therefore, practices that try to ensure that resources designated for RA purposes can reach CAISO load should be viewed as attempting to honor existing transmission commitments, not as discriminating against wholesale transactions.

## 5. Summary

Prior to August 2020, the CAISO market's scheduling protocols and policy parameters treated exports and wheeling transactions with equal or higher priority than CAISO load. In several dimensions therefore the CAISO design went farther to accommodate market transactions at the expense of local reliability than neighboring BAs. The changes in August and proposed here recalibrate those priorities and swing the priority pendulum more toward CAISO short-term reliability. No export or wheeling transaction will be given higher priority to California load, but exports and wheels associated with contracts with neighboring areas will be given equal priority. These changes do not guarantee that energy produced by CAISO RA capacity could not be exported, but make it substantially less likely. California LSEs can increase the priority of CAISO load by clearing their expected load in the day-ahead market, but in the absence of more

[32] See section 36.9 of the CAISO tariff at http://www.caiso.com/Documents/Section36-CongestionRevenueRights-asof-Aug12-2019.pdf.

[33] Morgan Stanley Capital Group, April 2, 2021 comments, https://stakeholdercenter.caiso.com/Comments/AllComments/10a75479-324d-491f-b688-16d98711e742#org-4fd4c237-ed7f-4712-b23b-4074ad417d0e.

effective scarcity pricing, the benefits from doing so accrue to all CAISO LSEs while the costs fall on the LSEs that fully schedule their load.

While the treatment of some exports, particularly those backed by long-term RA arrangements with external BAs, is arguably less generous than the stated practice of other western BAs, by giving such resources equal priority to load, the proposals treatment is not dramatically less generous. In the future, the CAISO should pursue negotiations with other BAs for mutually acceptable reciprocal treatment of exports from resources selling capacity to outside LSEs.

While this compressed process may result in some unanticipated changes to wheeling status, access to CAISO's transmission network would continue in many ways to be more generous and open than that found in other western BAs. Even with the proposed changes, the amount of high-priority wheeling transactions allowed this summer, combined with the capacity needed for RA imports, could exceed the CAISOs transfer capability during some periods. Therefore, these changes do not guarantee that CAISO LSEs will be able to access their full RA import capability during stressed conditions. We have not seen a quantitative assessment of how much capacity could qualify or is likely to qualify for PT Wheeling status and therefore cannot assess the likelihood of such an outcome. High priority wheels will gain the equivalent of firm access under "pay as you go" terms. To the extent that the capacity of qualifying PT Wheels exceeds what an objective measure of available transmission capacity would have made available for sale, the CAISO will have gone beyond its obligations under open access principles.

Although CAISO ~~staff believes~~ staff believes that this proposal is the only feasible approach for this summer, longer-term solutions will need to more precisely assess the amount of available transmission capacity that can be made available for PT wheels without degrading CAISO system reliability. This is one of the stated goals of the ISO's new Maximum Import Capability initiative.[34] Another question that will have to be confronted in this process is the degree to which the CAISO model of transmission access should be shaped to fit the norms and practices of other BAs.

We believe there are significant efficiency and transparency benefits from the general ISO/LMP model of transmission pricing and that these benefits should be maintained as much as possible. Under this model, physical access to transmission is cleared by a short-term market and transmission rights are financial rather than physical. These financial transmission rights (e.g., CRRs) provide the financial hedge that allows the owners of these rights to "outbid" their competitors for transmission if necessary and desirable. This model breaks down, however, when the hypothetical market clearing price for transmission rises above the levels constrained by price caps. To the extent that scarcity prices across the western BAs are more aligned with each other in the future, the competition between wheeling and import transactions would be resolved by congestion pricing, rather than by the penalty values assigned to different forms of transactions.

[34] https://stakeholdercenter.caiso.com/StakeholderInitiatives/Maximum-import-capability-enhancements