

Western Power Pool: Western Resource Adequacy Program (WRAP)

White Paper on WRAP Interoperability with Markets: Focus on Transfer Scenarios

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Executive Summary

As the Western Power Pool (WPP) moves into the implementation phase for the Western Resource Adequacy Program (WRAP), two alternative Western markets are emerging – the California Independent System Operator’s (CAISO) Extended Day-Ahead Market (EDAM) and the Southwest Power Pool’s (SPP) Markets+. WPP has determined that WRAP’s ability to operate in parallel with these markets and interact with them is critical for WRAP to run successfully and deliver on its value proposition to participants. The WPP commits to continue to work closely with its own participants, stakeholders, and regional market operators to address interoperability between WRAP and emerging markets. Western grid integration and emerging markets is a very dynamic and quickly evolving policy space, which will require all stakeholders involved in WRAP or markets to remain nimble and flexible, including openness to consideration of design revisions to markets or to WRAP to ensure the WRAP value proposition.

WRAP promises greater regional reliability and situational awareness and the potential for cost and resource savings through diversity benefits of the loads and resources committed to the program. Importantly, interoperability between WRAP and EDAM or Markets+ must not pose an unreasonable risk to the WRAP value proposition. To examine this, WPP carefully analyzed how the markets would overlay with WRAP to determine any risk posed by interactions. This examination (and this paper) focused on transfer scenarios, specifically transmission and deliverability requirements that are essential to WRAP’s operations.

The results of the analysis show that WRAP and markets interoperability is feasible, but there are certain scenarios or policies that must be addressed at a more detailed level than what is available today to ensure that WRAP participants can reliably deliver or access their contracted or required resources to meet WRAP obligations. Without additional documented detail addressing how markets will accommodate transmission used to support WRAP deliveries, preferably in tariff language, current proposals for both EDAM and Markets+ leave some question as to their ability to support the WRAP value proposition:

- For EDAM, CAISO has substantially completed its tariff process. In the most recent set of revisions to its draft tariff published June 8, 2023, CAISO proposes that it may adjust day-ahead market availability (i.e., the use of “carve-outs”) under certain circumstances to accommodate transmission necessary for reliability, though the process is not entirely clear from the draft language. However, it is clear from the tariff language that implementing a carve-out process must be



performed in accordance with the tariffs of transmission service providers participating in EDAM. The tariff drafting process for transmission service providers participating in EDAM has not started and it is not clear to WPP when there will be additional EDAM tariff language on this matter.

- For Markets+, there is substantially more work to be done on design and tariff language. As a result, the analysis contained here is primarily limited to SPP's additional explanations regarding how transmission used to support WRAP obligations will be treated in Markets+. Some uncertainty about interoperability and deliverability will remain until the tariff is complete.

Accordingly, the WPP urges market operators and their respective stakeholders to continue to develop additional documentation addressing how markets will accommodate transmission used to support WRAP deliveries. Durable solutions are possible but should be documented in tariff language. In the case of EDAM, CAISO's EDAM proposal will require the use of carve outs, however, important details for how this will work are currently unclear or have been deferred to transmission service providers participating in EDAM. In the case of Markets+, draft tariff language addressing this issue is needed.

WPP is committed to continuing to monitor both market offerings, including changes or updates from what was provided for this analysis. We will update this document as new information is available and contemplate adding topics in future iterations of this paper. Topics likely to be considered include:

- Market treatment of WRAP-accredited capacity and its availability to WRAP participants
- Treatment of uncertainty – comparison of market and WRAP methodologies and impacts
- Governance considerations for the incremental approach to these programs
- Usage of transmission wheeling across the CAISO BA to meet WRAP deliverability requirements



Background

Over the past four years, entities in the West have come together through an initiative facilitated by the Western Power Pool (WPP) to scope and develop a voluntary, regional resource adequacy compliance program known as the Western Resource Adequacy Program (WRAP). The WPP filed a Tariff to implement WRAP with the Federal Energy Regulatory Commission on August 31, 2022, which was accepted by the Commission on February 10, 2023, granting WPP's WRAP Tariff effective date of January 1, 2023. The WRAP Tariff requires participants to provide administrative program funding, follow program rules, and be subject to financial charges for failure to meet program requirements. Participants are currently operating under the WRAP Tariff for a period when certain program rules will be informational only (referred to as "non-binding"). At the time of this paper, the WPP and WRAP participants are working together to determine when WRAP will transition into a fully binding program, between Summer of 2025 and Winter of 2027/2028.

The design of WRAP is intended to leverage the existing bilateral market structure in the West to develop a resource adequacy construct with two distinct aspects. First, the Forward Showing Program¹ requires participants to show, seven months in advance of each WRAP Winter and Summer Season, that they have sufficient capacity to meet a required planning reserve margin and have reserved at least 75% of the transmission (firm or conditional firm) necessary to deliver energy from that capacity to their load.² The program imposes deficiency charges on participants who do not satisfy the minimum capacity or transmission requirements. Second, the Operations Program addresses any shortfalls approaching a given operating day within each binding season. Participants who are short of necessary supply can call on the resources of other participants who have surplus supply of capacity relative to their Forward Showing obligations. During sharing events, participants with excess capacity are required to hold back capacity and are required to sell energy to participants who lack sufficient resources to serve real-time

¹ Capitalized terms in this paper shall have the same meaning as defined terms in the WRAP Tariff. https://www.westernpowerpool.org/private-media/documents/WRAP_Tariff_12-12-22_W0327945x8DF47_2.pdf

² It has been observed that policy and design decisions made in the implementation of the WRAP may introduce some potential deviation from the 1-in-10 loss of load expectation metric identified in the Forward Showing Program. These would include the fact that the program requires demonstration of only 75% of transmission mapped to participants' Forward Showing resources, that it allows either firm *or* conditional firm transmission rights to meet that requirement, and that the participants' required holdback (to help fellow participants in need) cannot be mandatorily increased after it is set on the Preschedule day if deficit participants need additional aid. Each of these policy decisions were vigorously debated with participants during design discussions and was paired with mitigation where possible (e.g., requirement to deliver resources on 100% firm/conditional firm transmission in operating day, ability to request additional voluntary holdback when encountering unforeseen circumstances). And importantly, every one of these accommodations was accepted with consensus from all WRAP participants, with the acknowledgement that the robust, independent governance process instituted within the WRAP would provide ample opportunity to adjust the policy if these potential risks are larger than anticipated.



load and who request assistance. This sale is referred to in the proposed WRAP Tariff as an “Energy Deployment.” The program imposes charges on participants who do not deliver their obligated Energy Deployments to participants in need. The WRAP relies on bilateral transactions (supported by transmission) between participants to satisfy resource adequacy obligations, including delivery of any required Energy Deployments.

Under the WRAP Tariff, the WPP serves as the Program Administrator, responsible for ensuring that Tariff requirements are fulfilled, and providing overall program administration, oversight, and governance by its independent Board of Directors. This includes providing legal, regulatory, and accounting support for WRAP and providing logistical support of the stakeholder process. To run the Forward Showing Program and Operations Program, WPP works with the Southwest Power Pool (SPP), serving as the Program Operator, responsible for performing planning studies, modeling planning reserve margins (to be accepted by the WPP Board), administering the Forward Showing Program, applying capacity accreditation rules, monitoring and administering the Operations Program, and maintaining the technical systems to administer both programs.

At the same time as the region has been building and standing up WRAP, entities across the West are actively evaluating market expansion alternatives, including the California Independent System Operator (CAISO) Extended Day-Ahead Market (EDAM) and the SPP Markets+, both of which are incremental market solutions offering day-ahead in addition to real-time market optimization services to Balancing Authorities in the West. EDAM and Markets+ are not fully integrated RTO/ISO market platforms.

The CAISO’s “Extended Day-Ahead Market Final Proposal” was jointly approved by the CAISO Board of Governors and the Western Energy Imbalance Market (WEIM) Governing Body February 1, 2023.³ The draft Tariff language⁴ posted on March 30, 2023, is being considered through additional stakeholder engagement in the first half of 2023 and is to be filed with the Federal Energy Regulatory Commission (FERC) later this summer. Revised draft tariff language was published June 8, 2023. Implementation activities will be underway through 2023 and part of 2024 in preparation for onboarding of first participating entities in the Spring of 2025.

³ <http://www.caiso.com/InitiativeDocuments/FinalProposal-ExtendedDay-AheadMarket.pdf> (“EDAM Final Proposal”).

⁴ <https://stakeholdercenter.caiso.com/StakeholderInitiatives/Extended-day-ahead-market>



SPP released a detailed “Proposal for Southwest Power Pool’s Western Day-Ahead Market and Related Services” (a.k.a. “Markets+”) in November 2022⁵ and initiated Phase one of Markets+ development in March of 2023. SPP launched the Markets+ governance structure in April 2023 with several working groups and task forces drafting Tariff and Protocol language consistent with the proposal published in 2022. SPP plans to file Tariff provisions at FERC by the beginning of 2024 and launch Markets+ services in late 2025 or early 2026. SPP’s Markets+ proposal includes a requirement that all participants be compliant with the WRAP, and SPP will be forming a Markets+ Resource Adequacy Task Force, consistent with the Markets+ governance process, to develop the Tariff and Protocol language required for interoperability with WRAP and Markets+ services.

⁵ <https://spp.org/Documents/68340/SPP%20Markets%20Plus%20Proposal.pdf> (“Markets+ Detailed Proposal”).



Issue and Principles

WPP fully supports market expansion for the Western grid and has been an active partner in regional stakeholder discussions on these topics to help advance these efforts and to identify solutions that ensure WRAP can deliver its value proposition to its participants. At its core, WRAP's value proposition is greater regional reliability and situational awareness and the potential for cost and resource savings through diversity benefits of the loads and resources committed to WRAP. The WRAP's value proposition relies on participants having access to their demonstrated (forward contracted and owned) resources and confidence in the operational sharing of resources within the WRAP footprint to safely lower the regional planning reserve margin.

As market expansion alternatives are explored and move forward, how these markets will interact with or relate to WRAP operations needs to be considered. The WRAP value proposition plays an important role in both of the primary functions of the WRAP:

- In the Forward Showing Program, participants are required to show that they own or have procured physically firm capacity which is supported by a significant amount of firm or conditional firm transmission service. The assumption underlying this compliance requirement (and the potential for a lower planning reserve margin) is that participants will make the considerable investments needed in firm resources and transmission which will in turn allow them to be able to reliably serve their load.
- In the Operations Program, participants must be able to rely on two things: 1) reliable access to the resources and transmission they demonstrated in the Forward Showing Program to meet their needs on the operating day, and 2) fellow participants to provide additional capacity (as an Energy Deployment) when that forward-procured supply is insufficient for operating needs, and that such deployments will be supported by firm or conditional firm transmission service to ensure their deliverability.

Effectively and fully implementing a West-wide resource adequacy program like WRAP must be a significant priority consideration for the region. Markets provide economic and reliability efficiencies in the operational timeframe, but are not equivalent to realize the reliability and diversity benefits that can be achieved through the advance planning, coordination, and compliance framework offered by WRAP. WPP emphasizes that durable reliability should be a significant priority consideration of stakeholders in the region.

Over the last several months, WPP has shared its observation that making WRAP work with markets appears to be feasible from a conceptual level, but that more detail has been needed to explore additional layers of complexity to ensure that WRAP can deliver



its value proposition to its participants. As WPP has navigated this issue, it has relied on the WRAP-Markets Interoperability Principles to help guide regional discussions on this topic. These Principles were created in October 2022 by the WPP and participants in WRAP, working through the Resource Adequacy Participants Committee (RAPC).⁶

To achieve the interoperability of WRAP and Western organized markets, *Western organized markets should:*

1. Be designed such that they do not interfere with or preclude participation in the WRAP.
2. Respect the governance framework and decision-making of the WRAP.
3. Preserve the diversity and investment cost savings derived from participation in the WRAP.
4. Preserve the supply priority and Open Access Transmission Tariff (OATT) transmission priority of WRAP Forward Showing supply to meet WRAP obligations.
5. Preserve the delivery of diversity benefits (holdback and energy) in the operational timeframe from one WRAP Participant to another, including from WRAP participants in one organized market to WRAP participants in another or no organized market.
6. Seek to collaborate with WRAP to ensure compatibility and to achieve potential operational efficiencies and reliability benefits for all WRAP participants.

This paper is a first step in sharing outcomes and observations resulting from analysis on WRAP-markets interoperability and focuses on the interplay of markets with WRAP transmission and deliverability requirements, looking at both interoperability with proposed EDAM design and Markets+ design under a variety of transfer scenarios. Future versions of this paper may add other interoperability topics, but deliverability is the first focus issue because of its criticality to assuring WRAP's value proposition in both the planning and operations timeframe. As such, this paper with a focus on transfer scenarios

⁶ It should be noted that these Principles were written and agreed to by RAPC in October 2022 based on then-current conditions in the West with respect to Western market expansion and WRAP design, both of which contain published design elements which assume the presence of OATT transmission priority frameworks supporting bilateral transactions primarily based on a contract path approach. As such, the Principles reflect the current importance of and the reliance upon such frameworks for ensuring the WRAP value proposition. It is possible that market or transmission conditions may change over time potentially opening up additional opportunities for efficiency with WRAP transfers or deliverability. The WPP commits to work with its stakeholders within its governance framework to ensure that its assumptions and approaches are appropriately calibrated to current operational conditions and opportunities, including how transmission is utilized by markets and by WRAP to ensure the WRAP value proposition.



relates primarily to WRAP-Markets Interoperability Principles #4 and #5, and secondarily to Principle #3.

Introduction to Scenario Analysis

One of the unique features of incremental Western market expansion including EDAM and Markets+ is the fact that Balancing Authorities (BAs) do not give up BA or transmission provider responsibilities. Importantly for this discussion, BAs in these markets still sell and administer transmission services under an OATT. Both market operators proposing incremental markets in the West state in their respective proposals that the markets are being designed to respect existing transmission rights of market participants. WRAP's primary reliability functions depend on the use of transmission rights of WRAP participants. WRAP's reliability metrics are built on the following foundational premises: 1) WRAP participants will be able to use firm or conditional firm transmission service to reliably deliver the energy from their owned or contracted resources (demonstrated in the Forward Showing Program) to their loads; and 2) when the Operations Program requires a Holdback Obligation and Energy Deployment, firm or conditional firm transmission service will enable reliable delivery/receipt of additional energy to a WRAP Participant in need.

Assuming that in the future the Western grid will have an EDAM, Markets+ and broad WRAP footprint that spans part or all of the markets, it is necessary to analyze multiple operational scenarios involving WRAP-related transmission and deliverability to identify impacts and interactions that may or may not require accommodation with applicable market design.

It is important to clarify that although this paper is necessarily focused on the ability to use transmission rights to fulfill WRAP requirements, the scenarios discussed below involve a general issue that many stakeholders have engaged on – will the market design in question allow transmission customers with firm transmission rights to utilize those rights day-ahead through real-time?



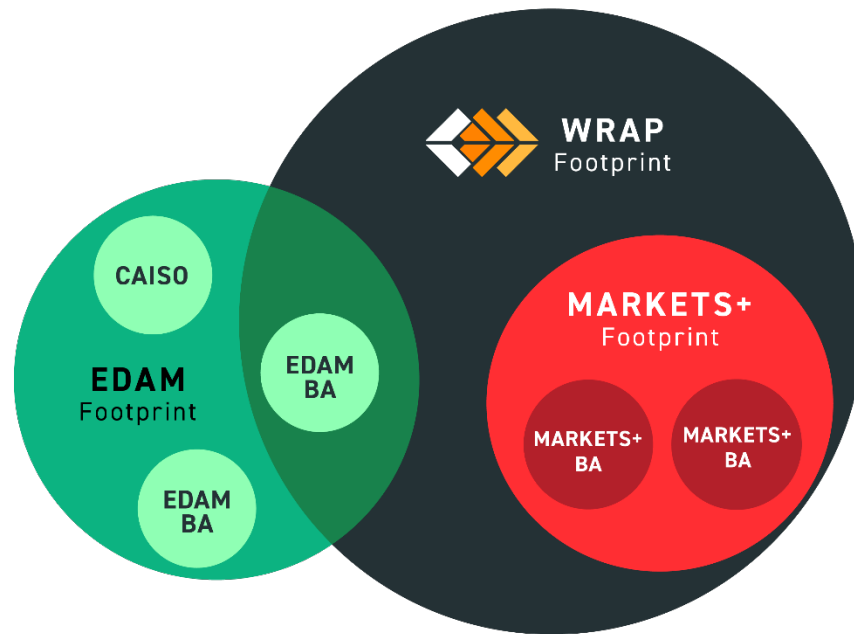


Diagram 1 – Conceptual WRAP and multiple markets footprint

When analyzing scenarios for purposes of this paper, the approach is different depending on which market footprint is involved: 1) with EDAM, there are existing Tariff provisions relating to CAISO markets (e.g., real-time and day-ahead market rules) that may relate to WRAP interoperability as well as market design rules specific to the CAISO BA and what has been proposed for EDAM or other initiatives, and 2) Markets+ is a new market design with no currently existing market operations or Tariff provisions; it is reasonably anticipated that market design for transactions under Markets+ will leverage OATT processes and priorities used in SPP’s other markets. For example, SPP’s Western Energy Imbalance Service market and Eastern Integrated Marketplace provide existing interchange rules to be used as a foundation that can be leveraged for Markets+. Analysis in this paper will necessarily be more detailed when more material is available on market design. WPP intends to update the document as additional information is provided on both markets.

The scenario analysis below will first analyze multiple operational scenarios involving WRAP transfers across the EDAM footprint. The analysis will then focus on the same operational scenarios involving WRAP transfers across the Markets+ footprint.

EDAM

For EDAM scenario analysis, the WPP relied upon the EDAM Final Proposal, the proposed EDAM Tariff, and discussion with CAISO.

EDAM Scenario A.1: Use of Transmission Rights by WRAP Participants Through the EDAM Footprint (Diagram 2)

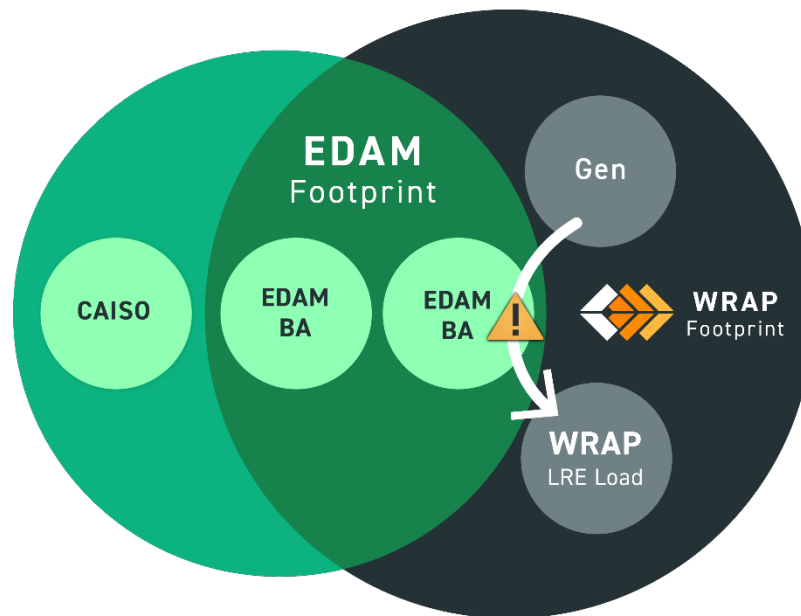


Diagram 2 – Use of transmission rights by WRAP participants through EDAM footprint.

In this scenario, the WRAP footprint overlaps with the EDAM footprint. The EDAM BAs shown in the diagram contain load responsible entities that are WRAP participants. There are also WRAP participants outside of the EDAM footprint (for purposes of this analysis, these WRAP participants could be contained in a BA that is a Markets+ entity or they could be contained in a BA that is not participating in any market).

Diagram 2 illustrates a WRAP obligation that needs to be delivered between a resource to a load, but this delivery requires a wheel across an EDAM entity where there exists an internal EDAM constraint (“⚠”). The delivery obligation shown in the diagram can be triggered in one of two ways:

- 1) A WRAP Participant (“WRAP LRE Load”) wants to use its firm or conditional firm transmission service associated with an owned or procured resource (“Gen”) consistent with its Forward Showing demonstration (a.k.a. “WRAP Load Service Transaction”).

- 2) A WRAP Participant (“WRAP LRE Load”) has been determined by WRAP to be deficit and under WRAP is entitled to receive an Energy Deployment supported by firm or conditional firm transmission service from another WRAP Participant that owns or has procured resource (“Gen”) (a.k.a. “WRAP Energy Deployment Transaction”).

EDAM Scenario A.1.a: Use of Transmission Rights by WRAP Participants Through the EDAM Footprint/WRAP Load Service Transaction – Block Energy

The CAISO’s proposed EDAM Tariff recognizes the scenario depicted in Diagram 2, anticipating that there will be transmission customers with firm OATT transmission rights⁷ across the interties between an EDAM BA and a BA outside of the EDAM footprint to support delivery of energy schedules wheeling through an EDAM BA (or exporting from an EDAM BA to outside the EDAM footprint) to support resource adequacy obligations or otherwise meet reliability or operational needs on OATT transmission.

In the EDAM Final Proposal, CAISO states that the EDAM design supports the exercise of these firm OATT transmission rights subject to the procedures described in the proposal:

- Transmission customers holding firm OATT transmission rights across an EDAM to non-EDAM interface will be able to self-schedule their firm transmission rights through the day-ahead market, whether to wheel through or export from the EDAM footprint.
- CAISO’s EDAM design, as described in the draft EDAM Tariff,⁸ allows transmission customers to exercise their transmission rights through real-time to support load service, meet operational or reliability needs, or otherwise exercise transmission rights, provided the transmission customer adheres to the scheduling process described below.
 - In the case of Scenario A.1.a, if the resource Gen needed by WRAP LRE Load to serve its load is a block-style contract, this requirement should not be difficult: WRAP LRE Load/transmission customer would submit a self-schedule by 10:00 a.m. of the day-ahead clearly indicating through the e-tag the required energy and transmission amounts and these amounts will not change day-ahead to real-time. According to the EDAM Final Proposal and the revised tariff, a self-schedule submitted according to the procedures

⁷ For purposes of this analysis and paper discussion, references to “firm” transmission are also intended to include conditional firm transmission.

⁸ EDAM draft tariff language, section 33.18.14, <https://stakeholdercenter.caiso.com/StakeholderInitiatives/Extended-day-ahead-market>



contemplated in Sections 33.18.3 and 33.18.3.1, associated with the exercise of OATT transmission rights, will be included and respected in the day-ahead market run.

EDAM Scenario A.1.b.: Use of Transmission Rights by WRAP Participants Through the EDAM Footprint/ WRAP Load Service Transaction – Dispatchable and Variable Energy Resource

The scenario depicted in Diagram 2 also addresses the more complicated case where the Gen needed by WRAP LRE Load/transmission customer to serve its load is not a block [e.g., it is a dispatchable resource or a Variable Energy Resource (VER)]. In this case, the WRAP LRE Load/transmission customer can submit a self-schedule by 10:00 a.m. of the day-ahead but cannot definitively indicate the required energy amount because it will vary between day-ahead and real-time. The WRAP LRE Load/transmission customer has some choices, each with different consequences:

- The WRAP LRE Load/transmission customer could schedule corresponding energy and transmission at the maximum of amount of its total transmission rights or the max capacity of the Gen (whichever is lower) prior to the day-ahead scheduling deadline, as a way of reserving all its transmission rights in case they are needed in real-time to support incremental VER output. However, this choice may result in possible uplift charges, primarily differences in congestion costs, to the EDAM entity, who is expected to hold the transmission rights holder harmless, associated with a potential need for redispatch to accommodate new real-time schedules and respond to other changes in conditions between day-ahead and real-time (e.g., load forecast changes or outages).
- It is more likely that the WRAP LRE Load/transmission customer will submit a day-ahead self-schedule prior to the day-ahead scheduling deadline with its best estimate of the actual energy that will be needed in real-time based on forecasts.⁹ This could result in a day-ahead energy self-schedule that does not correspond to the WRAP LRE Load/transmission customer's entire firm transmission right. As a result, the WRAP LRE Load/transmission customer may need to submit a real-time self-schedule to increase the energy amounts (e.g., to ramp up a dispatchable resource or to deliver energy from VERs performing better than forecasted in day-ahead). When a previously unscheduled energy self-schedule associated with firm transmission rights is submitted into the real-time market (such as with Scenario

⁹ Note that it is possible, or likely, that a WRAP participant anticipating high loads or adverse conditions may schedule the full amount of their firm OATT transmission rights in the day ahead (prior to the market runs). The EDAM will consider only the transmission with a corresponding energy schedule, not firm transmission schedules beyond the scheduled transmission.



A.1.b), CAISO explains that it may need to employ market redispatch to accommodate the exercise of those rights if a binding constraint exists (such as the internal EDAM constraint identified in Diagram 2). CAISO expects the redispatch capability to be robust, and only when the market cannot clear through redispatch, and faces a constraint violation, would CAISO take further actions.¹⁰

Importantly, CAISO clarifies that if a transmission customer seeks to increase energy schedules on their OATT transmission rights after the day-ahead market has run, they can do so through the submission of a self-schedule associated with those transmission rights in the real-time market. The CAISO will seek to accommodate the exercise of those rights, if necessary, through redispatch, for which provides the market operator with significant capabilities to arrive at a feasible market solution, potentially reducing the probability of an infeasibility and edge case scenarios.

For Scenario A.1.b, the internal EDAM constraint (identified in Diagram 2) has become binding and redispatch has failed to accommodate the previously unscheduled energy self-schedule. According to CAISO's proposal, this incremental energy schedule will have an equal priority in the market, through its application of penalty price parameters used for uneconomic adjustments to cleared day-ahead schedules which will include schedules supporting transfers between EDAM BAs (i.e., "EDAM transfers") to the extent that schedule adjustments are needed. The inability to redispatch and accommodate schedules through application of equal priority in the market will indicate an infeasibility in the market, in a particular EDAM area, and the CAISO will inform the EDAM entity of the magnitude of the infeasibility to resolve. In discussions with CAISO they explain that the EDAM entity will then, pursuant to its processes, take actions to resolve the infeasibility and manage reliability pursuant to its protocols, and will inform the CAISO of such actions through the appropriate systems as is the case in WEIM today.

In discussions with CAISO and as reflected in revised EDAM Tariff Section 33.18.3.3, the CAISO provided the following to the WPP: The EDAM policy design establishes the ability of EDAM entity transmission providers to adjust the transmission capability available to the day-ahead market based on impacted transmission elements (flowgates/paths). This ability to adjust this transmission available was discussed on page 46 of the EDAM Final Proposal and was intended to be narrowly applied. A day-ahead market design that is applied over multiple balancing authority areas and transmission providers must take into account that each entity has their own OATT terms and conditions for procurement and management of transmission constraints/limitations. Through the current EDAM tariff development process, the tariff drafts reflect the ability of the EDAM transmission provider to adjust day-ahead market transmission availability consistent with the terms defined within their OATT. Section 33.18.3.3 establishes this ability by the EDAM entity to notify

¹⁰ CAISO also commits in their EDAM Final Proposal (pages 39, 42) that the transmission customer will be held harmless from direct redispatch costs by the transmission provider as a result of it exercising previously unscheduled transmission rights.



the CAISO of reductions in transmission availability in the day ahead market consistent with the terms of its OATT, considering the needs for reliability and limiting or avoiding market infeasibilities.

Section 33.18.3.3 of the Updated EDAM Draft Tariff provides:

Transmission Not Available in the Day-Ahead Market: If the CAISO is informed through the prospective EDAM Entity implementation process or by the EDAM Entity Scheduling Coordinator for the EDAM Transmission Service Provider that, based on actual market operational experience, accommodating Self-Schedules accounting for incremental intra-day schedules in the Real-Time Market that were not scheduled in the Day-Ahead Market impacts market outcomes or reliability, the CAISO will accept a notification from the EDAM Entity Scheduling Coordinator associated with the EDAM Transmission Service Provider and will adjust Day-Ahead Market availability of the impacted transmission elements and the associated transmission service rights in accordance with the EDAM Transmission Service Provider tariff.

The CAISO further explained to WPP that carve outs of transmission from the day-ahead market in the EDAM are seen by CAISO as an exception rather than the rule, recognizing the potentially significant impact on market efficiency of reduced transmission availability as well as the potentially adverse economic impacts on congestion prices that are ultimately borne by and settled with the EDAM entity. The CAISO indicated that it expects that EDAM entity transmission providers will carefully consider the implications of carve outs, expected or observed persistent transmission constraint relaxation, limited ability to economically redispatch, expected use of rights associated with resource adequacy type of holdbacks like the WRAP hold-backs, and other factors in determining when and whether to make these carve out adjustments.

For example, in the context of the WRAP, CAISO indicated that it would expect that the WRAP member can coordinate with the EDAM transmission service provider to carve out transmission in the day ahead market associated with a forecasted operational holdback requirements to meet operational obligations to WRAP members outside of or within the EDAM footprint. To the extent a carve out is identified by the EDAM transmission service provider, they would inform the EDAM ahead of the day-ahead market run to effectuate the necessary transmission adjustments to ensure these are reflected in the market and the transmission is not optimized day-ahead, making it available ultimately for the expected real-time market schedule that will utilize those rights. Ultimately, the EDAM defers to the applicable OATT to describe further the process and conditions supporting the reduction in transmission availability for the day ahead market.

The CAISO provided the following illustration to show where “Targeted Carve Outs” and “TSP Management” would factor into CAISO market processes:



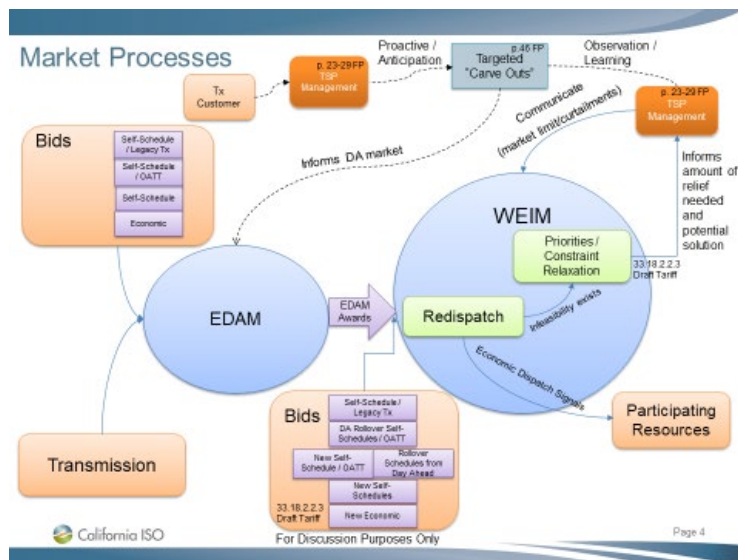


Figure provided by CAISO, illustrating how TSP management and targeted carve outs will relate to market activities.

EDAM Scenario A.1.c.: Use of Transmission Rights by WRAP Participants Through the EDAM Footprint / WRAP Operations Program Energy Deployment Transaction

Diagram 2 also captures Scenario A.1.c where a WRAP Participant (“WRAP LRE Load”) has been determined by WRAP to be deficient in the WRAP Operations Program and is entitled to receive an Energy Deployment supported by firm or conditional firm transmission service from another WRAP Participant that owns or has procured resource (“Gen”) (a.k.a. “WRAP Energy Deployment Transaction”). A WRAP Energy Deployment Transaction is specifically defined by the WRAP Tariff, determined in the Preschedule Day prior to 10:00 a.m. (a.k.a. day-ahead), and cannot increase going into real-time.

The analysis for Scenario A.1.c is almost the same as the discussion provided above for Scenario A.1.b, with a few important clarifications. This scenario is more limited than the broader load service scenario contemplated above. On the Preschedule Day, the WRAP will inform participants of potential WRAP Energy Deployment Transactions; after being set on the Preschedule Day, the amount of these potential transactions cannot be increased, though recipient participants can elect to refuse the energy on the operating day. Due to the settlement pricing structure of WRAP Energy Deployment Transactions, WPP expects participants will likely schedule energy and transmission at the full amount of the likely WRAP Energy Transaction on the Preschedule Day, however it is not a requirement of the WRAP that they do so. Because of the defined and time-limited nature of WRAP Energy Deployment Transactions, the day-ahead self-scheduling procedures described for Scenario A.1.b are likely to be sufficient for reliably fulfilling Energy Deployments in WRAP. It is possible that WRAP participants will want flexibility for WRAP

Energy Deployment Transactions between day-ahead and real-time in which case the same issues and procedures for Scenario A.1.b are implicated.

EDAM Scenario A.2.: Use of Transmission Rights by WRAP Participants Through the EDAM Footprint/ Multiple EDAM BAs (Diagram 3)

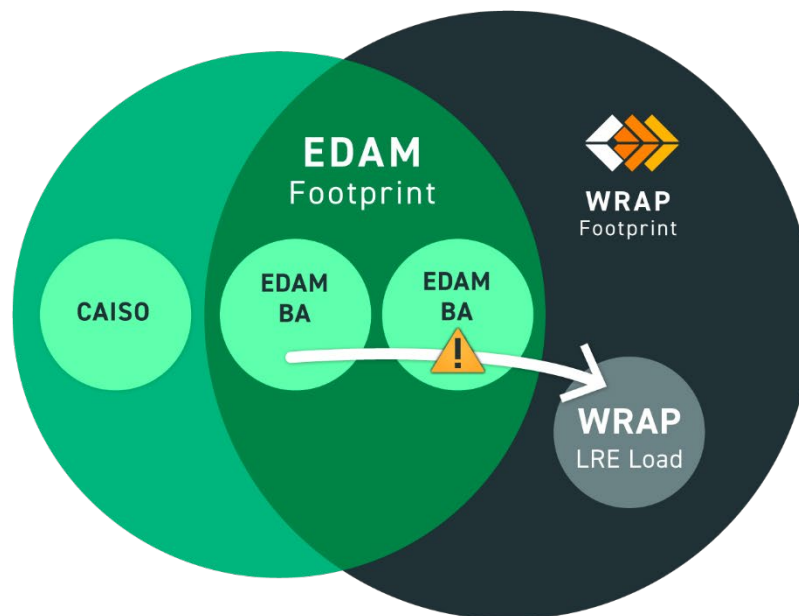


Diagram 3 – Use of Transmission Rights by WRAP participants Through the EDAM Footprint/ Multiple EDAM BAs

The scenario depicted in Diagram 3 is the same as Scenario A.1.b except that the VER Gen needed by WRAP LRE Load/transmission customer to serve its load must pass through multiple EDAM BAs before it is exported to the WRAP LRE Load. The analysis is the same as that for Scenario A.1.b, however, the issue highlighted above that every EDAM BA may also have or be required to have its own OATT rules for how to manage curtailment under these circumstances, is made more complicated by multiple EDAM BAs.

When generation is operated by an EDAM BA and has been forward-procured by a WRAP Participant for their Forward Showing or is being scheduled to meet operational Energy Deployments, there will be additional considerations related to the markets' treatment of that capacity. This first chapter of this interoperability paper focuses exclusively on transmission issues, but discussion of capacity considerations will be addressed in future additions to this paper.

Discussion – EDAM/WRAP Transfer Scenarios

WPP has engaged with participants and stakeholders on the issues related to market treatment of transmission necessary to effectuate WRAP and believes additional analysis and discussion will be helpful to understand some remaining concerns and issues; this section intends to outline those considerations and recommends areas for further discussion.

In its EDAM Final Proposal and Draft EDAM Tariff, as revised June 8, 2023 CAISO's approach to preserving OATT priority and delivering previously unscheduled energy in real-time includes the following steps:

1. Assertion that inability to accommodate real-time self-schedules would be a rare "edge case";
2. Day-ahead self-scheduling (to the extent the self-schedule will not require adjustment through real-time);
3. Redispatch, as possible;
4. Equal curtailment priority with cleared day-ahead schedules; and
5. Implementing "carve outs" at the request of an EDAM transmission service provider.

1. Inability to Accommodate RT Self Schedules as "Edge Case"

A reliability program like WRAP is primarily concerned with the instances where generation and transmission capacity in the West is particularly tight, and these edge cases would likely be operationally coincident with those instances where delivery of WRAP resources is most important for WRAP participants keeping the lights on. The range of tools and commitments provided in the Draft EDAM Tariff are contemplated to be used in the times where the WRAP and its participants are most concerned with ability to deliver forward-procured resources and WRAP obligations. As such, the risk associated with operational overlaps between EDAM and WRAP is likely to be high and requires careful consideration, even if the edge case events are hoped to be rare.

2. Day-Ahead Self Scheduling of Energy

Day-ahead scheduling of energy and transmission may be an effective operational measure to ensure that market participants will be able to use the full amount of their firm transmission rights, however, the practical ability to use this tool is likely to be limited to block energy transactions (Scenario A.1.a) and is only a partially effective tool for other types of transactions (Scenario A.1.b).



3. Redispatch to Accommodate Energy Profile Updates in Real Time

Redispatch is provided as a tool CAISO anticipates will offer a feasible solution to accommodate the real-time exercise of transmission rights contemplated by Scenario A.1.b. As noted above, WPP emphasizes that that a reliability program like WRAP is primarily concerned with the instances where generation and transmission capacity in the West is particularly tight, and this may be coincident with constrained operations within EDAM where redispatch is most likely to be infeasible.

4. Firm Real-Time Energy Schedules Prioritized Equally with EDAM Transfers

Next, CAISO has offered that a WRAP Load Service Transaction (as described by scenario A.1.b) would be curtailed at equal priority in real-time to cleared day-ahead schedules including EDAM transfers. WRAP's reliability metrics are built on a foundational premise that WRAP participants will be able to use firm or conditional firm transmission service to reliably deliver the energy from their owned or contracted resources consistent with Forward Showing Program demonstrations. While the EDAM Final Proposal explains how day-ahead scheduling and redispatch can be used to ensure that market participants will be able to use the full amount of their firm transmission rights, the proposal is also clear that under some circumstances, use of such rights may be subject to curtailment procedures.

Some stakeholders have taken issue with CAISO's proposal that a WRAP Load Service Transaction (as described by Scenario A.1.b) would be curtailed at equal priority in real-time to EDAM transfers. As WPP understands it, the concern about curtailment priority stems from the fact that Scenario A.1.b is supported with firm transmission rights and the observation that not all cleared day-ahead schedules (including EDAM transfers) are supported by firm transmission rights.¹¹ WRAP design has assumed that acquisition of

¹¹ EDAM transfers are supported by transmission rights that come from transmission customers of the EDAM entity subject to the EDAM Resource Sufficiency Evaluation (RSE) and used to support RSE accounting purposes in the day-ahead timeframe ("Bucket 1"), from transmission customers who have transmission rights other than those used to support RSE ("Bucket 2"), and from EDAM BAs ("Bucket 3"). Bucket 1 transmission must be firm or conditional firm transmission service. EDAM Bucket 3 requires EDAM BA transmission providers to make unsold firm Available Transfer Capability available to the market at the interfaces between EDAM BAs. Bucket 3 transmission is considered firm.

EDAM Bucket 2 is where the WRAP Load Service Transaction comes into play as a potential interoperability issue. Bucket 2 transmission is sourced from firm and conditional firm point-to-point transmission rights held by transmission customers that are not utilized for Bucket 1. Pursuant to CAISO's EDAM Proposal, Bucket 2 includes transmission rights voluntarily released by transmission customers to the EDAM before the day-ahead market (by 9:00 a.m. of the day-ahead), but also includes unscheduled, un-utilized, transmission rights (by 10:00 a.m. of the day-ahead). As explained above in Scenario A.1.b, if the transmission customer does not schedule use of the transmission rights *with* a corresponding energy schedule by the start of the day-ahead market processes at 10:00 a.m., the transmission capacity is considered to be unscheduled, and is proposed to be made available to the market to support optimized transfers.



firm transmission rights would enable WRAP-related transfers (forward-procured energy contracts or Operations Program Energy Deployments) to flow on these constrained paths, consistent with prevailing practices and OATT curtailment priority. The Draft EDAM Tariff (as revised June 8, 2023) maintains CAISO's originally proposed approach to curtailment priority, representing a fundamental shift from WRAP design assumptions.

5. Ability to 'Carve Out' Transmission Rights From Use by EDAM

The Draft EDAM Tariff (as revised June 8, 2023) now contains a section (33.18.3.3. Transmission Not Available in the Day-Ahead Market) that alludes to a pathway for EDAM Entities to request that transmission be 'carved-out' of the day ahead market solution. This is a positive development of affirmative language establishing the availability of carve outs upon notification to CAISO. The new tariff language appears to suggest that such carve outs could be established prospectively during an EDAM entity's implementation process, however, some other language is unclear and may undermine prospective carve out availability. For example, the tariff language also appears to suggest that a carve out would only be available "based on actual market operational experience" or if there are "impacts to market outcomes or reliability" both of which suggest a carve out can only be established based on operational data or some type of retroactive showing which is not clearly defined. This does not align with the objectives of the WRAP's forward showing and transmission demonstration requirements.

The revised tariff also makes clear that it is not only the CAISO that would need to be involved in implementation of carve outs or other operational curtailment measures; such solutions would also need to involve the EDAM BAs/transmission service providers involved with the transaction pathway. EDAM consists of a collection of EDAM BAs that are transmission providers and administer their own OATTs.

The requirement in the EDAM Draft Tariff Entity Implementation Agreement that EDAM BAs revise their OATTs upon joining, including to accommodate the process contemplated in CAISO's draft tariff Section 33.18.3.3., adds a layer of uncertainty to exactly what options might be available to transmission customers who own firm OATT rights and who

There appears to be reasonable debate as to whether EDAM Transfers on Bucket 2 transmission – sourced from firm transmission rights of transmission customers that do not schedule corresponding energy and transmission on these rights in the day-ahead – should be prioritized and curtailed equal to incremental energy schedules on those firm transmission rights submitted after the day-ahead market run. In the circumstance considered, the transmission capability has become the binding constraint, creating an infeasible market solution (due to some combination of EDAM transfers and non-EDAM transfers on firm transmission rights). At this point, the question is not whether the market is fully utilizing the available transmission, but which energy schedules get to flow on the limited transmission.

are WRAP participants required to ensure deliverability of their WRAP resources. While the ability of EDAM BAs to adopt their own operational procedures is a potential solution for this concern area, there is not enough information about what that would look like or when the procedures could be implemented.

EDAM/WRAP Transfer Scenario Conclusions

If the contemplated tools and procedures do not result in reasonable mitigation of curtailment of use of firm transmission rights in real-time (via increased energy profiles), there is added risk to load service for the participants of WRAP, impacting WRAP-Markets Interoperability Principle #4 (*Preserve the supply priority and OATT transmission priority of WRAP Forward Showing supply to meet WRAP obligations*). This Principle is based on the WRAP value proposition that comes from the Forward Showing Program obligations requiring participants to make considerable investments in firm resources and transmission which allows them to be able to reliably serve all their load and WRAP sharing obligations at a potentially lower planning reserve margin for the region.

The policy decision to give equal priority to increased energy schedules on firm transmission and EDAM transfers results in an increased risk to the certainty with which WRAP and its participants can rely on firm transmission for delivery of RA-quality resources. Identified alternatives to the proposed approach that would not impact the reliable deliverability of WRAP resources would include ensuring that if EDAM utilizes unscheduled transmission in the market dispatch and constraints become binding in real-time, OATT priority is observed when determining which energy schedules flow *or* clarifying the ability and process for transmission rights holders or EDAM Entities to make their transmission capacity unavailable to EDAM. For example, to the extent a firm e-Tag is submitted for an import, export, or wheel-through transaction using transmission rights over a transmission provider's system that is in an organized market (i.e., EDAM or Markets+), those transmission rights could be held out of the day-ahead market up to the quantity of transmission rights indicated in the e-Tag transmission profile. Or, consistent with the updates provided in the June 8 revision of the proposed tariff, CAISO could allow transmission rights holders to work with EDAM participating transmission service providers to proactively carve out transmission utilized to meet resource adequacy delivery requirements.

SPP Markets+

Given that Markets+ has yet to release draft Tariff language, WPP asked SPP to provide further context for how SPP is thinking about the above scenarios relevant to transmission treatment and WRAP interoperability. SPP provided the following:

SPP, as the market's independent operator, proposes to implement a design that complements and respects market participant transmission service provider OATT processes and the WRAP's and its participants' business requirements and agreements. The Markets+ proposed initial design leverages principles and processes from SPP's Eastern Integrated Marketplace and Western Energy Imbalance Service.

SPP's Markets+ design will allow firm transmission rights holders to utilize those rights day-ahead through real-time pursuant to standard OATT processes.¹² These firm rights will maintain their priority regardless of when scheduled and implemented, including adjustments of these firm schedules made by transmission customers. While SPP's Markets+ may utilize any unsold and unscheduled transmission capacity to maximize economic benefits, any firm transmission schedules will be respected as firm and be permitted to transfer through and within Markets+, even if not scheduled until real-time. Importantly, unsold and unscheduled transmission capacity that Markets+ used in the clearing of the day-ahead market would be equivalent to an "NN6" priority. Transmission service cleared by the day-ahead market used from generation within a Markets+ participating BA to Markets+ participating load using firm network service or firm point-to-point transmission service would be considered "F-7" priority. If an interchange schedule (e.g., WRAP Operations Program Energy Deployment, a WRAP Forward Showing resource, or any other interchange schedule) with firm transmission service is submitted after the day-ahead market, and impacts a transmission constraint, Markets+ will redispatch and potentially displace the lower priority day-ahead transfers to support the firm transfer. Redispatch provides the market operator with significant capabilities to arrive at a feasible market solution, potentially reducing the probability of an infeasibility and edge case scenarios.

¹² At the time of this white paper, SPP's Markets+ Phase One is launching and a Markets+ Resource Adequacy Task Force (MRATF) will develop the Tariff and Protocol language to document the approach for interoperability with the WRAP. To address the timing requirements of this paper, SPP includes its proposed approach for interoperability that it intends to bring to Markets+ stakeholders in the MRATF and subsequent Markets+ governance process. Therefore, this approach is still subject to review, input and approval from Markets+ stakeholders.



In the event that all of the lower priority service is displaced, and only firm transfers remain (new firm interchange schedule and firm transfers from the day-ahead clearing), those firm transfers would be eligible for curtailment on a pro-rata basis to relieve the constraint pursuant to standard OATT processes.

SPP will work with Markets+ participants through its stakeholder process to finalize details and the implementation of this approach, consistent with the business practices of the participating transmission service provider OATTs, during transmission constraint events in one or more areas in the Markets+ footprint.

Recognizing that additional detail and documentation is intended by SPP, WPP will continue to engage with SPP and its stakeholders in the drafting process and identify in future versions of this document any changes to what is provided here in concept (and noted in the below scenarios) when such information becomes available. Further, it will be of utmost importance for SPP to produce tariff documentation of the OATT transmission priority approach described above.

In accordance the final Markets+ design proposal from November 30, 2022,¹³ an underlying assumption for all scenarios and discussion below is that participation in the WRAP is a requirement for participation in Markets+. Thus, in all diagrams and scenarios discussed below, the Markets+ footprint is contained within the WRAP footprint and all Markets+ BAs shown in the diagrams are WRAP participants; there are also WRAP participants outside of the Markets+ footprint assumed in all scenarios.

¹³ <https://www.spp.org/documents/68340/spp%20markets%20plus%20proposal.pdf>



Markets+ Scenario B.1: Use of Transmission Rights by WRAP Participants Through the Markets+ Footprint (Diagram 4)

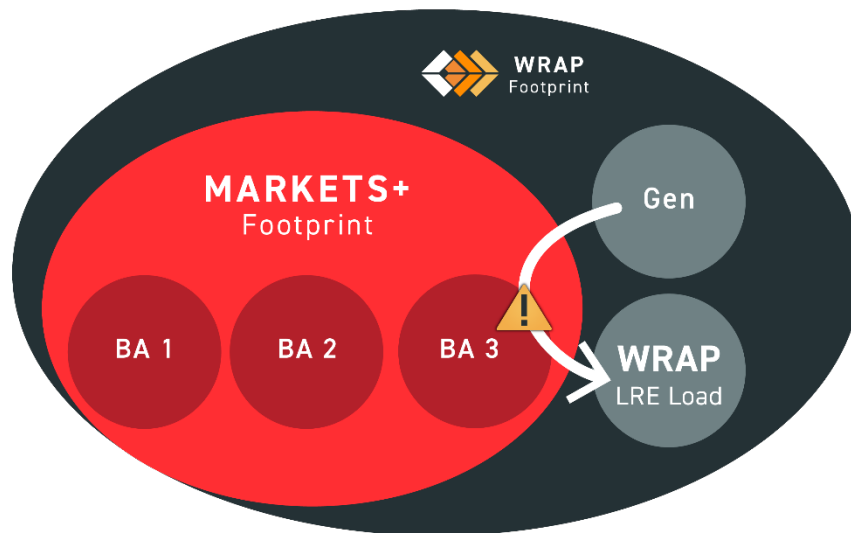


Diagram 4 – Use of Transmission Rights by WRAP participants Through the Markets+ Footprint

Diagram 4 illustrates a WRAP obligation requiring a wheel through the Markets+ footprint where there exists an internal Markets+ constraint (“⚠”).

In the event that the firm delivery obligation shown in the diagram is triggered,¹⁴ and consistent with SPP’s approach to firm transmission schedules, Markets+ will redispatch less firm market transfers (those that were utilizing the previously unscheduled transmission service), as described in above, to ensure any transmission constraint, including transmission constraint “⚠”, does not exceed its operating limit and coordinate with the participating transmission service providers. These WRAP deliveries on firm transmission would be given priority pursuant to standard OATT practices; in the event that all of the lower priority service is displaced, and only firm transfers remain (new firm interchange schedule and firm transfers from the day-ahead clearing), those firm transfers would be eligible for curtailment on a pro-rata basis to relieve the constraint pursuant to standard OATT processes.

¹⁴ The WRAP tariff requires that resources used to serve load are delivered on firm transmission and WRAP Operations Program Energy Deployment be delivered on firm transmission.

Markets+ Scenario B.2.: Use of Transmission Rights by WRAP Participants from the Markets+ Footprint (Diagram 5)

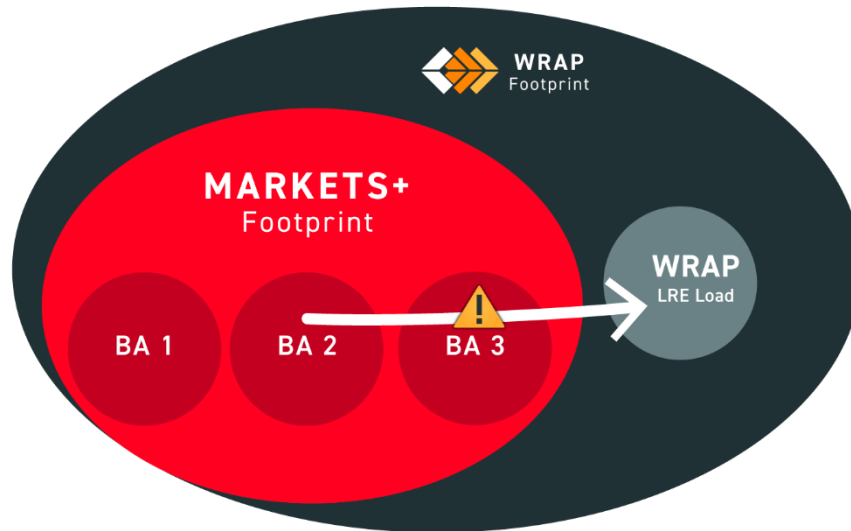


Diagram 5 – Use of Transmission Right by WRAP participants from the Markets+ Footprint

Diagram 5 illustrates a WRAP obligation requiring delivery to a load outside the Markets+ footprint.

In the event that the delivery obligation shown in the diagram is scheduled, and consistent with SPP’s approach to firm transmission schedules, Markets+ will redispatch less firm market transfers (those that were utilizing the previously unscheduled transmission service) to ensure transmission constraints do not exceed their operating limits and allow the WRAP transfer to be deliverable.

This WRAP transfer will be considered an incremental obligation to the Markets+ footprint and be considered a transfer with firm priority. If curtailments of exports are required despite the market redispatch, Markets+ will curtail based on transmission service priorities consistent with the participating transmission service provider OATT processes.¹⁵

Markets+ Scenario B.3.: Use of Transmission Rights by WRAP Participants to the Markets+ Footprint (Diagram 6)

¹⁵ Curtailments to exports contemplated here would be due to a transmission limitation. In a capacity deficiency situation requiring curtailments of exports, SPP has stated an intent that resources utilized to meet WRAP compliance obligations would be prioritized above firm market transfers not serving resource adequacy purposes. Capacity priority and implications for WRAP sharing obligations if all Markets+ participants are also participating in WRAP be further discussed in a future chapter of this document.

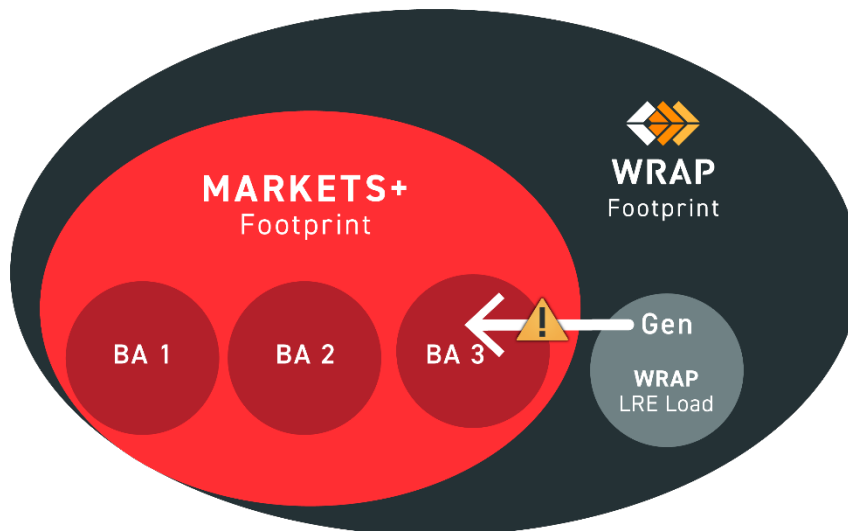


Diagram 6 – Use of Transmission Rights by WRAP participants to the Markets+ Footprint

Diagram 6 illustrates a WRAP obligation requiring delivery to a Markets+ participating entity from an entity outside the Markets+ footprint.

In the event that the delivery obligation shown in the diagram is triggered, and consistent with SPP’s approach to firm transmission schedules, Markets+ will redispach less firm market transfers (those that were utilizing the previously unscheduled transmission service), as described above, to ensure transmission constraints do not exceed their operating limit and allow the WRAP transfer to be deliverable consistent with the participating transmission service provider OATT processes.

This WRAP transfer will be considered a decrement to the receiving Markets+ participant obligation. To determine each BA’s must-offer requirement, BA3 may include this capacity assigned by the WRAP as a reduction of its obligation, pursuant to the WRAP governing rules.

Markets+ Scenario B.4.: Use of Transmission Rights by WRAP Participants in the Markets+ Footprint (Diagram 7)

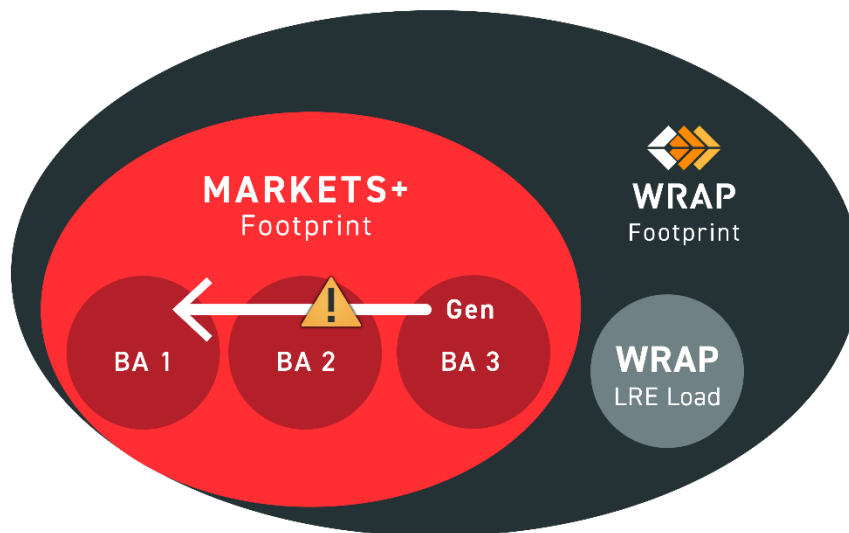


Diagram 7 – Use of Transmission Rights by WRAP participants in the Markets+ Footprint

Diagram 7 illustrates a WRAP obligation requiring delivery from one Markets+ participating entity to another.

In the event that the delivery obligation shown in the diagram is triggered, because all entities are Markets+ participants, optimization of the dispatch will continue to take place even after the obligation is triggered.

Discussion – Markets+/WRAP Transfer Scenarios

SPP is beginning the Tariff drafting and review process with stakeholders, and the outcomes of those discussions and draft documents will be important to fully understanding how the Markets+ treatment of transmission and transfers operates with WRAP’s deliverability assumptions and requirements. Nevertheless, deference to existing OATT processes (provided here by SPP as the proposed starting point for those discussions) would be in line with existing assumptions about deliverability supporting WRAP program design and reliability modeling. As with any live design and drafting process, the details and approach can change as a result of stakeholder engagement, technical requirements and limitations, or for other reasons and so there remains some uncertainty as to the reliable deliverability of WRAP resources with Markets+ until the design and Tariff drafting process is complete and fully addresses the issue.

Perhaps most impactful to the ability for Markets+ and WRAP to effectively operate in the ways described above is realization of the underlying assumption of this paper that

participation in the WRAP will be a prerequisite requirement to participation in Markets+. Deviation from that proposed approach would require reevaluation of the scenarios described above; though the integration of multiple RA programs would not inherently necessitate different answers by SPP and its stakeholders to the transfer scenarios proposed above, the underpinning assumptions about how the details of these transfers might work would potentially be impacted.

WPP will continue to monitor and support these efforts as the Markets+ policy and documentation evolves, especially regarding OATT transmission priority terms and conditions that should be set forth in SPP's Markets+ tariff.



Other Interoperability Issues

As market designs mature and WPP and WRAP participants get a better understanding of potential issues, considerations, or points of clarification, WPP intends to add 'chapters' to this document. In all cases, WPP will endeavor to pose similar questions to both market operators, while recognizing that the interoperability issues will differ somewhat between the two markets. Some of the topics likely to be considered more deeply in future iterations of this paper are:

- Market treatment of WRAP-accredited capacity and its availability to WRAP participants
- Treatment of uncertainty – comparison of market and WRAP methodologies and impacts
- Governance considerations for the incremental approach to these programs
- Usage of transmission wheeling across the CAISO BA to meet WRAP deliverability requirements

Stakeholders are encouraged to reach out to the WPP with questions and concerns related to interoperability for consideration as additional topics for future chapters of this document.

WPP is committed to continuing to monitor the evolution of both market offerings in the coming months, including changes or updates from what was provided here in collaboration with the two market operators. Updates to this document, as well as additional material, are expected as new information is available.

