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August 14, 2023

Via Electronic Filing

Public Utility Commission of Oregon
Attn: Filing Center
201 High St. SE, Suite 100
Salem OR 97301

Re: In the Matter of PORTLAND GENERAL ELECTRIC COMPANY,
Request for a General Rate Revision.
Docket No. UE 416

Dear Filing Center:

Please find enclosed the Alliance of Western Energy Consumers' Cross-Examination Exhibits in the above-referenced docket.

Thank you for your assistance. If you have any questions, please do not hesitate to call.

Sincerely,

/s/ Jesse O. Gorsuch
Jesse O. Gorsuch

Enclosure

**BEFORE THE PUBLIC UTILITY COMMISSION
OF OREGON**

UE 416

In the Matter of)
) CROSS-EXAMINATION EXHIBITS OF
) THE ALLIANCE OF WESTERN
PORTLAND GENERAL ELECTRIC)
COMPANY,) ENERGY CONSUMERS
)
)
Request for a General Rate Revision.)

Pursuant to the Administrative Law Judge’s Memorandum Revising Procedural Schedule issued on August 14, 2023, the Alliance of Western Energy Consumers submits the following cross-examination exhibits for the evidentiary hearing to be scheduled in the above-referenced Docket.

<u>Cross-Examination Exhibit</u>	<u>Description</u>
AWEC/500	CAISO Business Practice Manual for the Western Energy Imbalance Market (July 27, 2023)
AWEC/501	PGE EIM Benefit Workpaper (Feb. 15, 2023)
AWEC/502	Excerpt of PacifiCorp’s 2021 Washington Integrated Resource Plan Two-Year Progress Report (Mar. 31, 2023)
AWEC/503	CAISO Fifth Replacement Electronic Tariff, Section 29: Energy Imbalance Market (July 1, 2023)

Dated this 14th day of August, 2023.

Respectfully submitted,

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Of Attorneys for the

Alliance of Western Energy Consumers

Business Practice Manual For The Western Energy Imbalance Market

Version 29

Revision Date July 27, 2023

Approval History

Approval Date: October 2, 2014

Effective Date: October 2, 2014

BPM Owners: Mike Turner and Michael Martin

BPM Owners' Titles: Manager, Market Settlement Validation and Resolution and
Lead Day-Ahead Market Operator

Revision History

Version	PRR	Date	Description
29	1498	7/27/2023	Added section introducing the Assistance Energy Transfer (AET) concept as part of the Resource Sufficiency Evaluation Enhancement (RSEE) Phase 2 Project.
28	1506	4/27/2023	Related to the Washington WEIM GHG Enhancements project which includes updated calculations for default energy bids and commitment costs for resources subject to Washington's GHG compliance program. This is a temporary alternative solution that will remain in effect until the full functionality can be implemented (expected in Fall 2023)
27	1468	1/3/2023	Small changes to unaccounted for energy and resource sufficiency evaluation demand response attestation forms
26	1440	6/29/2022	Enhancements to the resource sufficiency evaluation tests per the resource sufficiency evaluation enhancement phase 1 project
25	1389	11/17/2021	This update is to establish a guideline to aid the WEIM entities in determining when and how to request exclusion of outlier data.
24	1368	10/27/2021	This is a new process related to Unaccounted For Energy Settlement election. This is detailed in section 2.4
23	1358	8/12/2021	This change is to update the mirror system resources to have auto-mirroring enabled for transactions between the ISO and other WEIM balancing authority areas in accordance with the specific procedure detailed in section 11.3.8. Effective Date: June 15, 2021
22	1349	6/29/2021	PRR 1349 This is related to summer readiness initiative focus on changes related to bid range capacity test, and changes related to the last solved advisory dispatch results. (11.3.2, 11.3.11)
21	1305, 1311	2/1/2021	PRR 1305 New process related to requests for some negotiated rates. PRR 1311 This enhancement is for the intertie Multi Stage Generator (TMSG) modeling for WEIM participating

Version	PRR	Date	Description
			resources that are import resources for particular WEIM BAA. Effective date: 1/1/21.
20	1289	12/17/2020	PRR1289 This enhancement is to allow individual resources, with potentially different SCs and technologies, to share a common point-of-interconnection (POI) to the transmission grid. Effective date; by 1/15/2021. Phase 1 is for Co-located resources only.
19	1271, 1279	10/12/2020	PRR 1271 Due to market settlement timeline initiative that will allow CAISO and Market Participants sufficient time to resolve disputes, reduce Market Participant financial exposure, and extend the flexibility in publishing settlement statements and weekly invoices. PRR 1279 Added clarity on how the market processes GHG Allocation when there is a market disruption. Additionally, added clarification to section 11.5.1 for the MCC will not be allocated to the isolated WEIM BAAs (this market issue fix was implemented 9/15/2020)
18	1199	11/20/2019	PRR1199 In April 2019, we implemented a software change to perform bid-range capacity test for each of the four fifteen-minute intervals for a trading hour. Accordingly we only updated section 11.3.2, however those changes were not added to section 11.3.2.2. This change is to update section 11.3.2.2.
17	1192	10/28/2019	PRR1192 These changes are to support the Local Market Power Mitigation Enhancements 2018 Project (LMPME). These changes include mitigation process enhancements for EIM. Effective date: November 2019.
16	1172	09/26/2019	PRR1172 Added new section 11.3.14 to detail the Market logic for WEIM Threshold.
15	1127,1142	05/02/2019	PRR1127 Applying a tolerance band threshold to the Flexible Ramping Sufficiency Tests for each WEIM BA. Targeted for February 15, 2019 PRR1142 This is related to the stakeholder feedback for improvements for business needs related to the WEIM resource sufficiency evaluation. Effective date is 4/16/19
14	1117	02/28/2019	PRR1117 Added a note in section 11.3.11 to refer to Market Operations Appendices BPM for load conformance.
13	1090	11/29/2018	PRR1090: This change is to provide clarity for WEIM entities scheduling practices related to dynamic pseudo-tie wheeling schedules.

Version	PRR	Date	Description
12	1072, 1082, 1085,1093	10/25/2018	<p>PRR1072: This is due to WEIM Enhancement 2018 project requirements where the market will not procure flexible ramping up and flexible ramping down capacity when any WEIM balancing authority is undergoing a contingency. Expected effective date is Fall 2018.</p> <p>PRR1082: This is to extend the Persistence Forecast modeling to WEIM entities.</p> <p>PRR1085: This is due to the WEIM Greenhouse Gas Enhancements policy to limit WEIM participating resources' greenhouse gas bid quantity to the MW value between the WEIM participating resource's base schedule and the resource's upper economic level.</p> <p>PRR1093: This is for an enhancement to modify the calculation logic for the Fifteen-Minute Schedules from hourly resources. The change is explained in a new section 11.3.13. Additionally, we added a clarification in section 16.2.1.1.4 in regards to Energy Transfer System Resource (ETSR) treatment of tagged quantities where WEIM BAAs paring includes the ISO BAA.</p>
11	1068	09/04/2018	<p>Added new paragraphs to define the behavior of the Western Energy Imbalance Market total and incremental flow constraint. Additionally, a clarification was added to paragraph 11.1.6 entitlement constraint for rate of changes. Effective date is August 2018.</p>
10	1033, 1051	4/02/2018	<p>(1033) This revision is due to the WEIM Enhancement 2017 initiative which includes the following functionalities;</p> <ul style="list-style-type: none"> Automated matching of import/export schedule changes. Automated mirror system resources at CAISO intertie scheduling points. Base WEIM transfer resource imbalance settlement. New non-generator resource (NGR) modeling functionality. Allow submission of base generation distribution factors (GDFs) for aggregated WEIM non-participating resources.. <p>In addition, this revision includes some clarification of the provisions associated with the submission and processing of variable energy resource forecasts;</p> <ul style="list-style-type: none"> Allow an WEIM Entity VER forecast to be considered independent if it is used for balancing their system Allow for freezing VER forecast between T-55 and T-40.

Version	PRR	Date	Description
			(1051) clarifying the flexible ramping requirements for the new WEIM entities joining the EIM
9	1032	1/2/2018	This BPM change is to enhance the current methodology used to calculate histogram percentile that is utilized in the bid range capacity test requirements. Effective 1/4/2018. Section 11.3.2.2 is updated accordingly. PRR 1032.
8	984	5/31/2017	This is due to a recent discovery regarding netting, versus not netting, imports and exports for every hour, for the purpose of calculating histograms percentage differences. Effective 4/1/17.
7	964	4/10/2017	Added new Tariff language to "Metering" Section 8 to include SQMD Plan & requirements for SCME's; Removed section 12 (PRD/RDRR) from being unavailable to WEIM market participants; Added 15-min option to "Participating" Generators granularity level.
6	939	8-31-16	This revision includes congestion cost content due to WEIM Y1 P2 enhancement project
5	891	03-31-2016	This revision introduces incremental language pertaining to Available Balancing Capacity (ABC), additionally it improves the language throughout the document.
4	866	12/02/2015	Updates for WEIM Year 1 policy enhancements. Addition of Readiness Criteria
3	846	07/06/2015	for clarification on the transmission relaxation, changes to section 10.1.6 and adding new section 10.1.7
2	788	10/30/2014	Clarification to section 10.3.2.1
1	748	10/2/2014	First version released.
0.3		9/18/2014	Updated draft section 10.3.3.
0.2		9/3/2014	Draft updated to reflect answers to the Market Participants' questions and comments.
0.1		7/1/2014	Created BPM draft.

TABLE OF CONTENTS

1. INTRODUCTION	10
1.1 Purpose of CAISO Business Practice Manuals	10
1.2 Purpose of This Business Practice Manual	10
1.3 References	11
2. BACKGROUND	11
2.1 Western Energy Imbalance Market Overview.....	12
3. ROLES AND RESPONSIBILITIES.....	13
3.1 Implementing and Terminating the WEIM Entity Participation	14
4. SCHEDULING COORDINATOR CERTIFICATION	15
4.1 Determination of SC Certification Requirements	16
5. AGREEMENTS	17
5.1 EIM Entity Agreement.....	17
5.2 EIM Entity Scheduling Coordinator (Entity SC).....	18
5.3 EIM Participating Resource Scheduling Coordinator (EIM PR SC)	19
5.4 EIM Participating Resource (PR)	21
6. CREDIT MANAGEMENT	22
7. FULL NETWORK MODEL	22
8. METERING	25
9. TELEMETRY.....	27
10. OUTAGE MANAGEMENT	27
10.1 Objectives, Roles, Scope, and Participants.....	28
10.1.1 Outage Management Objective	28
10.1.2 CAISO Role	28
10.1.3 Facility Owner Role	28
10.1.4 Application to Parties.....	28
10.1.5 CAISO Outage Coordination Office	29
10.2 Requesting Maintenance Outages.....	30

10.2.1	EIM Entity and WEIM Entity Scheduling Coordinator Outage Request Process	30
10.2.2	Generation Resource Start-Up Time	31
10.2.3	Confirmation and Acknowledgement of Receipt of Outage Request.....	31
10.2.4	Withdrawal or Modification of Request	32
10.2.5	Changes to Planned Maintenance Outages.....	32
10.3	Management of Forced Outages	32
10.3.1	Forced Outages.....	32
10.3.2	Extended Scheduled Outage.....	33
10.4	Communication of Maintenance Outage Information	33
10.4.1	Single Point of Contact.....	33
10.5	Records and Reports	35
10.5.1	Records of Approved Maintenance Outages	35
11.	MARKET OPERATIONS	35
11.1	About the Market	36
11.1.1	Ancillary Services	36
11.1.2	Interties Between BAAs	36
11.1.3	EIM Transmission Services Information	37
11.1.4	Maximum WEIM Transfer Limits	37
11.1.5	Energy Transfer Scheduling in Western Energy Imbalance Market	38
11.1.6	Entitlement Constraints for Rate of Changes	41
11.1.7	Constraint Relaxation.....	41
11.1.8	Transition Period Pricing	42
11.1.9	Coordination with Reliability Coordinator and WECC Unscheduled Flow Mitigation	42
11.1.10	Entitlement Constraints for WEIM Incremental Flow.....	43
11.1.11	Entitlement Constraints for WEIM Area Total Flow	44
11.2	Day-Ahead Operations.....	44
11.3	Real-Time Operations	46

11.3.1	Establishment of Hourly Base Schedules and Hourly Resource Plan	49
11.3.2	Resource Sufficiency Evaluation	50
11.3.3	Locational Marginal Prices.....	81
11.3.4	Using WEIM Available Balancing Capacity to Resolve Infeasible Power Balance Conditions in WEIM BAAs.....	106
11.3.5	EIM Market Power Mitigation	111
11.3.6	Default Energy Bids.....	113
11.3.7	Auto-Match of Import/Export Schedule Changes	114
11.3.8	Auto Mirror of CAISO Import/Export Schedule Changes.....	114
11.3.9	Manual Dispatch.....	115
11.3.10	Load Forecast Operator Adjustments	116
11.3.11	Contingency Dispatch	117
11.3.12	FMM Interchange Schedules based on RTSI.....	119
11.3.13	EIM Thresholds	119
11.4	Contingencies and Corrective Actions	123
11.4.1	Recovery Approach.....	123
11.5	Separation of the WEIM Entity.....	125
11.5.1	EIM Entity Separation from Market.....	126
11.6	Advanced Load Forecasting System (ALFS)	126
11.6.1	Requirements for Load Forecasting.....	126
11.7	Variable Energy Resource (VERs).....	127
11.7.1	Forecast Fee.....	127
11.7.2	EIM Variable Energy Resource Forecasting.....	128
11.8	Intertie Multi-Stage Generator (TMSG).....	128
12.	SETTLEMENTS AND BILLING	129
12.1	Charge Codes.....	129
12.2	Disagreements.....	130
12.3	Suspension	130
12.4	Real-Time Unaccounted For Energy (UFE) Election Process.....	131

13. READINESS	132
13.1 Readiness Criteria Categories.....	132
13.2 Readiness Metrics, Criteria, and Thresholds.....	134
13.3 Readiness Reporting, Determination & Certification	142
14. RULES OF CONDUCT	143
15. CHANGE MANAGEMENT.....	144
16. DEFINITIONS AND ACRONYMS.....	144
16.1 Acronyms	144
16.2 Definitions.....	145
Appendix A: Mathematical Formulation for WEIM Transfer.....	150
Appendix B: Mathematical Formulation for using Available Capacity resolving infeasible power balance conditions in WEIM BAAs	169
Appendix C: Demand Response Attestation.....	173

1. INTRODUCTION

Welcome to the CAISO *BPM for the Western Energy Imbalance Market*. In this Introduction you will find the following information:

- The purpose of California Independent System Operator Corporation (CAISO) Business Practice Manuals (BPMs);
- What you can expect from this CAISO BPM;
- Other CAISO BPMs or documents that provide related or additional information; and
- The draft status of this BPM and expected next steps.

1.1 Purpose of CAISO Business Practice Manuals

The Business Practice Manuals (BPMs) developed by CAISO are intended to contain implementation detail, consistent with and supported by the CAISO Tariff, including: instructions, rules, procedures, examples, and guidelines for the administration, operation, planning, and accounting requirements of CAISO and the markets. Each Business Practice Manual is posted in the BPM Library at:

<http://bpmcm.caiso.com/Pages/BPMLibrary.aspx>. Updates to all BPMs are managed in accordance with the change management procedures included in the [BPM for Change Management](#).

1.2 Purpose of This Business Practice Manual

The Western Energy Imbalance Market is an extension of CAISO's Real-Time Market. Many of the business practices applicable to the Real-Time Market also apply to the Western Energy Imbalance Market (EIM). This business practice manual is a guideline for WEIM participants and will outline the processes in the EIM, including references to existing Business Practice Manuals. Revision requests for the BPMs may be submitted by stakeholders or an internal CAISO department.

If a Market Participant detects an inconsistency between BPMs, it should report the inconsistency to CAISO before relying on either provision.

The provisions of this BPM are intended to be consistent with the CAISO Tariff. If the provisions of this BPM nevertheless conflict with the CAISO Tariff, CAISO is bound to operate in accordance with the CAISO Tariff. Any provision of the CAISO Tariff that may have been summarized or repeated in this BPM is only to aid understanding. Even though every effort will be made by CAISO to update the information contained in this BPM and to notify Market Participants of changes, it is the responsibility of each Market

Participant to ensure that he or she is using the most recent version of this BPM and to comply with all applicable provisions of the CAISO Tariff.

A reference in this BPM to the CAISO Tariff, a given agreement, any other BPM or instrument, is intended to refer to the CAISO Tariff, that agreement, BPM, or instrument as modified, amended, supplemented, or restated.

1.3 References

Reference information related to this BPM includes:

- Other CAISO BPMs
- CAISO Tariff
- EIM Final Proposal, September 23, 2013

CAISO posts current versions of these documents on its website.

Whenever this BPM refers to the Tariff, a given agreement (such as WEIM Entity Agreement), or any other BPM or instrument, the intent is to refer to the Tariff, that agreement, any other BPM or instrument as it may have been modified, amended, supplemented, or restated from the release date of this BPM for the Western Energy Imbalance Market.

The captions and headings in this BPM are intended solely to facilitate reference and not to have any bearing on the meaning of any of the terms and conditions of this BPM.

2. BACKGROUND

Welcome to the Background section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- Summary of CAISO's Western Energy Imbalance Market Processes.
- Summary of distinctive WEIM features.

The WEIM is a Real-Time Market to dispatch economic bids voluntarily offered by Participating Resources to efficiently balance supply, transfers between balancing authority areas, and load across its footprint. WEIM processes will be similar and integrated with CAISO's existing market processes. The primary difference is that the WEIM only includes CAISO's Real-Time Market and not CAISO's Day-Ahead Market. The WEIM will have some unique characteristics to reflect this difference. The WEIM includes design elements that ensure WEIM balancing authorities have sufficient generation resources available in the Real-Time Market, and allocates costs between balancing authorities according to CAISO guiding principles. The WEIM also ensures that protections are in place so convergence bidding does not cause cost uplifts in WEIM balancing authorities.

This market structure is reflected in the framework of this BPM, which is the same framework as applied to the WEIM tariff provisions. Matters that are unique to the WEIM will be addressed in this BPM. Matters that are generally applicable to the Real-Time Market and CAISO market participants will be addressed in existing BPMs. Matters applicable to both current Real-Time Market participants and WEIM participants, particularly cost allocation of charges applicable to the Real-Time Market, will be addressed in the existing BPMs. This framework integrates this BPM with other BPMs and establishes this BPM as a guide for WEIM participants. Existing market participants may continue to find practices applicable to their business in the current BPMs, available on the CAISO website.

2.1 Western Energy Imbalance Market Overview

CAISO has based the WEIM on the Real-Time Market design, which was developed in part to comply with FERC Order No. 764, and consists of a 15-minute market and a 5-minute dispatch. Each of these market runs will produce schedules and locational marginal prices for resources. The WEIM will also commit short-start generation units in the 15-minute market. Like CAISO's current Real-Time Market, the WEIM will enforce a flexible ramping constraint to commit and position resources to meet future load and supply variability and uncertainty.

In the Day-Ahead time frame, WEIM balancing authorities participating in the WEIM will submit load forecasts or elect to use the CAISO-created forecast for the WEIM balancing, and anticipated resource Base Schedules to CAISO, while remaining responsible for reliability in their area. This information will allow CAISO to identify infeasible schedules, such as those that might cause transmission overloads in the WEIM footprint, and provide advisory information to WEIM balancing authorities so they can revise the Base Schedules to resolve any infeasibilities. These WEIM Base Schedules will help to improve the accuracy of CAISO's Day-Ahead Market model.

In Real-Time, CAISO will financially settle the Western Energy Imbalance Market in a manner that appropriately recognizes the costs attributable to each participating balancing authority area. For

example, CAISO will allocate bid cost recovery payments to resources, as well as neutrality amounts that track differences between payments received from load and payments to generation to each participating balancing authority, consistent with CAISO's cost allocation principles. The participating balancing authorities will be responsible for allocating these amounts according to their respective open access transmission tariffs. CAISO will use a process based on its existing local market power mitigation approach to mitigate market power in each balancing authority area participating in the EIM, and will monitor and assess the application of market power mitigation before and after implementation.

The proposed tariff revisions recognize the need for resources that serve load in the CAISO balancing authority area through the WEIM to comply with California's greenhouse gas cap and trade regulations. As it currently does for resources participating in its Real-Time Market, CAISO will allow WEIM participating resources to include the costs of compliance in an WEIM bid adder and will incorporate this cost into its dispatch of generation as appropriate. CAISO will not consider this cost when it dispatches this generation that is attributable to serving load outside CAISO, and therefore, greenhouse gas regulation compliance costs will not affect locational prices outside the CAISO balancing authority area.

Transmission access to the WEIM will be provided under the applicable transmission service provider tariffs. As part of a reciprocal arrangement, CAISO has proposed that there be no incremental transmission charge for the use of transmission to support WEIM transfers between participating balancing authority areas. Within the first year of operation, CAISO will consider in consultation with stakeholders whether to continue this arrangement or to modify it, and this BPM will be updated accordingly.

3. ROLES AND RESPONSIBILITIES

Welcome to the *Roles and Responsibilities* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- This section identifies and describes the basic *Roles and Responsibilities* of the entities that participate in the CAISO Markets.
- This section introduces four new types of participants in the Real-Time Market, which are collectively known as WEIM Market Participants.

EIM Entity: The WEIM Entity is a balancing authority that elects to participate in the Western Energy Imbalance Market. As an WEIM Market Participant, the WEIM Entity is responsible: (1) for identifying

available transmission intertie capacity in its balancing authority area for use in CAISO's Real-Time Market and, (2) through its WEIM Entity Scheduling Coordinator, for scheduling all load and resources in its balancing authority area that do not participate in the Real-Time Market (known as non-participating load and non-participating resources) and for settling charges and payments related to non-participating load and non-participating resources.

EIM Entity Scheduling Coordinator: The WEIM Entity Scheduling Coordinator is the entity through which the WEIM Entity participates in the Real-Time Market. In order to prevent the inappropriate sharing of information regarding transmission and generation, an WEIM Entity Scheduling Coordinator cannot be a scheduling coordinator for a supply resource unless it is a transmission provider subject to the Commission's standards of conduct set forth in 18 C.F.R. § 358.

EIM Participating Resources: The WEIM Participating Resources are the owners or operators of WEIM resources that wish to bid supply into the Real-Time Market. WEIM resources can be generating units, participating load, demand resource providers, or other resources qualified to deliver energy or similar services, such as non-generation resources. Each type of resource that is eligible to participate in the current CAISO Real-Time Market is eligible to participate through the Western Energy Imbalance Market, but only if the WEIM Entity supports participation by that type of resource and the resource meets the technical requirements for such participation pursuant to the terms and conditions of the CAISO tariff and the WEIM Entity's open access transmission tariff.

EIM Participating Resource Scheduling Coordinator: The WEIM Participating Resource Scheduling Coordinator is the entity through which the WEIM Participating Resource participates in the Real-Time Market. To prevent the inappropriate sharing of information regarding transmission and generation, an WEIM Participating Resource Scheduling Coordinator cannot be an WEIM Entity Scheduling Coordinator unless it is a transmission provider subject to the Commission's standards of conduct set forth in 18 C.F.R. § 358.

To participate in the Real-Time Market through the Western Energy Imbalance Market, an entity must enter into a *pro forma* agreement with CAISO that sets out the parties' respective obligations with respect to the entity's role. The *pro forma* agreements are included in Appendix B of the tariff.

3.1 Implementing and Terminating the WEIM Entity Participation

Prior to becoming an WEIM Entity, an interested balancing authority must enter into an implementation agreement with CAISO. See Tariff Section 29.2(b). Each new WEIM entity will be made public through the filing of *New WEIM Entities*.

An WEIM Entity may terminate participation in the WEIM by providing 180 days' notice to CAISO. In addition, the WEIM Entity may suspend operation of the WEIM in its balancing authority area during the 180-day notice provision in accordance with Section 10.5 of this BPM.

4. SCHEDULING COORDINATOR CERTIFICATION

Welcome to the *Scheduling Coordinator Certification* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- An overview of how participants in the WEIM transact with CAISO through a Scheduling Coordinator (SC).
- An overview of the process used for Scheduling Coordinator Certification.

There are two types of Scheduling Coordinators specific to participation in the WEIM that are different from the Scheduling Coordinators listed in the [BPM for Scheduling Coordinator Certification and Termination](#). The two types of Scheduling Coordinators that may transact in the WEIM are:

- **EIM Entity Scheduling Coordinators:** Represent non-participating load and non-participating resources within the EIM. An WEIM Entity Scheduling Coordinator may represent multiple WEIM Entities if it has informed each WEIM Entity of the multiple representations, and has completed an WEIM Entity Scheduling Coordinator Representation Form and submitted it to CAISO in the manner noted on the form.
- **EIM Participating Resource Scheduling Coordinators:** Only represent resources that plan to participate in the WEIM and may not be the WEIM Entity Scheduling Coordinator.

The [BPM for Scheduling Coordinator Certification and Termination](#) outlines the processes and approximate associated timelines, including the training, testing, and informational submissions that an applicant must complete in order to become an eligible certified Scheduling Coordinator (SC) with CAISO. Both types of WEIM Entity Scheduling Coordinators are also responsible for registering with CAISO the resources that they will represent as noted in the [Full Network Model section of this BPM](#).

The [BPM for Scheduling Coordinator Certification and Termination](#) also addresses the responsibilities and status that an SC must maintain in order to participate in the markets operated by CAISO. To participate in the EIM, entities must request access to a variety of applications as noted in Section 5.3.4

of the [BPM for Scheduling Coordinator Certification and Termination](#). While registration as an WEIM participant is part of the standard process to become an SC, if additional SC_IDs are desired, an WEIM participant should refer to Section 5.5 of the [BPM for Scheduling Coordinator Certification and Termination](#) for more information.

For WEIM Entity Scheduling Coordinators and WEIM Participating Resource Scheduling Coordinators, certain activities outlined in Section 3 of the [BPM for Scheduling Coordinator Certification and Termination](#) do not apply to participation in the EIM. Specifically, those activities listed that reflect Inter-SC Trades, CAISO Balancing Authority Area Generating Units, CAISO Balancing Authority Area Load, and Convergence Bidding are not applicable to participation in the EIM.

4.1 Determination of SC Certification Requirements

An existing Certified Scheduling Coordinator with a valid Scheduling Coordinator Agreement (SCA) in place for the corporate parent of the WEIM Entity may qualify for certification requirements for WEIM Participating Resource Scheduling Coordinator and/or WEIM Entity Scheduling Coordinator certification requirements. Please review the provision set forth in tariff section 29.4 and section 3 of the WEIM BPM for determination of SC certification requirements:

Tariff section 29.4 Roles and Responsibilities; (c) 3 (b). An WEIM Entity Scheduling Coordinator may not also be an WEIM Participating Resources Scheduling Coordinator or a Scheduling Coordinator for a Participating Generator, Participating Load or Demand Response Provider, unless the WEIM Entity Scheduling Coordinator is a transmission provider subject to the standards of conduct set forth in 18 C.F.R § 358.

The determination of requirements will depend on the corporate structure of the WEIM Entity and WEIM Participating Resources owned by the parent company. Discussions between CAISO legal counsel and WEIM Entity legal counsel will be required. If it is determined that the WEIM Entity does not meet the stated exception, the WEIM Entity SC must complete the entire SC certification process which can take a minimum of 120 days. Please refer to the BPM for the requirements for SC certification.

If it is determined that the WEIM Entity does in fact meet the stated exception, then the WEIM entity SC will not need to complete the entire certification process.

- Business Practice Manual (BPM) Library: <http://bpmcm.caiso.com/Pages/BPMLibrary.aspx>
(Scheduling Coordinator Certification and Termination)

5. AGREEMENTS

For entities that have signed an WEIM implementation agreement, the purpose of this document is to provide the specific steps and appropriate links to obtain all the applicable agreements to be completed and executed in order to participate in the Western Energy Imbalance Market. References made to the WEIM BPM and CAISO tariff refer to the most current versions of these documents.

- Business Practice Manual (BPM) library: <http://bpmcm.caiso.com/Pages/BPMLibrary.aspx> under Western Energy Imbalance Market

CAISO Conformed Tariff

The addition of a new balancing area to the WEIM will typically involve the agreements listed below. The schedule for completion of these agreements will be developed during the initial project planning phases. It is recommended that the Implementation Agreement be executed 8-9 months prior to initial participation in order to begin the process for completing and executing the below agreements:

1. EIM Entity Agreement
2. EIM Entity Scheduling Coordinator Agreement
 - a. Meter Service Agreement for Scheduling Coordinators
3. EIM Participating Resource Scheduling Coordinator Agreements
 - a. Meter Service Agreement for Scheduling Coordinators
4. EIM Participating Resource Agreement
 - a. (optional) Meter Service Agreement for CAISO Metered Entities

5.1 EIM Entity Agreement

1. Submit the Information Request Sheet for WEIM Entity Agreement

<http://www.caiso.com/Documents/EnergyImbalanceMarketEntityAgreementInformationRequestSheet.doc>

Send submissions to: RegulatoryContracts@caiso.com

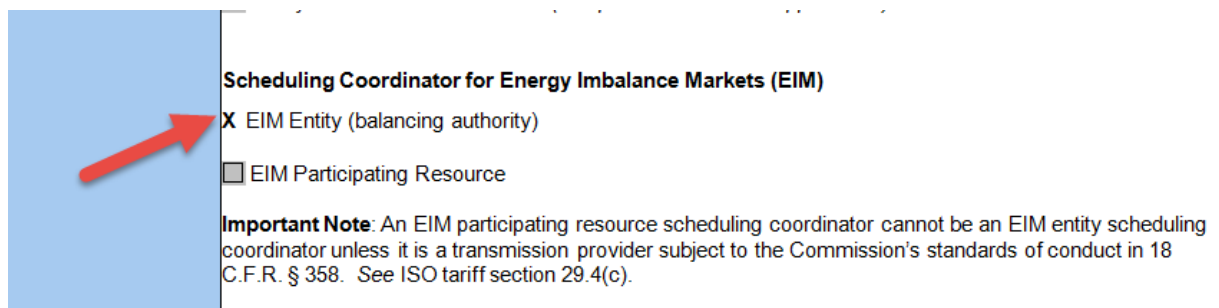
5.2 EIM Entity Scheduling Coordinator (Entity SC)

The submittals listed below should be sent to: SCRequests@caiso.com

1. EIM Entity will work with the CAISO to determine the SCID naming options. In addition to the SCID, there will be various other IDs that need to be set up for the WEIM Entity and the WEIM Entity SC. The CAISO will work with the WEIM Entity to have these IDs set up in the MAPStage testing environment.
2. Submit the WEIM entity SC application with the WEIM entity (balancing authority) box checked per example below

<http://www.caiso.com/Documents/SchedulingCoordinatorApplicationFormEIM-SelectionOptions.doc>

Indicate designated SCID on page 1



Scheduling Coordinator for Energy Imbalance Markets (EIM)

EIM Entity (balancing authority)

EIM Participating Resource

Important Note: An EIM participating resource scheduling coordinator cannot be an EIM entity scheduling coordinator unless it is a transmission provider subject to the Commission's standards of conduct in 18 C.F.R. § 358. See ISO tariff section 29.4(c).

1. Submit the Information Request Sheet for WEIM Entity SC

<http://www.caiso.com/Documents/EnergyImbalanceMarketEntitySchedulingCoordinatorAgreementInformationRequestSheet.doc>

2. Download the template from the CAISO website for the MSA/SC agreement for the WEIM entity (balancing area). Submit the MSA/SC Information Request Sheet – (Specific verbiage will be provided by the CAISO for the Schedule 3)

After all the requirements have been met by the WEIM entity SC, agreements are issued.

The following requirements to be met no later than 30 days prior to parallel operations.

3. Submit the updated Affiliate Form - (all SCs must have an up-to-date Affiliate form on file with the CAISO as affiliates change)

<http://www.caiso.com/Documents/ISOAffiliationResourceControlAgreementDisclosureForm.xls>

4. Submit the Electronic Funds Transfer form – (if the WEIM Entity SC plans on using a separate bank account different from the bank account currently on file with the CAISO)

http://www.caiso.com/Documents/ISO_PaymentSelectionInstructions-EFT-Form.doc

Required if WEIM entity SC will be using a separate bank account from the WEIM PR SC.

5. Submit an Emergency Plan – (If the WEIM Entity SC plans on having a separate operations real time desk from what is currently on file with the CAISO)

<http://www.caiso.com/Documents/EmergencyPlanForm.doc>

6. Perform Real Time Grid Ops test. The real time test is a series of 5 calls from the CAISO real time desk to the 24 hour number provided in the submitted Emergency Plan at any time or any day over a 7-10 period. (based on the submission of the Emergency Plan in #5)

5.3 EIM Participating Resource Scheduling Coordinator (EIM PR SC)

All of the following submittals should be sent to SCRequests@caiso.com

Special Note: For other WEIM PR SCs not part of the WEIM entity, there are steps and requirements. Refer to documentation posted on the CAISO web site:

1. Submit a request (email) for an additional SCID to SCRequests@caiso.com (indicating this is for EIM)

Optional: A separate SCID for the WEIM participating resource SC is not required, but it is recommended to have a dedicated SCID due to the fact the WEIM Entity SC will have visibility to the resource data templates for all resources associated with the specified SCID.

2. The PR SC will be notified of approval of the requested SCID and will be instructed to submit the SCID request letter

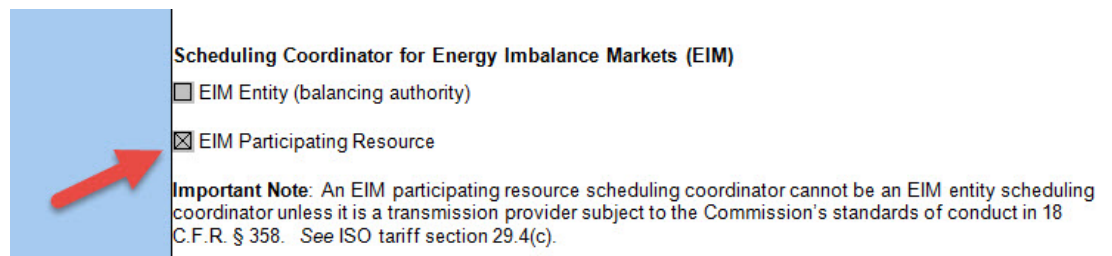
<http://www.caiso.com/Documents/ExistingSchedulingCoordinatorRequestsAdditionalSCID.doc>

3. Submit Base Schedule Coordinator (BSC) ID request form -- CAISO will provide the BSCID based on a specific naming convention. This form should be submitted along with the Additional SCID request letter to have the same effective start date. The BSC ID is used for the submission of base schedules into the BSAP (base schedule application)

- The master file is updated with an effective start date for the SCID and BSCID per this submission.

4. Submit the PR SC application with the WEIM participating Resource box checked per example below.

<http://www.caiso.com/Documents/SchedulingCoordinatorApplicationFormEIM-SelectionOptions.doc>



Scheduling Coordinator for Energy Imbalance Markets (EIM)

EIM Entity (balancing authority)

EIM Participating Resource

Important Note: An EIM participating resource scheduling coordinator cannot be an EIM entity scheduling coordinator unless it is a transmission provider subject to the Commission's standards of conduct in 18 C.F.R. § 358. See ISO tariff section 29.4(c).

5. Submit the Information Request Sheet for WEIM PR SC

<http://www.caiso.com/Documents/EnergyImbalanceMarketParticipatingResourceSchedulingCoordinatorAgreementInformationRequestSheet.doc>

6. Download the template from the CAISO website for the MSA/SC agreement for the WEIM Entity (balancing area)

Submit the MSA/SC Information Request Sheet – (Specific verbiage will be provided by the CAISO for the Schedule 3)

- After all the requirements have been met by the WEIM PR SC, agreements are issued.

The following requirements need to be met no later than 30 days prior to parallel operations.

7. Submit an updated Affiliate Form - (all SCs must have an up-to-date Affiliate form on file with the CAISO as affiliates change)

<http://www.caiso.com/Documents/ISOAffiliationResourceControlAgreementDisclosureForm.xls>

8. Submit the SC Acceptance letter – This is submitted to indicate agreement to be the SC for specified WEIM participating resources.

http://www.caiso.com/Documents/NewSCAcceptanceLetter_Sept2014.doc

9. Submit the RDT (resource data template) with the SC Acceptance letter

5.4 EIM Participating Resource (PR)

All of the following submittals should be sent to: SCRequests@caiso.com

IMPORTANT: The PR needs to submit an application to the WEIM entity and meet the requirements for that WEIM Entity.

- The WEIM Entity notifies the CAISO that the resource(s) have met the entities requirements and requests confirmation from the CAISO that the resource(s) have also met CAISO requirements.
- The PR needs to follow the steps below while working with the WEIM Entity

1. Submit WEIM Participating Resource Agreement Information Request sheet

<http://www.caiso.com/Documents/EnergyImbalanceMarketParticipatingResourceAgreementInformationRequestSheet.doc>

2. Submit the Schedule 1 (the schedule 1 needs to match the RDT submitted by the WEIM PR SC for the resource)

<http://www.caiso.com/Documents/EnergyImbalanceMarketParticipatingResourceAgreementSchedule1.xls>

NOTE: After all the requirements have been met by the resource for the WEIM entity and the CAISO, agreements are issued.

- The WEIM entity officially notifies the resource and the CAISO that the resource is an WEIM participating resource.
3. Submit the Resource Owner SC Selection letter – This is submitted to indicate the selection of the SC that is to represent and schedule for the PR in the EIM.

http://www.caiso.com/Documents/ResourceOwnerLetter_Sept2014.doc

6. CREDIT MANAGEMENT

Welcome to the *Credit Management* section of the CAISO *BPM for the Western Energy Imbalance Market*. In this section you will find the following information:

- Summary of CAISO's Credit Management policies and processes within the context of the EIM.

EIM Participants must comply with all applicable aspects of CAISO's Credit Management Policy. The [BPM for Credit Management](#) describes the credit-related policies and processes used at CAISO to protect the financial integrity and effectiveness of the CAISO markets. For WEIM participants, since Virtual Bidding, Reliability Must Run contracts, and Congestion Revenue Rights are not applicable to the EIM, these portions of the Financial Responsibilities outlined in the [BPM for Credit Management](#) are not applicable.

7. FULL NETWORK MODEL

Welcome to the *Full Network Model* section of the CAISO *BPM for the Western Energy Imbalance Market*. In this section you will find the following information:

- Summary of the Full Network Model in the EIM.

- Information that describes the business processes used by CAISO to maintain the Full Network Model in the EIM.

CAISO maintains a Network Model for use by the CAISO markets. The [BPM for Managing Full Network Model](#) explains how the Full Network Model and its associated processes are used to support market operations. [The BPM for Managing Full Network Model](#) also describes the process Market Participants follow in providing data used to support the model and in gaining access to model data. The CAISO Network Model contains some, but not all, of the related information for neighboring Balancing Authority Areas within WECC.

Balancing Authority Areas participating in the WEIM will maintain their own Network Model processes with resources within their BAA, and will export that information to CAISO on a regular basis for promotion into CAISO's Full Network Model and subsequent use by the EIM. Any issues identified by CAISO in the WEIM Entity BAA's model information will be resolved before promoting the information into a model used by the CAISO markets. WEIM Entities are responsible for coordinating their network model updates with other impacted parties, including neighboring Balancing Authorities and WECC as appropriate.

The CAISO Full Network Model timeline can be found in Section 5.1 of the [BPM for Managing Full Network Model](#). Before every network model update, an WEIM Entity will complete and provide a network model update template to CAISO. The document will contain a detailed description of the updates for communication between CAISO and the WEIM Entity network model teams, and to the Real-Time operators. The document is posted on the Network and Resource Modeling section of the CAISO website and should contain any changes to the WEIM Entity's network model including, but not limited to, new equipment, equipment commissioning/decommissioning, date/time, new system configurations, display changes, SCADA point changes, and interconnection changes.

The WEIM Entity shall make the Network Model Update document available to CAISO before the commissioning/decommissioning of transmission or generation equipment. This will help resolve and cross the gap between the different cycles of network model updates among CAISO and the different WEIM entities. The document is only used to synchronize the EMS network models between an WEIM Entity and CAISO. It does not replace the existing requirement or processes in place to register participating and non-participating resources in an WEIM Entity balancing area in the CAISO Market registry system or Master File.

An WEIM Entity will export its EMS network model to CAISO along with an associated limits file. In order for CAISO to implement an WEIM Entity's model into CAISO's full network model in a timely manner, the WEIM Entity will send the required information to CAISO based on the full network model timeline in Section 5.1 of the [BPM for Managing Full Network Model](#).

While an WEIM Entity's model deployment cycle may differ from CAISO's network model update timeline, any WEIM Entity market model changes should follow the effective timelines specified and maintained in the CAISO BPM Section 5.1 of the [BPM for Managing Full Network Model](#). New resources must complete the interconnection processes of their host Balancing Authority Area (BAA) prior to being included in a Full Network Model build and participating in the EIM.

All resources within an WEIM Entity must be included in the CAISO's Full Network Model. The New Resource Implementation guide posted on the CAISO website contains requirements for establishing new resources with CAISO. Resources participating in the WEIM will be required to submit requisite information to CAISO via the Resource Data Template (RDT) process described in Section 5.4 of the [BPM for Managing Full Network Model](#). Additional information regarding the specific information contained in the RDT can be found in Attachment B of the [BPM for Market Instruments](#). All WEIM Participating Resource Scheduling Coordinators must register the resources that they shall represent using the RDT process, update the information on a timely basis, and share that information with the WEIM Entity Scheduling Coordinator in coordination with CAISO's network model update timeline. Also, an WEIM Entity Scheduling Coordinator must register all non-participating resources, specifying the WEIM Entity within which the resources exist, using the RDT process and update that information in accordance with CAISO's network model build process.

An WEIM Entity shall update the WEIM Transmission Service Information no less frequently than the timelines for updates to the Full Network Model as outlined in Section 5.1 of the [BPM for Managing Full Network Model](#). Also, upon entering into an WEIM Implementation Agreement, an WEIM Entity shall establish and inform CAISO of the maximum WEIM Transfer limit at least ninety days prior to the WEIM Entity Implementation Date via the Full Network Model update process.

As previously described, the [BPM for Managing Full Network Model](#) explains how the Full Network Model and its associated processes are used to support market operations. For WEIM participants, references to the IFM, Use Limited Resources, CRR Systems, Participating Transmission Ownership, Metered Sub-Systems, Utility Distribution Companies, Trading Hubs, and RUC Zones are not applicable to the EIM.

The section of the [BPM for Managing Full Network Model](#) relating to maintenance of the Full Network Model depicts the existing process, but is currently being evaluated for revisions necessary to appropriately incorporate updates from WEIM Entity BAAs.

8. METERING

Welcome to the *Metering* section of the CAISO *BPM for the Western Energy Imbalance Market*. In this section you will find the following information:

- Description of the process and procedures used by CAISO, CAISO Metered Entities, and Scheduling Coordinators for Scheduling Coordinator Metered Entities to obtain Settlement Quality Meter Data (SQMD) used for the Settlement of the CAISO markets within the EIM.

The [BPM for Metering](#) covers the metering responsibilities for CAISO, CAISO Metered Entities, Scheduling Coordinator (SC) Metered Entities, and Scheduling Coordinators representing Metered Entities for the meter installation, certification, and maintenance in addition to the creation of SQMD. The [BPM for Metering](#) also describes the process and procedures used by CAISO, CAISO Metered Entities, and Scheduling Coordinators for Scheduling Coordinator Metered Entities to obtain SQMD used for the settlement of the CAISO markets. SQMD is used for billable quantities to represent the energy generated or consumed during a Settlement Interval.

SQMD is obtained from two different sources:

- **CAISO Metered Entities:** Meter Data directly polled by CAISO
- **Scheduling Coordinator Metered Entities:** Meter Data submitted to CAISO by Scheduling Coordinators

Entities participating in the WEIM may opt to be CAISO Metered Entities or Scheduling Coordinator Metered Entities. A determination must be made for each resource in an WEIM Entity BAA, and the requisite requirements of Section 29.10 of the CAISO Tariff met, prior to that BAA participating in the EIM. If an WEIM Participating Resource chooses to switch from one type to another, they must notify CAISO and complete the associated pieces of the *New Resource Interconnection Process*.

For Scheduling Coordinator Metered Entities that were not participating as such before April 10, 2017, or that repower, modify their Meter Data interval, or add generating capacity after April 10, 2017,

Scheduling Coordinators must submit an SQMD Plan to ensure that the Scheduling Coordinator will submit and maintain the integrity of Meter Data submitted to the CAISO for that Scheduling Coordinator Metered Entity. The SQMD Plan will describe how the Scheduling Coordinator will collect, maintain, aggregate, and submit Settlement Quality Meter Data in accordance with CAISO Tariff and, where

applicable, Local Regulatory Authority metering and settlement standards. SQMD Plans will include detailed descriptions of the following, as applicable, for each Scheduling Coordinator Metered Entity or Scheduling Coordinator Metered Entity aggregation or calculation:

- (1) The type, programming, and configuration of all associated metering devices;
- (2) How the Scheduling Coordinator or its agent will collect, validate, aggregate, and submit associated Meter Data;
- (3) Single-line diagrams with professional engineer stamps (or equivalent) depicting the physical elements and relationships among the metering device(s);
- (4) Any calculation or algorithm to derive Settlement Quality Meter Data from the metering device(s);
- (5) Processes for aggregating individual Scheduling Coordinator Metered Entities and Resource IDs; and
- (6) Plans and schedules to perform regular tests of the metering devices and audit the associated Meter Data pursuant to CAISO Tariff requirements.

Proxy Demand Resources and Reliability Demand Response Resources may satisfy their SQMD Plan requirements through the demand response registration process.

With the exception of Section 9.2, no other portion of the metering configurations listed in Sections 9, 10, or 11, of the [BPM for Metering](#) is currently available to WEIM participants.

All Scheduling Coordinators and other entities submitting meter data related to WEIM resources for either generation not associated with Ancillary Services, interties, or load, must submit meter data in the following granularity levels as stated in section 10.3.2.2 of the CAISO Tariff:

- a) Generation for participating generators at 5 or 15-minute intervals; non-participating generators at 5, 15 or 60-minute intervals.
- b) Interties at 5-minute intervals.

- c) Load at 5, 15 or 60-minute intervals.

9. TELEMETRY

Welcome to the *Telemetry* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- Summary of telemetry requirements and the transfer of telemetry information for the CAISO markets as it relates to the EIM.

CAISO has specific requirements regarding the transfer of telemetry information for the CAISO markets. WEIM entity is required to send CAISO Common Information Model (CIM) 15 compliant full network model with associated SCADA measurements. WEIM entity will send real time telemetry using ICCP (Inter-Control Center Communications Protocol) to run power flow, state estimation and market applications. CAISO may require other SCADA measurements that are not related to network model using ICCP such as flow gate limits or aggregate generation.

ICCP is industry standardized communication protocol but does not eliminate the need for a direct Energy Communication Network (ECN) connectivity.

All other information security requirements remain effective as set forth in *CAISO Information Security Requirements for the ECN*

If additional requirements are required and agreed to between CAISO and an WEIM Entity, a schedule of implementation of the additional requirements will be agreed to as well.

10. OUTAGE MANAGEMENT

Welcome to the *Outage Management* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- Summary of the Outage Management process within the framework of the Western Energy Imbalance Market.

CAISO will implement transmission and Generation Outages approved by the WEIM Entity through the Day-Ahead Market process. CAISO will also inform the WEIM Entity Scheduling Coordinator of any anticipated overloads. The WEIM Entity shall be responsible for performing engineering studies,

modeling, and approving Outages on transmission and generation facilities within the WEIM Entity Balancing Authority Area. The WEIM Entity will then submit the approved outages into the CAISO outage management system. CAISO will not evaluate or approve any outages submitted by the WEIM Entity.

10.1 Objectives, Roles, Scope, and Participants

10.1.1 Outage Management Objective

The objective of the CAISO business processes related to Outage Management for WEIM Entities is to reflect outage information in the CAISO markets as soon as possible in order to allow the WEIM to accurately reflect their operations in the market results. WEIM Entity approved Outages must be consistent with the Full Network Model.

10.1.2 CAISO Role

CAISO's role in the Outage Management business process for WEIM is to provide an outage management system to allow the WEIM Entity Scheduling Coordinator to submit notice of WEIM Entity approved transmission and generation Outages for the WEIM Entity BAA. This section describes the processes CAISO uses to perform this role.

10.1.3 Facility Owner Role

The WEIM Entity, WEIM Participating Resources, and WEIM Transmission Service Providers remain solely and directly responsible for the performance of all maintenance work, whether on energized or de-energized facilities, including all activities related to providing a safe working environment in coordination with the WEIM Entity. The WEIM Entity is responsible for ensuring Outages have been studied, modeled, and approved prior to submission to CAISO.

The WEIM Entity, WEIM Participating Resources, and WEIM Transmission Service Providers may elect to have an agent perform some or all of the activities required to meet their responsibilities related to Outage Management; however, the WEIM Entity remains responsible for the successful completion of these activities. See Section 6, *Communication of Outage Maintenance Information*, of the [BPM for Outage Management](#) for a discussion of the requirement for an WEIM Entity to establish a single point of contact, such as an WEIM Entity SC.

10.1.4 Application to Parties

The *BPM for Outage Management* applies to CAISO and the following WEIM parties:

- All associated with the WEIM Entity
- Connected Entities, to the extent that the agreement between the Connected Entity and CAISO so provides
- EIM Entity Scheduling Coordinators for WEIM Participating Resources
 - Notification of approved WEIM Outages via the CAISO outage management system UI/API if the CAISO outage management system is unavailable
- EIM Entity for Transmission and WEIM Non-Participating Resources
 - Notification of approved WEIM Outages via the CAISO outage management system UI/API if the CAISO outage management system is unavailable

10.1.5 CAISO Outage Coordination Office

The CAISO Outage Coordination Office (OCO) operates Monday through Friday, except holidays. OCO personnel are located in Folsom, California. The location, contact information, and areas of responsibility for this office are detailed in the most recent version of the applicable CAISO *Operating Procedures* (Section 1.5, References-3210F), available through the CAISO website.

The OCO uses an electronic CAISO outage management system application to support the receipt and processing for new WEIM approved Outages, as well as updates to existing Outages. The electronic application used by CAISO for Outage Management is referenced throughout this section of the BPM. CAISO does not approve outages in the WEIM Entity areas as they retain the BAA functions for reliability.

The types of scheduled WEIM Entity approved outages that are accepted and processed by the OCO outage management system are as follows (not an exhaustive list):

- Balancing Authority Area Interconnections work:
 - All Outages that affect interconnected systems will be coordinated between Interconnected Transmission Operators.
- All work on facilities forming the WEIM Entity Controlled Grid, including associated control or protective equipment:
 - This refers to all Outages affecting WEIM Entity equipment and Generators with an WEIM Participating Resource agreement.
- All reportable Outages or partial curtailments of WEIM Participating Resources and non-participating resources approved by and consistent with the outage management procedures of the WEIM Entity.

- EMS work that disables any portion of the WEIM Entity Grid monitoring, control, or protective equipment, including EMS equipment and communication circuits
- EMS work that affects Generator AGC or RIG equipment or communication circuits
- Interconnections with responsible entities outside the WEIM Entity Balancing Authority Area

10.2 Requesting Maintenance Outages

For additional information, see [Tariff Section 29.9 Coordination of Outages and Maintenance](#).

10.2.1 EIM Entity and WEIM Entity Scheduling Coordinator Outage Request Process

The WEIM Entity Scheduling Coordinator shall submit notice of approved transmission and generation Outages or revisions to approved maintenance Outages to CAISO.

10.2.1.1 Outage Scheduling Requirements

Transmission Outage Scheduling

The WEIM Entity must submit a new approved Maintenance Outage or a revision to an approved Maintenance Outage to CAISO via the CAISO outage management system no later than seven days prior to the start date of the proposed Outage for Transmission facilities, as specified in the CAISO Tariff Section 9.3.6.3.1, for the Outage to be a planned maintenance Outage.

Note: The determination of a seven-day prior notice excludes the date of submission and the date of the Outage.

Notification by the WEIM Entity Scheduling Coordinator of approved Transmission Outage must specify the following:

- Identification and location of the transmission system element(s) to be maintained
- Nature of the maintenance to be performed
- Modeled system Outage boundaries to facilitate the equipment Outage
- Date and time the Maintenance Outage is to begin
- Date and time the Maintenance Outage is to be completed

- Emergency Return Time – The time required to terminate the maintenance and restore the transmission system to normal operation, if necessary

Generation Outage Submission

The WEIM Entity or WEIM Entity Scheduling Coordinator must submit a new approved Maintenance Outage or a revision to an approved Maintenance Outage to CAISO via the CAISO outage management system no later than seven days prior to the start date of the proposed Outage as specified in CAISO Tariff Section 9.3.6.3.1 in order for the Outage to be a planned Maintenance Outage.

Note: The determination of seven-day prior notice excludes the date of submission and the date of the Outage.

For Generators, a request for an Outage must specify the following:

- Generating Unit or System Unit name and Location Code
- Nature of the maintenance to be performed
- Date and time the Outage is to begin
- Date and time the Outage is to be completed
- Emergency Return Time – The time required to terminate the Outage and restore the Generating Unit to normal capacity, if necessary

10.2.2 Generation Resource Start-Up Time

Generation Maintenance Outages should not include start-up time. Each generator's start-up time is documented in the Master File and is considered to begin once the generator has been called on by the WEIM Entity or for a scheduled start up.

10.2.3 Confirmation and Acknowledgement of Receipt of Outage Request

CAISO outage management system acknowledges receipt of each new WEIM Entity approved Outage request. WEIM Entity and WEIM Entity Scheduling Coordinator approved Outage requests and revisions must meet the minimum data requirements of the CAISO outage management system. If an Outage request or revision passes that validation, the Outage will automatically be processed and passed to the market systems without the CAISO OCO review or revision.

10.2.4 Withdrawal or Modification of Request

The WEIM Entity and WEIM Entity Scheduling Coordinator may withdraw an Outage at any time prior to actual commencement of the Outage. Outage modifications can be made via the CAISO outage management system and will automatically be processed if all data entries are valid.

10.2.5 Changes to Planned Maintenance Outages

The WEIM Entity or WEIM Entity Scheduling Coordinator may cancel a previously approved planned Maintenance Outage or submit a request to change a previously approved planned Maintenance Outage at any time prior to the Outage start. Requests for such changes must include the information required and be in accordance with the WEIM Outage request timing requirements which are consistent with the CAISO [BPM for Outage Management](#). Requests to cancel an Outage after the Outage start date and time have passed are not allowed. In that situation, the Outage must be returned to service even if no Outage activity actually occurred.

10.3 Management of Forced Outages

In the *Management of Forced Outages* Section you will find the following information:

- A description of how WEIM approved Forced Outages or an extension of an approved Maintenance Outage is processed in the CAISO outage management system.

10.3.1 Forced Outages

Outage Scheduling

If the WEIM Entity or the WEIM Entity Scheduling Coordinator submits a new approved Maintenance Outage or a revision to an approved Maintenance Outage to CAISO via the outage management system less than seven days prior to the start date of the proposed Outage, the Outage will be a Forced Outage. The timely submission of outages directly impacts the network topology configuration, availability of the electrically connected resources, and/or the MW dispatch range of the available resources. Delays in submission of the forced outage information may result inaccurate real-time imbalance calculation for the look-ahead market intervals, and as a result price signals that may not represent the actual system conditions. Therefore, the timing requirements for submission of forced outages in the WEIM entity BAA is set in accordance with the timing required for CAISO as described by the [BPM for Outage Management](#), which is currently set at 60 minutes after the occurrence of the outage.

Note: The determination of seven-day prior notice excludes the date of submission and the date of the Outage.

10.3.2 Extended Scheduled Outage

If the WEIM Entity or the WEIM Entity Scheduling Coordinator wishes to continue to perform maintenance work beyond the date and time specified in an approved Maintenance Outage, the Owner may submit an approved revision to extend the approved Maintenance Outage.

10.4 Communication of Maintenance Outage Information

In the *Communication of Maintenance Outage Information* Section you will find the following information:

- A description of the need for a single point of contact for communication purposes.
- A description of methods of communication to be used as a part of the Outage Management business processes.
- A brief description of the outage management system.

Refer to Tariff Sections 9.3.4: *Single Point of Contact* and 9.3.5: *Method of Communication*.

10.4.1 Single Point of Contact

All WEIM Entity Scheduling Coordinator communications concerning the notice of an approved transmission and generation Outage or to confirm or change an approved Maintenance Outage must occur between CAISO and the designated single point of contact for each WEIM Entity. The WEIM Entity must provide in its initial Outage notification and any subsequent changes to its Master File, the identification of the single point of contact who is responsible for all Outage Management related activities. This identification is confirmed in all communications with CAISO in relation to Outage notification, including any request to CAISO for confirmation, notification, and revision of approved Outages.

This section includes a discussion of the primary and backup mechanisms to communicate Outage Management information, a discussion of the need for some communications to be conducted with Control Center personnel, and a brief description of the CAISO outage management system.

10.4.1.1 Primary Mechanism

The CAISO outage management system is the primary method of communicating Outage Management related information. The outage management system, which is described in more detail in Section 6.2.1 of the [BPM for Outage Management](#), provides an automated mechanism for parties and CAISO to communicate the information required for all aspects of Outage Management. The CAISO outage management system provides both a mechanism to communicate as well as a mechanism to confirm the receipt of information from users and from CAISO either by using the system user interface or by using an Application Program Interface (API).

10.4.1.2 Backup Mechanism

In the event that the CAISO outage management system is not operational, emergency capabilities are used to communicate with CAISO. The emergency capabilities that can be used as a back-up if the CAISO outage management system application is unavailable include:

- Electronic format (such as e-mail)
- Voice communication with Control Center Personnel

As discussed in this BPM, some outage management related communications by or with CAISO Control Center personnel are conducted on the telephone. These communications are described in detail in CAISO Operating Procedures (see Section 1.3, *References*).

10.4.1.3 Use of the CAISO outage management system

The CAISO outage management system is a secure software system that enables parties to interact with CAISO to complete the various transactions included in the outage management business processes. The CAISO outage management system includes a web client version for use by an individual and an Application Program Interface (API) version for use in computer-to-computer data transfers. Using the outage management system, an WEIM Entity or WEIM Entity Scheduling Coordinator can perform the following functions:

- Submit notification of new approved WEIM Outage.
- Receive confirmation of notification from CAISO.
- Obtain status of an Outage.
- Enter Outage Cause Codes (NERC GADS, reason for Outage).
- Update an Outage.

- Search the database of completed, scheduled, or active Outages. This function allows an WEIM Entity Scheduling Coordinator to review only their data and not the data of other owners.
- User instructions are available on the CAISO website.

Other functions provided for in the CAISO outage management system are listed in the CAISO outage management system materials shown in Section 1.3, *References*, of the [BPM for Outage Management](#).

10.5 Records and Reports

In this section you will find the following information:

- Availability of and access to Outage records retention provided for by CAISO and the access provided to those records.
- A description of the various reports related to Outage Management that CAISO produces.
- Also refer to Tariff Sections 9.3, *Coordination of Outages and Maintenance*; and 9.5, *Records*.

10.5.1 Records of Approved Maintenance Outages

The CAISO OCO maintains a record of each approved Maintenance Outage as it is implemented. Such records are available for inspection at the CAISO OCO by WEIM Entities or their designated representatives. Only those records pertaining to the equipment or facilities owned by the facility owner are made available for inspection at the CAISO OCO with notice at least 15 days in advance of the requested inspection date.

11. MARKET OPERATIONS

Welcome to the *Market Operations* section of the BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- Summary of the EIM-specific rules, design, operational elements, and separation procedures of the CAISO markets.
- Operations information for those entities that expect to participate in the EIM, as well as those entities that interface with the EIM.

The operation of the WEIM and the regular CAISO market are similar in many ways. Rather than repeat the description of those portions which are the same between markets, this section describes only the EIM-specific implementation details and the differences from the regular CAISO market. Therefore, it is

recommended that the reader review the [BPM for Market Instruments](#) and the [BPM for Market Operations](#) prior to reading this section.

11.1 About the Market

This section is intended to describe the features of the EIM.

11.1.1 Ancillary Services

EIM participants will be responsible for procuring and managing their own ancillary services in conformance with NERC and WECC requirements. RTM will protect the participating resource WEIM Upward Available Balancing Capacity, WEIM Downward Available Balancing Capacity, and WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements not to be dispatched to meet WEIM footprint energy needs. However when an infeasible power balance condition in an WEIM BAA, other than CAISO, is detected by the CAISO's market clearing software, WEIM Upward or Downward Available Balancing Capacity will be released to the market clearing process to balance the respective WEIM BAA as explained in section 11.3.4 of this document. WEIM Downward Available Balancing Capacity consists of any downward capacity from an WEIM Participating Resources or a non-participating resource that an WEIM Entity Scheduling Coordinator has identified in the WEIM Resource Plan as available to address power balance and transmission constraint violations in the WEIM Balancing Authority Area, which may include downward regulation capacity. WEIM Upward Available Balancing Capacity consists of any upward capacity from an WEIM Participating Resources or a non-participating resource that an WEIM Entity Scheduling Coordinator has identified in the WEIM Resource Plan as available to address power balance and transmission violations in the WEIM Balancing Authority Area, which may include upward regulation capacity. WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements consists of any capacity that an WEIM Entity Scheduling Coordinator has designated, in the WEIM Resource Plan, as necessary to meet its NERC/WECC contingency reserves requirements in the applicable Trading Hour and which does not overlap with capacity designated in other parts of the WEIM Resource Plan specified in Section 29.34(e)(3) of the CAISO Tariff, which may include operating reserves.

11.1.2 Interties Between BAAs

This section describes intertie modeling and the use of data related to interties. The intertie is oriented in the export direction with the "From" bus being the CAISO/EIM BAA bus.

11.1.2.1 Interchange Transactions and E-Tagging

Since the non-EIM Entities net schedule interchange (NSI) values are not submitted to CAISO but are required for the calculation of loop flow impact of external schedules on the CAISO and the WEIM entities network, CAISO will receive/download automatically all raw tag data from Western Interchange Tool (WIT) for all external BAAs at a pre-defined frequency and time of day.

The data file will contain schedule and path information for every transaction schedule in WIT within the specified time period. Each transaction schedule will present the North American Energy Standards Board (NAESB) defined tag transaction type and composite state. The data will include the source and sink BAA information.

For e-tagging timelines and rules, please refer to the [BPM for Market Operations Section 8.0](#)

11.1.3 EIM Transmission Services Information

The WEIM Entity shall send to CAISO its EMS network model information including any flowgates, intertie definitions and physical limits on its transmission equipment and the available capacity limits for the WEIM Entity internally enforced flowgates. The submission of the WEIM Entity network model shall use the Common Information Model (CIM) industry standard protocol for exchanging network model data. The WEIM Entity shall also send to CAISO SCADA and measurements mapped to the WEIM Entity EMS network model. The process of submission of the WEIM network model shall be consistent and in accordance to the already established CAISO FNM update process and its publically published deadlines for collecting network updates. Please refer to the [BPM for Managing Full Network Model](#) for a description of this process.

The WEIM Entity shall send, via a direct interface to CAISO, the transmission limit updates due to planned or forced outages or derates for its internal major paths or flowgates that are usually posted on its OASIS system.

11.1.4 Maximum WEIM Transfer Limits

EIM Entity Scheduling Coordinators shall send to the CAISO market system the WEIM intertie Available Transfer Capacity (ATC) and any updates due to planned or forced outages or derates based on physical limits, schedule limits, and/or contract limits or rights owned by the WEIM Entity on the WEIM interties with neighboring BAAs. The CAISO shall enforce the limits in corresponding market optimization per

applicable Operating Procedures. The WEIM Entity shall communicate these limits via direct interface to CAISO.

The WEIM Entity shall communicate to the CAISO market system any real-time Dynamic Transfer Capability (DTC) limits enforced by any third party transmission provider that the WEIM Entity utilizes its transmission or has transmission rights. The WEIM Entity shall reflect the DTC limit in the transmission profile of the corresponding WEIM transfer dynamic e-tag.

Each WEIM Entity Scheduling Coordinator shall determine and send to the CAISO market system the WEIM intertie transmission right limits, static limits, dynamic incremental limits and any updates through the EIMDynamicLimitData file submitted to CAISO as changes to these limits are required by the WEIM Entity Scheduling Coordinators (*i.e.*, the WEIM Transfer limit). This should be finished prior to the start of the next Dispatch Interval by the WEIM Entity Scheduling Coordinator. The CAISO will use this information to calculate the Energy Transfer schedule limit according to Appendix A: Energy Transfer Schedule Limits. The CAISO will provide the WEIM Entity Scheduling Coordinator with the Energy Transfer schedule information according to Appendix A: Energy Transfer Schedule Tags.

Specific procedures may be developed to document specific conditions, communication of WEIM Entity, External BAA, or third party transmission provider as designed by WEIM Entity.

If there are two or more WEIM Entity Balancing Authority Areas that share the same WEIM Internal Intertie, the CAISO's Security Constrained Economic Dispatch in the Real-Time Unit Commitment and Real-Time Dispatch will enforce the individual WEIM Transfer limit for each WEIM Entity Balancing Authority Area while allowing Energy to wheel through the WEIM Entity Balancing Authority Areas based on the transmission made available for use in the Real-Time Market.

11.1.5 Energy Transfer Scheduling in Western Energy Imbalance Market

Energy Transfer Scheduling aims to determine the Energy Transfer schedules among the WEIM BAAs and the CAISO from the optimal WEIM Transfers of the BAAs in the WEIM Area using the transmission rights available to the WEIM without violating them. This is a part of the market optimization problem in Fifteen Minute Market and RTD of EIM.

The Appendix A Mathematical Formulation for WEIM Transfers outlines how the CAISO enforces scheduling constraints in the market optimization to ensure the energy from base schedules and WEIM Transfers in the FMM and RTD are consistent with intertie scheduling limits.

In calculating real-time neutrality by BAA, the System Marginal Energy Cost (SMEC) is used for the Energy Transfer (see Appendix A for an example).

11.1.5.1 Energy Transfer System Resources

For the convenience of modeling of the Energy Transfer Scheduling problem, Energy Transfer System Resources (ETSRs) are defined as aggregate resources at the WEIM BAA Default Generation Aggregation Point (DGAP), which is an aggregation of all supply resources in the BAA. They are dedicated System Resources in each WEIM BAA to anchor the Energy Transfer schedules from that BAA to other BAAs in the WEIM Area for tracking, tagging, and settlement. Each ETSR is defined as either an import or an export resource, and it is associated with an WEIM intertie with another WEIM BAA, or a CAISO intertie with the CAISO. The associated intertie is one where the WEIM Entity for the relevant WEIM BAA has made transmission rights available for scheduling Energy Transfers from/to the other WEIM BAA or the CAISO.

11.1.5.2 Base Schedules

Before WEIM market optimization, base Energy Transfer schedules between WEIM BAAs are submitted along with the generation and intertie base schedules. The base Energy Transfer schedules are assumed to be feasible. For each WEIM BAA and CAISO, the base WEIM Transfer, the base NSI, the base demand, the base generation and the base load are obtained from the base Energy Transfer schedules and RUC schedules. The base load for WEIM BAA is adjusted in the ACPF to absorb the loss error. The base load for WEIM BAAs is significant because it is used as a reference for imbalance energy settlement. Base schedules are also calculated for non-EIM BAAs to model unscheduled loop flow through the WEIM area.

11.1.5.3 Energy Transfer Schedule Calculation

Additional variables and constraints are added to the market optimization problem for the Energy Transfer Scheduling problem. In the market optimization problem, the NSI variables for each BAA are used to derive the WEIM Transfer for each WEIM BAA and for the CAISO. The WEIM Transfer Schedules represented by the ETSR variables are constrained by applicable WEIM Transfer limits.

The base Energy Transfer schedules may be included in the optimal Energy Transfer schedules or specified separately. After the market solution is obtained, the base and optimal Energy Transfer schedules assigned to the corresponding ETSRs are tagged to the associated intertie using the corresponding ETSR identification. Including the base Energy Transfer in the optimal Energy Transfer allows the optimal dynamic Energy Transfer to counter flow on the base Energy Transfer maximizing transmission capacity use. If the base Energy Transfer is scheduled separately on dedicated ETSRs, the Base ETSRs, it is not optimized but kept constant in the market, unless modified by the WEIM Entity SC after T-40' through the real-time intertie schedule interface. The transmission capacity consumed by the base Energy Transfer scheduled on Base ETSRs cannot be used for counter flow dynamic Energy Transfers. Schedules associated with pseudo tie or dynamic e-Tags for pseudo-tied resources or loads that involve one or multiple WEIM Entity BAAs should not be included in base Energy Transfers between

WEIM BAAs or intertie transactions between WEIM and non WEIM BAAs because these schedules have no effect on the NSI of the source/sink BAA or the NSI of intermediate BAAs.

In the mathematical formulation, without loss of generality, the base Energy Transfer schedules are included in the optimal Energy Transfer schedules, and the optimal Energy Transfer schedules are constrained by the WEIM Transfer limits determined by the transmission limits, static limits and incremental dynamic limit. In other words, the amount of total intertie utilization is modeled to be constrained by the total transmission capacity, rather than the amount of incremental intertie utilization being constrained by the available transmission capacity. There are three different types of ETSRs defined in the Master File: Base ETSR, Static ETSR (15 min), and Dynamic ETSR (5 min). This is to distinguish between the base and dynamic Energy Transfers so that WEIM Entity SCs can submit base Energy Transfers that will not be optimized by the market, while submitting ETSR limits that would apply to dynamic Energy Transfers only. The Static ETSRs are used only when dynamic transmission capability constraints apply in the ETSR contract path, necessitating separate limits for Static ETSRs in FMM and Dynamic ETSRs in RTD.

Base ETSRs are not optimized, thus they do not factor in the procurement of the Flexible Ramping Product (FRP), except for their contribution to the base net WEIM Transfer. For example, for a non-optimized dynamic ETSR, the difference between its limit and its optimal value contributes to NIC/NEC for calculating FRP requirements; however, for a base ETSR, there is no such contribution because it is fixed.

11.1.5.4 Non-Generator Resource (NGR) Modeling Functionality

Refer to section 2.1.13 of the Market Operations BPM for details on the NGR modeling.

11.1.5.5 Co-Located Resources

Refer to section 2.1.19 of the Market Operations BPM for details on the Co-Located Resources.

11.1.5.6 EIM Transfer Schedule Cost

To maximize the efficiency and robustness of Energy Transfer schedules without circulating Energy Transfer schedules, a small nominal cost, the WEIM Transfer schedule cost, is included in the objective function of the market optimization problem for each optimizable (static and dynamic) ETSR. The WEIM Transfer schedule cost will ensure the most optimal path or paths for the WEIM Transfer are used by placing a higher priority on the most optimal path over less optimal paths. This approach will also minimize the number of e-tags which must be updated and reduces the complexity of settling the financial value of the WEIM transfer used for neutrality calculations.

The CAISO determines the appropriate level of the transfer cost balancing the benefits of the transfer costs with the impact to locational marginal costs pursuant to Section 29.17(g)(2). The WEIM Transfer Cost shall be less than \$0.01. The WEIM Transfer Cost can be different for each Intertie. In case absent any priority defined by the entity and approved by the CAISO, the CAISO will set \$0.0001 for the WEIM Transfer schedule cost associated with each WEIM Internal Intertie.

The CAISO may adjust the WEIM Transfer schedule costs to maintain the path priorities established by the criteria in Section 29.17(g)(2) when an WEIM Entity Balancing Authority Area is added or subtracted from the WEIM Area, as seasonal transmission system ratings change or the transmission system topology changes.

11.1.6 Entitlement Constraints for Rate of Changes

The entitlement constraints limit power flow contributions from the dispatch of resources in an WEIM Entity Balancing Authority Area (BAA), or the CAISO BAA, on interties or transmission corridors in external BAAs. Power flow contributions from intertie transactions participating in the WEIM or DAM can also be constrained by entitlement constraints. The limit in an entitlement constraint represents either contractual rights or scheduling rights that have been agreed upon between BAAs. The difference between entitlement constraints and regular transmission constraints is that the former constraint only a subset of the resources that participate in a market, as opposed to the latter where all such resources are constrained. Furthermore, entitlement constraints in the WEIM limit the rate of change only of the relevant power flow contributions across 5-minute dispatch intervals. All resources which are in either start-up, shutdown or transition status are excluded from the rate of change constraints. In addition, resources that are online without bids are excluded from the rate of change constraints.

Specific procedures may be developed to document specific conditions, communication of WEIM Entity, External BAA, or third party transmission provider as designed by WEIM Entity.

11.1.7 Constraint Relaxation

Constraint Relaxation refers to the process of allowing the MW quantity to exceed the constraint limit using 'penalty' prices, as opposed to hard constraints, in order to improve the quality of the optimization solution. Constraints will be relaxed if the shadow price of the constraint otherwise exceeds the penalty value. Based on CAISO Tariff Section 29.34 (o), please refer to Section 6.6.5 of the [BPM for Market Operations](#) for details on the penalty prices and pricing parameters used in the markets.

11.1.8 Transition Period Pricing

For a period of six months following the Implementation Date of a new WEIM Entity, the provisions of CAISO Tariff Sections 27.4.3.2 and the second sentence of CAISO Tariff Section 27.4.3.4 shall not apply to constraints that are within Balancing Authority Areas of the new WEIM Entity or affect WEIM Transfers between the Balancing Authority Areas of the new WEIM Entity and any other WEIM Entity that is subject to CAISO Tariff subsection 29.27(b). For the those intervals that experience infeasibilities described in those provisions, the CAISO shall instead determine prices consistent with the provisions of CAISO Tariff Sections 27, 34, and Appendix C, that would apply in the absence of CAISO Tariff Section 27.4.3.2 and the second sentence of CAISO Tariff Section 27.4.3.4. In addition, when the power balance or transmission constraints are relaxed, the Flexible Ramping Constraint parameter in Section 27.10 of the CAISO tariff will be at an amount between and including \$0 and \$0.01. This enables the price to be set to the last economic bid cleared in the market as described above instead of the pricing parameter for the flexible ramping constraint as specified in Section 6.6.5 of the [BPM for Market Operations](#) and section 27.10 of the CAISO tariff that would otherwise apply.

The last economic signal is determined by the price discovery mechanism of the pricing run where the power balancing requirement is set to the relaxed scheduling level reduced by a small amount.

Since November 14, 2014, pursuant to FERC's order granting the ISO waiver of section 27.4.3.2 and 27.4.3.4 for PacifiCorp East and PacifiCorp West balancing authority areas, instead of setting prices based on the pricing parameter specified in those sections, the ISO has calculated prices using the last economic signal prior to constraint relaxation. With the activation of the available balancing capacity functionality, the price discovery mechanism will no longer be used, except for WEIM entities that are in their transition period. Consequently, when a constraint relaxation occurs, such as in the cases of power balance constraint infeasibility, the clearing prices will be based on the pricing parameters.

11.1.9 Coordination with Reliability Coordinator and WECC Unscheduled Flow Mitigation

EIM's congestion management process will use its effective resources to remove congestion before curtailing any existing schedules, by being responsive to price differences resulting from congestion, rather than only to reliability-based curtailments. Flows resulting from the WEIM dispatch will provide counter-flows for congestion, and thereby support scheduled flows that may otherwise need to be curtailed through WECC's Unscheduled Flow Mitigation Plan (UFMP). If the UFMP has not been initiated, the CAISO will manage congestion directly in the WEIM dispatch by automatically enforcing constraints, using the transmission capacity available to EIM. WEIM will dispatch only bids submitted by WEIM Participating Resource Scheduling Coordinators, and will not adjust self-schedules outside the

submitted bid range. However, the EIM's purpose is not to directly resolve unscheduled flow. Coordinated reliability curtailments such as through UFMP or Reliability Coordinator intervention in mandating schedule curtailments remain the role of the WEIM Entity.

The WEIM will not automatically initiate the UFMP, but will alert WEIM Entities to conditions that WEIM has no effective bids to resolve, which may require the WEIM Entity to initiate non-market procedures. An WEIM Entity may choose to issue reliability curtailments using its own procedures, after the WEIM CAISO notifies the WEIM Entity that the CAISO observes congestion or other conditions that WEIM cannot resolve, or separately before such conditions occur.

It is the responsibility of the WEIM entity to communicate unscheduled flow mitigation orders on any of its BAA resources via updating the energy profile of the corresponding tag to reflect the unscheduled flow mitigation procedure cuts, as well as entering manual dispatches in the designated BAA operator's CAISO provided user interface or displays, or if these displays are not functioning, through other back up mechanisms such as phone or oral communications with the CAISO. Financial implications resulting from any uninstructed energy deviations due to manual dispatches and or lack of communication of the manual dispatches to the CAISO is the responsibility of the resource's registered scheduling coordinator.

Dynamic e-tags for WEIM flows will be updated prior to real-time to show the expected WEIM Transfers, to enable management by the UFMP, and be updated for actual WEIM dispatch after the end of the operating hour. Any intra-hour reduction in WEIM available transmission must be communicated to the CAISO by the WEIM Entity.

When CAISO initiates curtailments through the UFMP, WEIM Market Participant schedules in the Real-Time Market will be affected based on the CAISO unscheduled flow mitigation procedure located at: <http://www.aiso.com/Documents/3510.pdf>

11.1.10 Entitlement Constraints for WEIM Incremental Flow¹

The entitlement constraints for WEIM Incremental Flow limit incremental power flow contributions from the dispatch of WEIM participating resources in WEIM Entity Balancing Authority Areas (BAAs), and all resources in the CAISO BAA. The incremental power flow contributions are measured from the base schedules for WEIM participating resources and from the day-ahead schedules for CAISO resources. The WEIM Incremental Flow limit will either result in WEIM dispatches not exacerbating or relieving a System

¹ EIM Incremental Flow is defined by the Coordinated Transmission Agreement as: The aggregate power flow contribution from the dispatch of WEIM Participating Resources. See FERC Letter Order, Docket No. ER17-1493-000, June 20, 2017.

Operating Limit (SOL) in the non-EIM BAA. The difference between WEIM Incremental Flow constraints and regular transmission constraints is that the former constrains only the subset of resources that participate in the EIM, as opposed to the latter where all resources are constrained.

11.1.11 Entitlement Constraints for WEIM Area Total Flow²

The entitlement constraints for WEIM Area Total Flow limit the total power flow contributions from the dispatch of WEIM participating and non-participating resources in WEIM Entity Balancing Authority Areas (BAAs), and all resources in the CAISO BAA. The WEIM Area Total Flow limit will result in WEIM dispatches not violating the portion of the System Operating Limit (SOL) in the non-EIM BAA attributed to WEIM flows. There is no difference between the WEIM Area Total Flow constraints and other regular transmission constraints except that the former apply to transmission corridors in non-EIM BAAs.

11.2 Day-Ahead Operations

This section is intended to describe the actions taken by WEIM participants in the Day-Ahead time frame. It is strongly recommended that readers first review Section 6 of the [BPM for Market Operations](#), which describes the general operation and timeline of the Day-Ahead Market. By 10:00 a.m. on the day preceding the Operating Day, the WEIM Entity Scheduling Coordinators on behalf of non-participating resources and WEIM Participating Resource Scheduling Coordinators on behalf of WEIM Participating Resources shall submit WEIM Resource Plan, which must cover a seven-day horizon with hourly granularity beginning with the Operating Day.

- The WEIM Resource Plan shall comprise
 - EIM Base Schedules of WEIM Entities and WEIM Participating Resources, which include hourly-level schedules for resources, and hourly-level scheduled Interchanges;
 - Energy Bids (applicable to WEIM Participating Resources only);
 - EIM Upward Available Balancing Capacity
 - EIM Downward Available Balancing Capacity
 - EIM Reserves to Meet NERC/WECC Contingency Reserves Requirements

² EIM Area Total Flow is defined by the Coordinated Transmission Agreement as: The aggregate power flow contribution of flows resulting from WEIM Base Schedules, Day-Head Schedules, and WEIM Area Incremental Flows. See FERC Letter Order, Docket No. ER17-1493-000, June 20, 2017.

- **EIM Scheduling Coordinators submit Base Schedules for External BAA Supply and Interchange as part of the WEIM Resource Plan**
 - Base Schedule Coordinators (BSCs) submit Base Schedules and ancillary services schedules for WEIM Participating and Non-Participating Resources and Interchanges through the Base Schedule Application Portal (BSAP).
 - The Base schedule submission may cover a seven-day horizon with hourly granularity beginning with the Operating Day.
 - Base Schedules must be submitted for all online generating resources in an WEIM Entity BAA and all interchanges with tagged schedules with other BAAs, except CAISO. A Base schedule of zero (0 MW) may be submitted for an offline WEIM Participating Resource with a three-part bid to be committed optimally.
 - Base schedules for online generating resources must include disaggregation of forward net export schedules to other BAAs, including RUC import schedules to CAISO.
 - Base import/export schedules to an WEIM Entity BAA from BAAs other than CAISO must be submitted at the relevant intertie scheduling points.
 - If resource(s) are modeled as a Multi-Stage Generator (MSG), the Base Schedule(s) shall include the base MSG configuration.

- **CAISO performs Feasibility Test for Each WEIM Entity BAA**
 - The WEIM Base Schedules included in the WEIM Resource Plan should be balanced with the Demand Forecast for each WEIM Entity Balancing Authority Area.
 - CAISO will perform Day-Ahead and Base Schedule power flow feasibility test by 1:00 pm on the day before the Operating Day; if the Day-Ahead Market or the Base Schedules submitted for the Real-Time Market result in transmission violation in the WEIM Entity Balancing Authority Area, then the test fails.
 - The test result will be broadcasted to the WEIM Entity SC.
 - The Day-Ahead Market test result is for information only and will not have a settlement impact. The WEIM Entity SC may adjust the components of WEIM Resource Plan up to 75 minutes before the Operating Hour, when the submission of Real-Time WEIM Base Schedules is due (see 11.3)

- **Other Considerations**
 - Bids may not be submitted for WEIM Participating Resources in the Day-Ahead Market. Similarly, Bids may not be submitted at interties between WEIM BAAs, or between WEIM BAAs and Non-EIM BAAs in the Day-Ahead Market. Day-Ahead Bids may be

submitted at CAISO interties for import/export to/from the CAISO BAA at the relevant Scheduling Points.

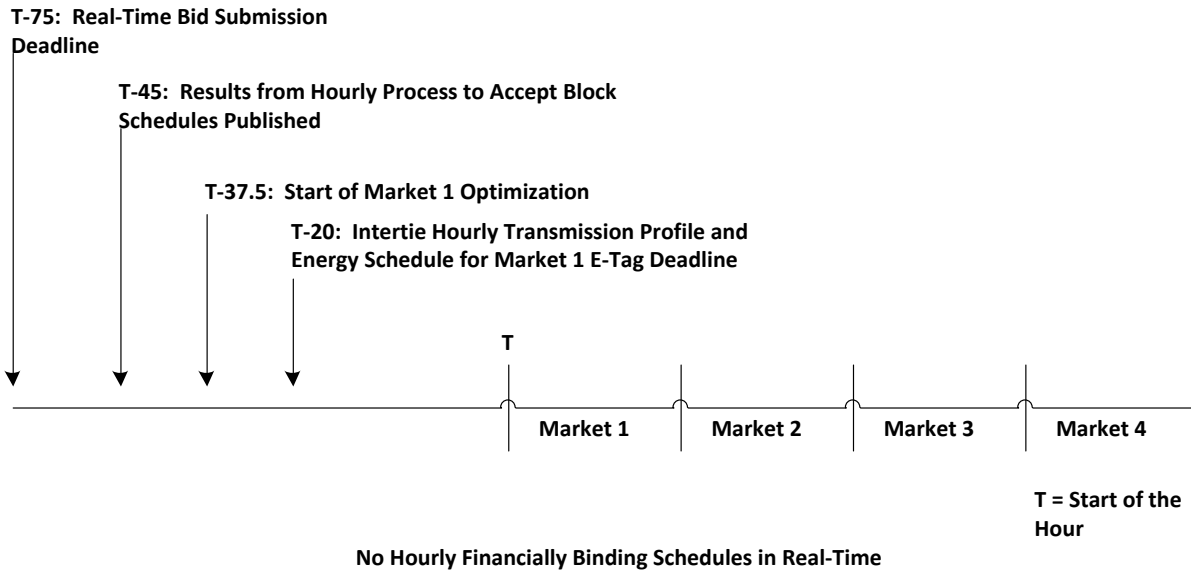
- The Day-Ahead Market shall run with the Day-Ahead Base Schedule as a fixed injection without enforcing transmission constraints in the external BAAs and the WEIM Entity BAAs.
- The CAISO will report any transmission overloads in the WEIM Entity BAAs.
- The Day-Ahead Market will maintain historical generation, demand, and interchange schedules for all external BAAs in the WEIM footprint. Also, it will harvest data from the State Estimator and WECC RC, and receive Area to Area Net Scheduled Interchange (AANSI) from WECC WIT and BAA load forecast.
- Since the actual non-EIM Entity BAA Day-Ahead supply schedules are unknown to CAISO but are required for a solution, CAISO will estimate the schedules based on the demand forecast and net scheduled interchange where supply, demand, and any known or historical net interchange are balanced for each BAA individually. The same process will also be performed for WEIM Entity BAAs.
- Import/export bids to/from CAISO will be excluded from Base Schedule calculation.
- SIBR validates the energy bids and notify the applicable SCs.

11.3 Real-Time Operations

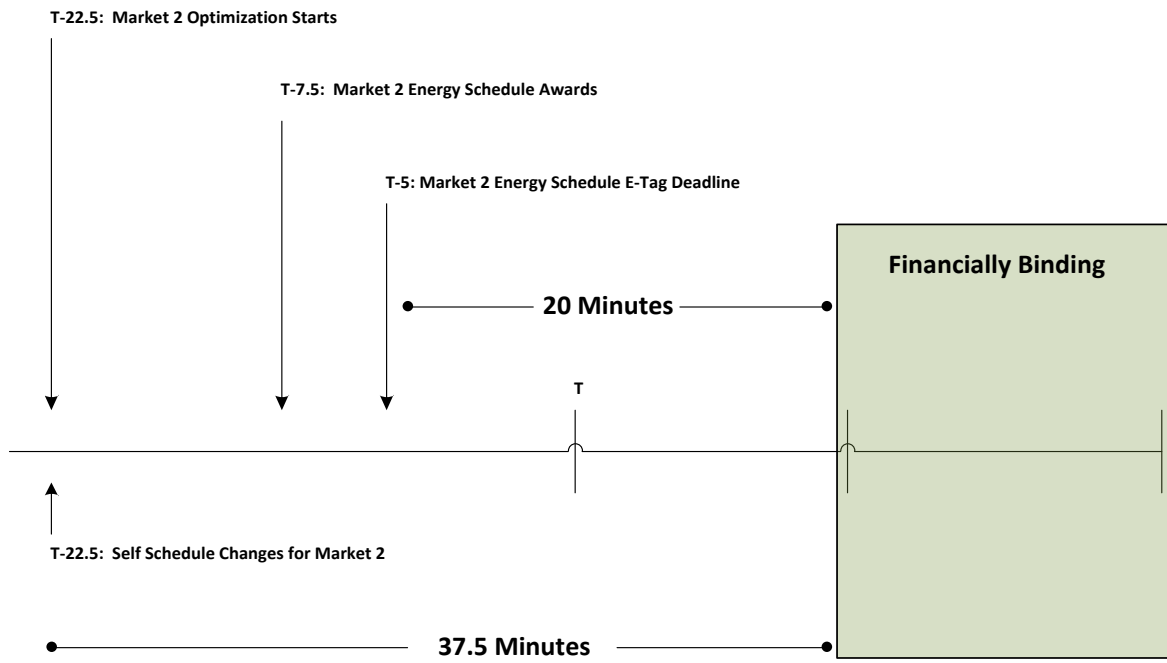
This section is intended to describe the actions taken by WEIM participants in the Real-Time Market.

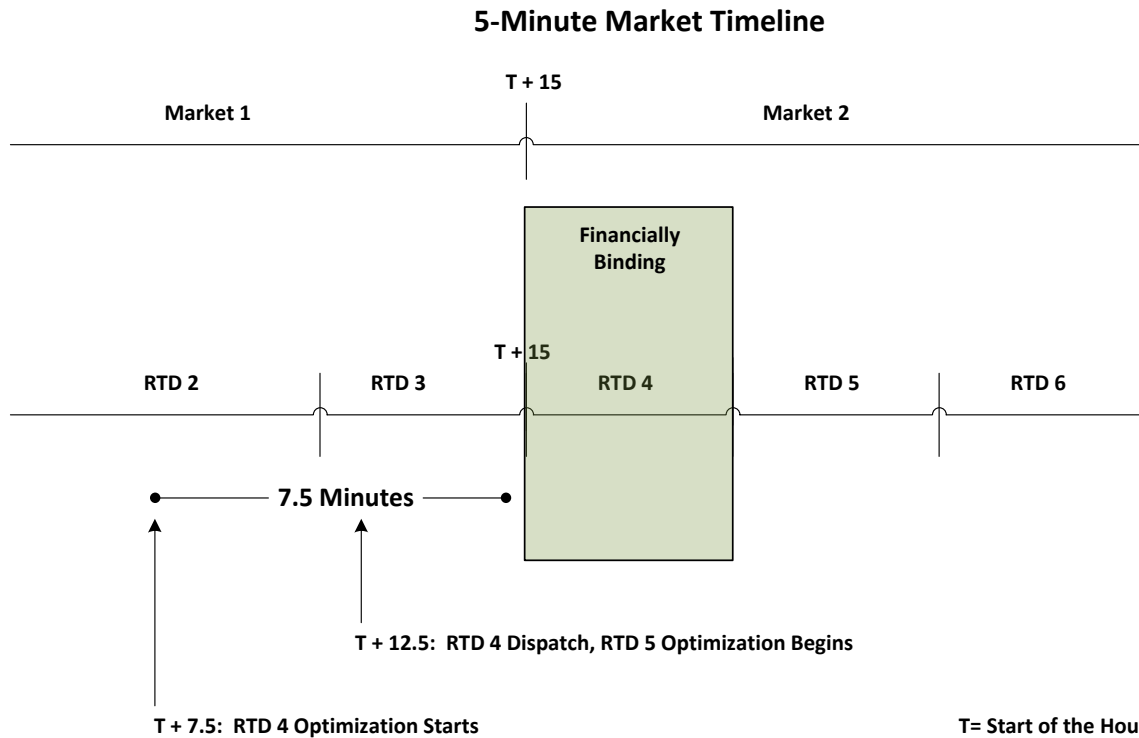
Readers should review Sections 6 and 7 of the [BPM for Market Operations](#), which describes the general operation and timeline of the Day-Ahead Market and Real-Time Market, respectively.

Hourly Process For Real-Time Market



15-Minute Market Timeline





11.3.1 Establishment of Hourly Base Schedules and Hourly Resource Plan

Entity Scheduling Coordinators, WEIM Participating Resource Scheduling Coordinators, and non-participating resources in the WEIM Entity Balancing Authority Area that wish to submit real-time hourly WEIM Base Schedules, or, with regard to non-participating resources, wish to submit WEIM Base Schedule information pursuant to Section 29.34(f)(4), must submit such schedules at least 75 minutes before the start of the Operating Hour.

The CAISO Markets systems will validate the WEIM Resource Plan including any adjustments to the WEIM Base Schedules within 15 minutes of the submission of WEIM Base Schedules or adjustments to WEIM Base Schedules and notify the WEIM Entity Scheduling Coordinator about the result of the Resource Sufficiency Evaluation.

The WEIM Entity Scheduling Coordinator has visibility to all elements of the WEIM Resource Plan and the results of the various checks in the resource sufficiency evaluation described below, and is able to make changes to hourly Base Schedules to resolve unbalanced supply and demand, transmission flow overloads, insufficient WEIM Participating Resource bid range, and ramping capability up to 55 minutes before the start of the Operating Hour (interim revision) and up to 40 minutes before the start of the

Operating Hour (final revision). This provides the WEIM Entity Scheduling Coordinator with the opportunity to resolve any identified issues prior to the start of the EIM. At 40 minutes prior to the operating hour, the hourly WEIM Resource Plan is approved by the WEIM Entity Scheduling Coordinator and it becomes final.

These final hourly Base Schedules are used to balance against the load forecast and serve as the baseline for settling imbalance energy in the EIM.

In addition to hourly Base Schedules, WEIM Participating Resources have the opportunity to submit bid offers and estimated Generator Distribution Factors (GDFs) for aggregate resources in SIBR by T-75. These factors are used to distribute aggregate energy schedules to the individual physical units in the aggregation.

For aggregate WEIM non-participating resources, Base Schedule Coordinators can submit base GDFs in BSAP by T-75, T-55, and T-40. These factors are used to distribute aggregate energy schedules to the individual physical units in the aggregation.

If GDFs are not provided with the base schedule or bid for an aggregate resource, the registered default GDFs for that resource in the Master File, normalized for physical outages, will be used instead.

11.3.2 Resource Sufficiency Evaluation

The WEIM does not include forward resource adequacy requirements or obligations for resources to submit bids, but instead includes several elements to ensure each WEIM balancing authority in the WEIM area has sufficient resources to serve its load while still realizing the benefits of increased resource diversity. Load conformance, transmission limit conformance and manual dispatch will not be considered in the Resource Sufficiency Evaluation (RSE) tests.

The WEIM design elements that ensure resource sufficiency include:

- **Load Base Schedule Adjustments (WEIM Entity BAAs):** If Base Schedules from generation and intertie resources in an WEIM Resource Plan do not balance the load forecast, CAISO will adjust the load Base Schedule to equal the scheduled generation and interchange, reduced by transmission losses. The resulting difference will be settled through the WEIM along with any applicable under-scheduling or over-scheduling penalties as applicable. The load Base Schedule is only used as a reference for calculating load imbalance energy for settlement. The market solution will use the applicable demand forecast for each interval in the market horizon.

The forecasted demand for the trading hour may change based on the system conditions, so this information is updated up to 60 minutes before the trading hour. At 40 minutes before the trading hour, the forecast demand updated at 60 minutes before the trading hour is used to evaluate under-scheduling and over-scheduling penalties.

- **Accounting for Non-Participating DR Scheduling in the Resource Sufficiency Evaluation (RSE) for WEIM Entity BAAs:** Non-participating DR (e.g., Demand response in an WEIM Entity BAA that is not able to be represented by PDR or RDRR models) may be accounted for as reductions to the Load Forecast utilized in the Balancing, Capacity and Flexible Ramping RSE tests. This functionality is based upon a MasterFile inclusion flag, which requires each participating WEIM Entity's attestation that only expected increases or reductions in demand provided by its demand response program(s) will be submitted. Hourly values may be provided for each WEIM Entity load forecast zone. WEIM Entity operators will submit these demand response adjustments via the BAAOP UI during events when such DR is called upon for RSE consideration only; *i.e.*, these values will not be passed to RTD, RTPD or STUC. See [Appendix C for Attestation for further details on this process.](#)

Demand Response adjustments shall be submitted to the Short Term Forecast Team for inclusion in RTD, RTPD or STUC when such DR is not entered via the BAAOP UI under the following conditions. 1) Demand Response is less than 5% of the Demand Forecast expected for the submitted time period, 2) Demand response submissions were not included in the ALFS Load Forecast software, described in Section 11.6. The RSE system will use the latest updated DR load forecast adjustment available for the T-75', T-55' and T-40' executions. For further details on this process, refer to the [Demand Response BPM, Section 18.](#)

- **WEIM Assistance Energy Transfer**

Assistance energy transfers allow the WEIM to provide reliability benefits to balancing authority areas (BAAs) deficient in capacity or flexibility. More specifically, BAAs that have voluntarily opted into receiving assistance energy transfers will not have their WEIM transfers limited when they fail the resource sufficiency evaluation (RSE) upward capacity test or the RSE upward flexibility test, and will instead have access to excess supply offered by other WEIM entities. For this reason, assistance energy transfers leverage a key benefit of the WEIM: the CAISO real-time market's ability to optimally dispatch all of the supply available and provide access to supply that may not otherwise be available in the bilateral market outside of the WEIM.

BAAs that have voluntarily opted into receiving assistance energy transfers will also be subject to an ex-post surcharge (the "WEIM Assistance Energy Transfer Surcharge") when they fail the RSE. This ex-post surcharge will be in addition to the applicable LMP cleared in the market for assistance energy transfers. BAAs may voluntarily opt in or out of receiving assistance energy transfers by submitting assistance energy designation requests to the Master File, as described below. The assistance energy transfer program will sunset by December 31, 2025.

Assistance Energy Designation Requests

A Balancing Authority Area (BAA) in the WEIM Area may obtain assistance energy transfers into its BAA prior to December 31, 2025 if it has submitted to the Master File an assistance energy designation request. Such designation requests must be made for a minimum of a full trading day and cannot be broken apart into hourly or other intervals. Designation requests must be labeled as either “opt-in” or “opt-out” and must include both an effective start date and also an end date (the last day). For example, an opt-in designation request for one day would have the same start date and end date.

For each BAA participating in the WEIM, the default value in the Master File for each trading day will be “opt-out” unless an “opt-in” designation request is submitted and processed. Designation requests must be submitted by 11am Pacific Time at least 5 business days in advance of the effective start date. To highlight this point, Table 1 below provides several examples and also notes how the 5 business day requirement translates into calendar days.

Table 1

Examples	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	Calendar Days
Regular week ³	●							✓									7
Regular week		●							✓								7
Regular week						●									✓		9
3-day holiday weekend		●								✓							8
3-day holiday weekend						●										✓	10
Mid-week holiday	●								✓								8
Thanksgiving weekend			●									✓					9
Thanksgiving weekend				●											✓		11

Legend

- Designation request submitted by 11am PST
- ✓ Earliest effective start date

³ As shown by the example in this row, submitting a designation request by 11am PST on Monday of a regular week is not sufficiently far in advance for an effective start date for the upcoming weekend. In order to achieve an effective start date on Saturday or Sunday, the designation request must be submitted by 11am PST on Friday of the previous week

A BAA, including the CAISO BAA, that submits a multi-day opt-in request may subsequently submit an opt-out request that supersedes the earlier opt-in request, as long as the opt-out request is submitted sufficiently far in advance. For example, on 8/15/23 a BAA submits an opt-in designation request with an effective start date of 9/1/2023 and an end date of 9/30/2023. Subsequently, in mid-September this BAA decides that it wants to opt out of the final 6 days in September. Accordingly, before 11am PST on 9/18/2023, it submits an opt-out designation request with a start date of 9/25/2023 and an end date of 9/30/2023.

Specific Instructions for WEIM BAAs:

Assistance energy designation requests must be submitted to the Master File via the CAISO's customer inquiry, dispute and information system (CIDI) by 11:00 AM Pacific Time at least 5 business days in advance of the effective start date, as described above. The WEIM entity submitting the CIDI ticket must enable the checkbox titled "assistance energy designation request" to ensure the timely processing of the request. The CIDI ticket must include the following information in order to be considered an assistance energy designation request:

- Either "opt-in" or "opt-out"
- Start date
- End date

Specific Instructions for CAISO BAA

Assistance energy designation requests must be submitted to the Master File by 11:00 AM Pacific Time at least 5 business days in advance of the effective start date. The designation request must include the following information in order to be considered an assistance energy designation request:

- Either "opt-in" or "opt-out"
- Start date
- End date

When the CAISO BAA submits an assistance energy designation request, it must simultaneously issue a market notification service to make the action transparent and public.

Assistance Energy Transfer opt-in / opt-out criteria for CAISO BAA

Each calendar day, the CAISO's market validation team, acting on behalf of the CAISO BAA, will look multiple calendar days ahead and will have the authority, subject to input from CAISO operations based on system conditions and operator experience, to submit an assistance energy designation request based on any of the following three criteria:

- A. Where today is day 1: if any hour of day 8 has (RA capacity + RA credits) forecast < (demand forecast + contingency reserve requirement + regulation reserve + 5% of demand forecast), then the CAISO BAA has the authority to submit an "opt-in" assistance energy designation request for day 8.

- B. Where today is day 1: if any hour of day 8 has (net RA capacity + RA credits) forecast < (net demand forecast + contingency reserve requirement + regulation reserve + 5% of net demand forecast), then the CAISO BAA has the authority to submit an “opt-in” assistance energy designation request for day 8.
- C. Where today is day 1: if the CAISO BAA has the authority (through criteria “A” or “B” above) to submit an “opt-in” assistance energy designation request for day 8 and day 8 is a Friday or a day that directly precedes one or more non-business days, then the CAISO BAA also has the authority to submit an “opt-in” assistance energy designation request for those non-business days that directly follow day 8.

Note

The forecasted terms in criteria “A” and “B” above are based on the ISO’s RA Capacity Trend data that is published to Today’s Outlook on the CAISO’s website.⁴ However, the terms “5% of demand forecast” and “5% of net demand forecast” are not part of the ISO’s RA Capacity Trend and have been incorporated in criteria “A” and “B” as an incremental margin adder to reflect the inherent uncertainty associated with a day 8 demand forecast.

- **Under-Scheduling and Over-Scheduling Penalties and Resource Balancing Provisions (WEIM Entity BAAs):** For each trade hour, the WEIM Balancing Test determines whether the BAA’s sum of base schedules (generation and net scheduled interchange, including base transfers) is within a 1% margin (over or under) of the hourly demand forecast. The hourly imbalance values are calculated based on the absolute difference between the sum of base schedules and the hourly demand forecast in the over or under direction. If an WEIM balancing authority elects to use the CAISO Demand Forecast and does not schedule resources within one percent of CAISO Demand Forecast or the WEIM Entity elects their own demand forecast, then the WEIM balancing authority will be subject to over-scheduling or under-scheduling assessment. If the over-scheduling or under-scheduling assessment determines the WEIM balancing authority metered load is five percent more or less than its load Base Schedule for that hour, over-scheduling or under-scheduling penalties will be applied. If an WEIM balancing authority does not use CAISO’s forecast, then it will be subject to over-scheduling or under-scheduling penalties for actual load imbalances. The penalties collected will be allocated to the other balancing authorities who have not incurred a scheduling penalty for the Operating Day, excluding the CAISO BAA.

Examples:

⁴ <http://www.caiso.com/TodaysOutlook/Pages/default.aspx#section-7day-ra-capacity-trend>

No.	Scenario Description	Expected Results
1	<p>EIM Balancing Test result fails (over):</p> <ul style="list-style-type: none"> - BAA sum of base schedules = 3500 MW - BAA Hourly Demand Forecast = 3580 MW 	<p>Since absolute (3500 MW – 3580 MW) > 0.01 * 3580 MW,</p> <p>CMRI results shall provide records as follows:</p> <ul style="list-style-type: none"> • Test Result: Fail • Imbalance Direction: UNDER • Imbalance Amount (MW): 80.0 • Imbalance Percentage (%): 2.23 • Requirement Amount (MW): 3,580.0
2	<p>EIM Balancing Test result fails (over):</p> <ul style="list-style-type: none"> - BAA sum of base schedules = 3500 MW - BAA Hourly Demand Forecast = 3400 MW 	<p>Since absolute (3500 MW – 3400 MW) > 0.01 * 3400 MW,</p> <p>CMRI results shall provide records as follows:</p> <ul style="list-style-type: none"> • Test Result: Fail • Imbalance Direction: OVER • Imbalance Amount (MW): 100.0 • Imbalance Percentage (%): 2.94 • Requirement Amount (MW): 3,400.0
3	<p>EIM Balancing Test result passes (over or under):</p> <ul style="list-style-type: none"> - BAA sum of base schedules = 3500 MW - BAA Hourly Demand Forecast = 3480 MW 	<p>Since absolute (3500 MW – 3480 MW) < 0.01 * 3480 MW,</p> <p>CMRI results shall provide records as follows:</p> <ul style="list-style-type: none"> • Test Result: Pass • Imbalance Direction: OVER • Imbalance Amount (MW): 20.0 • Imbalance Percentage (%): 0.57 • Requirement Amount (MW): 3,480.0

- CAISO shall set the histogram values described in Section 7.1.3 of the Market Operations BPM to ensure the flexible ramp requirements stay within a reasonable level for a transitional period following implementation. This histogram value will be used until the ISO is able to collect sufficient production-quality data to accurately calculate the flexible requirements based on the historical information gathered from Production. These initial thresholds may be adjusted according to each balancing authority area’s conditions including factors and data observed during market simulation and parallel operations. These thresholds will allow the Flexible Ramping Requirements to stay within a reasonable band

during the transitional period until an accurate histogram can be calculated from Production data for the balancing authority area.

- **Capacity Test:** At T-75, T-55, and T-40 minutes prior to the start of the next trading hour, CAISO will independently evaluate all 15-minute intervals within the next trading hour for sufficient bid range capacity for both over and under capacity requirements. There must be a sufficient WEIM Participating Resource capacity bid range in the WEIM through incremental or decremental energy bids above or below the Base Schedules or the CAISO equivalent to meet the imbalance.. WEIM The capacity test is applicable to the CAISO BAA.
- **Accounting for Offline Short-Start Resources.** Specific to the RSE Capacity Test, an offline Short-Start Unit (i.e., a resource where the sum of Start-up Time and Minimum Up Times ≤ 255 minutes) will be considered as available (online) supply in the forthcoming RSE evaluation hour when the following conditions are met:
 - The resource or resource configuration has a real-time bid for the testing hour;
 - The resource has remaining start-ups (i.e., Max Daily Starts constraint not been reached);
 - The resource is a participating generation type including PDR and Pump Storage.

The intent of this consideration is to recognize that although the resource is currently offline or transitioned to a lower state, and even if the resource could not physically be started or transitioned in time for the next RSE evaluation hour, prior RTPD market run(s) could have started the resource with sufficient time. The resultant amount of capacity determined is equal to the capacity if the resource had been started.

- **State-of-Charge (SOC) Consideration:** Storage resources (e.g., batteries) State-of-Charge (SOC) is calculated from the most recent RTPD run at T-7.5' in the Balancing Test, Capacity Test, and upward and downward Flexible Ramping Sufficiency Tests. In the Capacity Test and Flexible Ramping Sufficiency Tests, 1 MWh of SOC will provide 1 MW of upward capacity for all 4 intervals, and the same principle applies in the downward direction. This also includes accounting for maintaining 30-minutes for SOC for Ancillary Service schedules in the market optimization, as shown in the following example:

[Note: This includes accounting for maintaining 30-minutes for SOC for Ancillary Service schedules in the market optimization, but only for storage resources in the CAISO BAA.](#)

[SOC Example](#)

- [1 MW En base/self-schedule](#)
- [10 MWh initial SOC](#)

- Bid charge max charge limit is 70 MWh, bid in low charge limit is 2 MWh
- En bid in max is 30 MW
- En Bid in min is -80
- $\text{Max}(\text{RU}+\text{SR}+\text{NR}): 4 \text{ MW}$
- $\text{Max}(\text{RD}): 10 \text{ MW}$
- Charging efficiency is 1
- 30 minute for reserve SOC for AS
- Adjusted SOC in this case = $\text{max}(0, 10-2-30/60*4) = 6 \text{ MWh}$ for all 4 intervals, 1 MW will be reported as Energy base schedule for this resource. Available UPCAPACITY = $\text{max}(0, \text{min}(6, 30-4)-1) = 5 \text{ MW}$ in each interval;
- Adjusted SOC room = $\text{max}(0, (70-30/60*10*1 - 10) = 55 \text{ MWh}$ for all 4 intervals, 1 MW is reported as EN base schedule. Available DNCAPACITY = $\text{max}(0, \text{min}(1+55/1, 1-(-80+10))) = 56 \text{ MW}$ in each interval.

Regardless of the capacity test pass/fail results, CAISO will publish all the interval results of the trade hour for each insufficiency direction.

Examples:

No.	Scenario Description	Expected Results																																																																																																														
1	<p>BAA's WEIM Capacity Test result fails for a single 15-min interval, where the following conditions occur for trade hour:</p> <table border="1" data-bbox="277 380 915 993"> <thead> <tr> <th>Value</th> <th>:15</th> <th>:30</th> <th>:45</th> <th>:60</th> </tr> </thead> <tbody> <tr> <td>Sum of Base Schedules</td> <td>1100</td> <td>1100</td> <td>1100</td> <td>1100</td> </tr> <tr> <td>15-minute Demand Forecast</td> <td>975</td> <td>1050</td> <td>1125</td> <td>1025</td> </tr> <tr> <td colspan="5">Down Direction (over insufficiency direction in CMRI)</td> </tr> <tr> <td>Total Down Requirement</td> <td>125</td> <td>50</td> <td>-25</td> <td>75</td> </tr> <tr> <td>Bid Range Capacity (Down)</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>Down Direction Insufficiency</td> <td>25</td> <td>-50</td> <td>-125</td> <td>-25</td> </tr> <tr> <td>Down Direction Result</td> <td>Fail</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> <tr> <td colspan="5">Up Direction (under insufficiency direction in CMRI)</td> </tr> <tr> <td>Total Up Requirement</td> <td>-125</td> <td>-50</td> <td>25</td> <td>-75</td> </tr> <tr> <td>Bid Range Capacity (Up)</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>Up Direction Insufficiency</td> <td>-225</td> <td>-150</td> <td>-75</td> <td>-175</td> </tr> <tr> <td>Up Direction Result</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> </tbody> </table>	Value	:15	:30	:45	:60	Sum of Base Schedules	1100	1100	1100	1100	15-minute Demand Forecast	975	1050	1125	1025	Down Direction (over insufficiency direction in CMRI)					Total Down Requirement	125	50	-25	75	Bid Range Capacity (Down)	100	100	100	100	Down Direction Insufficiency	25	-50	-125	-25	Down Direction Result	Fail	Pass	Pass	Pass	Up Direction (under insufficiency direction in CMRI)					Total Up Requirement	-125	-50	25	-75	Bid Range Capacity (Up)	100	100	100	100	Up Direction Insufficiency	-225	-150	-75	-175	Up Direction Result	Pass	Pass	Pass	Pass	<p>CMRI reports will now provide Bid Range Capacity test results for both over and under directions each trade hour. In each direction, the most-insufficient 15-minute interval result (presented in blue text) will displayed and broadcasted (e.g. :15 for the over direction, :45 for the under direction). Only the intervals' trade hour will be identified in the report.</p> <table border="1" data-bbox="972 489 1534 1020"> <thead> <tr> <th>Value Description</th> <th>:15</th> <th>:30</th> <th>:45</th> <th>:60</th> </tr> </thead> <tbody> <tr> <td>Test Status (Over)</td> <td>Fail</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> <tr> <td>Insufficiency Direction (Over)</td> <td>Over</td> <td>Over</td> <td>Over</td> <td>Over</td> </tr> <tr> <td>Insufficiency Percentage (%)</td> <td>25.0</td> <td>-50.0</td> <td>-125.0</td> <td>-25.0</td> </tr> <tr> <td>Insufficiency Amount (MW)</td> <td>25</td> <td>-50</td> <td>-125</td> <td>-25</td> </tr> <tr> <td>Test Status (Under)</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> <tr> <td>Insufficiency Direction (Under)</td> <td>Under</td> <td>Under</td> <td>Under</td> <td>Under</td> </tr> <tr> <td>Insufficiency Percentage (%)</td> <td>-225</td> <td>-150.0</td> <td>-75.0</td> <td>-175.0</td> </tr> <tr> <td>Insufficiency Amount (MW)</td> <td>-225</td> <td>-150</td> <td>-75</td> <td>-175</td> </tr> </tbody> </table> <p>Since the BAA failed the "over" capacity test in the first interval, the BAA's import WEIM transfer limit is reduced in that interval. WEIM</p>	Value Description	:15	:30	:45	:60	Test Status (Over)	Fail	Pass	Pass	Pass	Insufficiency Direction (Over)	Over	Over	Over	Over	Insufficiency Percentage (%)	25.0	-50.0	-125.0	-25.0	Insufficiency Amount (MW)	25	-50	-125	-25	Test Status (Under)	Pass	Pass	Pass	Pass	Insufficiency Direction (Under)	Under	Under	Under	Under	Insufficiency Percentage (%)	-225	-150.0	-75.0	-175.0	Insufficiency Amount (MW)	-225	-150	-75	-175
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3	<p>BAA’s WEIM Capacity Test result passes for all 15-minute interval for each direction in same trade hour, where the following conditions occur:</p> <table border="1" data-bbox="274 489 943 1003"> <thead> <tr> <th>Value</th> <th>:15</th> <th>:30</th> <th>:45</th> <th>:60</th> </tr> </thead> <tbody> <tr> <td>Sum of Base Schedules</td> <td>1100</td> <td>1100</td> <td>1100</td> <td>1100</td> </tr> <tr> <td>15-minute Demand Forecast</td> <td>1050</td> <td>1025</td> <td>1125</td> <td>1150</td> </tr> <tr> <td colspan="5" style="text-align:center">Down Direction (over insufficiency direction in CMRI)</td> </tr> <tr> <td>Total Down Requirement</td> <td>50</td> <td>75</td> <td>-25</td> <td>-50</td> </tr> <tr> <td>Bid Range Capacity (Down)</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>Down Direction Insufficiency</td> <td>-50</td> <td>-25</td> <td>-125</td> <td>-150</td> </tr> <tr> <td>Down Direction Result</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> <tr> <td colspan="5" style="text-align:center">Up Direction (under insufficiency direction in CMRI)</td> </tr> <tr> <td>Total Up Requirement</td> <td>-50</td> <td>-75</td> <td>25</td> <td>50</td> </tr> <tr> <td>Bid Range Capacity (Up)</td> <td>100</td> <td>100</td> <td>100</td> <td>100</td> </tr> <tr> <td>Up Direction Insufficiency</td> <td>-150</td> <td>-175</td> <td>-75</td> <td>-50</td> </tr> <tr> <td>Up Direction Result</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> </tbody> </table>	Value	:15	:30	:45	:60	Sum of Base Schedules	1100	1100	1100	1100	15-minute Demand Forecast	1050	1025	1125	1150	Down Direction (over insufficiency direction in CMRI)					Total Down Requirement	50	75	-25	-50	Bid Range Capacity (Down)	100	100	100	100	Down Direction Insufficiency	-50	-25	-125	-150	Down Direction Result	Pass	Pass	Pass	Pass	Up Direction (under insufficiency direction in CMRI)					Total Up Requirement	-50	-75	25	50	Bid Range Capacity (Up)	100	100	100	100	Up Direction Insufficiency	-150	-175	-75	-50	Up Direction Result	Pass	Pass	Pass	Pass	<p>For this scenario, CMRI shall report the most-insufficient 15-minute interval results (in blue text) (using interval :30 results for the over direction, interval :60 results for the under direction). Only the intervals’ trade hour will be identified in the report.</p> <table border="1" data-bbox="969 543 1536 1077"> <thead> <tr> <th>Description</th> <th>:15</th> <th>:30</th> <th>:45</th> <th>:60</th> </tr> </thead> <tbody> <tr> <td>Test Status (Over)</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> <tr> <td>Insufficiency Direction (Over)</td> <td>Over</td> <td>Over</td> <td>Over</td> <td>Over</td> </tr> <tr> <td>Insufficiency Percentage (%)</td> <td>-50</td> <td>-25</td> <td>-125</td> <td>-150</td> </tr> <tr> <td>Insufficiency Amount (MW)</td> <td>-50</td> <td>-25</td> <td>-125</td> <td>-150</td> </tr> <tr> <td>Test Status (Under)</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> </tr> <tr> <td>Insufficiency Direction (Under)</td> <td>Under</td> <td>Under</td> <td>Under</td> <td>Under</td> </tr> <tr> <td>Insufficiency Percentage (%)</td> <td>-150</td> <td>-175</td> <td>-75</td> <td>-50</td> </tr> <tr> <td>Insufficiency Amount (MW)</td> <td>-150</td> <td>-175</td> <td>-75</td> <td>-50</td> </tr> </tbody> </table> <p>Since none of the 15-minute intervals failed the BAA’s capacity test, no WEIM transfer limits will be reduced for any of the intervals within the trade hour in neither the import nor export direction.</p>	Description	:15	:30	:45	:60	Test Status (Over)	Pass	Pass	Pass	Pass	Insufficiency Direction (Over)	Over	Over	Over	Over	Insufficiency Percentage (%)	-50	-25	-125	-150	Insufficiency Amount (MW)	-50	-25	-125	-150	Test Status (Under)	Pass	Pass	Pass	Pass	Insufficiency Direction (Under)	Under	Under	Under	Under	Insufficiency Percentage (%)	-150	-175	-75	-50	Insufficiency Amount (MW)	-150	-175	-75	-50
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➤ **Exclusion of Failed-to-Start Short-Start Units as Available Supply in the Capacity Test:**

Specific to the Capacity Test, a resource’s capacity will be excluded as online capacity if non-positive telemetry is measured at the time of the RSE execution and an online status from the RTPD interval that lies within the execution time of the RSE only if the following conditions are met:

- A Start-able, Short-Start Unit (where Start-Up Time plus Minimum Up Time <= 255 minutes);
- Has a bid in the RTM for the testing hour;
- Has continuous RTPD online statuses starting from the time interval that is aligned with the time of RSE execution all the way until the end RSE time horizon, using the latest RTPD run that is available before RSE execution (See detailed examples);
- RTPD advisory horizon overlaps with all RSE time intervals
- A non-positive telemetry at the time of the RSE execution (indicating the resource failed to Start-Up to reach its first RTD dispatch);
- Available Telemetry at the time of the RSE execution with Good Quality Flag;

- Includes MSG and PDR resources, excludes Pumping Storage and battery storage resources

➤ *Examples for RTBS1 @ T-75'*

RSE Horizon: 18:00-19:00					
RTBS1 @ 16:46:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
16:45-17:00	Online	RTPD5	Yes	<=0	No, due to no RTPD advisories for RSE hour
17:00-17:15	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour
17:15-17:30	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour
17:30-17:45	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour
17:45-18:00	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour

RSE Horizon: 18:00-19:00					
RTBS1 @ 16:46:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
16:45-17:00	Online	RTPD5	Yes	<=0	No, due to no RTPD advisories for RSE hour
17:00-17:15	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour
17:15-17:30	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour
17:30-17:45	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour
17:45-18:00	Online	RTPD4	No	N/A	No, due to no RTPD advisories for RSE hour

➤ *Examples for RTBS2 @ T-55'*

RSE Horizon: 18:00-19:00					
RTBS2 @ 17:05:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:00-17:15	Online	RTPD4	Yes	<=0	No, due to no continuous Online status
17:15-17:30	Online	HASP	No	N/A	No, due to no continuous Online status
17:30-17:45	Online	HASP	No	N/A	No, due to no continuous Online status
17:45-18:00	Online	HASP	No	N/A	No, due to no continuous Online status

18:00-18:15	Online	HASP	No	N/A	No, due to no continuous Online status
18:15-18:30	Offline	HASP	No	N/A	No, due to no continuous Online status
18:30-18:45	Offline	HASP	No	N/A	No, due to no continuous Online status
18:45-19:00	Offline	HASP	No	N/A	No, due to no continuous Online status

RSE Horizon: 18:00-19:00

RTBS2 @ 17:05:30

Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:00-17:15	Online	RTPD4	Yes	<=0	No, due to no continuous Online status
17:15-17:30	Online	HASP	No	N/A	No, due to no continuous Online status
17:30-17:45	Online	HASP	No	N/A	No, due to no continuous Online status
17:45-18:00	Online	HASP	No	N/A	No, due to no continuous Online status
18:00-18:15	Online	HASP	No	N/A	No, due to no continuous Online status
18:15-18:30	Offline	HASP	No	N/A	No, due to no continuous Online status
18:30-18:45	Offline	HASP	No	N/A	No, due to no continuous Online status
18:45-19:00	Online	HASP	No	N/A	No, due to no continuous Online status

RSE Horizon: 18:00-19:00

RTBS2 @ 17:05:30

Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:00-17:15	Online	RTPD4	Yes	<=0	No, due to no continuous Online status
17:15-17:30	Offline	HASP	No	N/A	No, due to no continuous Online status
17:30-17:45	Offline	HASP	No	N/A	No, due to no continuous Online status
17:45-18:00	Offline	HASP	No	N/A	No, due to no continuous Online status
18:00-18:15	Online	HASP	No	N/A	No, due to no continuous Online status
18:15-18:30	Online	HASP	No	N/A	No, due to no continuous Online status
18:30-18:45	Online	HASP	No	N/A	No, due to no continuous Online status
18:45-19:00	Online	HASP	No	N/A	No, due to no continuous Online status

RSE Horizon: 18:00-19:00

RTBS2 @ 17:05:30

Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
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17:00-17:15	Online	RTPD4	Yes	<=0	Yes
17:15-17:30	Online	HASP	No	N/A	Yes
17:30-17:45	Online	HASP	No	N/A	Yes
17:45-18:00	Online	HASP	No	N/A	Yes
18:00-18:15	Online	HASP	No	N/A	Yes
18:15-18:30	Online	HASP	No	N/A	Yes
18:30-18:45	Online	HASP	No	N/A	Yes
18:45-19:00	Online	HASP	No	N/A	Yes

➤ *Examples for RTBS3 @ T-40'*

RSE Horizon: 18:00-19:00					
RTBS3 @ 17:22:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:15-17:30	Online	HASP	Yes	<=0	No, due to no continuous Online status
17:30-17:45	Online	RTPD6	No	N/A	No, due to no continuous Online status
17:45-18:00	Online	RTPD6	No	N/A	No, due to no continuous Online status
18:00-18:15	Online	RTPD6	No	N/A	No, due to no continuous Online status
18:15-18:30	Offline	RTPD6	No	N/A	No, due to no continuous Online status
18:30-18:45	Offline	RTPD6	No	N/A	No, due to no continuous Online status
18:45-19:00	Offline	RTPD6	No	N/A	No, due to no continuous Online status

RSE Horizon: 18:00-19:00					
RTBS3 @ 17:22:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:15-17:30	Online	HASP	Yes	<=0	No, due to no continuous Online status
17:30-17:45	Online	RTPD6	No	N/A	No, due to no continuous Online status
17:45-18:00	Online	RTPD6	No	N/A	No, due to no continuous Online status
18:00-18:15	Online	RTPD6	No	N/A	No, due to no continuous Online status
18:15-18:30	Offline	RTPD6	No	N/A	No, due to no continuous Online status
18:30-18:45	Offline	RTPD6	No	N/A	No, due to no continuous Online status
18:45-19:00	Online	RTPD6	No	N/A	No, due to no continuous Online status

RSE Horizon: 18:00-19:00					
RTBS3 @ 17:22:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:15-17:30	Offline	HASP	Yes	<=0	No, Offline status at time of telemetry check
17:30-17:45	Offline	RTPD6	No	N/A	No, Offline status at time of telemetry check
17:45-18:00	Offline	RTPD6	No	N/A	No, Offline status at time of telemetry check
18:00-18:15	Online	RTPD6	No	N/A	No, Offline status at time of telemetry check
18:15-18:30	Online	RTPD6	No	N/A	No, Offline status at time of telemetry check
18:30-18:45	Online	RTPD6	No	N/A	No, Offline status at time of telemetry check
18:45-19:00	Online	RTPD6	No	N/A	No, Offline status at time of telemetry check

RSE Horizon: 18:00-19:00					
RTBS3 @ 17:22:30					
Time Interval	Status	Data Source	Telemetry Check	Telemetry Value	Assessed for Disqualification
17:15-17:30	Online	HASP	Yes	<=0	Yes
17:30-17:45	Online	RTPD6	No	N/A	Yes
17:45-18:00	Online	RTPD6	No	N/A	Yes
18:00-18:15	Online	RTPD6	No	N/A	Yes
18:15-18:30	Online	RTPD6	No	N/A	Yes
18:30-18:45	Online	RTPD6	No	N/A	Yes
18:45-19:00	Online	RTPD6	No	N/A	Yes

- **Flexible Ramping Sufficiency Test:** At T-75, T-55, and T-40 minutes prior to start of the next trading hour, CAISO will independently evaluate flexible ramping sufficiency test for each BAA within the WEIM area for each 15-minute interval of that trading hour. The flexible ramping requirement is based on the historical error in the CAISO load forecast and the CAISO variable energy resource forecast. The test assesses whether there is sufficient ramping capability among all resources in the BAA as explained, including demand response forecast adjustments, adjustments for power balance constraint relaxations and adjustments for the T-40 transmission e-tag confirmation to meet the forecasted demand change across intervals plus a high/low percentile of the historical uncertainty.

A 1% (one percent) tolerance band threshold or 1 MW (one MW) will be applied to the flexible ramping uncertainty requirement (both upward and downward) for a given 15-

minute interval for each WEIM BAA. Resulting amount (both upward and downward) is calculated as follows;

The $\max(\epsilon_r, FRUR_i, \epsilon_a)$ will be subtracted from $FRUR'$ for flexible ramping up

The $\max(\epsilon_r, FRDR_i, \epsilon_a)$ will be subtracted from $FRDR'$ for flexible ramping down

Where:

- ϵ_r Flexible Ramping sufficiency test relative tolerance (%).
- ϵ_a Flexible Ramping sufficiency test absolute tolerance (MW).
- $FRUR_i$ is the flexible ramp up uncertainty requirement for a given 15-minute interval in the next hour for WEIM Entity i without diversity benefit;
- $FRDR_i$ is the flexible ramp down uncertainty requirement for a given 15-minute interval in the next hour for WEIM Entity i without diversity benefit (negative);
- $FRUR'_i$ is the cumulative flexible ramp up requirement from the last 15-minute interval of the current hour to a given 15-minute interval in the next hour for WEIM Entity i; it includes the effects of WEIM diversity benefit and credit; and
- $FRDR'_i$ is the cumulative flexible ramp down requirement from the last 15-minute interval of the current hour to a given 15-minute interval in the next hour for WEIM Entity i; it includes the effects of WEIM diversity benefit and credit.

In the event there is an under-generation power balance constraint relaxation for the interval immediately prior to the hour being evaluated, the cumulative flexible ramp up ($FRUR'_i$) and down ($FRDR'_i$) requirements are adjusted for the hour being evaluated. The cumulative flexible ramp up requirement is increased by the relaxation amount whereas the cumulative flexible ramp down requirement is decreased by the same amount. Any operator load conformance is excluded from the under-generation power balance constraint relaxation. Note that the power balance calculations details in the upward and downward directions are available in RTM/BAAOP Flexible Ramp Sufficiency results UI.

Power Balance Constraint Examples

Example-1

- Forecast Load @ T-7.5' = 1000 MW
- Market Cleared Load (with PBC under-gen relaxation) @ T-7.5' = 950 MW
- PBC under-gen relaxation quantity = 50 MW
- Forecast Load in next hour = 1000, 1025, 1050, 1100 MW
- FRU Forecast requirement = 0, 25, 50, 100 MW
- FRU requirement due to change in forecast and PBC under gen requirement = 50, 75, 100, 150 MW
- FRD Forecast requirement = 0, -25, -50, -100 MW
- FRD requirement due to change in forecast and PBC under gen requirement = -50, -75, -100, -150 MW

Example-2

- Forecast Load @ T-7.5' = 1001 MW
- Market Cleared Load (with PBC under-gen relaxation) @ T-7.5 = 1000 MW
- PBC under-gen relaxation quantity = 1 MW
- Forecast Load in next hour = 1000,1000,1000,1000 MW
- FRU Forecast requirement = -1, 0, 0, 0 MW
- FRU requirement due to change in forecast and PBC under gen requirement = 0, 1, 1, 1 MW
- FRD Forecast requirement = 1, 0, 0, 0 MW
- FRD requirement due to change in forecast and PBC under gen requirement = 0, -1, -1, -1 MW

Example-3

- Under Generation infeasibility: 100MW
- Operator load conformance: 50MW
- PBC under-gen relaxation quantity = $\max(0, [100\text{MW} - 50\text{MW}]) = 50\text{MW}$

Example-4

- Under Generation infeasibility: 50MW
- Operator load conformance: 100MW
- PBC under-gen relaxation quantity = $\max(0, [50\text{MW} - 100\text{MW}]) = 0\text{MW}$

Example-5

- Under Generation infeasibility: 100MW
- Operator load conformance: -50MW
- PBC under-gen relaxation quantity = $\max(0, [100\text{MW} - (-50\text{MW})]) = 150\text{MW}$

Consider a Resource's Transition through FOR in the Flexible Ramping Sufficiency Test: To properly account for the Forbidden Operating Region in the flexible ramping sufficiency test, a forbidden zone (FBZ) ramp rate is calculated as $\text{FBZ Length} / \text{FBZ Crossing Time}$. This ramp rate is used to calculate the FRU and FRD capacity. For the duration the resource moving to and through their FBZ, the resource cannot provide the FRU capacity (if crossing down) or FRD capacity (if crossing up). Once the resource is out of their Forbidden Operating Region, the resource can provide flex ramp capacity in both directions as is counted as such in the flexible ramping sufficiency test.

Examples

1. Initially not in FOR

Resource ramp rate 2 MW/min

Bid_max: 100 MW, Bid_min: 0 MW, FBZ: 20-50, crossing time: 30mins

T-7.5' MW = 10 MW

New ramp rate = $30/30 = 1 \text{ MW/min}$

Time	FRU	FRD
15 mins	10	10
30 mins	25	10
45 mins	40	10
60 mins	70	10

2. Initially in FOR, crossing up

Resource ramp rate 2 MW/min

Bid_max: 150, bid_min: 0, FOR: 20-50, crossing time: 30

T-7.5' MW = 35, T-22.5' MW = 20 [FZ: if table EMM_SCUC_INITIAL_RES_STATUS is copied to RTBS from RTPD, field PROHIBITED_ZONE_DIR should indicate the direction]

New ramp rate = 30/30 = 1 MW/min

Time	FRU	FRD
15 mins	15	-15
30 mins	45	0
45 mins	75	15
60 mins	105	35

➤ **MSG Configuration accounting as Available Supply in the Capacity Test.**

When the following conditions are true:

- MSG Configuration has a bid, an Exceptional Dispatch (ED) or WEIM Manual Dispatch (MD) or commitment override in RTM through the upcoming hour
- MSG resource is online (or in-transition state) in the last 15 minute interval before the hour

The available online capacity is calculated to equal the maximum MW of the MSG configuration that is achievable based upon the enforcement of intertemporal constraints including ramp rate and transition time RTPD and RTD executions prior to the horizon hour.

For Example:

Resource X Configurations:

1x1 20 (Pmin) to 150	(Transition Time to 2X1 30 Minutes) Ramp Rate = 10
2X1 140 to 300	(Transition to 3X1 60 Minutes, Transition to 1x1 0 minutes) Ramp Rate = 15
3X1 300 to 600 (PMax)	(Transition to 2X1, 0 Minutes) Ramp Rate =20

Assumption (Resource X meets the conditions above)

Resource X is online in 1x1 configuration at 20MW at T-7.5 and 1X1 can only transition to 2X1

Base Energy schedule for the plant is 160 MW for the testing hour

In the previous implementation, the Upward capacity was reported as 440 MW. With the RSE Enhancement, Available Capacity for Resource X used in Bid Capacity = 140 MW as only 1X1 and 2X1 will be considered for the bid capacity test.

- **Discount CAISO Interchange Awards that have not submitted Transmission Profile e-Tag:**
System shall discount any interchange (import/export) awarded bids that have not submitted a transmission profile e-Tag equal to their HASP award by the T-40' deadline for Capacity Test and Flexible Ramping Sufficiency Test. The objective of this feature is ensure import and export capacity has procured sufficient transmission to deliver or receive the award

For each BAA in the WEIM Area that fails its Flexible Ramping Up or Flexible Ramping Down sufficiency test or the Bid Range Capacity Up or Down test, for a 15-minute interval in the next trading hour, the market shall limit the net WEIM transfer from below (import) for upward failure and from above (export) for downward failure, to the less-restrictive of the following values:

- Base Transfer Schedule for the failed 15-minute interval; or

- Net WEIM transfer schedule for the interval prior to the failed 15-minute interval as provided by the last successful FMM market run (i.e. the “last previous” 15-minute interval)

The following rules will be applied to the 15-minute interval for all the bid-range capacity and flexible ramping sufficiency test;

- At T-75, RUC schedules plus all available bids for system resources are used for assessing CAISO BAA. For the sufficiency test performed at T-55 and T-40, the latest FMM results are used for assessing CAISO BAA.
- The same WEIM transfer limit applied to the failed 15-minute interval shall also apply to its three corresponding 5-minute market intervals
- If a FMM run, other than HASP, fails, the WEIM Transfer schedules from the last FMM run that has succeeded shall be used to derive the WEIM Transfer limits for the 15-minute intervals
- If HASP or all prior FMM runs fail, the base WEIM Transfer will be used.
- The last previous 15-minute interval will be the last 15-minute interval of the current hour if the 15-minute interval that fails is the first 15-minute interval of the next hour
- Likewise, the same is true if the 15-min interval that fails is the second, third, or fourth 15-minute interval in the second hour of the HASP time horizon for which there is no previous solution for the immediately prior 15-minute interval

Examples:

This example shows how the WEIM transfer limit will be curtailed for the 15-minute intervals and associated 5-minute intervals with failed FRU/FRD sufficiency test.

Market Run			15-min Interval				
Market	Run Time	Result	0 (T-7.5')	1 (T+7.5')	2 (T+22.5')	3 (T+37.5')	4 (T+52.5')
FMM	T-82.5'	EIM Transfer (MW)	-200				
RTBS	T-75'	Base Transfer (MW)		-300	-300	-300	-300
		FRU Test		Pass	Pass	Fail	Fail
FMM	T-67.5'	Transfer Limit (MW)				-300	-300
		EIM Transfer (MW)		-400	-320	-210	-300
RTBS	T-55'	Base Transfer (MW)		-100	-100	-100	-100

		FRU Test		Fail	Pass	Fail	Fail
FMM	T-52.5'	Transfer Limit (MW)		-200		-320	-210
		EIM Transfer (MW)		-200	-270	-180	-210
RTBS	T-40'	Base Transfer (MW)		-250	-250	-250	
		FRU Test		Fail	Pass	Fail	Fail
FMM	T-37.5'	Transfer Limit (MW)		-250		-270	-250
		EIM Transfer (MW)		-230	-350	-270	-250
FMM	T-22.5'	Transfer Limit (MW)		-250		-350	-270
		EIM Transfer (MW)		-240	-330	-300	-270
FMM	T-7.5'	Transfer Limit (MW)				-330	-300
		EIM Transfer (MW)			-280	-330	-300
FMM	T+7.5'	Transfer Limit (MW)				-280	-330
		EIM Transfer (MW)				-260	-330
FMM	T+22.5'	Transfer Limit (MW)					-260
		EIM Transfer (MW)					-260

11.3.2.1 Flexible Ramping Sufficiency Test and Capacity Test Details

The individual WEIM Entity or CAISO BAA requirement for the flexible ramping sufficiency test will be calculated for the next hour (using algebraic notation) as follows:

$$FRUR'_i = \Delta D_i + \max \left(FRUR_i - NIC_i, FRUR_i \frac{FRUR}{TFRUR} - FRUC_i \right)$$

$$FRDR'_i = \Delta D_i + \min \left(FRDR_i + NEC_i, FRDR_i \frac{FRDR}{TFRDR} - FRDC_i \right)$$

The individual WEIM BAA requirement for the capacity test will be calculated for the next hour (using algebraic notation) as follows:

$$BRCUR_i = DF_i - \sum BS_i +$$

$$BRCUR_i = \sum BS_i - DF_i$$

Where:

i	is the BAA index in the WEIM Area;
$FRUR_i$	is the flexible ramp up uncertainty requirement for a given 15-minute interval in the next hour for WEIM Entity i without diversity benefit; this value is calculated using a histogram of historical net forecast error, see Market Operations BPM section 7.1.3 for more details;
$FRDR_i$	is the flexible ramp down uncertainty requirement for a given 15-minute interval in the next hour for WEIM Entity i without diversity benefit (negative); this value is calculated using a histogram of historical net forecast error, see Market Operations BPM section 7.1.3 for more details;
$FRUR'_i$	is the cumulative flexible ramp up requirement from the last 15-minute interval of the current hour to a given 15-minute interval in the next hour for WEIM Entity i ; it includes the effects of WEIM diversity benefit and credit;
$FRDR'_i$	is the cumulative flexible ramp down requirement from the last 15-minute interval of the current hour to a given 15-minute interval in the next hour for WEIM Entity i ; it includes the effects of WEIM diversity benefit and credit;
ΔD_i	is the change in the demand forecast from the last 15-minute interval of the current hour to a given 15-minute interval in the next hour for WEIM Entity i , including any non-participating DR entered and any adjustments made due to infeasibilities ;
NIC_i	is the available net import transfer capability of WEIM Entity i at the last 15-minute interval of the current hour (negative);
NEC_i	is the available net export transfer capability of WEIM Entity i at the last 15-minute interval of the current hour (positive);
$FRUR$	is the flexible ramp up uncertainty requirement for a given 15-minute interval in the next hour for the entire WEIM Area;
$FRDR$	is the flexible ramp down uncertainty requirement for a given 15-minute interval in the next hour for the entire WEIM Area (negative);

$TFRUR$	is the sum of the flexible ramp up uncertainty requirements, including Power Balance Constraint adjustments, of all BAAs in the WEIM Area for a given 15-minute interval in the next hour;
$TFRDR$	is the sum of the flexible ramp down uncertainty requirements. Including Power Balance Constraint adjustments, of all BAAs in the WEIM Area for a given 15-minute interval in the next hour (negative);
$FRUC_i$	is the flexible ramp up credit for a given 15-minute interval in the next hour for WEIM Entity i , equal to the net WEIM export transfer at the last 15-minute interval of the current hour; and
$FRDC_i$	is the flexible ramp down credit for a given 15-minute interval in the next hour for WEIM Entity i , equal to the net WEIM import transfer at the last 15-minute interval of the current hour (negative).
$BRCUR_i$	is the bid range capacity up requirement for a given 15-minute interval in the next hour for WEIM Entity i .
$BRCDR_i$	is the bid range capacity down requirement for a given 15-minute interval in the next hour for WEIM Entity i .
DF_i	is the demand forecast for a given 15-minute interval in the next hour for WEIM Entity i .
$\sum BS_i$	For WEIM Entity BAAs, this is the sum of all base schedules and net scheduled inter-change, in the next hour for WEIM Entity i , minus any applicable derates due to outages, or exceptional dispatches. For the CAISO BAA, this is the sum RUC Schedules, the HASP Advisory Schedules and HASP Intertie Block Schedules or the advisory FMM Schedules.

This requirement reflects a pro rata share of potential WEIM Diversity Benefit and the flexible ramping credit, up to the available net import/export transfer capability. The WEIM Diversity Benefit is the difference between the sum of the individual flexible ramping requirements of each BAA in the WEIM Area and the flexible ramping requirement for the entire WEIM Area taken as a whole.

The CAISO will perform a series of flexible ramping constraint sufficiency tests prior to each hour. The WEIM Entity Scheduling Coordinator will have an opportunity to re-submit Base Schedules if it fails the flexible ramping constraint sufficiency test or to resolve congestion up to 40 minutes prior to the operating hour, which is just before the start of the first financially binding WEIM 15-minute market for the operating hour. Thresholds are developed by the CAISO to cap the flexible ramp up and down uncertainty requirements to within historical bounds.

The flexible ramping sufficiency test is performed for each WEIM Entity BAA after T-75', T-55', and T-40' for the trading hour starting at T. The test uses the initial schedules at T-7.5', variable energy resource (VER) forecast, WEIM resources energy bids, ramp rates, manual dispatch constraints and operational de-rates. Since the VER forecast information is updated every five minutes, it is possible that VER forecast may change between the three flex ramp sufficiency tests. The VER forecast information is held fixed at the T-55', and T-40' such that the updated VER forecast information at T-55 is used for the T-40 flex ramp sufficiency test.

The test for meeting flexible ramp requirements is cumulative for each 15' interval of the hour. More specifically, for each interval, the flexible ramp requirement is the sum of the demand forecast change from T-7.5' to the relevant interval plus the flexible ramp uncertainty requirement for that interval. Since the load forecast information may be updated between the three flex ramp sufficiency test, load forecast information used to calculate the net load movement is held fixed at the T-55', and T-40' such that the updated load forecast information at T-55 is used for the T-40 flex ramp sufficiency test. The net

requirement for the flex ramp sufficiency test includes the effects of WEIM diversity and credit, and it is calculated as:

- 15' ramp from T-7.5' to T+7.5' (1st 15' interval)
- 30' ramp from T-7.5' to T+22.5' (2nd 15' interval)
- 45' ramp from T-7.5' to T+37.5' (3rd 15' interval)
- 60' ramp from T-7.5' to T+52.5' (4th 15' interval)

The test passes if all four cumulative tests pass; the test fails if any of the four cumulative tests fail.

In Fifteen Minute Market and RTD, the flexible ramping capacity requirement constraints for the CAISO BAA, each WEIM Entity BAA, and the total WEIM footprint must be enforced:

- If the WEIM Entity or CAISO BAA fails the flexible ramp up sufficiency test or fails the over capacity (resource plan) test in a 15-minute interval, the WEIM Transfer in that interval will be bounded as specified in Section 11.3.2. WEIM WEIM Furthermore, the CAISO will enforce the individual WEIM Entity BAA flexible ramp up uncertainty requirement in the WEIM Entity BAA without diversity benefit, but the credit shall apply. If the WEIM Entity BAA passes the flexible ramp up sufficiency test, the flexible ramp up uncertainty requirement without diversity benefit shall be reduced by the available net import transfer capability. The CAISO will enforce the constraint for each WEIM Entity BAA, the CAISO BAA, and the total flexible ramp up uncertainty requirement for the WEIM Area.
- If the WEIM Entity or CAISO BAA fails the flexible ramp down sufficiency test or fails the under capacity (resource plan) test in a 15-minute interval, the WEIM Transfer in that interval will be bounded as specified in Section 11.3.2. WEIM WEIM Furthermore, the CAISO will enforce the individual WEIM Entity BAA flexible ramp down uncertainty requirement in the WEIM Entity BAA without diversity benefit, but the credit shall apply. If the WEIM Entity BAA passes the flexible ramp down sufficiency test, the flexible ramp down uncertainty requirement without diversity benefit shall be reduced by the available net export transfer capability. The CAISO will enforce the constraint for each WEIM Entity BAA, the CAISO BAA, and the total flexible ramp down uncertainty requirement for the WEIM Area.
- WEIM The flexible ramp requirements for total WEIM footprint can be potentially lower than the sum of individual requirements of each BAA, reflecting the benefits of reduced uncertainty and volatility across the BAAs.
- For a period of six months following the Implementation Date of a new WEIM Entity, the CAISO shall set the Flexible Ramping Constraint parameter specified in Section 27.10, for pricing purposes, for the new WEIM Entity Balancing Authority Area, at an amount between and

including \$0 and \$0.01 only for when the transmission or power balance constraints are relaxed in the corresponding new WEIM Entity Balancing Authority Area.

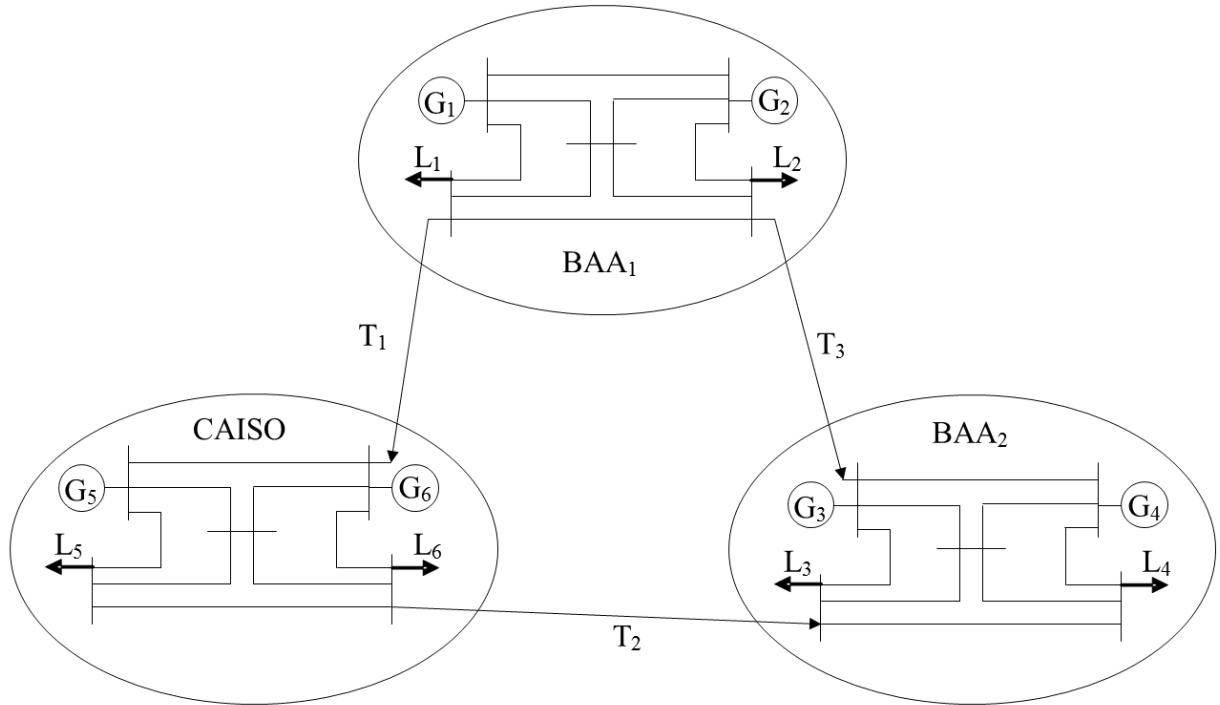
- CAISO will broadcast the resource flexible ramping awards to the relevant SCs.
- CAISO will publish the shadow prices of each flexible ramping constraint and associated BAA, and total WEIM footprint. The flexible ramping capacity shall be managed in corresponding RTD for WEIM market in the same manner as the current CAISO RTM. The RTD shall enforce the flexible ramping capacity requirement constraints. The requirement of each five-minute interval in the RTD run horizon will be preserved according to the pre-defined attenuation percentage of each interval, currently as 0%, 25%, 50%, 75%, 100%, 100%... The same percentage will apply to the effective requirement (reduced by the available net import capacity) for each WEIM Entity BAA and WEIM footprint constraints.

Example Assumptions

- CAISO BAA and two WEIM Entity BAAs
- All interties rated at 10MW
- Two generators and two loads in each BAA
- Zero base schedules; no transmission losses
- Real-Time Unit Commitment run at $T-37.5'$
- Only upward flexible ramp capacity
- Flexible ramp capacity requirement determined by demand forecast change and historical assessment of ramping capability to meet forecast uncertainty

Example

15' Schedules at $T-7.5'$					
BAA ₁		BAA ₂		CAISO	
G ₁	60	G ₃	10	G ₅	100
G ₂	50	G ₄	80	G ₆	100
L ₁	40	L ₃	30	L ₅	100
L ₂	60	L ₄	70	L ₆	100
NSI ₁	+10	NSI ₂	-10	NSI ₀	0
T ₁	4	T ₂	4	T ₃	6



Available Flexible Ramp Capacity

BAA	Resource	Initial Schedule	UEL	Ramp Rate	15' FRC	30' FRC	45' FRC	60' FRC
BAA ₁	G ₁	60	100	1	15	30	40	40
	G ₂	50	100	1	15	30	45	50
	<i>Total</i>	110	200		30	60	85	90
BAA ₂	G ₃	10	100	1	15	30	45	60
	G ₄	80	100	1	15	20	20	20
	<i>Total</i>	90	200		30	50	65	80

Case 1: Flexible Ramp Sufficiency Test Pass

BAA		T-7.5'	T+7.5'	T+22.5'	T+37.5'	T+52.5'
CAISO	Total CAISO load	200	220	210	200	190
	Cumulative flexible ramp requirement		20	10	0	0
BAA1	L1 + L2	100	120	140	160	180
	Ramp need for forecast uncertainty		15	10	15	20
	EIM diversity benefit		0	0	0	-15
	Flexible ramp requirement credit		-10	-10	-10	-10
	Cumulative flexible ramp requirement		25	40	65	75
	Cumulative flexible ramp capacity		30	60	85	90
	Flexible ramp sufficiency test outcome		✓	✓	✓	✓
BAA2	L3 + L4	100	120	140	160	180
	Ramp need for forecast uncertainty		10	5	5	10
	EIM diversity benefit		0	0	0	-15
	Cumulative flexible ramp requirement		30	45	65	75
	Cumulative flexible ramp capacity		30	50	65	80
	Flexible ramp sufficiency test outcome		✓	✓	✓	✓
EIM	Total EIM load	400	460	490	520	550
	Cumulative flexible ramp requirement		85	105	140	130
	Sum of BAA flexible ramp requirement		85	105	140	160

Case 1: Flexible Ramp Capacity Constraints

For T+7.5'

- $FRC_0 \geq \max(0, FRR_0 - 20) = 0$
- $FRC_1 \geq \max(0, FRR_1 - 30) = 0$
- $FRC_2 \geq \max(0, FRR_2 - 10) = 20$

$$\text{FRC}_0 + \text{FRC}_1 + \text{FRC}_2 \geq \text{FRR}_{0,1,2} = 85$$

Case 2: Flexible Ramp Sufficiency Test Fail

BAA		T-7.5'	T+7.5'	T+22.5'	T+37.5'	T+52.5'
CAISO	Total CAISO load	200	220	210	200	190
	Cumulative flexible ramp requirement		20	10	0	0
BAA1	L1 + L2	100	120	140	160	180
	Ramp need for forecast uncertainty		15	10	15	20
	EIM diversity benefit		0	0	0	-15
	Flexible ramp requirement credit		-10	-10	-10	-10
	Cumulative flexible ramp requirement		25	40	65	75
	Cumulative flexible ramp capacity		30	60	85	90
	Flexible ramp sufficiency test outcome		✓	✓	✓	✓
BAA2	L3 + L4	100	120	150	170	180
	Ramp need for forecast uncertainty		10	5	5	10
	EIM diversity benefit		0	0	0	-15
	Cumulative flexible ramp requirement		30	55	75	75
	Cumulative flexible ramp capacity		30	50	65	80
	Flexible ramp sufficiency test outcome		✓	✗	✗	✓
EIM	Total EIM load	400	460	490	520	550
	Cumulative flexible ramp requirement		85	115	150	130
	Sum of BAA flexible ramp requirement		85	115	150	160

Case 2: Flexible Ramp Capacity Constraints

For T+7.5'

$$\text{FRC}_0 \geq \max(0, \text{FRR}_0 - 20) = 0$$

$$\text{FRC}_1 \geq \max(0, \text{FRR}_1 - 30) = 0$$

- $FRC_2 \geq FRR_2 = 30$
- $NSI_2 \geq -10$
- $FRC_0 + FRC_1 + FRC_2 \geq FRR_{0,1,2} = 85$

11.3.2.2 Import/Export Hourly Block Schedule Difference Calculation

The CAISO will calculate and publish, for each WEIM Entity BAA, the absolute and the relative hourly net inter-tie scheduling error of imports and exports whose final tagged schedules differ from either the WEIM base schedule or, in the case of the CAISO BAA, the CAISO hourly schedules. The CAISO calculates two histograms: one based on absolute hourly scheduling deviation and another based on relative hourly scheduling deviation. The hourly scheduling deviations over each month between the 15th day of the third prior month and the 15th day of the current month.

If an WEIM Entity BAA has historical deviations in the net import/export schedule changes between T-40 and T-20, the CAISO will add an additional capacity requirement to the capacity test. This ensures that the bid range from WEIM Participating Resources cover the difference between net WEIM Base Schedules and the Demand Forecast for the Operating Hour, including the historical intertie over/under-scheduling within a 95% confidence interval.

In the event the historical net import/export calculation produces anomalous results, the CAISO will set the low histogram percentile, high histogram percentile, low absolute histogram percentile and high absolute histogram percentile described below to zero temporarily while it investigates the cause of the anomalous results.

The CAISO will calculate the histograms and the additional capacity requirement as follows:

- The CAISO will net imports and exports against each other in each Operating Hour.
- If net-tagged imports are greater than net imports in the WEIM Base Schedules, the CAISO will add to the affected BAA in the WEIM an additional downward capacity requirement. If net-tagged imports are less than net imports included in the WEIM Base Schedules, the CAISO will add to the affected BAA in the WEIM an additional upward capacity requirement.
- If net-tagged exports are greater than net exports included in the WEIM Base Schedules, the CAISO will add to the affected BAA in the WEIM an additional upward capacity requirement. If net-tagged exports are less than net exports included in WEIM Base Schedules, the CAISO will add to the affected BAA in the WEIM an additional downward capacity requirement.
- The CAISO will include only data for hourly Scheduled imports and exports and base WEIM Transfers in the histogram. The following schedules will be excluded from the histogram: 15-minute intertie schedules, dynamic inter-tie schedules, and pseudo-ties.

- The CAISO will exclude any outlier data from the histogram calculations. See below for details on this process.
- Three months of production data is required to calculate the histogram. So, for all new WEIM entities, the histogram percentiles will be set to zero until this information is available.

Histogram Calculations:

The CAISO will calculate the data samples for the absolute and relative histogram for the net hourly inter-tie schedules deviation between imports and exports scheduled at T-40 (net base inter-tie schedules) and the final tagged net imports at T-20 (net actual hourly inter-tie schedule) as:

- Data sample for relative deviation: $(\text{net actual hourly inter-tie schedule} - \text{net base inter-tie schedule}) / \text{net base inter-tie schedule}$
- Data sample for absolute deviation: $\text{net actual hourly intertie schedule} - \text{net base intertie schedule}$.

The CAISO will provide each WEIM Entity the low- and high-end cutoff percentiles for both the absolute and the relative net inter-tie schedule deviation histograms (2.5% and 97.5%, configurable from each histogram). If either the high-end cutoff percentile or the high-end cutoff absolute value based on the histogram data is below zero, then it will be set to 0. Similarly, if either the low cutoff percentile or the low cutoff absolute value based on the histogram data is above zero, then they will be set to 0.

The CAISO will perform a bid range capacity test for each of the four fifteen-minute intervals in every hour. The CAISO will calculate the additional up and down requirements as follows:

The CAISO calculates additional upward capacity requirement using data from both the absolute and relative histograms. First, consider a scenario with net imports for a trade hour. In this case, the application considers the minimum of the highest expectation of the net import or the minimum of the absolute difference in net imports for the past 90 days. Second, consider a scenario with net exports for the hour under consideration. In this case, the application considers the minimum of the highest expectation of the net export or the minimum of the absolute difference in net imports for the past 90 days. The calculations for both these scenarios are captured in the equation below.

For Net Import:

Additional upward capacity requirement = $\min(-1 * \text{relative low percentile} * \text{net base intertie schedule}, -\text{absolute low percentile})$

For Net Export:

Additional upward capacity requirement = $\min(-1 * \text{relative high percentile} * \text{net base intertie schedule}, \text{absolute high percentile})$

Similarly, the ISO calculates the additional downward capacity requirements in case of overscheduling using the equation captured below.

For Net Import:

Additional downward capacity requirement = $\max(-1 * \text{relative high percentile} * \text{net base intertie schedule}, -\text{absolute high percentile})$

For Net Export:

Additional downward capacity requirement = $\max(-1 * \text{relative low percentile} * \text{net base intertie schedule}, \text{absolute low percentile})$

Exclusion of Outlier Data from Histogram Calculations:

EIM entities may request that the CAISO exclude certain outlier data from the absolute and relative net intertie schedule deviation histograms. The following data is eligible for exclusion from the histograms:

- Data samples impacted by an intertie path capacity reduction as a result of a forced outage.
- Data samples impacted by energy assistance sent to a participant in a reserve sharing group.

In order to request the exclusion of the above data from the histogram calculation, WEIM entity Scheduling Coordinators should submit a CIDI ticket with the following information:

1. Subject Line: Exclusion of Outlier Data from NSI Uncertainty Calculations
2. Trade date
3. Hour(s)
4. BAA name
5. Justification for exclusion of data

Once the WEIM entity Scheduling Coordinator submits the CIDI ticket with the appropriate information, the CAISO will review the request. The CAISO expects to complete the process within ten (10) business days. However, if there are any delays processing this request, the CAISO will inform the Scheduling Coordinator of the root cause of the delay.

11.3.3 Locational Marginal Prices

The CAISO Markets, including the EIM, are based on using a Full Network Model coupled with locational marginal pricing. This coupling is meant to ensure that the Locational Marginal Prices (LMPs) reflect both the physical system as well as the schedules produced by the market applications. A detailed explanation for how the LMPs are derived is contained in Section 3.2 of the [BPM for Market Operations](#).

11.3.3.1 Accounting for Greenhouse Gas Regulation

Imports of energy into CAISO and generation of energy within CAISO from greenhouse gas emitting resources are subject to the California Cap on Greenhouse Gas Emissions regulated by the California Air Resources Board (CARB). According to CARB rules, energy generated outside of California that is not imported into California is not subject to this regulation.

The WEIM design accounts for this regulation through the following:

- For generation within an WEIM balancing authority, the cost of the greenhouse gas compliance obligation will be included in dispatching energy from resources located outside of the CAISO BAA that serve CAISO load as determined by the WEIM market optimization, but will otherwise be excluded. Thus, for resources located outside CAISO that do not serve CAISO load under the WEIM market optimization, the cost of the greenhouse gas compliance obligation will be excluded from dispatching energy from these resources.
- The energy produced by each generator within an WEIM balancing authority that serves CAISO load will be calculated by CAISO. Through a market results interface, CAISO will provide WEIM Participating Resource Scheduling Coordinators with summary reports listing the amounts of energy exported to CA as determined by the WEIM market optimization, which will be the basis of their greenhouse gas regulation compliance obligation with the California Air Resources Board (CARB).
- EIM Participating Resource Scheduling Coordinators can include the costs of their greenhouse gas regulation compliance obligation as an adder to their energy bids.

The WEIM has been designed so that the greenhouse gas compliance costs will not affect the locational marginal price in an WEIM balancing authority area. Rather, the market optimization will calculate the marginal cost difference between WEIM generation serving load in CAISO and serving load outside of CAISO. This difference will be the marginal greenhouse gas regulation compliance cost and will be the rate CAISO will use to calculate a payment to each generator in an WEIM balancing authority for its output that served CAISO imbalances. This payment will be funded through the price paid within CAISO for imbalance energy. CAISO will publish the marginal GHG compliance price.

11.3.3.2 Greenhouse Gas Methodology

The following methodology describes the real time optimal dispatch that accounts for the greenhouse gas allowance costs of resources in WEIM Entity BAAs outside California:

- The net imbalance energy export from all WEIM Entity BAAs outside California, exclusive of import/export imbalance energy schedules to non-EIM BAAs, is imbalance energy imported into the CAISO BAA and WEIM Entity BAAs inside California. This energy would be allocated optimally to supply resources in the WEIM Entity BAAs outside California.
- The net imbalance energy export allocation to supply resources in WEIM Entity BAAs outside California does not depend on the location of these resources; no shift factors are used in this allocation. The rationale is that this allocation is an accounting problem, which is irrelevant to the actual flow of energy on the network; in other words, supply resources in WEIM Entity BAAs outside California are only differentiated in terms of their respective energy and emission costs, as reflected by a greenhouse gas (GHG) bid adder, and not in terms of their physical location.
- On an hourly basis by T-75, the WEIM participating resource SC in an WEIM Entity BAA outside California may submit a single GHG bid capacity (MW) quantity and single GHG bid price (\$/MWh) expressing its willingness for its energy to be deemed delivered to the CAISO BAA and WEIM Entity BAAs inside California. The MW quantity is independent of the submitted energy bid curve.

- The GHG allocation will be limited by the GHG bid capacity, the optimal dispatch, and the difference between the upper economic limit (UEL) and the base schedule:

$$\text{GHG MW} = \max(0, \min(\text{GHG Bid}, \text{UEL} - \text{Base Schedule}, \text{Optimal Dispatch}))$$

for all WEIM participating resources in WEIM Entity BAAs outside California that submit a GHG bid.

The UEL is the top of the energy bid after accounting for applicable derates and capacity reservation for upward ancillary services (regulation up, and spinning and non-spinning reserves).

- EIM participating resource can, through its GHG bid, accomplish the objective of not being considered for WEIM transfers into the CAISO BAA and WEIM Entity BAAs inside California by bidding zero GHG MW. In addition, the CAISO will set the default value of the MW bid to zero. If an WEIM participating resource SC, does not submit a GHG bid, it will not be considered for WEIM transfer into the CAISO BAA and WEIM Entity BAAs inside California because the GHG MW quantity will be set to zero.
- Each WEIM Participating Resource in an WEIM Entity BAA outside California may submit a greenhouse gas bid adder that reflects the cost of procuring GHG allowances required by CARB for energy imports to California. This cost is added to the objective function for an efficient cost-effective imbalance energy dispatch.

- The CAISO will use a process similar to establishing the GHG cost adder included in the default energy bids of CAISO resources to determine WEIM Greenhouse Gas Maximum Cost. This includes a variable cost option and a negotiated rate option. The negotiated rate option may be used for new participating resources that do not have an emission rate used by the CARB in assessing GHG compliance obligations. However, rather than calculating a GHG cost curve, the CAISO will calculate a single daily value based upon the maximum heat rate of the WEIM participating resource.
- Under the variable cost option, on a daily basis, the CAISO will calculate a single WEIM GHG maximum cost. The CAISO calculates each unit's greenhouse gas emissions maximum cost based on the resource's highest registered average heat rate, the applicable California GHG allowance price, the resource's emission rate, and a unit conversion factor. Similar to the default energy bids of CAISO resources, there will be a 10% adder to the calculated cost. The formula is as follows:

$$\text{GHG Maximum Cost (\$/MWh)} = 110\% * \text{Heat rate (Btu/kWh)} * \text{GHG emission rate (MTCO}_2\text{e/MMBtu)} * \text{California GHG allowance index price (\$/MTCO}_2\text{e)} * \text{Unit conversion factor (1/1,000,000 MMBtu/Btu * 1000 Kwh/MWh)}$$

Where the heat rate used is the resource's highest registered average heat rate. For MSG resources, the heat rate used will be the highest average heat rate of any MSG configuration

- An WEIM participating resource SC must submit a GHG bid price equal to or less than its GHG maximum cost, but not less than zero. If an WEIM participating resource SC submits a GHG bid price above the GHG maximum cost of the WEIM participating resource, the GHG bid price will be set to the calculated GHG maximum cost. If a resource submits a MW quantity, but fails to submit a GHG bid price, the default will be the calculated GHG maximum cost.
- If an WEIM entity for an WEIM Entity BAA outside California allows economic participation in the FMM by imports on WEIM external interties, the imports may also submit an hourly GHG MW quantity and bid price. If the import is registered as a resource specific resource, the GHG emissions rate authorized by CARB for the specific resource will be used in the calculation of the maximum GHG cost. If the import is registered as a system resource, the carbon dioxide equivalent emission rate of the resource with the highest such rate in the WECC region and the applicable Greenhouse Gas Allowance Price Index will be used in the calculation of the maximum GHG cost.
- An WEIM participating resource SC may negotiate an alternative GHG maximum cost through the negotiated rate option procedures described in tariff section 39.7.1.3.1. An SC wishing to negotiate a GHG maximum cost may contact the CAISO by submitting a CIDI ticket with Case Record Type "Negotiated Rate Application" and Application Type "Other".
- If the net imbalance energy export from all WEIM Entity BAAs outside California as a group is negative or zero, there is no associated net imbalance energy export allocation or greenhouse

gas allowance cost. Otherwise the net imbalance energy export allocation constraint is binding and it may have a nonzero shadow price.

- Greenhouse gas allowance costs are reflected through the net imbalance energy export allocation shadow prices in the Locational Marginal Prices (LMPs) in the WEIM Entity BAAs outside California through a fourth component that is the same for all locations in these WEIM Entity BAAs. This LMP component can be seen as an adder to the marginal energy component that reflects the marginal cost of greenhouse gas allowance credits in WEIM Entity BAAs. This LMP component is absent for locations in the CAISO BAA and WEIM Entity BAAs inside California, because in these cases the cost of greenhouse gas allowance credits is included in the energy bids; hence it is already reflected in the marginal energy component.
- The absence of the fourth LMP component for locations in the CAISO BAA and WEIM Entity BAAs inside California results in no impact on existing Market Participants that would not have to modify their systems.
- As a result of the imbalance energy settlement, the CAISO will collect greenhouse gas allowance revenue for the net imbalance energy export from the WEIM Entity BAAs outside California at the respective net imbalance energy export allocation constraint shadow price, similarly to the congestion revenue. Distributing this revenue back to the optimal net imbalance energy export allocations in addition to the imbalance energy settlement at the LMP would adequately compensate supply resources in WEIM Entity BAAs outside California for their energy and greenhouse gas allowance costs without a need for any side payments and uplift.
- This methodology is very general and robust and it does not depend on the particular network configuration or how the various BAAs are interconnected. Therefore, it is readily expandable to any number of BAAs in the Full Network Model (FNM) with any number of WEIM Entity BAAs and any BAA interconnection pattern.
- The state of Washington also has a GHG compliance program. As an interim solution, CAISO allows supply resources located within the state of Washington to include the cost of allowances for Washington's GHG compliance program in their reference levels (default energy bids, default commitment costs) similar to how such costs are included for supply resources located within the state of California. See the BPM for Market Instruments, Attachments C, D, G, and K for more information.

11.3.3.2.1 Mathematical Formulation

To illustrate the method, consider a simple network configuration that consists only of the CAISO and a single WEIM Entity BAA. Furthermore, day-ahead and base schedules are ignored for simplicity, as well as ancillary services, transmission losses, and inter-temporal constraints, focusing on a single time period.

Notation

The following notation is used to formulate the problem:

i	Node index in CAISO.
j	Node index in WEIM Entity BAA.
k	Oriented transmission line index.
\forall	For all...
G_i	Imbalance energy dispatch for generator at node i .
G_{MINi}	Minimum capacity for generator at node i .
G_{MAXi}	Maximum capacity for generator at node i .
L_i	Distributed load forecast at node i .
C_i	Incremental energy bid for generator at node i .
C_{Gj}	GHG bid adder for generator at node j .
$S_{i,k}$	Shift Factor of power injection at node i on transmission line k .
F_k	Active power flow on transmission line k .
F_{MAXk}	Active power flow limit on transmission line k .
E	Net imbalance energy export from WEIM Entity BAA.
E_S	Net imbalance energy export surplus (cannot be allocated).
E_j	Net imbalance energy export from WEIM Entity BAA allocated to generator j .
E_{MAXj}	GHG quantity bid for generator at node j .
LMP_i	Locational Marginal Price at node i .
λ	Shadow price of power balance constraint.
μ_k	Shadow price of active power flow limit constraint on transmission line k .

- η Shadow price of net imbalance energy export allocation constraint.
- R_G Greenhouse gas allowance revenue.
- R_{Gj} Greenhouse gas allowance revenue distribution to generator at node j .
- M Penalty cost for net imbalance energy export surplus (E_S).
- ε A small tolerance.

Optimization Problem

The mathematical formulation is as follows:

$$\min \left(\sum_i C_i G_i + \sum_j (C_j G_j + C_{Gj} E_j) \right)$$

subject to:

$$\text{power balance: } \sum_i (G_i - L_i) + \sum_j (G_j - L_j) = 0$$

$$\text{transmission line flow: } F_k \equiv \sum_i S_{i,k} (G_i - L_i) + \sum_j S_{j,k} (G_j - L_j) \leq F_{MAXk}, \forall k$$

$$\text{net export allocation: } E \equiv \sum_j (G_j - L_j) \leq \sum_j E_j$$

$$\text{generator limits: } \begin{matrix} G_{MINi} \leq G_i \leq G_{MAXi}, \forall i \\ G_{MINj} \leq G_j \leq G_{MAXj}, \forall j \end{matrix}$$

$$\text{allocation limits: } 0 \leq E_j \leq \min(G_j, E_{MAXj}), \forall j$$

When the net export E is zero or negative (import), the net export allocation constraint is not binding and all allocations E_j are zero.

The LMPs are determined as follows:

$$LMP_i = \lambda + \sum_i S_{i,k} \mu_k, \forall i$$

$$LMP_j = \lambda + \sum_j S_{j,k} \mu_k + \eta, \forall j$$

Where the marginal loss component is missing because transmission losses are ignored.

The greenhouse gas allowance revenue is calculated as follows:

$$R_G = -\eta E$$

This revenue is then distributed to the optimal net imbalance energy export allocations as follows:

$$R_{Gj} = -\eta E_j$$

11.3.3.2.2 Implementation Details

With non-EIM BAAs in the FNM, the net export allocation E in the formulation of §11.3.3.2.1 is the net WEIM Transfer from all WEIM BAAs, i.e., the opposite of the WEIM Transfer for the CAISO BAA. When it is negative, i.e., an import to the WEIM BAAs from the CAISO BAA, the net export allocation constraint is irrelevant (not binding) and its shadow price is zero. When it is positive, i.e., an export from the WEIM BAAs to the CAISO BAA, the net export allocation constraint is binding and its shadow price may be nonzero. In the latter case, the positive WEIM Transfer from all WEIM BAAs must be allocated to WEIM Participating Resources. There should be no allocation to WEIM Non-Participating Resources because these resources do not bid in the EIM, thus they do not submit a GHG compliance bid.

Specifically, in RTUC, since the net base WEIM Transfer from all WEIM BAAs is zero, the positive 15-minute net WEIM Transfer must be allocated to the 15-minute schedule of WEIM Participating Resources. This allocation considers the entire 15-minute schedule and not only the incremental portion above the base schedule. This is because the energy from these resources is used for meeting imbalance energy requirements in the WEIM BAAs as well as supplying energy exports to the CAISO BAA. Therefore, it can be argued that these resources could potentially be decremented below their base schedule absorbing negative imbalance energy to meet imbalance energy requirements in the WEIM BAAs, while producing positive imbalance energy to supply exports to the CAISO BAAs. Hence, it is conceivable that the imbalance energy export allocation quantity that receives GHG compliance revenue at the 15-minute marginal GHG compliance price could exceed the 15-minute incremental imbalance energy that receives a 15-minute imbalance energy settlement, both on an WEIM Participating Resource level, and overall.

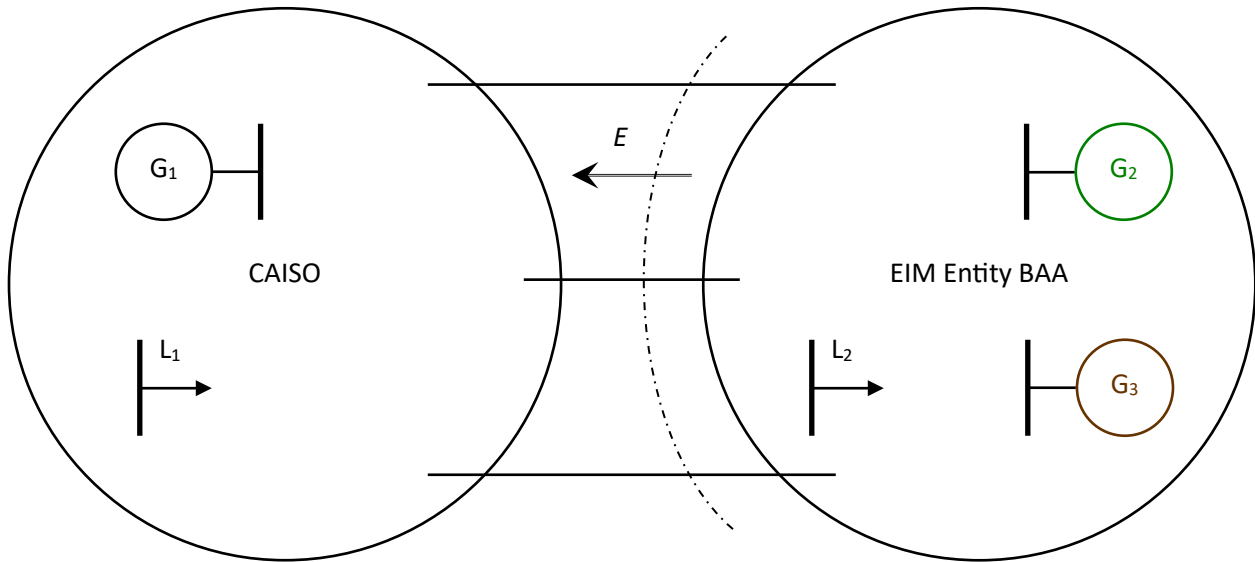
In RTD, the mathematical formulation is no different than in RTUC: the positive 5-minute net WEIM Transfer must be allocated to the 5-minute dispatch of WEIM Participating Resources. Similarly, to the RTUC allocation, the 5-minute allocation considers the entire 5-minute dispatch and not only the incremental portion above the 15-minute schedule or the base schedule. However, the settlement for the 5-minute GHG compliance revenue at the 5-minute marginal GHG compliance price is for the algebraic deviation of the imbalance energy export allocation between the 5-minute and the 15-minute quantities. If the 5-minute allocation is lower than the 15-minute allocation, the participant will buy back the difference at the 5-minute marginal GHG compliance price. Nevertheless, since the imbalance energy export allocation is optimally determined in both RTUC and RTD based on the GHG compliance bids, the net settlement will not result in a financial loss. The participant will be required to report to CARB only the 5-minute imbalance energy export allocations from RTD, for which they may need to acquire emission credits.

11.3.3.2.3 Examples

The following examples show the application of this method:

Example 1

One generator and a load are in the CAISO, and two generators and a load are in the WEIM Entity BAA, as shown in the figure below.



The power transfer (E) between the BAAs is limited to 100MW. The resource data is as follows:

Load	Forecast (MW)
L ₁	200
L ₂	50

Generator	Minimum (MW)	Maximum (MW)	Energy Bid (\$/MWh)	GHG Compliance Bid Adder (\$/MWh)
G ₁	0	300	50	-
G ₂	0	200	35	0
G ₃	0	200	30	6

Generator G_2 is a non-emitting resource with a GHG compliance bid adder of zero, whereas G_3 is an emitting resource with a GHG compliance bid adder of \$6.00. They are both less expensive than G_1 . Therefore, the power export from the WEIM Entity BAA to the CAISO is binding at the optimal solution at 100MW. The optimal dispatch and export allocation are as follows:

Resource	Dispatch (MW)	Export Allocation (MW)	LMP (\$/MWh)
G1	100	-	50
G2	100	100	30
G3	50	0	30
L1	200	-	50
L2	50	-	30

Example 1: $\mu = -\$15/\text{MWh}$; $\eta = -\$5/\text{MWh}$

Generator G_3 is the least expensive resource for serving Load L_2 , and as such it sets the LMP in the WEIM Entity Area to \$30/MWh. However, for serving Load L_1 , a \$6/MWh additional GHG compliance cost would be incurred to G_3 , making G_2 more effective for that purpose. Consequently, G_2 is dispatched with its energy all exported to the CAISO at the limit of the power transfer capability. The balance of 100MW of L_1 can only be served by G_1 , which sets the LMP in the CAISO to \$50/MWh.

The LMP difference of \$20/MWh is made up by the marginal congestion cost of \$15/MWh and the marginal GHG compliance cost of \$5/MWh. The marginal congestion cost can be easily verified if the power transfer limit is relaxed by 1MW to 101MW, in which case one additional MWh from G_2 will displace 1MWh from G_1 for a net benefit of \$15. The marginal GHG compliance cost can be easily verified if the export allocation (which carries the GHG compliance cost) is relaxed by 1 MW to 99MW, in which case one additional MWh from G_3 will displace 1MWh from G_2 for a net benefit of \$5. It is interesting to note that there is a non-zero marginal GHG compliance cost in the optimal solution even when all the exported energy is allocated to the non-emitting resource G_2 who bid zero. This is because the cost of that export to California is \$5/MWh higher than otherwise available energy from G_3 .

The marginal congestion cost of \$15/MWh and the marginal GHG compliance cost of \$5/MWh on a 100MWh energy export result in a congestion revenue of \$1,500 and a GHG compliance revenue of \$500, respectively. Assuming that the GHG compliance revenue is distributed to the optimal export allocations, the settlement is as follows:

Resource	Energy Cost	GHG Compliance Cost	Total Cost	Energy Payment	GHG Compliance Payment	Total Payment
G ₁	\$5,000	-	\$5,000	\$5,000	-	\$5,000
G ₂	\$3,500	\$0	\$3,500	\$3,000	\$500	\$3,500
G ₃	\$1,500	\$0	\$1,500	\$1,500	\$0	\$1,500
L ₁				-\$10,000		
L ₂				-\$1,500		
Congestion Revenue				\$1,500		
GHG Compliance Revenue				\$500		

Where it is assumed that GHG compliance costs for G₁ are included in the energy bid (cost) and recovered through the energy payment, and as such they are not shown explicitly. It can be seen in the settlement results above that the total payment to each generator is sufficient to cover the respective energy and GHG compliance costs.

Example 2

This is a variation on the first example where G₃ reduces its bid price to \$28 to become a more competitive exporter to the CAISO compared to G₂, taking into account the additional GHG compliance bid of \$6/MWh. In this case, the optimal dispatch and export allocation are as follows:

Resource	Dispatch (MW)	Export Allocation (MW)	LMP (\$/MWh)
G ₁	100	-	50
G ₂	0	0	28
G ₃	150	100	28

L1	200	-	50
L2	50	-	28

Example 2: $\mu = -\$16/\text{MWh}$; $\eta = -\$6/\text{MWh}$

G3 is the least expensive resource for serving L2, and as such it sets the LMP in the WEIM Entity Area to \$28/MWh. It is also the least expensive resource for serving L1 at \$34/MWh (including the \$6/MWh GHG compliance cost). Consequently, G3 is dispatched at 150MW with 100MW exported to the CAISO at the limit of the power transfer capability. The balance of 100MW of L1 can only be served by G1, which sets the LMP in the CAISO to \$50/MWh.

The LMP difference of \$22/MWh is made up by the marginal congestion cost of \$16/MWh and the marginal GHG compliance cost of \$6/MWh. The marginal congestion cost can be easily verified if the power transfer limit is relaxed by 1MW to 101MW, in which case one additional MWh from G3 will displace 1MWh from G1 for a net benefit of \$16. The marginal GHG compliance cost can be easily verified if the export allocation (which carries the GHG allowance cost) is relaxed by 1 MW to 99MW, in which case 1MWh from G3 will not incur GHG allowance costs for a benefit of \$6.

The marginal congestion cost of \$16/MWh and the marginal GHG compliance cost of \$6/MWh on a 100MWh energy export result in a congestion revenue of \$1,600 and a GHG compliance revenue of \$600, respectively. Assuming that the GHG compliance revenue is distributed to the optimal export allocations, the settlement is as follows:

Resource	Energy Cost	GHG Compliance Cost	Total Cost	Energy Payment	GHG Compliance Payment	Total Payment
G ₁	\$5,000	-	\$5,000	\$5,000	-	\$5,000
G ₂	\$0	\$0	\$0	\$0	\$0	\$0
G ₃	\$4,200	\$600	\$4,800	\$4,200	\$600	\$4,800
L ₁				-\$10,000		
L ₂				-\$1,400		
Congestion Revenue				\$1,600		

GHG Compliance Revenue				\$600		
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It can be seen in the settlement results above that the total payment to each generator is sufficient to cover the respective energy and GHG allowance costs.

Example 3

This is a variation on the second example where the available maximum capacity of G3 is reduced to 75MW in addition to reduced bid price of \$28/MWh as in Example 2. In this case, G2 is dispatched to make up for the remaining 75MW and the optimal dispatch and export allocation are as follows:

Resource	Dispatch (MW)	Export Allocation (MW)	LMP (\$/MWh)
G ₁	100	-	50
G ₂	75	75	29
G ₃	75	25	29
L1	200	-	50
L2	50	-	29

Example 3: $\mu = -\$15/\text{MWh}$; $\eta = -\$6/\text{MWh}$

G3 is the least expensive resource for serving L2; one additional MW of L2 will divert 1MW of G3 export to L2 saving \$6/MWh on GHG compliance costs and that export will be made up by one additional MW from G2 at a net cost of \$29/MWh, which is the LMP in the WEIM Entity BAA. The balance of 100MW of L1 can only be served by G1, which sets the LMP in the CAISO to \$50/MWh.

The LMP difference of \$21/MWh is made up by the marginal congestion cost of \$15/MWh and the marginal GHG compliance cost of \$6/MWh. The marginal congestion cost can be easily verified if the power transfer limit is relaxed by 1MW to 101MW, in which case one additional MWh from G2 will displace 1MWh from G1 for a net benefit of \$15. The marginal GHG compliance cost can be easily verified if the export allocation (which carries the GHG compliance cost) is relaxed by 1 MW to 99MW, in which case 1MWh from G3 will not incur GHG compliance costs for a benefit of \$6.

The marginal congestion cost of \$15/MWh and the marginal GHG compliance cost of \$6/MWh on a 100MWh energy export result in a congestion revenue of \$1,500 and GHG compliance revenue of \$600,

respectively. Assuming that the GHG compliance revenue is distributed to the optimal export allocations, the settlement is as follows:

Resource	Energy Cost	GHG Compliance Cost	Total Cost	Energy Payment	GHG Compliance Payment	Total Payment
G ₁	\$5,000	-	\$5,000	\$5,000	-	\$5,000
G ₂	\$2,625	\$0	\$2,625	\$2,175	\$450	\$2,625
G ₃	\$2,100	\$150	\$2,250	\$2,175	\$150	\$2,325
L ₁				-\$10,000		
L ₂				-\$1,450		
Congestion Revenue				\$1,500		
GHG Compliance Revenue				\$600		

It can be seen in the settlement results above that the total payment to each generator is sufficient to cover the respective energy and GHG compliance costs.

Example 4

This is a variation on the third example where a new resource G4 is introduced in the WEIM Entity BAA with a generating capacity of 100MW, a GHG compliance bid adder of \$3.00/MWh, and an energy bid of \$30/MWh, while the power transfer capability is increased to 300MW. Therefore, the resource data is as follows:

Generator	Minimum (MW)	Maximum (MW)	Energy Bid (\$/MWh)	GHG Compliance Bid Adder (\$/MWh)
G ₁	0	300	50	-
G ₂	0	200	35	0
G ₃	0	75	28	6
G ₄	0	100	30	3

The purpose of this example is to show that the LMP in the CAISO would include the GHG compliance costs for imports; this effect was masked in the previous examples because the more expensive resource G1 was setting the LMP in the CAISO. In this case, without a binding power transfer limit, G2, G3 and G4 are dispatched to serve both loads L1 and L2. The optimal dispatch and export allocation are as follows:

Generator	Dispatch (MW)	Export Allocation (MW)	LMP (\$/MWh)
G ₁	0	-	35
G ₂	75	75	29
G ₃	75	25	29
G ₄	100	100	29

Example 4: $\mu = \$0/\text{MWh}$; $\eta = -\$6/\text{MWh}$

G3 is the least expensive resource for serving L2 and G4 is the least expensive resource for serving L1; consequently, both resources are dispatched at their maximum capacity. G2 is marginal for serving L1 and sets the LMP in the CAISO to \$35/MWh. One additional MW of L2 will divert 1MW of G3 export to L2 saving \$6/MWh on GHG compliance costs and that export will be made up by one additional MW from G2 at a net cost of \$29/MWh, which is the LMP in the WEIM Entity BAA.

Since there is no transmission congestion, the LMP difference of \$6/MWh amounts to the marginal GHG compliance cost of \$6/MWh. The marginal GHG compliance cost can be easily verified if the export allocation (which carries the GHG compliance cost) is relaxed by 1 MW to 199MW, in which case 1MWh from G3 will not incur GHG compliance costs for a benefit of \$6.

The marginal GHG compliance cost of \$6/MWh on a 200MWh energy export results in a GHG compliance revenue of \$1,200. Assuming that the GHG compliance revenue is distributed to the optimal export allocations, the settlement is as follows:

Resource	Energy Cost	GHG Compliance Cost	Total Cost	Energy Payment	GHG Compliance Payment	Total Payment
G ₁	\$0		\$0	\$0		\$0

G ₂	\$2,625	\$0	\$2,625	\$2,175	\$450	\$2,625
G ₃	\$2,100	\$150	\$2,250	\$2,175	\$150	\$2,325
G ₄	\$3,000	\$300	\$3,300	\$2,900	\$600	\$3,500
L ₁				-\$7,000		
L ₂				-\$1,450		
Congestion Revenue				\$0		
GHG Compliance Revenue				\$1,200		

It can be seen in the settlement results above that the total payment to each generator is sufficient to cover the respective energy and GHG compliance costs. Furthermore, all export allocations receive the marginal GHG compliance cost irrespective of the resource’s GHG compliance bid.

11.3.3.3 Impact of WEIM Transfer Cost on LMPs

The impact of WEIM Transfer Cost on LMPs is *de minimus* since the maximum of WEIM Transfer schedule cost is less than \$0.01. Thus the transfer cost will be included in the Marginal Cost of Congestion and not explicitly settled.

11.3.3.4 Marginal Cost of Congestion (MCC)

MCC is the component of the Locational Marginal Price that reflects the sensitivity of relieving congestion by increasing supply at the location balanced by an equal increase in demand at the reference bus. The impact of the WEIM Transfer Cost on the LMP will be included in the MCC calculation to help address the issues concerning allocation of congestion revenues at interties.

Notation:

The following notation is used in this section:

- i* Node index.
- j, k, r* BAA indexes; zero (0) is used for CISO.

l	Intertie or Energy Transfer schedule index; in the latter case, it is the corresponding ETSR index (ETSR pair for Energy Transfers between BAAs in the WEIM Area).
m	Transmission constraint index.
n	Component index in transmission constraint m .
\forall	For all...
\in	Member of...
\wedge	...and...
N_m	Set of components for transmission constraint m (only one component for simple constraints, but there may be multiple components for nomograms).
EIM	Set of CISO and all WEIM BAAs; the WEIM Area.
BAA_j	Set of nodes in BAA j .
$L_{j,k}$	Set of interties between BAAs j and k .
LPF_i	Loss penalty factor at node i .
$LPF_{j,k,l}$	Loss penalty factor at the Scheduling Point for import/export schedule l to/from BAA j from/to BAA k .
$a_{m,n}$	Coefficient for component n of transmission constraint m (1.0 for simple constraints with a single component).
$SF_{m,n,i}$	Shift factor for injection at node i on component n of transmission constraint m .
$SF_{m,n,j,k,l}$	Shift factor for import/export schedule l to/from BAA j from/to BAA k on component n of transmission constraint m .
λ	Shadow price of the system power balance constraint.
λ_j	Shadow price of the power balance constraint for BAA j .
φ_j	Shadow price of the energy transfer distribution constraint for BAA j .
μ_m	Shadow price of transmission constraint m .
ψ	Shadow price of GHG regulation export allocation constraint.
$\zeta_{j,k,l}$ $\eta_{j,k,l}$	Shadow prices of upper/lower scheduling limits on intertie l to BAA j from BAA k , on interties with energy transfers.
ν_j, ξ_j	Shadow prices of upper/lower bound constraints on WEIM transfer of WEIM BAA j .
$\rho_{j,k,l}, \sigma_{j,k,l}$	Shadow prices of upper/lower bound constraints on export energy transfer schedule l from BAA j to BAA k .
LMP_i	LMP at node i .
$LMP_{j,k,l}$	SP-TIE LMP for import/export schedule l to/from BAA j from/to BAA k .

$SMEC$	System marginal energy cost (SMEC).
MCL	Marginal cost of losses (MCL).
MCC	Marginal congestion cost (MCC).
MGC	Marginal greenhouse gas regulation cost (MGC).
$MCC_{i,r}$	MCC component for BAA r at node i .
$MCC_{j,k,l,r}$	MCC component for BAA r for import/export schedule l to/from BAA j from/to BAA k .
b_m	Power flow limit for transmission constraint m .
T_j	Net WEIM Transfer of BAA j ; positive for export and negative for import.
$ET_{j,k,l}$	Export energy transfer (ETSR) schedule l from BAA j to BAA k .
R_m	Congestion revenue from transmission constraint m .
R_{Tj}	Congestion revenue from WEIM transfer scheduling limits for BAA j .
$R_{j,k,l}$	Congestion revenue from ETSR $ET_{j,k,l}$.
R_{Dj}	Congestion revenue from the WEIM transfer distribution constraint for BAA j .
R_D	Congestion revenue from all WEIM transfer distribution constraints.
$R_{CTj,k,l}$	Congestion revenue from the transmission cost of the energy transfer schedule l between BAAs j and k .
$R_{ETj,k,l}$	Congestion revenue from the upper/lower bound constraints on ETSR $ET_{j,k,l}$.
$R_{SLj,k,l}$	Congestion revenue from the upper/lower scheduling limits on intertie l to BAA j from BAA k , on interties with energy transfers.
$f_{m,r}$	Congestion revenue distribution factor from transmission constraint m on BAA r .
$f_{Tj,r}$	Congestion revenue distribution factor from WEIM transfer scheduling limits for BAA j on BAA r .
$f_{CTj,k,l,r}$	Congestion revenue distribution factor from transmission cost of the energy transfer schedule l between BAAs j and k on BAA r .
$f_{ETj,k,l,r}$	Congestion revenue distribution factor from upper/lower bound constraints on export energy transfer schedule l from BAA j to BAA k on BAA r .
$f_{SLj,k,l,r}$	Congestion revenue distribution factor from upper/lower scheduling limits on intertie l to BAA j from BAA k on BAA r .
f_{Dr}	Distribution factor for the shadow price of the energy transfer distribution constraint of any BAA in the WEIM Area on BAA r .

11.3.3.4.1 Congestion Revenue Allocation (MCC Decomposition)

The LMP decomposition is used in neutrality cost allocation. Before presenting the MCC decomposition, it is useful to present all LMP components first. The LMP can be decomposed to the following components:

- the System marginal energy cost (SMEC) component;
- the marginal cost of losses (MCL) component;
- the marginal congestion cost (MCC) component; and
- the marginal greenhouse gas cost (MGC) component.

These LMP components are as follows:

$$\begin{aligned}
 LMP_i &= SMEC + MLC_i + MCC_i + MGC_i, & \forall i \in BAA_j \wedge j \in EIM \\
 LMP_{j,k,l} &= SMEC + MLC_{j,k,l} + MCC_{j,k,l} + MGC_{j,k,l}, & \forall j \in EIM \wedge k \neq j \wedge l \in L_{j,k} \\
 SMEC &= \lambda \\
 MLC_i &= \lambda \left(\frac{1}{LPF_i} - 1 \right) \\
 MCC_i &= - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,i} \mu_m \\
 MGC_i &= 0 \\
 \left. \begin{aligned}
 MLC_i &= (\lambda + \lambda_j - \psi) \left(\frac{1}{LPF_i} - 1 \right) \\
 MCC_i &= \lambda_j - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,i} \mu_m \\
 MGC_i &= -\psi
 \end{aligned} \right\}, & \forall i \in BAA_0 \\
 \left. \begin{aligned}
 MLC_{0,k,l} &= \lambda \left(\frac{1}{LPF_{0,k,l}} - 1 \right) \\
 MCC_{0,k,l} &= - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,0,k,l} \mu_m - \zeta_{0,k,l} + \eta_{0,k,l} \\
 MGC_{0,k,l} &= 0
 \end{aligned} \right\}, & \forall k > 0 \wedge l \in L_{j,k} \\
 \left. \begin{aligned}
 MLC_{j,k,l} &= (\lambda + \lambda_j - \psi) \left(\frac{1}{LPF_{j,k,l}} - 1 \right) \\
 MCC_{j,k,l} &= \lambda_j - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,j,k,l} \mu_m - \zeta_{j,k,l} + \eta_{j,k,l} \\
 MGC_{j,k,l} &= -\psi
 \end{aligned} \right\}, & \forall j \in EIM \wedge j > 0 \wedge k \notin EIM \wedge l \in L_{j,k}
 \end{aligned}$$

Where the MCC contributions from FRP requirement constraints are not shown for simplicity.

For the MCC Decomposition, the allocation of congestion revenue to corresponding BAAs in the WEIM area is based on the congestion revenue distribution factors set up for each constraint whose shadow

price contributes to the MCC. The congestion revenue distribution factors for BAA constraints of all types are defined in the Master File (MF) and these congestion distribution factors are used in the market.

Example:

BAA	Intertie Schedule/EIM Transfer/Constraints	Congestion Revenue Distribution Factor
BAA 1	Tie 1-Scheduling limit	1
BAA 1	Tie 1-EIM transfer: ETSR (BAA 1)	0.5
BAA 2	Tie 1- WEIM transfer ETSR (BAA 2)	0.5

For transmission constraints that do not affect energy transfers (generic transmission constraint m), the congestion revenue is allocated as follows:

$$R_m = \mu_m b_m = \sum_{r \in EIM} f_{m,r} \mu_m b_m, \quad \forall m$$

Where:

$$\sum_{r \in EIM} f_{m,r} = 1, \quad \forall m$$

This is accomplished by decomposing the corresponding MCC contributions using the congestion revenue distribution factors, as follows:

$$\begin{aligned} - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,i} \mu_m &= - \sum_{r \in EIM} \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,i} f_{m,r} \mu_m, \quad \forall i \in BAA_j \wedge j \in EIM \\ - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,j,k,l} \mu_m &= - \sum_{r \in EIM} \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,j,k,l} f_{m,r} \mu_m, \\ &\quad \forall j \in EIM \wedge k \notin EIM \wedge l \in L_{j,k} \end{aligned}$$

This is equivalent to distributing the transmission constraint shadow price across BAAs in the WEIM Area. Typically, the congestion revenue distribution factors for these constraints allocate the congestion revenue 100% to a single BAA, the one the constraint resides in, or if it is an intertie constraint, the BAA at the intertie definition side where the constraint is enforced.

If the constraint is located in a non-EIM BAA (e.g., Rate of Change constraints or WEIM flow limits in BPAT pursuant to the Coordinated Transmission Agreement), the congestion revenue distribution factors for these constraints allocate the congestion revenue among the WEIM Area BAAs responsible for the limits in proportion to the transmission rights made available by the relevant WEIM BAAs through the non-EIM BAA, which are generally those WEIM BAAs that have made transmission rights through the non-EIM BAA available to the WEIM model.

EIM BAA	Non-EIM BAA	Transmission Rights (MW)			CDF
		Import	Export	Total	
PACW	BPAT	400	400	800	0.4
PSEI	BPAT	300	300	600	0.3
PGE	BPAT	300	300	600	0.3

This methodology can be extended to the shadow prices of the WEIM transfer scheduling limits (ν or ξ). The congestion revenue from the WEIM transfer scheduling limits is allocated as follows:

$$R_{T_j} = -(-\nu_j + \xi_j) T_j = - \sum_{r \in EIM} f_{T_j,r} (-\nu_j + \xi_j) T_j, \quad \forall j \in EIM \wedge j > 0$$

Where:

$$\sum_{r \in EIM} f_{T_j,r} = 1, \quad \forall j \in EIM \wedge j > 0$$

This is accomplished by decomposing the corresponding MCC contributions using the congestion revenue distribution factors, as follows:

$$-\nu_j + \xi_j = \sum_{r \in EIM} f_{T_j,r} (-\nu_j + \xi_j), \quad \forall j \in EIM \wedge j > 0$$

The congestion revenue distribution factors for these constraints allocate the congestion revenue 100% to the BAA for which the constraint is formulated:

$$\left. \begin{array}{l} f_{T_j,r} = 1 \quad \therefore r = j \\ f_{T_j,r} = 0 \quad \therefore r \neq j \end{array} \right\}, \quad \forall j \in EIM \wedge j > 0$$

MCC contributions from FRP requirement constraints for specific BAAs (due to the dependency on the available net import/export capability) are similarly distributed 100% to the BAA for which the constraint is formulated.

The only remaining MCC component after the allocation of the shadow prices of generic transmission constraints (μ), WEIM transfer scheduling limits (ν or ξ), and FRP requirement constraints, is the shadow price of the WEIM transfer distribution constraint (φ). The same allocation process is used, but instead of allocating the congestion revenue at the BAA level, the allocation is performed for each BAA intertie instead. The congestion revenue collected at the BAA level through φ is equal overall to the congestion revenue collected from each intertie with ETSRs due to the ETSR transmission cost (CT), the shadow price of the ETSR schedule limit (ρ or σ), and the intertie scheduling limit (ISL or ITC) shadow price (η or ζ).

$$R_D = - \sum_{j \in EIM} \varphi_j T_j = \sum_{\substack{j, k \in EIM \\ j \neq k}} \sum_{l \in L_{j,k}} R_{j,k,l}$$

The congestion revenue from each ETSR ($R_{j,k,l}$) can be separated to its contributions from the ETSR transmission cost (CT), the shadow price of the ETSR schedule limit (ρ or σ), and the intertie scheduling limit shadow price (η or ζ) as follows:

$$\left. \begin{aligned} R_{j,k,l} &= R_{CTj,k,l} + R_{ETj,k,l} + R_{SLj,k,l} \\ R_{CTj,k,l} &= CT_{j,k,l} ET_{j,k,l} \\ R_{ETj,k,l} &= (\rho_{j,k,l} - \sigma_{j,k,l}) ET_{j,k,l} \\ R_{SLj,k,l} &= -(\zeta_{j,k,l} - \eta_{j,k,l} - \zeta_{k,j,l} + \eta_{k,j,l}) ET_{j,k,l} \end{aligned} \right\}, \quad \forall j, k \in EIM \wedge k \neq j \wedge l \in L_{j,k}$$

Each of these contributions can be distributed to BAAs in the WEIM Area using configurable distribution factors as follows:

$$\left. \begin{aligned} R_{CTj,k,l} &= \sum_{r \in EIM} f_{CTj,k,l,r} CT_{j,k,l} ET_{j,k,l} \\ R_{ETj,k,l} &= \sum_{r \in EIM} f_{ETj,k,l,r} (\rho_{j,k,l} - \sigma_{j,k,l}) ET_{j,k,l} \\ R_{SLj,k,l} &= - \sum_{r \in EIM} f_{SLj,k,l,r} (\zeta_{j,k,l} - \eta_{j,k,l}) ET_{j,k,l} + \sum_{r \in EIM} f_{SLk,j,l,r} (\zeta_{k,j,l} - \eta_{k,j,l}) ET_{j,k,l} \end{aligned} \right\}, \quad \forall j, k \in EIM \wedge k \neq j \wedge l \in L_{j,k}$$

Where:

$$\left. \begin{aligned} \sum_{r \in EIM} f_{CTj,k,l,r} &= 1 \\ \sum_{r \in EIM} f_{ETj,k,l,r} &= 1 \\ \sum_{r \in EIM} f_{SLj,k,l,r} &= 1 \end{aligned} \right\}, \quad \forall j, k \in EIM \wedge k \neq j \wedge l \in L_{j,k}$$

The congestion distribution factors for the ETSR transmission cost ($f_{CTj,k,l,r}$) are set to 50% for each of the two BAAs of the associated ETSR. The congestion distribution factors for the ETSR scheduling limits ($f_{ETj,k,l,r}$) are set to 50% for each of the two BAAs of the associated ETSR if they have transmission rights through the intertie (typical case for ETSRs between WEIM BAAs), or 100% to the BAA that has transmission rights to, but not through, the intertie (typical case for ETSRs between an WEIM BAA and the CISO). The congestion distribution factors for the intertie scheduling limit (ISL or ITC) ($f_{SLj,k,l,r}$) are set to 100% for the BAA that manages the limit.

The total congestion revenue from all interties can be distributed to the BAAs in the WEIM Area as follows:

$$\begin{aligned}
R_D &= \sum_{r \in EIM} R_{Dr} = \sum_{\substack{j,k \in EIM \\ j \neq k}} \sum_{l \in L_{j,k}} R_{j,k,l} = \sum_{\substack{j,k \in EIM \\ j \neq k}} \sum_{l \in L_{j,k}} (R_{CTj,k,l} + R_{ETj,k,l} + R_{SLj,k,l}) \\
&= \sum_{\substack{j,k \in EIM \\ j \neq k}} \sum_{l \in L_{j,k}} \sum_{r \in EIM} (f_{CTj,k,l,r} CT_{j,k,l} + f_{ETj,k,l,r} (\rho_{j,k,l} - \sigma_{j,k,l}) \\
&\quad - f_{SLj,k,l,r} (\zeta_{j,k,l} - \eta_{j,k,l}) + f_{SLk,j,l,r} (\zeta_{k,j,l} - \eta_{k,j,l})) ET_{j,k,l} \\
&= \sum_{r \in EIM} \sum_{\substack{j,k \in EIM \\ j \neq k}} \sum_{l \in L_{j,k}} (f_{CTj,k,l,r} CT_{j,k,l} + f_{ETj,k,l,r} (\rho_{j,k,l} - \sigma_{j,k,l}) \\
&\quad - f_{SLj,k,l,r} (\zeta_{j,k,l} - \eta_{j,k,l}) + f_{SLk,j,l,r} (\zeta_{k,j,l} - \eta_{k,j,l})) ET_{j,k,l} \Rightarrow \\
R_{Dr} &= \sum_{\substack{j,k \in EIM \\ j \neq k}} \sum_{l \in L_{j,k}} (f_{CTj,k,l,r} CT_{j,k,l} + f_{ETj,k,l,r} (\rho_{j,k,l} - \sigma_{j,k,l}) - f_{SLj,k,l,r} (\zeta_{j,k,l} - \eta_{j,k,l}) \\
&\quad + f_{SLk,j,l,r} (\zeta_{k,j,l} - \eta_{k,j,l})) ET_{j,k,l}, \quad \forall r \in EIM
\end{aligned}$$

Therefore, all shadow prices of the WEIM Transfer distribution constraints can be decomposed to BAA contributions using a global distribution vector as follows:

$$\varphi_j = \sum_{r \in EIM} f_{Dr} \varphi_j, \quad \forall j \in EIM$$

Where:

$$f_{Dr} = \frac{R_{Dr}}{R_D}, \quad \forall r \in EIM$$

And:

$$\sum_{r \in EIM} f_{Dr} = 1$$

Finally, all BAA MCC contributions can be summed up to yield the MCC decomposition to BAA components:

$$\begin{aligned}
MCC_{i,r} &= - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,i} f_{m,r} \mu_m, \quad \forall i \in BAA_0 \\
MCC_{i,r} &= - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,i} f_{m,r} \mu_m + f_{Tj,r} (-v_j + \xi_j) + f_{Dr} \varphi_j, \\
&\quad \forall i \in BAA_j \wedge j \in EIM \wedge j > 0 \\
MCC_{0,k,l,r} &= - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,0,k,l} f_{m,r} \mu_m - f_{SLO,k,l,r} (\zeta_{0,k,l} + \eta_{0,k,l}), \quad \forall k > 0 \wedge l \in L_{j,k}
\end{aligned}$$

$$MCC_{j,k,l,r} = - \sum_m \sum_{n \in N_m} a_{m,n} SF_{m,n,j,k,l} f_{m,r} \mu_m - f_{SLj,k,l,r} (\zeta_{j,k,l} + \eta_{j,k,l}) + f_{Tj,r} (-v_j + \xi_j) + f_{Dr} \varphi_j, \\ \forall j \in EIM \wedge j > 0 \wedge k \notin EIM \wedge l \in L_{j,k}$$

Where the contributions from FRP requirement constraints are not shown for simplicity.

11.3.3.5 Marginal Cost of Losses (MCL)

Marginal Cost of Losses is a component of the Locational Marginal price that considers the System Marginal Energy Cost (SMEC), and the Loss Penalty Factor (LPF) at the PNode (Physical Node). The MCL at a particular PNode may be positive or negative, depending on the submitted bids. At a Particular PNode, the MCL accounts for the real power marginal losses as measured between a CNode (Connection Node) and the distributed load reference. The LPF is derived by the market optimization software (IFM/RTM).

11.3.3.5.1 Marginal Cost of Losses Decomposition as LMP Component

The MCL as a component of the LMP is calculated on the Node price and the SP-Tie Price. Mathematically expressed as below:

Node Price:

$$LMP_i = SMEC + MCL_i + MCC_i + MGC_i, \quad \forall i \in BAA_j \wedge j \in EIM$$

SP-Tie Price:

$$LMP_{j,k,l} = SMEC + MCL_{j,k,l} + MCC_{j,k,l} + MGC_{j,k,l}, \quad \forall j \in EIM \wedge k \neq j \wedge l \in L_{j,k} \\ SMEC = \lambda$$

A. CAISO Nodal MCL Component

The MCL component of the LMP at any bus i within the ISO BAA is calculated in the Real-Time Market (RTM) and represented mathematically as below:

$$SMEC = \lambda$$

$$MCL_i = \lambda \left(\frac{1}{LPF_i} - 1 \right) \forall i \in BAA_0$$

B. EIM Nodal MCL Component

The Nodal MCL component of the LMP at any bus i within an WEIM BAA is calculated in the RTM. This component takes the BAA j power balance shadow price λ_j and GHG shadow price ψ . It is mathematically represented as below:

$$SMEC = \lambda$$

$$MCL_i = (\lambda + \lambda_j - \psi) \left(\frac{1}{LPF_i} - 1 \right) \forall i \in BAA_j \wedge j \in EIM \wedge j > 0$$

C. ISO SP-Tie MCL Component

This is the MCL component of the LMP at a scheduling point (SP) within the ISO BAA for import/export l to/from ISO BAA from/to BAA k . It is mathematically represented as below:

$$SMEC = \lambda$$

$$MCL_{0,k,l} = \lambda \left(\frac{1}{LPF_{0,k,l}} - 1 \right) \forall k > 0 \wedge l \in L_{j,k}$$

D. EIM SP-Tie MCL Component

This is the MCL component of the LMP at a scheduling point within the WEIM BAA j for import/export l to/from WEIM BAA j from/to BAA k . This is calculated with BAA j power balance shadow price λ_j and GHG shadow price ψ . It is mathematically represented as below:

$$SMEC = \lambda$$

$$MCL_{j,k,l} = (\lambda + \lambda_j - \psi) \left(\frac{1}{LPF_{j,k,l}} - 1 \right)$$

$$\forall j \in EIM \wedge j > 0 \wedge k \notin EIM \wedge l \in L_{j,k}$$

11.3.4 Using WEIM Available Balancing Capacity to Resolve Infeasible Power Balance Conditions in WEIM BAAs

The WEIM entity scheduling coordinator may identify any available balancing capacity that it wishes the Western Energy Imbalance Market to utilize to address any infeasibility in its balancing authority area in the fields labelled as “regulation up” and “regulation down” of its resource plans.

11.3.4.1 Available Capacity Bid Curve

EIM participating resources and non-participating resources for which the WEIM Entity Scheduling Coordinator has identified WEIM Upward Available Balancing Capacity and/or WEIM Downward Available Capacity in the WEIM resource plan submission can provide available balancing capacity to designated EIM.

To be able to dispatch any available balancing capacity, in applicable EIM, the market optimization requires the WEIM Base schedule, and an Energy Bid Curve from the resource identified as available balancing capacity by the WEIM Scheduling Coordinator. In order to make the designated available balancing capacity participate in the applicable WEIM area, the WEIM participating resources scheduling coordinator must also submit an economic bid for that resource for the relevant trading hour. For non-participating resources, the WEIM entity scheduling coordinator established Default Energy Bids with the CAISO consistent with the rules in Section 39.7.1 of the CAISO tariff. The CAISO creates Energy Bid Curves based on the Default Energy Bids created for non-participating resources. The allocation of the energy bid portions to ancillary services and available balancing capacity is described below, and is done differently than for CAISO’s resources (see 4.2.5 in BPM for Market Operations).

Energy Bid Curves for WEIM Available Balancing Capacity

For each trading hour, CAISO determines the resource’s overall available capacity based on any updated outage information. Then CAISO determines if the submitted Energy Bid Curve for participating resources or the Default Energy Bid Curve for non-participating resources is sufficient to cover all the services identified in the Resource Plan in the following priority:

- 1) If the WEIM Resource Plan includes WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements, the Energy Bid portion equal to the base WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements schedule (MW) just below the URL (if base WEIM Upward or Downward Available Balancing Capacity schedules are specified) or the Upper Operating Limit (UOL), whichever lower, and above the base WEIM Energy Base Schedule is reserved for WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements. If there is insufficient capacity to allocate all of the base WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements schedule, the latter shall be reduced accordingly.
- 2) If the WEIM Resource Plan includes Non-Spinning Reserve, the Energy Bid portion equal to the base Non-Spinning Reserve schedule (MW) just below the allocated portion for Spinning Reserve, if any, otherwise below the URL (if base Regulation schedules are specified) or the Upper Operating Limit (UOL), whichever lower, and above the base WEIM Energy Base Schedule is reserved for Non-Spinning Reserve. If there is insufficient capacity to allocate all of the base Non-Spinning Reserve schedule, the latter shall be reduced accordingly.
- 3) If the WEIM Resource Plan includes WEIM Upward Available Balancing Capacity, the Energy Bid portion equal to the Regulation Up (MW) just below the allocated portion for WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements, if any, otherwise below the URL (if base WEIM Upward or Downward Available Balancing Capacity schedules are specified) or the Upper Operating Limit (UOL), whichever lower, and above the base WEIM Energy Base Schedule is reserved for Regulation Up. If there is insufficient energy bid range to allocate all of the base WEIM Upward Available Balancing Capacity schedule, the latter shall be reduced accordingly.
- 4) If the WEIM Resource Plan includes WEIM Downward Available Balancing Capacity, the Energy Bid portion equal to the WEIM Downward Available Balancing Capacity (MW) just above the Lower Operating Limit (LOL), or the Lower Economic Limit (LEL), whichever higher, and below the base WEIM Energy Base Schedule is reserved for Regulation Down. If there is insufficient energy bid range to allocate all of the base WEIM Downward Available Balancing Capacity schedule, the latter shall be reduced accordingly.
- 5) The remaining portion of the Energy Bid, if any, is used for Dispatch.
- 6) For WEIM Non-Participating Resources, the Default Energy Bid (DEB) is used for WEIM Resource Plan's capacity allocation. The allocation is similar to that for WEIM Participating Resources, except that after the allocation, WEIM Upward Available Balancing Capacity and WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements slides down and WEIM Downward Available Balancing Capacity slides up to the base Energy schedule so that there is no remaining energy bid range available for Dispatch.
- 7) The energy bid ranges reserved for base WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements and base WEIM Upward and Downward Available Balancing Capacity shall not be considered available in the capacity and flexible ramp sufficiency tests for WEIM BAAs.

11.3.4.2 Use of WEIM Available Balancing Capacity

The CAISO's market clearing software calculates the optimal solution in two passes, referred to as the scheduling and pricing run. The scheduling run is a full optimization run where constraints may be relaxed at a penalty price to avoid infeasibility. The pricing run is a simple economic dispatch, initialized from the scheduling run solution, where penalty prices are replaced by administrative prices and the problem is constrained so that the primal solution does not drift far away from the primal solution of the scheduling run. Both binding schedules and prices are obtained from the pricing run.

Scheduling Run

To effectively reserve WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements from Dispatch and dispatch WEIM Upward and Downward Available Balancing Capacity after the dispatch of all available economic bids and before violating power balance or transmission constraints, the WEIM applications make WEIM Upward and Downward Available Balancing Capacity for dispatch at penalty prices. Those penalty prices are economically differentiated for the energy bid portions allocated to base WEIM Upward and Downward Available Balancing Capacity schedules prices to maintain the economic merit order reflected in the energy bid prices of the allocated energy bid portions. The penalty prices are contained within a configurable penalty price range. The penalty price range for WEIM Upward and Downward Available Balancing Capacity is sufficiently above the bid ceiling and below the self-schedule penalty, the power balance and transmission constraint violation penalties.

The economically differentiated penalty prices for WEIM Upward and Downward Available Balancing Capacity are determined by a linear transformation into the relevant configurable penalty price ranges as follows:

- 1) If the configurable penalty price range for WEIM Upward Available Balancing Capacity is sufficiently wide to accommodate the range of economic prices of the energy bid segments allocated to base WEIM Upward Available Balancing Capacity schedules among all WEIM Resources, these segments are elevated by a positive penalty offset so that the lowest economic price among these segments will be equal to the bottom of the configurable penalty price range.
- 2) Otherwise, each energy bid segment allocated to a base WEIM Upward Available Balancing Capacity schedule is scaled by an upward scaling factor and then elevated by a positive penalty offset so that the lowest economic price among these segments will be equal to the bottom of the configurable penalty price range, while the highest economic price among these segments will be equal to the top of the configurable penalty price range.

- 3) If the configurable penalty price range for WEIM Downward Available Balancing Capacity is sufficiently wide to accommodate the range of economic prices of the energy bid segments allocated to base WEIM Downward Available Balancing Capacity schedules among all WEIM Resources, these segments are lowered by a negative penalty offset so that the highest economic price among these segments will be equal to the top of the configurable penalty price range.
- 4) Otherwise, each energy bid segment allocated to a base WEIM Downward Available Balancing Capacity schedule is scaled by a downward scaling factor and then lowered by a negative penalty offset so that the highest economic price among these segments will be equal to the top of the configurable penalty price range, while the lowest economic price among these segments will be equal to the bottom of the configurable penalty price range.
- 5) For multi-stage generation units (MSG) if the penalty prices are left in place, it will prevent economical transitions. In order to avoid this problem, the economic cost instead of the penalty cost of regulation will be associated with the decision variables for transitions such that the optimization can determine optimally economical transitions.

To limit WEIM Upward and Downward Available Balancing Capacity dispatch only to the amount required to resolve power balance infeasibility in the native WEIM BAA, two constraints are included in the problem formulation for each WEIM BAA, one for limiting WEIM Upward Available Balancing Capacity dispatch and the other for limiting WEIM Downward Available Balancing Capacity. The first constraint prevents WEIM Upward Available Balancing Capacity dispatch when the net optimal transfer is higher than the base net transfer for the WEIM BAA (exporting above base). The second constraint prevents WEIM Downward Available Balancing Capacity dispatch when the net optimal transfer is lower than the base net transfer for the WEIM BAA (importing below base).

These constraints, in conjunction with the economically differentiated penalty prices for Regulation Up and Down, result in an optimal solution where WEIM Upward or Downward Available Balancing Capacity in an WEIM BAA are dispatched only if that is necessary to remove power balance infeasibility in that BAA, while not violating transmission constraints when doing so.

If the available WEIM Upward or Downward Available Balancing Capacity is fully dispatched in an WEIM BAA and infeasibility conditions persist, the relevant surplus variable in that BAA's power balance constraint will normally take value at the applicable power balance relaxation penalty price.

Pricing Run

Only energy bid portions allocated to base WEIM Upward and Downward Available Balancing Capacity schedules that were dispatched in the scheduling run are available for dispatch at the corresponding economic energy bid prices at the pricing run. WEIM Upward and Downward Available Balancing Capacity schedules that were not dispatched in the Scheduling Run and energy bid portions allocated to base WEIM Reserves to Meet NERC/WECC Contingency Reserves Requirements are not available for dispatch in the pricing run.

LMP

To calculate an economic optimal solution in an WEIM BAA where WEIM Upward and Downward Available Balancing Capacities dispatched to resolve power balance infeasibility, the demand forecast shall be reduced or increased in the Pricing Run by a small tolerance, respectively, so that the marginal economic bid would set the price. The marginal bid at the pricing run may be from an energy bid allocated to WEIM Upward and Downward Available Balancing Capacity or to capacity that is normally available for dispatch in EIM, or even an energy bid outside the WEIM BAA, in which case the WEIM Transfer would move off its limit. If the dispatched WEIM Upward and Downward Available Balancing Capacity was insufficient to resolve the power balance infeasibility in an WEIM BAA in the Scheduling Run, the relevant surplus variable in that BAA's power balance constraint will be normally priced at the applicable bid ceiling or floor, respectively, thus setting the administrative price.

Expected Energy Calculation

RTD passes to MQS the energy bid used for Imbalance Energy and WEIM Upward and Downward Available Balancing Capacity dispatch in the Pricing Run for the 5min RTD binding interval. The applicable DEB shall be passed for WEIM Non-Participating Resources.

MQS calculates and allocates Expected Energy using the DOPs and the applicable energy bid. Expected Energy from WEIM Upward and Downward Available Balancing Capacity dispatch from WEIM Participating Resources is accounted as Optimal Energy. WEIM Non-Participating Resources are treated similarly to any resource and therefore, Expected Energy from WEIM Upward and Downward Available Balancing Capacity dispatch from WEIM Non-Participating Resources is also accounted as Optimal Energy.

Appendix B presents Mathematical Formulation for using regulation to resolve infeasible power balance conditions in WEIM BAAs.

11.3.5 EIM Market Power Mitigation

CAISO is authorized to adjust a resource's submitted energy bid downward to the level of the resource's cost based bid, or Default Energy Bid, when the resource has been determined to wield Local Market Power. The Local Market Power Mitigation procedure is administrated by an automated process integrated into the Day-Ahead and Real-Time Market systems. This section describes the Local Market Power Mitigation procedure as it is applied to the WEIM market. Applicable portions of Sections 6 and 7 of the [BPM for Market Operations](#) describe the general operation and timeline of the Local Market Power Mitigation process for the Day-Ahead and Real-Time Markets, respectively.

As mentioned in the previous section, the Default Energy Bid is a resource's cost-based bid that may be used in the event that the CAISO markets determine that the resource wields Local Market Power. See also the [BPM for Market Instruments](#) Appendix Attachment D for additional details.

11.3.5.1 EIM Market Power Mitigation Procedure

CAISO will use the same dynamic competitive path assessment (DCPA) and LMPM methodology to mitigate energy bids from WEIM Participating Resources in the RTM. DCPA will be conducted for each transmission constraint separately in each WEIM Entity BAA, and LMPM may mitigate WEIM Participating Resource bids for binding congestion separately in each WEIM Entity BAA. Interties between BAAs are not subject to market power mitigation, except for groups of interties which make up an WEIM Transfer constraint.

11.3.5.2 Dynamic Competitive Path Assessment

CAISO shall conduct the dynamic competitive path assessment to determine for each WEIM Entity Balancing Authority Area whether a path is competitive or non-competitive, consistent with Tariff Section 39.7.2, except that:

- EIM Participating Resource Scheduling Coordinators shall submit information required by CAISO to perform dynamic competitive path assessment.
- The dynamic competitive path assessment shall not exclude WEIM Participating Resources from the test used to determine the competitiveness of Transmission Constraints on the basis that they may be net buyers of energy in the Real-Time Market.
- CAISO may establish different Reference Buses for each Balancing Authority Area, which need not be within the Balancing Authority Area, for calculating the LMP Decomposition

which is used to trigger Bid mitigation, based on the topology of each Balancing Authority Area and consideration of the bus at which the Marginal Cost of Congestion component of Locational Marginal Prices is least influenced by market power. With that said, CAISO will use a common Reference Bus for both the WEIM and CAISO areas upon commencement of WEIM operations. See the [BPM for Market Operations](#), Section 6.5.1, for more information on Reference Bus selection.

- In case WEIM Upward and Downward Available Balancing Capacity is dispatched in a WEIM BAA to resolve power balance infeasibility in that BAA, the WEIM Transfer for that WEIM BAA will be constrained in the import direction. If this constraint is assessed to be non-competitive, the energy bids of all WEIM Participating Resources in that WEIM BAA would be subject to Market Power Mitigation (MPM). Therefore the energy bids used for WEIM Upward Available Balancing Capacity dispatch would be mitigated.
- The shadow price of the power balance constraint for a WEIM BAA is calculated with reference to the system marginal energy cost (SMEC), which is the shadow price of the system power balance constraint. When the shadow price of the power balance constraint of a WEIM BAA is positive, it indicates that there are binding constraints in the WEIM Area that constrain the WEIM Transfers into that BAA. This condition triggers a dynamic competitive path assessment (DCPA) evaluation of whether the available generation in that WEIM BAA can competitively satisfy the demand in that WEIM BAA without additional WEIM Transfer imports. If the DCPA identifies non-competitive conditions, all WEIM Participating Resource Bids in that WEIM BAA are mitigated above the Competitive LMP at their location to the lower of their submitted Bid, or the applicable DEB, as described in §6.5 of the BPM for Market Operations.

11.3.5.3 Locational Marginal Price Decomposition

CAISO shall perform the Locational Marginal Price decomposition for each WEIM Entity Balancing Authority Area using the results of the dynamic competitive path assessment and the Congestion pricing results of the pre-market run to determine which resources may have local market power due to Congestion on a non-competitive Transmission Constraint, consistent with CAISO Tariff Sections 34.2.3 and 39.7, except that:

- CAISO will not mitigate resource bids for scheduling limit constraints with Balancing Authority Areas that do not participate in the EIM;

- The Locational Marginal Price decomposition shall only be triggered if the resource is effective at relieving an uncompetitive constraint within the same Balancing Authority Area in which the resource is located, except as described in Tariff Section 29.39(c)(4);
- EIM Resources shall be mitigated to relieve congestion on uncompetitive constraints within the same Balancing Authority Area in which the WEIM Resources are located except as described in Tariff Section 29.39(c)(4); and
- EIM Transfer constraints into an WEIM Entity Balancing Authority Area on an WEIM Internal Intertie shall be included in the Market Power Mitigation procedures if CAISO determines that WEIM Entity Balancing Authority Area market power exists based on a structural competitiveness assessment of an individual or group of WEIM Balancing Authority Areas in the WEIM Area, provided such authority has been granted by the CAISO Governing Board based on the assessment of structural competitiveness.
- EIM Transfer constraints that are included in the market power mitigation procedures are represented in the LMP decomposition by the WEIM BAA specific power balance constraints. The shadow price of the BAA specific power balance constraint is related to the shadow prices of the relevant set of binding WEIM transfer constraints that restrict energy transfer in or out of that BAA. The shadow price on the WEIM BAA specific power balance constraint will be included in the LMP decomposition as either competitive congestion costs or non-competitive congestion costs depending on whether the constraint is deemed competitive or non-competitive.
- A small configurable adder, which must in all cases be less than \$0.01, shall be added to the Competitive LMP at each location in the WEIM Area to reduce the occurrence of flow reversal that may happen after WEIM Participating Resource Bids are mitigated in an WEIM BAA.

11.3.6 Default Energy Bids

CAISO shall use the methods and standards set forth in Section 39.7 of the CAISO Tariff to determine Default Energy Bids for WEIM Participating Resources. Please note that default energy bids are also used for WEIM Non Participating Resources that the WEIM Entity Scheduling Coordinator has identified as available balancing.

11.3.7 Auto-Match of Import/Export Schedule Changes

The auto-match feature facilitates the management of base intertie schedule changes after T-40'. It is limited to WEIM Non-Participating Resources (EIMNPR), namely System Resources (SRs), including Energy Transfer System Resources (Base ETSRs) and Mirror System Resources (MSRs).

If the schedule of an WEIM System Resource changes from its base schedule after -40' for an WEIM BAA, the CAISO will automatically match that schedule change from a pre-selected available EIMNPR in the same WEIM BAA. The net of multiple System Resource schedule deviations at the interties of an WEIM BAA can be matched by the same pre-selected EIMNPR in the same BAA, and different pre-selected EIMNPRs can be used to match different System Resource schedule changes. The pre-selected EIMNPRs and their associated System Resources must be registered in the Master File for the auto-match feature by the relevant WEIM Entity Scheduling Coordinator.

Schedule deviations from System Resources registered for auto-match will be ignored from the historical data used in compiling the intertie over/under-scheduling histogram. Additionally, the corresponding schedules will be excluded from the gross import or export base schedule for the purpose of calculating additional capacity test requirements associated with intertie over/under-scheduling for the corresponding WEIM BAA.

No Manual Dispatch Instructions or ABC are allowed for EIMNPRs that are registered for the auto-match feature since their schedules are determined by the market.

11.3.8 Auto Mirror of CAISO Import/Export Schedule Changes

The auto-mirror feature facilitates the mirroring of intertie schedules with CISO (CAISO BAA) at CAISO intertie Scheduling Points from System Resources (SRs) and Tie-Generators (TGs) when the associated energy is generated, consumed, or wheeled through an WEIM BAA. The CAISO will automatically mirror the gross import/export schedule changes after T-40' from specified SRs and TGs at a CAISO intertie Scheduling Point by adjusting the schedule of an associated Mirror System Resource (MSR) at the same Scheduling Point. An import MSR may only be associated with export SRs, and an export MSR may only be associated with import SRs and TGs at the same CAISO Scheduling Point. The MSRs and their associated SRs and TGs must be registered in the Master File for the auto-mirror feature by the relevant WEIM Entity Scheduling Coordinator.

MSRs may also be registered to participate in the auto-match feature, but only when the mirrored CISO intertie schedules are submitted as Self-Schedules without bids.

No real-time schedule change submission is allowed for MSRs registered for the auto-mirror feature since their schedules are determined by the market.

11.3.8.1 Auto-Mirror Implementation Activities

CAISO will implement each auto-mirror in coordination with the WEIM Entity responsible for the resource or the Energy being wheeled through its Balancing Authority Area, and will track progress to ensure the auto-mirror functionality is implemented within a reasonable time. Each impacted WEIM Entity will need to:

- Provide a list of System Resources linked to the registered mirror,
- Update their internal systems and procedures to ensure accurate accounting of the inertie schedules accounted for,
- Verify the system development changes of the base schedule submission, RT interchange schedule data (RTSI) during PRE-HOUR, and RT interchange schedule data (RTSI) during after the fact, and
- Coordinate with CAISO on an activation date for each auto-mirror.

11.3.8.2 Auto-Mirror Implementation Review Procedure

In some circumstances, the auto mirror functionality can create interchange accounting issues when a resource is wheeled through an WEIM Entity Balancing Authority Area. It is therefore necessary to review each auto-mirror implementation in accordance with CAISO Tariff section 29.27(c). Accordingly, the CAISO will determine whether:

- The source of the Energy at the resource location is dynamic,
- The Energy is wheeled through an WEIM Entity Balancing Authority Area, and
- Auto mirroring the resource can cause an imbalance in the WEIM Entity Balancing Authority Area through which the energy is wheeled.

If all of these conditions in this review procedure are met, then the Tie Gen Energy will be reflected at the Tie Gen and linked to the resource without auto-mirroring to ensure that the Energy dispatched is committed for delivery through the Tie Gen and does not create incorrect imbalance for the wheeling WEIM Entity Balancing Authority.

11.3.9 Manual Dispatch

Manual dispatches refer to a manual override of an WEIM market dispatch in cases where the WEIM Entity BAA recognizes a need to adjust the dispatch. Reasons for a manual dispatch include, but are not limited to: congestion management not otherwise handled by the WEIM market systems, response to contingency events, implementation of unscheduled loop flow procedures, or to comply with orders from a reliability coordinator, or to address operational issues in the WEIM BAA that the CAISO Market is not able to address through the WEIM auto-match feature.

EIM Entity BAA must inform CAISO RTM of any manual dispatch within its area which includes both participating and non-participating resources in the WEIM BAA. The market will reflect the dispatch in the next RTD run whenever possible. CAISO will provide a software tool that will allow the WEIM Entity operator to enter a Manual Dispatch. The manual dispatch will include information such as resource name, start and end time, and megawatt constraint values. The WEIM Entity operator shall enter this information as soon as possible. Once entered, the WEIM Entity operator has the ability to modify the instruction while it is still active; for example, extending the time of the dispatch.

Once received by CAISO, CAISO will dispatch the resource in the next applicable market interval in accordance with the manual dispatch. Note that the market systems will still honor resource constraints. For example, the market systems may take several intervals to dispatch a resource to be within the manual dispatch constraint range if the resource is limited by ramp rate capability.

11.3.10 Load Forecast Operator Adjustments

The WEIM BAA operators, like the CAISO operators may adjust –upwards or downwards- the load forecast of either the fifteen- and five-minute market used in the market clearing process to reflect the system needs and conditions. However, the operator adjustments to load forecasts tend to be coarse adjustments and the the operator cannot know at the time the adjustment is made exactly what will be the system ramp. Therefore, in making the adjustment, the operator could cause the load forecast to exceed the system’s ability to respond. Such coarse adjustments, if more than necessary, can produce unnecessary infeasible market solutions. To prevent such over-adjustments, the CAISO employs a feature that limits the load forecast adjustment in the CAISO and WEIM balancing authority areas, which automatically limits the course operator adjustment to what is feasible as long as the quantity of the infeasibility is less than the operator adjustment and is in the same direction as the operator adjustment.

The collects from each WEIM BAA entity relevant data about load bias, including the frequency, volume and reasons for load bias in the fifteen- and five-minute markets, as well as any alternatives considered (e.g., use of manual dispatch).

Note: Please refer to Market Operations Appendices BPM Attachment M for details on load forecast conformance.

11.3.11 Contingency Dispatch

The Real-Time Contingency Dispatch (RTCD) mode of operation is run in response to a significant Contingency event, such that waiting until the next normal Real-Time Economic Dispatch (RTED) run is not adequate.

RTCD produces an optimized set of Dispatch Instructions for a single five-minute Dispatch Interval for WEIM Entity BAA. It is possible that Dispatch Instructions are issued more than once in the same five-minute Interval, once from RTED and later from RTCD. Resources must respond to RTCD Dispatch Instructions as soon as possible. The Dispatch Instructions from RTCD override any previously issued Dispatch Instructions from RTED.

11.3.11.1 In the Event of a Contingency in CAISO

- RTCD shall isolate the CAISO BAA from the rest of the WEIM Area by fixing the WEIM Transfer between the CAISO BAA and the WEIM Entity BAAs at the last non-contingency market solution for binding and advisory intervals.
- The prior advisory interval results for WEIM Participating Resources from the last RTD run prior to the contingency event are used while RTCD or RTDD is invoked for CAISO, unless curtailments of the WEIM Transfer have occurred. In this case, the WEIM Transfer will be capped at the minimum of the curtailed limit or the advisory dispatch from the last non-contingency market solution for the duration of the contingency status. The advisory results come from the last RTD before the contingency event, and shall be sent through the Automatic Dispatching System (ADS).
- This process will persist for the duration of the contingency status until RTD runs are reinstated.
- The contingency dispatch instructions for CAISO internal or CAISO dynamic resources shall be sent through ADS normally.
- Any contingency reserves dispatched in RTCD/RTDD from Intertie Resources shall be included in the CAISO BAA Net Scheduled Interchange.

11.3.11.2 In the Event of a Contingency in an WEIM Entity Area

Contingencies in an WEIM Entity area are generally handled by that WEIM Entity, since the WEIM Entity manages their own operating reserves. Thus RTCD will not be used in this case. However, the regular market systems, RTUC and RTD, will adjust available resources within the affected area to help manage the contingency situation.

- In the event of a contingency, the WEIM Entity Operator will electronically communicate the contingency status to RTM.
- The net transfers into the WEIM BAA with the contingency event are not optimized by the real-time market. RTD will only optimize the internal participating resources of the WEIM BAA. The net WEIM transfers into the BAA are set during each RTD run, to the results of the solved advisory RTD solution prior to the balancing authority area entering into contingency operations. Should the contingency operation extend beyond the advisory horizon of the last pre-contingency RTD run, the net WEIM transfers will still be retained as the last solved advisory RTD result.
- The contingency flag of the WEIM Entity BAA shall be published through ADS.
- The WEIM Entity Operator for the WEIM Entity BAA that is under contingency may dispatch manually contingency reserves from resources (participating or not) in the BAA or Interchanges through interties with other BAAs outside the WEIM Area; these manual dispatch instructions must be sent to RTM. Any interchange schedules changes shall be included in the WEIM Entity BAA NSI.
- RTD shall be run with the latest operating conditions and any manual dispatch instructions. Within the affected WEIM Entity area, RTD will adjust available resources and manually dispatched resources in order to help manage the contingency event.
- RTD/RTPD will set and broadcast Flex Ramp UP and Flex Ramp Down requirements to zero in the WEIM BAA(s) undergoing contingency.
- RTD/RTPD will not procure any Flex Ramp UP and Flex Ramp Down awards from the WEIM BAA(s) undergoing contingency.
- RTD/RTPD will subtract the Flex Ramp Up requirements from the WEIM BAA(s) undergoing contingency with pro rata diversity factor from the overall WEIM area requirement, such that the adjusted WEIM area's Flex Ramp UP and Flex Ramp Down requirement with one or more WEIM BAA undergoing contingency is:

$$\text{Adjusted WEIM Area Requirement} = \max\{M, [(Original WEIM Area Requirement) - (Diversity Factor) * \Sigma(Original Requirement of BAAs under contingency)]\}$$

Where:

$M = \max(\text{Original Requirement of BAAs without contingency})$

Diversity Factor = (Original WEIM Area Requirement) / Σ (Original BAA Requirement of all BAAs in the WEIM Area)

- Designated interval(s) in which an WEIM BAA(s) experienced a contingency event will be published on OASIS.

For WEIM Entities that represent multiple WEIM Entity BAAs, the functionality described above is supported for the individual BAA.

11.3.12 FMM Interchange Schedules based on RTSI

Markets translate pre-hour interchange schedules into 15-minute schedules. The FMM calculates schedules reflective of the expected outcomes and align with the 5-minute real-time market using the following logic:

<i>FMM Market Interval</i>	<i>Calculated Fifteen-Minute Schedule (based on RTSI Schedule Submissions)</i>
<i>:00 to :15</i>	<i>The schedule submission for 5-minute interval value at end time :15</i>
<i>:15 to :30</i>	<i>Average of the schedule submissions for 5-minute intervals beginning at minutes :15, :20, and :25 of trade hour (i.e. each 5-minute interval spanning from :15 to :30)</i>
<i>:30 to :45</i>	<i>Average of the schedule submission for 5-minute intervals beginning :30, :35, and :40 (i.e. each 5-minute interval spanning from :30 to :45)</i>
<i>:45 to :00</i>	<i>The schedule submission for 5-minute interval value at start time :45</i>

11.3.13 EIM Thresholds

EIM Thresholds serve as a comprehensive safeguard to check the market solution before it is finalized for implementation. The WEIM thresholds will mitigate unreasonable excursions in WEIM energy transfers among the different WEIM BAAs due to unjustified large changes in market solution because of software defect or inconsistency in any of the market input data. Preventing this extreme solution from being further processes helps BAAs avoid, or at least mitigate, unnecessary reliability issues caused by the market solution excursions. A threshold set too low may trip too often including times when the solution is actually valid, whereas a threshold set too high will not be of value. See the section titled “Guidelines for Determination of RTD WEIM Thresholds” below for guidance on how an WEIM Entity should set WEIM thresholds for its BAA.

11.3.13.1 EIM Thresholds for RTD/RTPD

- Total Generation INC/DEC MWs per BAA
 - Actual total INC, Actual total DEC
 - Net algebraic sum of total INC and total DEC MWs
- Total ETSRs INC and DEC MWs per BAA
 - Separate Actual total INC, and Actual total DEC MWs
 - Net algebraic sum of INC and DEC MWs
- Total Intertie INC/DEC MWs per BAA
 - Actual total INC, Actual total DEC
 - Net algebraic sum of total INC and total DEC MWs

Actual Generation

- INC: Sums up the RTD/RTPD External DOT INC, VER DOT INC, and DR DOT INC numbers shown on the Dispatch Control Screen and compares that to the Actual Generation INC Threshold.

Total Delta SUM:	7
External DOT	
SUM:	107
INC:	271
DEC:	-163
Internal DOT	
SUM:	-7
INC:	0
DEC:	-7
VER Total:	-100
DR Total:	
Total EIM Transfer:	0
MCP:	\$29.07
Dispatched REG UP:	0
Dispatched REG DOWN:	0

- DEC: Sums up the RTD/RTPD External DOT DEC, VER DOT DEC, and DR DOT DEC numbers shown on the Dispatch Control Screen and compares that to the Actual Generation DEC Threshold.

Total Delta SUM:	7
External DOT	
SUM:	107
INC:	271
DEC:	-163
Internal DOT	
SUM:	-7
INC:	0
DEC:	-7
VER Total:	-100
DR Total:	
Total EIM Transfer:	0
MCP:	\$29.07
Dispatched REG UP:	0
Dispatched REG DOWN:	0

Net Generation

- INC: Sums up the RTD/RTPD External DOT SUM, VER DOT SUM, and DR DOT SUM numbers shown on the Dispatch Control Screen and compares that to the Net Generation INC Threshold.
- DEC: Sums up the RTD/RTPD External DOT SUM, VER DOT SUM, and DR DOT SUM numbers shown on the Dispatch Control Screen and compares that to the Net Generation DEC Threshold.

Total Delta SUM:	7
External DOT	
SUM:	107
INC:	271
DEC:	-163
Internal DOT	
SUM:	-7
INC:	0
DEC:	-7
VER Total:	-100
DR Total:	
Total EIM Transfer:	0
MCP:	\$29.07
Dispatched REG UP:	0
Dispatched REG DOWN:	0

Actual ETSR

- INC: Compares the total RTD/RTPD ETSR DOT INC number shown on the Dispatch Control Screen to the Actual ETSR INC Threshold.
- DEC: Compares the total 5-minute ETSR DOT DEC number shown on the RTD Dispatch Control Screen to the Actual ETSR DEC Threshold.

Net ETSR

- INC: Compares the total RTD/RTPD Total WEIM Transfer number shown on the Dispatch Control Screen to the Actual ETSR INC Threshold.
- DEC: Compares the total RTD/RTPD Total WEIM Transfer number shown on the Dispatch Control Screen to the Actual ETSR DEC Threshold.

Total Delta SUM:	7
External DOT	
SUM:	107
INC:	271
DEC:	-163
Internal DOT	
SUM:	-7
INC:	0
DEC:	-7
VER Total:	-100
DR Total:	
Total EIM Transfer:	0
MCP:	\$29.07
Dispatched REG UP:	0
Dispatched REG DOWN:	0

11.3.13.2 Guidelines for Determination of WEIM Thresholds for RTD/RTPD

- **Generation Thresholds:** should be greater than the WEIM Entity BAA total generation 5-minute max ramping capability of participating resources with economic bids, plus the Historical base schedule generation movement to meet the BAA demand obligation changes in 5-minutes, plus any other 5-min uncertainty related to supply or load movements. The final generation threshold number should be the maximum of the above calculation, the contingency reserve obligation, or the Most Severe Single Contingency (MSSC).
- **ETSR Thresholds:** should be at least the maximum of the 5-min ramping capability of the WEIM BAA's participating generators with economic bids supporting the ETSR movements.
- **Intertie Threshold:** Currently set to high value (not active) since the interties are hourly scheduled by the WEIM entities.

It should be noted that the above guidelines should be tuned for each WEIM Entity BAA depending on the amount of realistic movements and response capability of each BAA. Another important point to note is that the above thresholds are active all the time for all WEIM BAAs including when an WEIM BAA is flagged as being in a contingency. Since CAISO BAA has a contingency dispatch mode with 10-min recovery timeline, the 5-min thresholds are not enforced for CAISO BAA during CAISO's contingency dispatch mode.

11.3.13.3 Process to Implement WEIM Thresholds

Once an WEIM entity has determined their WEIM Threshold values, then they need to submit the values to the CAISO via a CIDI ticket. Once the CAISO receives this request, the threshold values will be analyzed to ensure its reasonableness. Since these threshold values affect the entire WEIM market solution for all BAAs, CAISO validation of the numbers is necessary before implementing these thresholds. If the value submitted does not pass the validation, then the WEIM Entity will be informed of why and a new number needs to be submitted if warranted. If the value submitted passes the validation, then the associated threshold value will be implemented into the production environment and will be available to the WEIM Entity BAA operators to see on the BAAOP display.

Once the WEIM thresholds are implemented, it may be raised at times to allow a valid solution to be sent. Once the solution is sent, the threshold value will be returned to its original value. The threshold values will not be lowered below the submitted and CAISO approved value without going through the submittal process above.

11.3.13.4 EIM Thresholds in RTD/RTPD Dispatch Control Display

Individual WEIM Entity Thresholds exist in RTD/RTPD and can be viewed on the Dispatch Control screen. Once set, if a given WEIM Entity Threshold is exceeded, the RTD/RTPD market will automatically come up in a block all mode and revert to the “Use Previous” solution for all WEIM participants.

11.3.13.4.1 Alarms/Notifications

When any of the RTD/RTPD WEIM Thresholds described above are exceeded, the cell in the WEIM Thresholds table will highlight red and a message will appear above the blue box on the Dispatch Control indicating which WEIM Threshold was exceeded, by which WEIM Entity, and by how many MW the threshold was exceeded by. If there is more than one threshold exceedance, then multiple cells will be highlighted red and multiple messages will appear.

11.3.13.4.2 Safety Net

To avoid entry of incorrect numbers, the following safety net has been added:

- The market UI will not accept any threshold values lower than 100.

11.4 Contingencies and Corrective Actions

With the implementation of the EIM, measures must be in place to ensure a smooth transition from the current CAISO markets to include the co-optimization with WEIM Entities. These measures must consider grid reliability, market stability, and other system conditions for all market participants. Although CAISO will do everything possible to assure a successful transition and operation of the EIM, problems may arise which would require the WEIM Entity to be suspended and potentially revert back to a previous state.

A monitoring strategy is necessary to evaluate whether or not the WEIM is performing according to market design and system requirements. In the event that either the market design or the software systems are not performing as expected, a series of pre-defined steps will need to be followed to address the situation and all resulting impacts.

This section of the WEIM BPM covers the overview of the criteria used to arrive at the decision to revert back and to provide a high level plan to ensure a reliable and orderly termination.

11.4.1 Recovery Approach

In the event that data exchange and/or communication between CAISO and the WEIM Entity BAA are disrupted, the following steps may be implemented to handle such disruptions:

1. When certain input data becomes unavailable and there is a recent history that can be used by the market applications, the latter can continue to function producing approximate, acceptable market results. For example, if demand forecast becomes unavailable, the last available demand forecast for that period could be used for the market horizon and for several market runs. Similarly, if telemetry becomes unavailable, the last SE solution can be used in the next market run. This recovery approach can be used until the data is considered too old to produce reasonable market results. The time cutoff depends on the nature and importance of the data and will be determined separately for each data stream.
2. When a market run fails, advisory market results, including GHG allocations, from the last successful market run can be used. This recovery approach can be used until all advisory intervals run out. When a failed market run is the first interval of a trading hour and the market uses advisory market results, from the previous trading hour, the market will also use any GHG allocation from the previous trading hour even when a resource in the current trading hour may not have GHG bids.
3. When certain input data becomes unavailable, the affected BAA can be isolated from the WEIM by freezing the Net Scheduled Interchange, the demand, and the dispatch at the last market solution within the hour, and at the base for future hours, and also by ignoring bids in that BAA. The market applications will still produce market results for the remaining BAAs in EIM. The affected BAA operator must balance the BAA outside WEIM through regulation and dispatch instructions issued directly to resources, following pre-EIM protocols. LMPs will be calculated for that BAA and will be used to settle Uninstructed Imbalance Energy. This disruption is not expected to last more than one trading day.
4. If disruption is prolonged, an additional option can be enabled to suppress settlement statements for the affected BAA.
5. When market runs continuously fail and the above disruptions are no longer applicable because the advisory dispatches are exhausted and the market application cannot run, the fallback is the Day-Ahead schedules for the CAISO BAA and the Base Schedules for the WEIM Entity BAAs; each BAA operator will balance the BAA through regulation and dispatch instructions issued directly to resources. Administrative prices will be used to settle imbalance energy. The CAISO will use the Open Access Transmission Tariff (OATT) approved price used by the WEIM Entity during a market suspension to settle imbalance within the WEIM Entity BAA.

Corrective Actions

Summary of Authority to Address Contingencies	
Period	CAISO Corrective Action(s)
	Discontinuation: per Tariff Section 29.1(d)(1):

Summary of Authority to Address Contingencies	
Initial 60 days from Implementation Date	<ul style="list-style-type: none"> ➤ Prevent WEIM Transfers ➤ Suspend WEIM settlements ➤ Terminate participation of WEIM Entity (if resolution is not achieved within Tariff timeframes)
After 60 days from Implementation Date (ongoing operations)	<p>EIM Disruption: per Tariff Section 29.7(j)</p> <ul style="list-style-type: none"> ➤ Prevent WEIM Transfers ➤ Communications failure measure ➤ Market run failure measure ➤ Establish administrative prices ➤ Suspending WEIM settlements is not available CAISO option, but CAISO will respond to request from WEIM Entity for termination of WEIM participation
After WEIM Entity Notice of Termination (180 day notice period)	<p>Termination for this time period <u>not</u> at election of CAISO. CAISO would respond to Termination of WEIM Entity with the following measures:</p> <ul style="list-style-type: none"> ➤ Prevent WEIM Transfers (day 1 of 180 day period) ➤ EIM Entity is switched to “non-EIM Entity” (day 2 of 180 day period)

11.5 Separation of the WEIM Entity

In the event the WEIM Entity needs to separate from the EIM, CAISO will take appropriate steps to restrict operations and suspend settlements within the market.

11.5.1 EIM Entity Separation from Market

When a separation is activated by CAISO, the followings will apply:

- SIBR will reject any energy bids from the resources that belong to the WEIM Entity BAAs. As a result, there will be no unit commitment or economic dispatch for WEIM resources in the real-time market.
- The flexible ramping requirement will be set equal to zero for the WEIM Entity BAA. Also, the flexible ramping requirement will be set to fail for WEIM Entity BAA.
- To avoid imbalance energy settlement under separation, WEIM Entity is responsible to submit base schedules and meter data.
- The Energy Transfer System Resources (ETSR) at the WEIM Entity BAA will be locked and there will be no incremental transfer between WEIM Entity BAA and the CAISO BAA. The locked ETSR will not be included in the congestion revenue calculation.
- There will be no congestion management and no transmission constraint enforcement for the WEIM Entity BAA.
- The WEIM Entity SC shall submit meter in alignment with T+55B (retired trade date 12/31/2020) Recalculation Statement (Final Meter Submittal T+48B) or T+70B (effective trade date 1/1/2021) Recalculation Statement (Final Meter Submittal T+52B).
- EIM Entity SC shall submit the meter equal to the total expected energy for all the WEIM Entity BAA resources.
- As normal process, the settlement produces statements at T+3B (retired trade date 12/31/2020) and T+12B (retired trade date 12/31/2020) or T+9B (effective trade date 1/1/2021) using estimation of meter, which is the total expected energy from the market. If an WEIM Entity BAA activates the separation flag, the expected energy calculated from the market will equal to the Base Schedule for all the resources/loads/interties that belong to this BAA. Therefore, the estimation of meter will equal to Base Schedule. The WEIM imbalance energy will equal to zero.

Note: The WEIM Entity will be responsible for Base Schedule, meter submission, and imbalance energy settlement if the meter is not equal to the Base Schedule.

11.6 Advanced Load Forecasting System (ALFS)

11.6.1 Requirements for Load Forecasting

CAISO forecasts load demand for each hour of the next nine Operating Days utilizing advanced utility industry accepted neural-network forecasting software for each load forecast zone. In order to

accurately forecast the load zone, the software requires historical load profiles and utilizes an ensemble of weather forecasting data sources for each zone.

CAISO's forecasting software requires the following:

- Defined WEIM Entity Balancing Authority Areas to forecast.
- Defined national weather stations within WEIM Entity Balancing Authority Areas
 - CAISO will contract to receive hourly weather data from weather forecast vendor (s) for stations and historical weather data, to use as an input for WEIM load forecast.
- The five-minute average historical load data (at least two years) to train the forecast software.
- PI tags for WEIM load data points as input to collect five-minute average data that feeds into software.
- Non-participating Demand Response (DR) (*e.g.*, Demand Response in an WEIM Entity BAA that are not represented by PDR or RDRR models) shall be accounted for in the formation of the CAISO forecast of WEIM Demand, if determined by the Short Term Forecasting team to enhance the accuracy of the CAISO forecast of WEIM Demand. For more information on the function and process, refer Section 11.3.2 and the *Demand Response BPM Section 18*.

Using the above data for input into the neural-network forecasting software, CAISO will create and continually monitor its load and weather forecasting results to ensure the average forecast error is minimized.

11.7 Variable Energy Resource (VERs)

This section is based on CAISO Tariff Sections 4.6.1.1, 4.8, 9.3.10; Appendix F, *Rate Schedules*; and Appendix Q, *Eligible Intermittent Resources Protocol (EIRP)*.

11.7.1 Forecast Fee

11.7.1.1 Variable Energy Resource Forecast Charge

In general CAISO will charge WEIM Entity Scheduling Coordinators and WEIM Participating Resource Scheduling Coordinators a fee for the Variable Energy Resource forecasting services in accordance with Appendix F, Schedule 4.

CAISO will waive the Variable Energy Resource forecast charge if an WEIM Entity has an independent forecast for its Variable Energy Resources and provides the independent forecast to CAISO.

11.7.2 EIM Variable Energy Resource Forecasting

EIM Variable Energy Resources, both participating and non-participating, may provide the CAISO with an independent third party forecast of energy output or through the CAISO forecasting service. . In addition, if an WEIM Entity certifies to the CAISO that it produces its own Variable Energy Resource forecast to operate its WEIM Entity Balancing Authority Area and the CAISO is able to verify the accuracy of the forecast initially and on an ongoing basis, this forecast will be accepted by the CAISO as independent. The forecast granularity produced by an WEIM Entity approved forecast service provider must be produced in five-minute intervals and updated every five minutes. The forecast of WEIM Variable Energy Resources must be automatically submitted to the CAISO forecast system.

EIM VER resources shall submit base schedules and/or bids to the markets. The forecasts will be used to adjust the base schedule (if no bid) or the bid curve to reflect the forecast. The dispatch from CAISO real-time application will be the financial binding schedules.

If the WEIM Variable Energy Resource elects the CAISO forecast, the WEIM Variable Energy Resource must make metrological data available at minimum 30 days in advance of a forecast being produced the CAISO system can do the forecast for WEIM Variable Energy Resources.

If the WEIM Entity elects the VER Persistence Market Model Forecast within the RTD market for solar resources, the WEIM Variable Energy Resource must provide 1 year of metrological/production data. This data is to compute reference curves used in creating the forecast. If the WEIM Entity elects the VER Persistence Market Model Forecast within the RTD market for wind resources, the 30-day minimum of metrological/production data is adequate.

The VER Persistence Market Model Forecast cannot be elected for fuel types outside of wind/solar, and is only available to resources that have similar response to weather conditions or other variables relevant to forecasting renewable energy. For example, if a solar resource has a Pmax of 300 MW and 50 MW can be moved with gas support, it is not eligible.

In addition, the WEIM participating resource, similar to VER resources located in the CAISO BAA, may elect to use SC forecast option that will allow it to submit its five-minute output forecast to CAISO SIBR system. The SC forecast will be used as the financially binding forecast under this election.

11.8 Intertie Multi-Stage Generator (TMSG)

Real Time Market applications will support dynamic imports as Intertie Multi-Stage Generators (TMSG) on interties between an WEIM Entity BAA and a non-EIM BAA. The TMSG is a

resource-specific dynamic import from a physical resource in the non-EIM BAA with a dynamic scheduling agreement with the WEIM Entity BAA. To qualify, the physical resource must meet the Multi-Stage Generator (MSG) model requirements as provided in Market Operations BPM section 2.1.5. Since the intertie shall not have intertie constraints or intertie scheduling limits, CAISO interties cannot support TMSGs.

The WEIM Entity BAA dynamic scheduling agreement for TMSGs must have provisions for dedicated long-term transmission capacity through the associated intertie and into the WEIM Entity BAA. The long-term transmission capacity must accommodate the highest maximum capacity among all registered MSG configurations. If the dynamic scheduling agreement has no such provisions, the intertie must have only one TMSG (i.e., no other TMSGs on the relevant intertie), Tie Generators (TG), ETSRs, other intertie resources that can participate in the market with a bid, or intertie resources with a self-schedule or base schedule).

12. SETTLEMENTS AND BILLING

Welcome to the *Settlements and Billing* section of the *CAISO BPM for the Western Energy Imbalance Market*. In this section you will find the following information:

- The processes of Settlements and Billing within the context of the Western Energy Imbalance Market.

The business process for settlement of the fiscal results of participation in the WEIM is outlined in the [BPM for Settlements and Billing](#). That BPM provides an overview of the settlement, billing, invoicing, and financial clearing business functions, an overview of key settlement and billing principles, and an overview of the settlement and invoicing cycles.

12.1 Charge Codes

CAISO maintains the *CAISO Market Charge Codes Matrix* which can be found by navigating to the Settlements subheading under the Market & Operations portion of the CAISO website. This matrix highlights which Charge Codes are applicable to the various forms of resources participating in the markets operated by CAISO. A detailed description of each settlement Charge Code or predecessor Pre-Calculation, including business rules and specific data calculation formulas, can be found in the *BPM Configuration Guide* documents posted under the Settlements and Billing section of the BPM Document

Library on the CAISO website. Section 8 of the [BPM for Settlements and Billing](#) provides details on how to use and read a *BPM Configuration Guide*.

Settlements concepts unique to participation in the WEIM include settlements related to Over- and Under-Scheduling of WEIM Base Schedules, the WEIM Initial Fee, and WEIM Administrative Charges. As documented in Sections 29.11, 29.26, and 29.32 of the CAISO Tariff, calculations of some settlement Charge Codes have EIM-specific implications referencing the submitted WEIM Base Schedules or the transfer of energy between BAAs participating in the EIM. In addition, the calculation of the settlement of the Real-Time Congestion Offset will incorporate the respective pieces of the congestion component of the LMP for PNode in each WEIM BAA as noted in the formulas contained in the Configuration Guide for the Real-Time Price Pre-Calc. However, CAISO will not calculate and invoice charges related to FERC fees or NERC/WECC fees for WEIM participants. In addition, there will be no charge between CAISO and WEIM balancing authorities for use of transmission to support WEIM Transfers for the first year of WEIM operation. During this time, as stakeholders gain operational experience and additional balancing authorities consider joining the EIM, CAISO will coordinate with stakeholders to consider various alternatives for a long-term transmission rate design.

12.2 Disagreements

Any disagreements with the published results of CAISO's settlement process for the WEIM must be submitted to CAISO by the Scheduling Coordinator with which CAISO settled and are governed by the dispute process outlined in Section 2.3.5 and Section 5 of the [BPM for Settlements and Billing](#). Disputes by a non-participating resource of amounts calculated by CAISO and distributed to it by an WEIM Entity Scheduling Coordinator are between the non-participating resource and the WEIM Entity Scheduling Coordinator, not with CAISO. If an WEIM Entity Scheduling Coordinator disagrees with the amounts calculated by CAISO for WEIM non-participating resources, the WEIM Entity Scheduling Coordinator is responsible for submitting a settlement dispute through the process outlined in Section 2.3.5 and Section 5 of the [BPM for Settlements and Billing](#).

12.3 Suspension

In the case where there is a suspension of WEIM participation by an WEIM Entity, as described in Section 10.5.1 of this BPM, a Market Notice will be issued by CAISO to alert all market participants. The WEIM Entity will still be required to submit Base Schedules during the period of the suspension along with meter data matching those values. CAISO will manually suspend the calculation of Unaccounted For Energy (UFE) for the WEIM Entity BAA, but will continue to generate and publish settlement statements utilizing the Base Schedule and meter data information submitted by the WEIM Entity.

12.4 Real-Time Unaccounted For Energy (UFE) Election Process

Following are the steps for the WEIM BAA to elect the settlement of the UFE;

WEIM UFE Election Letter Process

- Entity submits an Inquiry Ticket in CIDI and attaches the completed Annual UFE election letter described below. The annual elections span from Trade Dates January 1st through Dec 31st. Each WEIM Entity shall provide their annual UFE election letter by October 31 for the following calendar year.
- To submit documentation, please review <http://www.caiso.com/Documents/How-to-Submit-Documents-for-Applications-and-Ongoing-Obligations.pdf> for proper steps
Letter templates must be printed on applicable company letterhead, signed, scan as a pdf.

Remove this text box when copying to resource owner letterhead

[Current Date]

California Independent System Operator

250 Outcropping Way

Folsom, CA 95630

Dear [SC Requests]:

Please find the information below to complete the requirements for Unaccounted for Energy (UFE) Election Process as stated in the Energy Imbalance Market (EIM) Business Practice Manual, Section 12.4.

WEIM Entity Name:

WEIM Entity Address:

Pursuant to CAISO Tariff Section 29.11(c) (2) (B), [insert WEIM Entity Name] makes the following UFE Elections for Trade Dates 1/1/[Year] - 12/31/[Year]

UFE Settlement Election: Yes (settle) or No (do not settle).

Loss Factor:

- If UFE Settlement Election is “Yes”, please provide the OATT Loss factor or agreed upon loss factor percentage. If UFE Settlement Election is “No”, enter 0%.

Please contact [insert contact name and info] with any questions.

Signature: _____

Name:

Title:

Phone:

Email Address:

1. Once the CIDI ticket is received, it will be routed by Customer Services to Regulatory Contracts. [Incoming CIDI tickets will go directly to Regulatory Contracts based on key words from the CIDI ticket Subject field.]
2. Regulatory Contracts will review and process the UFE elections, then route the CIDI ticket to the Masterfile Team.
3. The Masterfile Team will set the election flag and loss percentage, then route the CIDI ticket to the Market Settlement Design configuration (MSDC) team.
4. MSDC will verify the information, then route the CIDI ticket to Customer Services for closure.
5. The recorded elections for each WEIM Entity will remain in effect until a subsequent UFE Election Letter requesting changes to the WEIM Entity's elections has been received and processed.

13. READINESS

Welcome to the *Readiness* section of the *CAISO BPM for the Western Energy Imbalance Market*. In this section you will find:

- Descriptions of the established readiness criteria categories
- A listing of readiness criteria, metrics and thresholds
- Information on the process for readiness determination, reporting and certification.

13.1 Readiness Criteria Categories

The readiness criteria are intended to support readiness certification prior to implementation. Leading to certification, the WEIM Entity and CAISO will conduct appropriate steps to ensure that each criteria is evaluated compared with the metric and threshold.

- EIM Entity Full Network Model Integration – in order to participate in EIM, the prospective WEIM Entity's full network model is integrated into CAISO full network model. This activity precedes testing and is demonstrated during market simulation. The incorporation of the WEIM Entity's network model into CAISO's production full network model follows the standard promotion process and timing.

- Agreements – prior to the established implementation date, the prospective WEIM Entity must execute all necessary agreements in accordance with the timelines described in section 5 of the WEIM Business Practice Manual.
- Training –CAISO provides training for prospective WEIM Entity operators before and during market simulation. All training is to be completed prior to the start of parallel operations.
- Forecasts – forecasting capabilities are established and measured during the market simulation.
- Balanced Schedules– balanced schedule capabilities are measured during the market simulation.
- Operating Procedures - the prospective WEIM Entity and CAISO will review and test applicable operating procedures prior to the start of parallel operations.
- System Readiness & Integration - the prospective WEIM Entity and CAISO will perform functional and system testing and system integration testing.
- Market Simulation - the CAISO will conduct a market simulation for the prospective WEIM Entity and any participating resource scheduling coordinators registered with the prospective WEIM Entity prior to that new prospective WEIM Entity entering EIM.
- Settlements – the CAISO submits a settlement statement to the prospective WEIM Entity including WEIM participating and non-participating resources and load. The prospective WEIM Entity will verify the accuracy of the CAISO settlement statement to the prospective WEIM Entity. Prior to financially binding operations, the prospective WEIM Entity will demonstrate it can produce allocations of the CAISO settlement to its customers that are verifiably accurate against available data.
- Monitoring – the CAISO ensures that the CAISO Market Analysis Team and the Department of Market Monitoring have the data that is required to adequately monitor market performance.
- Parallel Operations Planning – the CAISO and prospective WEIM Entity ensure that systems, processes and staff are prepared for deployment of systems, parallel operations, and support beyond parallel operations for issues that may arise.
- Communication - the CAISO and prospective WEIM Entity ensure all tools and procedures used for communication between the CAISO and prospective WEIM Entity are in place and tested before the implementation date
- EIM Available Balancing Capacity – the CAISO and the prospective WEIM Entity register resources that the prospective WEIM Entity intends to identify as WEIM Available Balancing Capacity in the WEIM Resource Plan.

13.2 Readiness Metrics, Criteria, and Thresholds

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
1	Prospective WEIM Entity Full Network Model Integration	Generation, Interchange and Load comparison	Load, WEIM Internal Intertie and WEIM External Interties, and Generating Unit definition in the Full Network Model is consistent with the Load, WEIM Internal Intertie and WEIM External Interties, and Generating Unit definition in the exported prospective WEIM Entity network model file that it delivered to the CAISO.	Data matches within 10%, measured in MW capacity to start parallel operation, and within 5% before full activation. Discrepancies, if any, are accounted for in terms of imbalance adjustment
2	Prospective WEIM Entity Full Network Model Integration	Comparison of SCADA measurement	SCADA measurements used in prospective WEIM Entity EMS model match the measurements observed by the CAISO through the CAISO EMS model	Critical and used SCADA measurements match 90% to start parallel operation and 95% before full activation, measured in MW, outside of any exception in EMS model
3	Prospective WEIM Entity Full Network Model Integration	State Estimator solution	CAISO state estimator solution is equivalent or superior to the prospective WEIM Entity state estimator solution for its Balancing Authority Area.	State Estimator solutions converge >90% of the time in two days before parallel operation and three days before full activation. Solution differences within 10% before parallel operation and 5% before full activation measured in MW or justified due to different external BAA modeling
4	Prospective WEIM Entity Full Network Model Integration	Non-Conforming Load, Behind-the-Meter Generation, Pseudo Ties, and Dynamic Schedules	Physical representation of the prospective WEIM Entity's network matches the Base Market Model that accounts for non-conforming load, behind-the-meter generation, pseudo-ties, and dynamic schedules, and third party	Prospective WEIM Entity major non-conforming loads > 5% of prospective WEIM Entity total actual load in MW are modeled separately from conforming load in market model

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
			transmission service provider and path operator information that supports WEIM Transfers and Real-Time Dispatch in the Western Energy Imbalance Market, as applicable	
5	Agreements	Execution of Necessary Agreements	The prospective WEIM Entity has executed all necessary agreements.	The prospective WEIM Entity will execute all agreements, as outlined in Section 5 of the WEIM BPM within the required timelines outlined in Section 5.
6	Operations Training	Completion of mandatory training courses	Prospective WEIM Entity operators who will have responsibility for WEIM operations, transactions and settlements, will complete CAISO training modules.	<p>Prospective WEIM Entity operators will complete training and close-of-training assessment in the appropriate timeframes as outlined in</p> <ul style="list-style-type: none"> • “100 series”— an introduction to Western Energy Imbalance Market training • “200 series”— the specific hourly and daily tasks and duties for normal operation training module; and • “300 series”— the assessment of market results and response to contingencies and abnormal situations training module.
7	Forecasting Capability	Load forecast capability	Definition of WEIM demand forecast boundaries based on the conforming and non-conforming load	All Plant Information (PI) tags and historical data for defined load area(s), and non-conforming load, if applicable, compared with load forecasts

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
			characteristics, as applicable <ul style="list-style-type: none"> • Accuracy of the CAISO forecast of WEIM demand based on historical actual load data for the defined WEIM demand forecast boundaries. • Identification of weather station(s) locations used in forecasting, if applicable, 	provided from CAISO (if CAISO load forecast used).
8	Forecasting Capability	Variable Energy Resource (VER) forecast capability	Identification of the source of VER forecasts. (If a participating wind or solar unit requires a CAISO forecast, then BPM and Tariff requirements apply.)	Forecasting entity must demonstrate delivery of Unit MW forecast at 5 min intervals for at least three hours ahead. Forecasting entity must also provide base schedule by T-75, T-55 and T-40. WEIM Entity provides to CAISO real-time MW production PI tags.
9	Forecasting Capability	Flexible capacity requirements	CAISO has established flexible capacity requirements for the prospective WEIM Entity Balancing Authority Area and the combined WEIM Area including the prospective WEIM Entity	The CAISO has received and stored all historical data from the prospective WEIM Entity necessary and sufficient for the CAISO to perform the flexible ramp requirement.
10	Balanced Schedules	Base schedule balancing capability	The prospective WEIM Entity Scheduling Coordinator demonstrates its ability to balance WEIM demand and WEIM supply for the prospective WEIM Entity's Balancing Authority Area	90% or greater of base schedules balance tests during monitored hours are within 10% average imbalance of load forecast over one day period before parallel operation, and 5% average over five full days before full activation. The CAISO will provide examples of MW thresholds for each

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
				prospective WEIM Entity to indicate a reasonable threshold as it applies to a given WEIM Entity and indicate the potential implications of a swing from 5% over to 5% under forecast in one hour to the next.
11	Balanced Schedules	Flexible ramping sufficiency test capability	The prospective WEIM Entity \ Scheduling Coordinator demonstrates its ability to pass the flexible ramping sufficiency test	Passes 90% of the time or greater over monitored hours of one day before parallel operation and five non-consecutive days before full activation
12	Balanced Schedules	Capacity test capability	The prospective WEIM Entity Scheduling Coordinator demonstrates its ability to pass capacity test	Passes 90% of the time or greater over monitored hours of one day before parallel operation and five non-consecutive days before full activation. The CAISO will explain the implications of any potential issues with the reliability of an WEIM Entity to meet its capacity requirements.
13	Operating Procedures	CAISO operating procedures (relevant to WEIM operations)	The prospective WEIM Entity signs CAISO non-disclosure agreement and receives appropriate CAISO "public" and "restricted" operating procedures	Operating procedures NDA signed by the prospective WEIM Entity. The prospective WEIM Entity receives CAISO operating procedures four months prior to the parallel operations date.
14	Operating Procedures	Prospective WEIM Entity operating procedures	The prospective WEIM Entity operating procedures are defined, updated, and tested for the WEIM Entity Scheduling Coordinator	The prospective WEIM Entity operating procedures are updated tested and implemented prior to parallel operations date.

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
15	System Readiness & Integration	Functional Testing	The prospective WEIM Entity and the CAISO will test the functional and system elements in accordance with functional and system testing documentation posted on the CAISO website	<p>All tasks identified in the functional and system testing documentation are completed and will not have any issues deemed significant.</p> <p>Any exceptions will be explained or have an interim solution that is functionally equivalent.</p>
16	System Readiness & Integration	System Integration	The prospective WEIM Entity and CAISO will test system integration testing in accordance with the system integration testing documentation posted on the CAISO website	<p>All tasks identified in the system integration testing documentation are completed and will not have any issues deemed significant.</p> <p>Any exceptions will be explained or have an interim solution that is functionally equivalent.</p>
17	System Readiness & Integration	The prospective WEIM Entity system access complete	All prospective WEIM Entity employees who require system access to perform EIM-related job functions identified and have necessary certificates.	<p>All prospective WEIM Employees performing job functions for WEIM market are identified.</p> <p>All CASIO issued certificates are requested within the appropriate timeframes.</p> <p>All identified employees provided the necessary WEIM system access certificates.</p>
18	System Readiness & Integration	ISO - prospective WEIM Entity interfaces	Data interfaces between prospective WEIM Entity's systems and CAISO systems are tested	<p>ISO and prospective WEIM Entity identify significant data interface issues.</p> <p>EIM Entity and CAISO executives to approve exceptions.</p>

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
19	Market Simulation	Day in the life simulation	The prospective WEIM Entity operators are able to meet the market timelines	The prospective WEIM Entity grid operations staff complete end-to-end daily market workflow with no critical defects.
20	Market Simulation	Structured scenarios simulation	The prospective WEIM Entity operators execute and pass all structured scenarios provided by CAISO	All significant issues resolved or have an interim solution that is functionally equivalent.
21	Market Simulation	Unstructured scenarios simulation	The prospective WEIM Entity operators execute and pass all unstructured scenarios provided by prospective WEIM Entity	All significant issues resolved or have an interim solution that is functionally equivalent.
22	Market Simulation	Market results reports	Market results are appropriate based on inputs	The prospective WEIM Entity and CAISO executive project sponsors approve the market results reports during market simulation
23a	Market Simulation	Market quality review	Prices are validated based on input data	Market simulation prices and MWs schedules/dispatches are validated by CAISO market quality team for entry into parallel operation
23b	Parallel Operations	Market quality review	Prices are validated based on input data	Parallel operations prices and MWs schedules/dispatches are validated by the CAISO market quality team
24	Market Simulation	The prospective WEIM Entity Identification	Validation of SCID's and Resource ID's	The CAISO has established and the prospective WEIM Entity has tested all necessary SCIDs and Resource IDs established for the prospective WEIM Entity's Balancing Authority Area

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
25	Settlements	ISO Settlement Statements and Invoices published to the prospective WEIM Entity and WEIM Participating Resources	The CAISO Settlement statements and invoices match the operational data published to stakeholders or fed into settlement system and the resulting calculations correspond to the formulas defined in ISO's tariff and BPMs	Monthly settlement statement and invoice with corresponding daily statements produced during market simulation and parallel operations are verifiably accurate against available data.
26	Settlements	The prospective WEIM Entity settlement statements and invoices reflect accurate allocations to the prospective WEIM Entity customers prior to financially binding operations.	Verification that settlement statements and invoices accurately reflects system and market data	The prospective WEIM Entity settlement statements and invoices that allocate charges and credits to its customers accurately reflect system and market data during parallel operations.
27	Monitoring	Data monitoring	Sufficient and adequate data is available to the CAISO and the Department of Market Monitoring	All required market monitoring data is available during testing and during post go-live for the key metrics (any exceptions will be addressed). CAISO will provide a market report that will provide publicly available information to all market participants.
28	Parallel Operations Plan	Deployment plan	Parallel operations run consistently and in accordance with the timeframe set forth in the prospective WEIM Entity specific parallel operation plan	Parallel operations runs consistently within normal production CAISO Market disruption tolerances.
29	outage management system	Transmission and generation outage submittal and retrieval	The prospective WEIM Entity will verify its ability to	The prospective WEIM Entity validate their ability to submit and retrieve transmission out-of-service outages, generation

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold*
			submit and retrieve outage information with the CAISO	Pmax derates, generation Pmin rerates, and generation out-of-service outage tickets within the required timelines.
30	Communications between the CAISO and the prospective WEIM Entity	Voice and/or electronic messaging	Implemented process and procedures used for voice and/or electronic messaging	The process and procedures are incorporated into the prospective WEIM Entities business processes before the start of market simulation.
31	Communications between the CAISO and the prospective WEIM Entity	Communication tools	Staff are trained on communication procedures and tools	The prospective WEIM Entity operations staff who will have responsibility for WEIM operations, transactions and settlements are trained on the relevant operating procedures and tools used for WEIM related communications before the start of parallel operations
32	Communications between the CAISO and the prospective WEIM Entity	3 rd party transmission service provider	The third party transmission service provider information that supports WEIM Transfers and Real-Time Dispatch included in the Full Network Model is available during parallel operations	The CAISO provides third party transmission service provider and path operator information to the prospective WEIM Entity through parallel operations
33	EIM Available Balancing Capacity	Identification of WEIM Available Balancing Capacity	Participating resources and non-participating resources for WEIM Available Balancing Capacity.	The prospective WEIM Entity has identified WEIM participating resources and non-participating resources that it intends to designate in the WEIM Resource Plan as WEIM Available Balancing Capacity

Exceptions to Thresholds

Any exceptions to the adherence to the thresholds listed above will be considered by the CAISO and prospective WEIM Entity in accordance with the procedures for granting exceptions outlined below,

explained fully in stakeholder calls, noted on the readiness dashboard that is posted on the CAISO website. Exceptions will also be explained in the certification statements of the CAISO and the WEIM Entity. With each prospective WEIM Entity implementation, the CAISO will revisit the readiness thresholds and make modifications based on stakeholder feedback.

Any exception to a threshold would be reviewed by the responsible staff, escalated to the senior officers ultimately responsible for certification, and then documented in the readiness report that supports the certification. The CAISO and the prospective WEIM Entity will engage in a collaborative approach to satisfy the readiness criteria and endeavor to make decisions based on consensus between the parties. Both parties will strive to avoid exceptions by providing comprehensive updates and proactively managing issues and risks. When an exception is required, it will be defined by specifying what is not conforming and why an exception is necessary.

13.3 Readiness Reporting, Determination & Certification

Welcome to the *Readiness Certification* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- Timeline in which CAISO will report on the status of readiness criteria
- Timeline in which the CAISO and the WEIM Entity Initiate will determine readiness
- Timelines in which CAISO and the WEIM Entity Initiate will submit readiness certification to the Federal Energy Regulatory Commission

Readiness Reporting

CAISO will report at least monthly during market simulation and at least twice a month during parallel operations on the status of the readiness criteria. The reporting will be on the public CAISO web site (www.caiso.com), and will consist of current progress towards readiness thresholds and any exceptions or deviations from the readiness thresholds.

Readiness Determination

No later than 30 days prior to the prospective WEIM Entity's Implementation Date, the CAISO will determine, in consultation with the prospective WEIM Entity, whether the systems and processes of the prospective WEIM Entity will be ready for participation in the Western Energy Imbalance Market. Readiness will be determined by the thresholds specified in section 2.1 of the Business Practice Manual, with any exceptions for the certifying prospective WEIM Entity.

Readiness Certification

CAISO and the prospective WEIM Entity will track their progress and report on readiness criteria prior to filing for WEIM readiness certification. Both parties will file a market readiness certificate with the Federal Energy Regulatory Commission 30 days in advance of the prospective WEIM Entity established implementation date. The readiness certification will cover the following information:

- That the processes and systems of the prospective WEIM Entity have satisfied or will have satisfied the readiness criteria as outlined above.
- Any known issues requiring resolution prior to the established WEIM Implementation Date.
- Any exceptions from the readiness thresholds as outlined above.

That the WEIM Implementation Date is conditional upon the resolution of any known issues identified in the certificates filed with FERC and any unforeseen issues that arise that undermine the satisfaction of the readiness criteria. If, subsequent to readiness certification the CAISO or the prospective WEIM Entity determines they cannot proceed with implementation on the Implementation Date, the CAISO and the prospective WEIM Entity will notify the Federal Energy Regulatory Commission of the delay, the reason for the delay, the new Implementation Date if it can be determined, and whether it will need to re-issue a portion or all of the readiness certification.

14. RULES OF CONDUCT

Welcome to the *Rules of Conduct* section of the *CAISO BPM for the Western Energy Imbalance Market*. In this section you will find the following information:

- Summary of the behavior that is subject to Sanction under the CAISO Tariff Rules of Conduct (CAISO Tariff Section 37).

Participants in the CAISO markets are expected to comply with the provisions of the CAISO Tariff as well as requirements contained within its Business Practice Manuals. The process that CAISO undertakes to ensure compliance with these documents is described in the [BPM for Rules of Conduct Administration](#). A participant in the WEIM is also subject to these rules as defined by their specific participation in the EIM.

15. CHANGE MANAGEMENT

Welcome to the *Change Management* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- Information relating to requests for additions, edits, deletions, revisions, or clarifications to a BPM, including any attachments and exhibits to a BPM that are expressly incorporated by reference.

The Business Practice Manuals (BPMs) developed by CAISO are intended to contain implementation detail consistent with and supported by the CAISO Tariff, including: instructions, rules, procedures, examples, and guidelines for the administration, operation, planning, and accounting requirements of CAISO and the markets operated by CAISO. Changes to the information provided in the BPMs posted by CAISO are governed by the process outlined in the [BPM for Change Management](#).

16. DEFINITIONS AND ACRONYMS

Welcome to the *Definitions and Acronyms* section of the CAISO BPM for the Western Energy Imbalance Market. In this section you will find the following information:

- A list of defined terms, abbreviations, and acronyms that are used in the CAISO BPM for the Western Energy Imbalance Market.

The [BPM for Definitions & Acronyms](#) serves as a general reference for readers of the CAISO BPMs. It lists definitions used in the BPMs, including both newly defined terms and pertinent terms from the CAISO Tariff Appendix A. [The BPM for Definitions & Acronyms](#) also provides a list of acronyms used in CAISO BPMs, as well as acronyms associated with the remainder of the defined terms in Appendix A, regardless of whether they appear in the BPMs.

16.1 Acronyms

In this section you will find abbreviations and acronyms that are used in the CAISO WEIM BPM.

Acronym	Definition
AANSI	Area to Area Net Scheduled Interchange
API	Application Program Interface

BPM	Business Practice Manual
CAISO	California Independent System Operator Corporation
CAISO BAA	The Balancing Authority Area of California Independent System Operator
DAM	Day-Ahead Market
DB	EIM diversity benefit
EIM	Western Energy Imbalance Market
EIM Entity BAA	The Balancing Authority Area of Entity that is participating in the Western Energy Imbalance Market
External BAA	The Balancing Authority Area of Entities that are not CAISO BAA. External BAA includes WEIM Entity BAA, non-EIM Entity BAA, and boundary BAA that are not modeled in the FNM.
HVDC	High-Voltage Direct Current
Non-EIM Entity BAA	The Balancing Authority Area of Entity that is not participating in the Western Energy Imbalance Market
NSI	Net Scheduled Interchange
OCO	Outage Coordination Office
OMS	outage management system
PSE	Purchasing Selling Entity
RDT	Resource Data Template
RTM	Real-Time Market
WECC RC	Western Electricity Coordinating Council Reliability Coordinator

16.2 Definitions

In this section you will find terms and definitions that are used in the CAISO WEIM BPM.

Term	Definition
Base Schedule	A forward energy schedule, with hourly granularity, that is the baseline to measure deviations for settlement through the EIM. Base Schedules include the hourly forecasts of load, hourly generation schedules, and hourly interchange schedules.
EIM Entity	A Balancing Authority that represents one or more WEIM Transmission Service Providers and that enters into an WEIM Entity Agreement with CAISO to enable the operation of the Real-Time Market in its Balancing Authority Area (BAA).
EIM Entity Scheduling Coordinator	The WEIM Entity or a third party designated by the WEIM Entity that is certified by CAISO and that enters into an WEIM Entity Scheduling Coordinator Agreement, under which it is a Scheduling Coordinator and a Market Participant and is responsible for meeting the requirements specified in Section 29 on behalf of the WEIM Entity.
EIM BAA	Individual WEIM BAA, include CAISO
EIM footprint	Includes all WEIM BAAs and CAISO
EIM Net Imbalance Interchange	The net energy transfer of real time between an WEIM Entity BAA and the CAISO BAA or between WEIM Entity BAAs as a result of WEIM market optimization. It is calculated after the WEIM market optimization, excluding Base Schedule. WEIM Transfer out is the net imbalance energy export from the WEIM Entity BAA. WEIM Transfer in is the net imbalance energy import to the WEIM Entity BAA.
EIM Participating Resource	An owner of, operator of, or seller of Energy from an WEIM Resource that elects to participate in the Real-Time Market and enters into an WEIM Participating Resource Agreement, under which it is responsible for meeting the requirements specified in Section 29 of the Tariff.
EIM Participating Resource Scheduling Coordinator	The WEIM Participating Resource, or a third-party designated by the WEIM Participating Resource, that is certified by CAISO and enters into an WEIM Participating Resource Scheduling Coordinator Agreement, under which it

Term	Definition
	is a Scheduling Coordinator and is responsible for meeting the requirements specified in Section 29 of the Tariff on behalf of the resource.
EIM Transfer	The transfer of Energy in Real Time between an WEIM Entity Balancing Authority Area and the CAISO Balancing Authority Area or between WEIM Entity Balancing Authority Areas using transmission capacity made available to the Real-Time Market through the Western Energy Imbalance Market.
Western Energy Imbalance Market (EIM)	The rules and procedures in Tariff Section 29 governing CAISO's operation of the Real-Time Market in Balancing Authority Areas outside of the CAISO Balancing Authority Area and the participation of WEIM Market Participants in the Real-Time Market.
Non-Participating Loads	<p>The WEIM Entity SC shall receive the settlement for the non-participating load. CAISO will settle WEIM non-participating load UIE as the algebraic difference between the hourly meter data and the calculated Base Schedule at the applicable hourly Real-Time LAP price using volumetric weighted average LMP of 15-minute and 5-minute markets in that hour for the relevant LAP. The weights in the calculation are as follows:</p> <p>For the 15-minute LMP, it is the difference between 15-minute demand forecast and the demand forecast that was used to calculate base load at T-40 (Load + Loss). For the 5-minute LMP, it is the difference between 5-minute and 15-minute demand forecast. The LMP is bounded by Max/Min LMP over the hour:</p> <p>For Hourly LMP, is the sum of (15-minute LMP * 15-minute demand forecast deviation from the demand forecast that was used to calculate the base load at T-40) over four 15-minute intervals + Sum of (5-minute LMP * 5-minute demand forecast deviation from the 15-minute demand forecast) over twelve 5-minute intervals</p> <p>divided by</p> <p>The sum of [15-minute demand forecast deviation from the demand forecast that was used to calculate base load at T-40 over four 15-minute intervals + the sum of (5-minute demand forecast deviation from the 15-minute demand forecast) over twelve 5-minute intervals]</p>
Non-Participating Resource	A resource located within an WEIM Entity that chooses not to make its resource available for dispatching in the Real-Time Market. The Entity

Term	Definition
	Scheduling Coordinator must ensure that these resources are accounted for when determining balanced Base Schedules.
NSI Forecast	Net-Scheduled Interchange Forecast
Operating Day	The day when the Real-Time Market runs and Energy is supplied to Load.
Participating Resource	A resource located within an WEIM Entity that elects to participate in the EIM. Through their Participating Resource Scheduling Coordinator, these resources submit bids to the CAISO which convey their availability in the Real-Time Market.
Participating Resource Scheduling Coordinator	An entity certified by CAISO that submits economic bids and is responsible for financial settlements for one or more Participating Resources.
Resource Plan	Hourly resource components must may cover a up to seven-day horizon beginning with the Operating Day, and must cover at least five hours.. The Resource Plan consists of a combination of load Base Schedules, generation Base Schedules, interchange Base Schedules, ancillary services plans of the WEIM Entity, transmission available for WEIM Transfers, and the bid range voluntarily submitted by WEIM Participating Resources. Also, if an WEIM Entity Scheduling Coordinator is not using CAISO demand forecast, then it includes demand forecast. Resource Plans balance demand and supply and are used in the resource sufficiency evaluation.
System Resource	A group of resources, single resource, or a portion of a resource located outside of the CAISO Balancing Authority Area, or an allocated portion of a Balancing Authority Area's portfolio of generating resources that are either a static Interchange Schedule or directly responsive to that Balancing Authority Area's Automatic Generation Control (AGC) capable of providing Energy and/or Ancillary Services to the CAISO Balancing Authority Area, provided that if the System Resource is providing Regulation to CAISO it is directly responsive to AGC.
EIM Reserves to Meet NERC/WECC Contingency Reserves Requirements	Any capacity that an WEIM Entity Scheduling Coordinator has designated, in the WEIM Resource Plan, as necessary to meet its NERC/WECC contingency reserves requirements in the applicable Trading Hour and which does not overlap with capacity designated in other parts of the WEIM Resource Plan specified in Section 29.34(e)(3) of the CAISO Tariff.

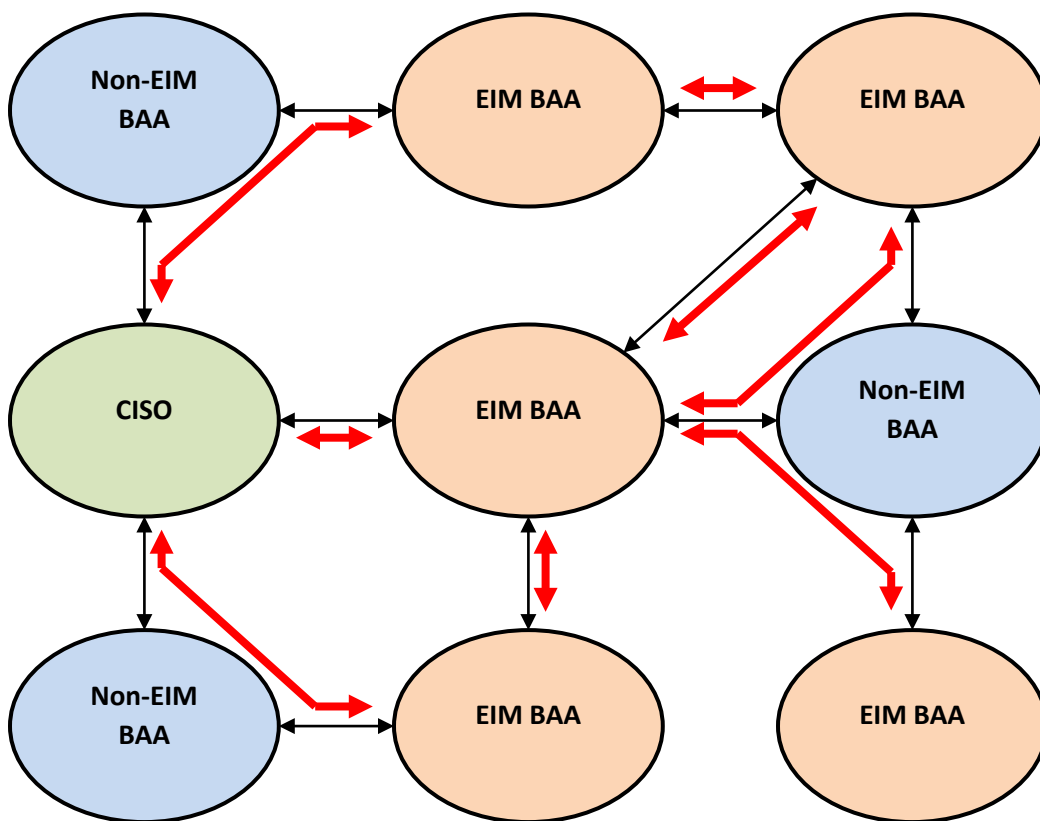
Term	Definition
EIM Downward Available Balancing Capacity	Any downward capacity from an WEIM Participating Resources or a non-participating resource that an WEIM Entity Scheduling Coordinator has identified in the WEIM Resource Plan as available to address power balance and transmission constraint violations in the WEIM Balancing Authority Area.
EIM Upward Available Balancing Capacity	Any upward capacity from an WEIM Participating Resources or a non-participating resource that an WEIM Entity Scheduling Coordinator has identified in the WEIM Resource Plan as available to address power balance and transmission violations in the WEIM Balancing Authority Area.

Appendix A: Mathematical Formulation for WEIM Transfer

Energy Transfer Scheduling in Western Energy Imbalance Market

16.2.1.1.1 Introduction

This technical paper describes the calculation of Energy Transfer schedules between Balancing Authority Areas (BAAs) in the Western Energy Imbalance Market (EIM) Area from the optimal WEIM Transfer calculated for each BAA in the WEIM Area by the Real-Time Unit Commitment (RTUC) and the Real-Time Dispatch (RTD) applications. The methodology in this document is general to account an arbitrary network configuration of WEIM and non-EIM BAAs in the Full Network Model (FNM), such as the example shown below:



EIM BAAs may be interconnected with the CISO directly, through another WEIM BAA, through a Non-EIM BAA, or a combination thereof. The WEIM Entity for an WEIM BAA may have made available transmission rights on a direct interconnection with the CISO, on a direct interconnection with another WEIM BAA, or on an indirect interconnection with the CISO or another WEIM BAA through one or more

non-EIM BAAs. The red arrows in the example above illustrate such transmission rights. These transmission rights are essential to the WEIM Transfers for each BAA in the WEIM Area as they both allow and constrain the optimal exchange of imbalance energy among the BAAs in the WEIM Area.

The WEIM Transfer is an algebraic quantity (positive for export and negative for import) for the net energy exchange between a given BAA and the remaining BAAs in the WEIM Area. The problem at hand is to determine the Energy Transfer schedules among the WEIM BAAs and the CISO from the optimal WEIM Transfers of the BAAs in the WEIM Area using the available transmission rights without violating them. These Energy Transfer schedules can then be tagged to the relevant interties among the BAAs.

16.2.1.1.2 Energy Transfer System Resources

Although not necessary for implementation, it is convenient to define dedicated System Resources in each WEIM BAA to anchor the Energy Transfer schedules from that BAA to other BAAs in the WEIM Area for tracking, tagging, and settlement. These Energy Transfer System Resources (ETSRs) are defined as aggregate resources at the WEIM BAA Default Generation Aggregation Point (DGAP), which is an aggregation of all supply resources in the BAA. Each ETSR is defined as either an import or an export resource, and it is associated with an WEIM intertie with another WEIM BAA, or a CISO intertie with the CISO. The associated intertie is one where the WEIM Entity for the relevant WEIM BAA has made transmission rights available for scheduling Energy Transfers from/to the other WEIM BAA or the CISO.

At least two ETSRs must be defined in a BAA for each Energy Transfer schedule with another BAA in the WEIM Area: one for import, and the other for export. An aggregate intertie may be used if there are multiple interties under the transmission rights that are made available. It may be necessary to define ETSRs for each intertie separately if the transmission rights are different for each one of them. It may also be necessary to define multiple ETSRs for each Transmission Service Provider (TSP) whose transmission rights are made available. Finally, it may be necessary to define different ETSRs for static 15min Energy Transfer schedules and dynamic 5min Energy Transfer schedules. The applicable transmission right limits can then be modeled as upper operating limits on the corresponding ETSRs.

For Energy Transfer schedules between BAAs in the WEIM Area, the relevant ETSRs in these BAAs must be associated in import-export pairs since an Energy Transfer schedule between the BAAs is an import to one and an export to the other.

16.2.1.1.3 Notation

The following mathematical notation is used in this paper:

i	Node index.
j, k	BAA indexes; zero (0) is used for the CISO.
l	Intertie or Energy Transfer schedule index; in the latter case, it is the corresponding ETSR index (ETSR pair for Energy Transfers between BAAs in the WEIM Area).
$\bar{}$	Accent denoting base schedule (RUC schedule for the ISO BAA).
$\hat{}$	Accent denoting gross tagged or forecasted interchange schedule between non-EIM BAAs.
$\tilde{}$	Accent denoting initial values from the last AC Power Flow (ACPF) solution.
Δ	Denotes incremental values from the last ACPF solution.
\forall	For all...
\in	Member of...
\wedge	...and...
EIM	The set of CISO and all WEIM BAAs.
BAA_j	The set of nodes in BAA j .
G_i	The generation at node i .
L_i	The load at node i .
$I_{j,k,l}$	The import schedule l into WEIM BAA j from BAA k .
$E_{j,k,l}$	The export schedule l from WEIM BAA j to BAA k .
D_j	The demand (load plus losses) forecast in BAA j .
$Loss_j$	The transmission loss in BAA j .
LPF_i	The loss penalty factor at node i .

$LPF_{j,k,l}$	The loss penalty factor at the Scheduling Point for intertie schedule l between BAA j in the WEIM Area and non-EIM BAA k .
NSI_j	The Net Scheduled Interchange of BAA j ; positive for export and negative for import.
T_j	The WEIM Transfer of WEIM BAA j ; positive for export and negative for import.
$IT_{j,k,l}$	The import Energy Transfer schedule l of WEIM BAA j from BAA k in the WEIM Area.
$ET_{j,k,l}$	The export Energy Transfer schedule l of WEIM BAA j to BAA k in the WEIM Area.
$IT_{MAXj,k,l}$	The applicable limit of the import Energy Transfer schedule l of WEIM BAA j from BAA k in the WEIM Area.
$ET_{MAXj,k,l}$	The applicable limit of the export Energy Transfer schedule l of WEIM BAA j to BAA k in the WEIM Area.
$IT_{TRj,k,l}$	The transmission right for the import Energy Transfer schedule l of WEIM BAA j from BAA k in the WEIM Area.
$ET_{TRj,k,l}$	The transmission right of the export Energy Transfer schedule l of WEIM BAA j to BAA k in the WEIM Area.
$IT_{MAX15j,k,l}$	The static limit for the import Energy Transfer schedule l of WEIM BAA j from BAA k in the WEIM Area.
$ET_{MAX15j,k,l}$	The static limit of the export Energy Transfer schedule l of WEIM BAA j to BAA k in the WEIM Area.
$IT_{MAX5j,k,l}$	The dynamic incremental limit for the import Energy Transfer schedule l of WEIM BAA j from BAA k in the WEIM Area.
$ET_{MAX5j,k,l}$	The dynamic incremental limit of the export Energy Transfer schedule l of WEIM BAA j to BAA k in the WEIM Area.
$C_{j,k}$	The transmission cost of the Energy Transfer schedules of WEIM BAA j from/to BAA k in the WEIM Area.

16.2.1.1.4 Mathematical Formulation

This section describes the relevant calculations and mathematical formulae.

Base Schedules

The base Energy Transfer schedules between WEIM BAAs are submitted along with the generation and intertie base schedules ahead of the market run. The base Energy Transfer schedules between WEIM BAAs and the CISO are the corresponding intertie schedules from the Residual Unit Commitment (RUC)⁵ and need not be submitted since they are known:

$$\left. \begin{array}{l} \overline{IT}_{j,0,l} = \overline{E}_{0,j,l} \\ \overline{ET}_{j,0,l} = \overline{I}_{0,j,l} \end{array} \right\} \forall j \in EIM \wedge j > 0$$

The base Energy Transfer schedules between WEIM BAAs on the same intertie must be matching:

$$\overline{IT}_{j,k,l} = \overline{ET}_{k,j,l} \quad \forall j, k \in EIM \wedge j \neq k \wedge j, k > 0$$

The base Energy Transfer schedules on a given intertie between two BAAs are submitted only for the ETSRs of one BAA, whereas the base Energy Transfer schedules for their ETSR counterparts of the other BAA are set to match. An ETSR attribute in the Master File is used to designate the ETSRs for which base Energy Transfer schedules are submitted and used for tagging, as explained in §11.1.5.

It is assumed that the base Energy Transfer schedules are feasible:

$$\left. \begin{array}{l} 0 \leq \overline{IT}_{j,k,l} \leq IT_{MAXj,k,l} \\ 0 \leq \overline{ET}_{j,k,l} \leq ET_{MAXj,k,l} \end{array} \right\} \forall j, k \in EIM \wedge j \neq k \wedge j > 0$$

For efficiency, there should not be both an import and an export base Energy Transfer schedule on a given intertie; at least one of them ought to be zero.

The base WEIM Transfer for each WEIM BAA is the net of all base Energy Transfer schedules:

$$\overline{T}_j = \sum_{\substack{k \in EIM \\ k \neq j}} \sum_l (\overline{ET}_{j,k,l} - \overline{IT}_{j,k,l}) \quad \forall j \in EIM \wedge j > 0$$

⁵ Currently, RUC intertie schedules are not part of the base WEIM Transfer because no scheduling is allowed from WEIM BAA Scheduling Hubs in the Day-Ahead Market, and intertie schedules from existing CISO Scheduling Points in WEIM BAAs are not considered WEIM transactions; hence the base Energy Transfer schedules with the CISO and the base WEIM Transfer for the CISO are all zero.

The base WEIM Transfer for the CISO is simply the negative sum of the base WEIM Transfers of all WEIM BAAs:¹

$$\bar{T}_0 = - \sum_{\substack{j \in EIM \\ j > 0}} \bar{T}_j$$

The base NSI for each WEIM BAA is the net of the WEIM Transfer and the submitted base intertie schedules with non-EIM BAAs:

$$\overline{NSI}_j = \bar{T}_j + \sum_{k \notin EIM} \sum_l (\bar{E}_{j,k,l} - \bar{I}_{j,k,l}) \quad \forall j \in EIM \wedge j > 0$$

The base demand in each WEIM BAA is derived to achieve power balance with the submitted base generation schedules and the base NSI:

$$\bar{D}_j = \sum_{i \in BAA_j} \bar{G}_i - \overline{NSI}_j \quad \forall j \in EIM \wedge j > 0$$

The base load in each WEIM BAA is obtained initially by reducing the base demand with an assumed initial transmission loss and then distributing it to the load nodes in the BAA using Load Distribution Factors (LDFs); the base load is then adjusted to absorb the loss error by an AC Power Flow (ACPF) using distributed load slack and Area Interchange Control (AIC) to maintain the base NSI:

$$\bar{D}_j = \sum_{i \in BAA_j} \bar{L}_i + \overline{Loss}_j \quad \forall j \in EIM \wedge j > 0$$

The base generation and load for the CISO are initialized at the RUC schedules; the CISO base load is also adjusted in the ACPF to account for generation and transmission outages occurred after RUC, and to absorb loss error as the CISO base NSI is maintained.

The base load for WEIM BAAs is significant because it is used as a reference for imbalance energy settlement; however, the base load for the CISO is not important since for the CISO the reference for imbalance energy settlement is the day-ahead schedules from the Integrated Forward Market (IFM); nevertheless, it is used in the ACPF to balance the CISO, and the FNM overall, for calculating the power flows on WEIM BAA transmission branches to identify any transmission limit violations for the feasibility test.

For the same reason, base schedules are also calculated for non-EIM BAAs to model unscheduled loop flow through the WEIM Area. The approach for the non-EIM BAA base schedules is somewhat different because they are not submitted; instead, the demand forecast and the tagged or forecasted interchange

schedules with other non-EIM BAAs are used to supplement the information available for the WEIM BAAs and the CISO. Specifically, the base NSI for non-EIM BAAs is derived as follows:

$$\overline{NSI}_j = \sum_{\substack{k \notin EIM \\ k \neq j}} \sum_l (\hat{E}_{j,k,l} - \hat{I}_{j,k,l}) - \sum_{k \in EIM} (\bar{E}_{k,j,l} - \bar{I}_{k,j,l}) \quad \forall j \notin EIM$$

The base generation in each non-EIM BAA is derived as the sum of the demand forecast and the base NSI, and it is distributed to the generating resources in the BAA using Generation Distribution Factors (GDFs), renormalized for generation outages:

$$\sum_{i \in BAA_j} \bar{G}_i = \bar{D}_j + \overline{NSI}_j \quad \forall j \notin EIM$$

The base load in each non-EIM BAA is calculated similarly to the base load in WEIM BAAs.

The base NSI for the CISO is simply the negative sum of the base NSIs of all BAAs in the FNM:

$$\overline{NSI}_0 = - \sum_{j > 0} \overline{NSI}_j$$

Optimal NSI and WEIM Transfers

The optimal NSI for each BAA in the WEIM Area, as calculated by RTUC and RTD, is the result of the optimal dispatch of resources within the BAA:

$$NSI_j = \sum_{i \in BAA_j} (G_i - L_i) - Loss_j \quad \forall j \in EIM \wedge j > 0$$

Linearizing from the previous ACPF solution:

$$\left. \begin{aligned} NSI_j &= \widetilde{NSI}_j + \Delta NSI_j \\ \widetilde{NSI}_j &= \sum_{i \in BAA_j} (\widetilde{G}_i - \widetilde{L}_i) - \widetilde{Loss}_j \\ \Delta NSI_j &= \sum_{i \in BAA_j} \frac{(\Delta G_i - \Delta L_i)}{LPF_i} \end{aligned} \right\} \forall j \in EIM$$

Where the optimal changes in generation and load are adjusted for marginal losses. Note that the load is not dispatched unless there is an outage or it is a dispatchable load, e.g., a hydro pump.

The optimal WEIM Transfer for each WEIM BAA is derived from the optimal NSI by subtracting the next export interchange with non-EIM BAAs:

$$T_j = NSI_j - \sum_{k \notin EIM} \sum_l (E_{j,k,l} - I_{j,k,l}) \quad \forall j \in EIM \wedge j > 0$$

Linearizing from the previous ACPF solution:

$$\left. \begin{aligned} T_j &= \tilde{T}_j + \Delta T_j \\ \tilde{T}_j &= \tilde{NSI}_j - \sum_{k \notin EIM} \sum_l (\tilde{E}_{j,k,l} - \tilde{I}_{j,k,l}) \\ \Delta T_j &= \sum_{i \in BAA_j} \frac{(\Delta G_i - \Delta L_i)}{LPF_i} - \sum_{k \notin EIM} \sum_l \frac{(\Delta E_{j,k,l} - \Delta I_{j,k,l})}{LPF_{j,k,l}} \end{aligned} \right\} \forall j \in EIM \wedge j > 0$$

Note that marginal loss contributions from network branches external to the WEIM Area are ignored in the Loss Penalty Factors; consequently, the effect of intertie schedules between non-EIM BAAs and BAAs in the WEIM Area on the WEIM Area losses is the same as if the energy was generated or consumed at the WEIM Area boundary.

The optimal WEIM Transfer for the CISO is simply the negative sum of the optimal WEIM Transfers of all WEIM BAAs:

$$T_0 = - \sum_{\substack{j \in EIM \\ j > 0}} T_j$$

The aggregate interchange dispatch at non-EIM BAA Scheduling Points/Hubs determines the NSI deviation (from the base NSI) of non-EIM BAAs and it is distributed to the generating resources of the relevant Generation Aggregation Point (GAP) using the applicable GDFs:

$$NSI_j - \tilde{NSI}_j = - \sum_{k \in EIM} \sum_l (\Delta E_{k,j,l} - \Delta I_{k,j,l}) = \sum_{i \in BAA_j} (G_i - \tilde{G}_i) \quad \forall j \notin EIM$$

The NSI is maintained for each BAA in the ACPF by adjusting the load using distributed load slack and AIC. Therefore, the NSI, WEIM Transfer, and generation for WEIM BAAs in the ACPF solution are always equal to the optimal solution in the last iteration.

Energy Transfer Schedules

The WEIM Transfer for each WEIM BAA is distributed optimally to the applicable Energy Transfer Schedules:

$$\sum_{\substack{k \in EIM \\ k \neq j}} \sum_l (ET_{j,k,l} - IT_{j,k,l}) = T_j \quad \forall j \in EIM \wedge j > 0$$

Where:

$$IT_{j,k,l} = ET_{k,j,l} \quad \forall j, k \in EIM \wedge j \neq k \wedge j, k > 0$$

Without violating the applicable transmission right limits:

$$\left. \begin{array}{l} 0 \leq IT_{j,k,l} \leq IT_{MAXj,k,l} \\ 0 \leq ET_{j,k,l} \leq ET_{MAXj,k,l} \end{array} \right\} \quad \forall j, k \in EIM \wedge j \neq k \wedge j > 0$$

For efficiency, there should not be both an import and an export Energy Transfer schedule on a given intertie; at least one of them should be zero.

It is assumed that the transmission limits are symmetric:

$$IT_{MAXj,k,l} = ET_{MAXk,j,l} \quad \forall j, k \in EIM \wedge j \neq k \wedge j, k > 0$$

To clarify, Energy Transfer schedules are variables in the market optimization calculated optimally subject to the above constraints. The base Energy Transfer schedule is included in the optimal Energy Transfer schedule; in other words, the optimal Energy Transfer schedule on any given intertie may completely back down a base Energy Transfer schedule and the energy transfer may reverse, resulting in efficient use of interconnecting transmission capacity.

To reduce the problem dimensionality and potential degeneracy, for Energy Transfer schedules between two BAAs on a given intertie, only the ETSRs of one BAA are included in the problem formulation; their ETSR counterparts of the other BAA can be eliminated. An ETSR attribute in the Master File is used to designate the ETSRs that are optimized and used for tagging, as explained in §11.1.5.

Note: When calculating ETSR schedules where one of the associated BAAs is the ISO BAA, the WEIM Entity/Entities should not submit pre-hour or after-the-fact interchange schedules. As these are tags with the ISO BAA, the CAISO will use the tag to determine the scheduled quantities needed.

Energy Transfer Schedule Limits

Normally, Energy Transfer schedules are dynamic and the same ETSRs and transmission limits are used in both RTUC and RTD. However, if some Energy Transfer schedules must be differentiated between RTUC

and RTD, static ETSRs will be used for the 15min Energy Transfer schedules in RTUC and dynamic ETSRs will be used for the incremental 5min Energy Transfer schedules in RTD. In this case, the base Energy Transfer schedule is included in the 15min Energy Transfer schedule, and the transmission limit for the 5min Energy Transfer schedule is zero in RTUC and incremental (from the optimal 15min Energy Transfer schedule) in RTD. For a uniform treatment of all ETSRs to simplify implementation, the applicable Energy Transfer schedule limits in RTUC and RTD can be derived from the transmission right, static limit, and incremental dynamic limit, as follows:

$$\begin{aligned} \text{RTUC: } & \left\{ \begin{aligned} IT_{MAXj,k,l} &= \min(IT_{TRj,k,l}, IT_{MAX15j,k,l}) \\ ET_{MAXj,k,l} &= \min(ET_{TRj,k,l}, ET_{MAX15j,k,l}) \end{aligned} \right\} \forall j, k \in EIM \wedge j \neq k \wedge j > 0 \\ \text{RTD: } & \left\{ \begin{aligned} IT_{MAXj,k,l} &= \min(IT_{TRj,k,l}, IT_{j,k,l} + IT_{MAX5j,k,l}) \\ ET_{MAXj,k,l} &= \min(ET_{TRj,k,l}, ET_{j,k,l} + ET_{MAX5j,k,l}) \end{aligned} \right\} \forall j, k \in EIM \wedge j \neq k \wedge j > 0 \end{aligned}$$

Where the Energy Transfer schedules used in the calculation of the applicable Energy Transfer schedule limit in RTD are the optimal 15min Energy Transfer schedules from RTUC. With these generic formulae, the static limit is what is made available from the transmission right in RTUC, and the dynamic limit is additional transmission capacity that can be used in RTD. If there is no distinction between static and dynamic Energy Transfer schedules, both static and dynamic limits should be equal to the transmission right to maximize transmission capacity use across RTUC and RTD.

For Energy Transfer schedules between two BAAs on a given intertie, the Energy Transfer schedule limits are submitted only for the ETSRs of one BAA. The WEIM Entity of that BAA is responsible for submitting base Energy Transfer schedules and the associated Energy Transfer schedule limits, as well as for tagging base and optimal Energy transfer schedules between the relevant BAAs. An ETSR attribute in the Master File is used to designate the ETSRs that are used for tagging and for which Energy Transfer schedule limits are submitted, as explained in §11.1.5.

Energy Transfer Schedule Tags

The base and optimal Energy Transfer schedules are assigned to the corresponding ETSRs and are tagged by the WEIM Entity Scheduling Coordinator to the associated intertie using the corresponding ETSR identification. The WEIM Entity Scheduling Coordinator should obtain a unique identifier to list as the “Purchasing Selling Entity” if at all possible. If that is not possible, designated agents, e.g., the WEIM Entity Scheduling Coordinator, may list the WEIM Entity as the “Purchasing Selling Entity” on such tags for convenience provided the WEIM Entity has authorized its agent to do so and the tag identifies that relationship as the basis for doing so.

For static ETSRs, the tag is a static 15-minute tag that includes the base Energy Transfer. For dynamic ETSRs, the tag is a dynamic 5-minute tag; if there is no distinction between static and dynamic Energy Transfers on a given intertie, there is no static tag and the base Energy Transfer schedule is included in the dynamic 5-minute tag. Because the Energy Transfer schedules between two WEIM BAAs are duplicated as import and export counterparts seen from each WEIM BAA, only the ETSRs of one WEIM BAA will be tagged between the two WEIM BAAs. An ETSR attribute in the Master File is used to designate the ETSRs that are used for tagging. The same attribute is used to indicate the ETSRs for which base Energy Transfer schedules and limits are submitted, as well as the ones that are included in the problem formulation.

Intertie Transmission Cost

The distribution of the Energy Transfer for a BAA over the various interties to adjacent BAAs in the WEIM Area is not influenced by network impedance or transmission losses, and as such it does not represent actual power flows on these interties; it resembles the classical problem of transferring goods from supply centers to demand centers over a road network. The Energy Transfer schedule limits are scheduling limits and they resemble road throughput capacity. Physical intertie limits need to be enforced separately to constrain actual power flows on the interties, including loop flow contributions from base schedules in non-EIM BAAs.

In a problem like that, there is often not a unique solution, particularly if many intertie scheduling limits are not binding, i.e., there may be multiple ways to transfer the goods from the supply centers to the demand centers without violating any road constraints. To obtain a robust and efficient solution without circulating Energy Transfer schedules, a small nominal cost should be included in the objective function for each ETSR, as follows:

$$\min \left(\dots + \sum_{\substack{j,k \in EIM \\ k \neq j \\ j > 0}} C_{j,k} \sum_l (ET_{j,k,l} + IT_{j,k,l}) \right)$$

This cost resembles tolls paid on the roads connecting the supply and demand centers. Introducing this cost will also guarantee that Energy Transfer schedules between two BAAs in the WEIM Area will always be unidirectional, i.e., either the export or the import will take value, but never both. This cost may

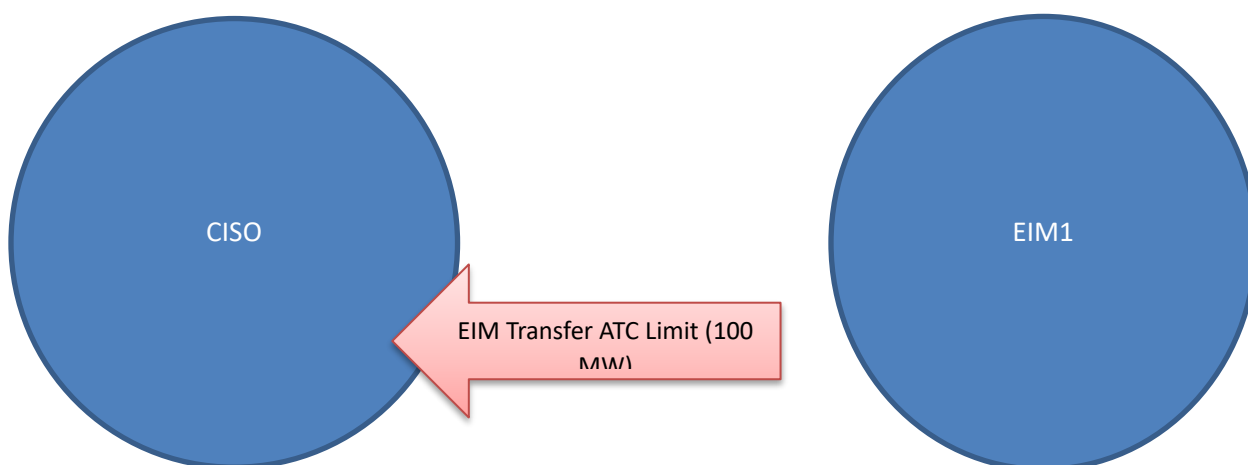
ultimately reflect applicable wheeling or transmission access fees depending on agreed transmission pricing methods among the BAAs in the WEIM Area.

Energy Transfer Financial Value

In calculating real-time neutrality by BAA, a financial value is required for the Energy Transfer, which must be considered to balance the BAA. Currently, the financial value is determined by pricing the WEIM Transfer at the LMP of the metered end of the intertie used for tagging the relevant WEIM Transfer schedule. With the introduction of multiple interties (multiple ETSRs) for a given BAA where the Energy Transfer can be optimally distributed based on the presented methodology, a more robust and uniform price is the System Marginal Energy Cost (SMEC), which is the same in any location in the network and does not include the marginal cost of losses or congestion. This is a more appropriate price because it is independent from the particular way an Energy Transfer is distributed to Energy Transfer schedules on the various interties.

Examples

EIM Transfer Constraint Congested/Intertie Scheduling Limit Not Congested



In the example presented below, the Real Time Market receives Bids from EIM1 Generator and CISO Generator in order to serve EIM1 Load and CISO Load. The Real Time Market Conditions have determined that there is 100 MWs Available Transmission Capacity between EIM1 and CISO with an WEIM Transfer Cost of \$0.01. Based upon these conditions, the Real Time Market has dispatched a Generator in the EIM1 Balancing Authority Area (BAA) to serve 50 MWs of EIM1 Load and 100 MWs of CISO Load. The Real Time Market also dispatched a Generator in the CISO BAA to serve an additional 100 MWs of internal Load. Market Conditions has determined that marginal unit is CISO Generator, the WEIM Transfer Constraint is congested, and the Intertie scheduling Limit Constraint is not congested.

Based upon the above mentioned Market Conditions, Settlement calculations will be as follows:

Bids

Resource	Quantity (MW)	Energy Bid Price (\$/MW)	GHG Bid Price (\$/MW)	All-in Bid Price (\$/MW)
EIM1Gen	200	\$ 35.00	\$ -	\$ 35.00
CISOGen	300	\$ 50.00	\$ -	\$ 50.00

Load Forecast

Resource	Quantity (MW)
EIM1Load	50
CISOLoad	200

Market Dispatch (RTD)

Resource	Quantity (MW)	LMP
EIM1Gen	150	\$ 34.99
CISOGen	100	\$ 50.00

Location Marginal Pricing (RTD)

Location	Energy	Congestion*	Losses	GHG	Price
EIM1Gen	50	(15.01)	-	-	34.99
CISOGGen	50	-	-	-	50
PACLoad	50	(15.01)	-	-	34.99
CISOLoad	50	-	-	-	50
EIM Transfer	50	-	-	-	50

* Congestion is based upon the WEIM Constraint (\$15) plus Intertie Scheduling Limit (\$0) plus the WEIM Transfer Costs (\$0.01).

Settlement:

Charge Code	Resource	Qty	Price	(Payment)/Charge
CC 64700	EIM1Gen	150	\$ 34.99	\$ (5,248.50)
CC 6470	CISOGGen	100	\$ 50.00	\$ (5,000.00)
CC 64750	EIM1Load	50	\$ 34.99	\$ 1,749.50
CC 6475	CISOLoad	200	\$ 50.00	\$ 10,000.00

RTCO Calculation	QTY	MCC(EIM1)*	Amount	MCC(CISO)	Amount
EIM1Gen	150	\$ (15.01)	\$ 2,251.50	\$ -	\$ -
CISOGGen	100	\$ -	\$ -	\$ -	\$ -
EIM1Load	-50	\$ (15.01)	\$ (750.50)	\$ -	\$ -
CISOLoad	-200	\$ -	\$ -	\$ -	\$ -
Total			\$ 1,501.00		\$ -

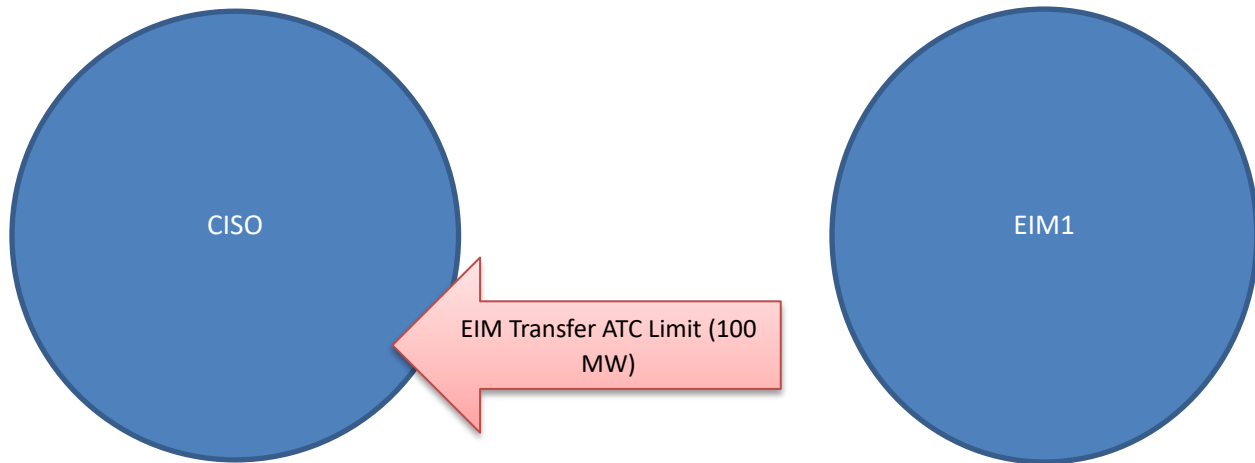
RTCO Allocation	QTY	MCC(EIM1)**	Amount	MCC(CISO)**	Amount
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EIM1Gen	150	\$ (7.51)	\$(1,125.75)	\$ (7.51)	\$(1,125.75)
CISOGen	100	\$ -	\$ -	\$ -	\$ -
EIM1Load	-50	\$ (7.51)	\$ 375.25	\$ (7.51)	\$ 375.25
CISOLoad	-200	\$ -	\$ -	\$ -	\$ -
CC 67740			\$ (750.50)		
CC 6774					\$ (750.50)

** Sum of the Intertie Scheduling Limit plus product of WEIM Transfer Costs and the WEIM Transfer Cost Ratio Share (50/50) plus the product of WEIM Constraint and the WEIM Transfer Constraint Ratio Share (50/50)

RTIEO Charge/Payment	Charge Code	EIM1	CISO
	CC 64700	\$(5,248.50)	
	CC 6470		\$ (5,000.00)
	CC 64750	\$ 1,749.50	
	CC 6475		\$ 10,000.00
	EIM Financial Value***	\$ 5,000.00	\$ (5,000.00)
	RTCO Calculation	\$ 1,501.00	\$ -
	RTLosses	0	0
RTIEO		\$ -	\$ -

*** WEIM Transfer is settled at the System Marginal Energy Costs

EIM Transfer Constraint Not Congested/Intertie Scheduling Limit Congested

In the example presented below, the Real Time Market receives Bids from EIM1 Generator and CISO Generator in order to serve EIM1 Load and CISO Load. The Real Time Market Conditions have determined that there is 100 MWs Available Transmission Capacity between EIM1 and CISO with an WEIM Transfer Cost of \$0.01. Based upon these conditions, the Real Time Market has dispatched a Generator in the EIM1 Balancing Authority Area (BAA) to serve 50 MWs of EIM1 Load and 100 MWs of CISO Load. The Real Time Market also dispatched a Generator in the CISO BAA to serve an additional 100 MWs of internal Load. Market Conditions has determined that marginal unit is CISO Generator, the WEIM Transfer Constraint is not congested, and the Intertie scheduling Limit Constraint is congested.

Based upon the above mentioned Market Conditions, Settlement calculations will be as follows:

Bids

Resource	Quantity (MW)	Energy Bid Price (\$/MW)	GHG Bid Price (\$/MW)	All-in Bid Price (\$/MW)
EIM1Gen	200	\$ 35.00	\$ -	\$ 50.00
CISOGen	300	\$ 50.00	\$ -	\$ 50.00

Load Forecast

Resource	Quantity (MW)
EIM1Load	50
CISOLoad	200

Market Dispatch (RTD)

Resource	Quantity (MW)	LMP
EIM1Gen	150	\$ 34.99
CISOGen	100	\$ 50.00

Location Marginal Pricing (RTD)

Location	Energy	Congestion*	Losses	GHG	Price
EIM1Gen	50	(15.01)	-	-	34.99
CISOGen	50	-	-	-	50
PACLoad	50	(15.01)	-	-	34.99
ISOLoad	50	-	-	-	50

EIM Transfer	50	(15.01)	-	-	34.99
--------------	----	---------	---	---	-------

* Congestion is based upon the WEIM Constraint (\$15) plus Intertie Scheduling Limit (\$0) plus the WEIM Transfer Costs (\$0.01).

Settlement:

Charge Code	Resource	Qty	Price	(Payment)/Charge
CC 64700	EIM1Gen	150	\$ 34.99	\$ (5,248.50)
CC 6470	CISOGen	100	\$ 50.00	\$ (5,000.00)
CC 64750	EIM1Load	50	\$ 34.99	\$ 1,749.50
CC 6475	CISOLoad	200	\$ 50.00	\$ 10,000.00

RTCO Calculation	QTY	MCC(EIM1)*	Amount	MCC(CISO)	Amount
EIM1Gen	150	\$ (15.01)	\$ 2,251.50	\$ -	\$ -
CISOGen	100	\$ -	\$ -	\$ -	\$ -
EIM1Load	-50	\$ (15.01)	\$ (750.50)	\$ -	\$ -
CISOLoad	-200	\$ -	\$ -	\$ -	\$ -
Total			\$ 1,501.00		\$ -

RTCO Allocation	QTY	MCC(EIM1)**	Amount	MCC(CISO)**	Amount
EIM1Gen	150	\$ (0.005)	\$ (0.75)	\$ (15.005)	\$(2,251.50)
CISOGen	100	\$ -	\$ -	\$ -	\$ -
EIM1Load	-50	\$ (0.005)	\$ 0.25	\$ (15.005)	\$ 750.25
CISOLoad	-200	\$ -	\$ -	\$ -	\$ -
CC 67740			\$ (0.50)		
CC 6774					\$ (1500.50)

** Sum of the Intertie Scheduling Limit plus product of WEIM Transfer Costs and the WEIM Transfer Cost Ratio Share (50/50) plus the product of WEIM Constraint and the WEIM Transfer Constraint Ratio Share (50/50)

RTIEO Charge/Payment	Charge Code	EIM1	CISO
	CC 64700	\$(5,248.50)	
	CC 6470		\$ (5,000.00)
	CC 64750	\$ 1,749.50	
	CC 6475		\$ 10,000.00
	EIM Financial Value***	\$ 5,000.00	\$ (5,000.00)
	RTCO Calculation	\$ 1,501.00	\$ -
	RTLoses	0	0
RTIEO		\$ -	\$ -

*** WEIM Transfer is settled at the System Marginal Energy Costs

Appendix B: Mathematical Formulation for using Available Capacity resolving infeasible power balance conditions in WEIM BAAs

Introduction

This appendix describes the mathematical formulation of the market software feature that enables the WEIM entity to identify available balancing capacity for resolving infeasible power balance conditions in the applicable WEIM BAAs.

The available balancing capacity feature is configured to ensure the energy from capacity designated as available balancing capacity does not exit relevant WEIM entity's BAA through the WEIM Transfer. The capacity identified as the available balancing capacity will be released only to the extent necessary to resolve power balance infeasibility and should not be used to displace other capacity made available in the BAA for WEIM participation. It should be noted that if the infeasibility persists after dispatching all the capacity designated as available balancing capacity for the relevant WEIM entity BAA, the price will be set consistent with rules in Section 27.4.3.4.

For purposes of this appendix, the capacity designated as WEIM Upward or Downward Available Balancing Capacity will be referred to herein as Regulation Up or Down.

Technical Description

The CAISO's market clearing software calculates the optimal solution in two passes, referred to as the scheduling and pricing run. The scheduling run is a full optimization run where constraints may be relaxed at a penalty price to avoid infeasibility. The pricing run is a simple economic dispatch, initialized from the scheduling run solution, where penalty prices are replaced by administrative prices and the problem is constrained so that the primal solution does not drift far away from the primal solution of the scheduling run. Both binding schedules and prices are obtained from the pricing run.

Mathematical Formulation

This section contains the mathematical formulation for the new elements introduced in the Scheduling and Pricing Run for dispatching Regulation to resolve power balance infeasibility in WEIM BAAs.

The following notation is used in this section:

i	EIM Resource index.
k	EIM BAA index.
t	Time period index (0 for initial condition).
N	Number of time periods in the time horizon.
K	Number of WEIM BAAs.
R_k	Set of WEIM Resources for BAA k .
\forall	For all...
\rightarrow	Leads to...
$T_{k,t}$	EIM Transfer of BAA k in time period t (positive for export and negative for import).
$\bar{T}_{k,t}$	Base WEIM Transfer of BAA k in time period t .
$RU_{i,t}$	Regulation Up schedule of Resource i in time period t .
$RD_{i,t}$	Regulation Down schedule (non-positive) of Resource i in time period t .
$\overline{RU}_{i,t}$	Base Regulation Up schedule of Resource i in time period t .
$\overline{RD}_{i,t}$	Base Regulation Down schedule (non-positive) of Resource i in time period t .
$\widehat{RU}_{i,t}$	Regulation Up schedule of Resource i in time period t from the Scheduling Run used as upper limit in the Pricing Run.
$\widehat{RD}_{i,t}$	Regulation Down schedule of Resource i in time period t from the Scheduling Run used as lower limit in the Pricing Run.
C	Objective function.
$CRU_{i,t}(p)$	Incremental energy cost function allocated to Regulation Up schedule of Resource i in time period t .
$CRD_{i,t}(p)$	Incremental energy cost allocated to Regulation Down schedule of Resource i in time period t .
PU_H	High penalty price for Regulation Up.
PU_L	Low penalty price for Regulation Up; $0 \ll PU_L \leq PU_H$.
PD_H	High penalty price for Regulation Down.
PD_L	Low penalty price for Regulation Down; $PD_L \leq PD_H \ll 0$.

A_U	Linear penalty price transformation coefficient for Regulation Up.
B_U	Constant penalty price transformation for Regulation Up.
A_D	Linear penalty price transformation coefficient for Regulation Down.
B_D	Constant penalty price transformation for Regulation Down.

The contribution of Regulation dispatch in the Scheduling Run objective function is as follows:

$$C = \dots + \sum_{t=1}^N \sum_{k=1}^K \sum_{i \in R_k} \int_0^{RU_{i,t}} (A_U CRU_{i,t}(p) + B_U) dp + \sum_{t=1}^N \sum_{k=1}^K \sum_{i \in R_k} \int_0^{RD_{i,t}} (A_D CRD_{i,t}(p) + B_D) dp$$

Where the linear transformation parameters for the economically differentiated penalty prices are derived as follows:

$$A_U = \min \left(1, \frac{PU_H - PU_L}{\max_{i,t} (CRU_{i,t}(p)) - \min_{i,t} (CRU_{i,t}(p))} \right)$$

$$B_U = PU_L - A_U \min_{i,t} (CRU_{i,t}(p))$$

$$A_D = \min \left(1, \frac{PD_H - PD_L}{\max_{i,t} (CRD_{i,t}(p)) - \min_{i,t} (CRD_{i,t}(p))} \right)$$

$$B_D = PD_H - A_D \max_{i,t} (CRD_{i,t}(p))$$

Regulation Up/Down dispatch in the Scheduling Run is prevented when the WEIM Transfer is higher/lower than the base WEIM Transfer for the WEIM BAA as follows:

$$\left. \begin{array}{l} T_{k,t} > \bar{T}_{k,t} \rightarrow \sum_{i \in R_k} RU_{i,t} = 0 \\ T_{k,t} < \bar{T}_{k,t} \rightarrow \sum_{i \in R_k} RD_{i,t} = 0 \end{array} \right\}, \forall k, t$$

Regulation Up/Down dispatch in the Scheduling Run is also limited by the base Regulation schedule as follows:

$$0 \leq RU_{i,t} \leq \overline{RU}_{i,t}, \forall i, t$$

$$0 \geq RD_{i,t} \geq \overline{RD}_{i,t}, \forall i, t$$

Whereas the Regulation dispatch in the Pricing Run is limited by the optimal dispatch in the Scheduling Run as follows:

$$0 \leq RU_{i,t} \leq \widehat{RU}_{i,t}, \forall i, t$$

$$0 \geq RD_{i,t} \geq \widehat{RD}_{i,t}, \forall i, t$$

Appendix C: Demand Response Attestation

WEIM Demand Response Attestation

- *The following attestation form may be used to acknowledge EIM Entity responsibilities when accounting for non-participating demand response as described in Section 11.3.2. This attestation must be completed and attached to a CIDI ticket with the Subject Line "RSE Attestation" for the BAAOP functionality to be enabled and allow the Short-Term Forecast adjustments process to proceed. For any desired changes to this attestation after its submission, please contact your Client Representative.*
- **To submit documentation, please review <http://www.caiso.com/Documents/How-to-Submit-Documentation-for-Applications-and-Ongoing-Obligations.pdf> for proper steps**
Letter templates must be printed on applicable company letterhead, signed, scan as a pdf.

Remove this text box when copying to resource owner letterhead

[Current Date]

California Independent System Operator
250 Outcropping Way
Folsom, CA 95630

Dear [SC Requests]:

I, [_____, Title, Department, WEIM Entity], with my knowledge and experience given my position with [WEIM Entity], attest as follows

The CAISO allows the demand response reductions not otherwise accounted for in the WEIM to be included in, or excluded from, the generated demand forecast referenced in the Resource Sufficiency Evaluation (RSE), based on this attestation.

Pursuant to the CAISO Tariff Section 29.34(l)(2)(D), the [WEIM Entity] shall utilize a demand response program such that adjustments made to the demand forecast used by the RSE correspond to expected increases or reductions in demand provided by its demand response program.

[WEIM Entity] certifies the adjustments made to its Demand Forecast will correspond to expected increases or reductions in demand provided by its respective demand response.

I declare under penalty of perjury pursuant to 28 USC 1746 and the laws of the State of California that, to the best of my knowledge, the foregoing is true and correct. Executed on [month, day, 202_] ("Execution Date").

WEIM Entity

By: _____

Name, Title, Depart, WEIM Entity

2024 GRC – February 2023 Initial Filing

Western Energy Imbalance Market (EIM) NVPC Net Benefit

The 2024 EIM net benefit forecast in the MONET model will be based on the same methodology employed in the 2023 AUT.

The methodology used to calculate the estimated EIM benefit was developed by the Trading Strategy and Analytics team at PGE. This methodology forecasts:

1. A sub-hourly dispatch savings associated with the results of the MONET NVPC forecast,
2. Greenhouse Gas (GHG) benefits in addition to the sub-hourly dispatch savings,
3. CAISO Flex award savings, and
4. Grid Management charges.

Sub-Hourly Dispatch Savings:

See “*Sub-Hourly Dispatch Savings*” folder

Doc #1 calculates the sub-hourly dispatch savings based on MONET hourly results using the Lydia2.2 methodology.

The calculation is set up as described below:

1. “hrlydiagnosticcost” worksheet: MONET output, but columns BF:BM are added to calculate EIM sub-hourly dispatch savings. See Docs #2-5 for a full description of the calculation logic.
2. “Hrlydiagnosticenergy” worksheet: MONET output, but columns BG:BK are added to provide the needed price parameters for the EIM methodology.
3. “EIM Hydro and Thermal Limits” worksheet: Sets the limits for hydro and thermal trading in the EIM methodology. Detail for the limits can be found in Doc #6 and Doc #7.
4. “AS_DiagThermal” worksheet: MONET output with no changes.
5. “Thermal Production Cost” worksheet: Calculates hourly production cost for marginal thermal unit based-off of the resources MONET selects for economic generation.
6. “DP Output Plant_State” worksheet: MONET output with no changes.
7. “STATE_TABLE LOOKUP” worksheet: a lookup table of all possible plant states, and whether that state would be eligible for sell or purchase in the EIM.

Note: EIM prices that are used to calculate the sub-hourly dispatch savings are calculated using an EIM price factor (relative to Mid-C price), as described in next sub-section.

EIM Price Factor

See “*EIM Price Factor*” sub-folder

Doc #09 calculates the EIM price factor as described below:

1. EIM price factor calculations are based on 2019 – 2021 historical data. For EIM prices, 15-minute price data is converted into hourly prices in Doc #10. Doc #11 provides hourly Mid-C prices for the same historical time-period (source: Powerdex).

2. EIM price factor calculation methodology was developed in conjunction with Lydia 2.0 methodology. Like Lydia2.0 (and Lydia 2.2), this methodology intends to capture the historical relationship between EIM prices and Mid-C prices depending on wind generation volume, monthly.
3. Historical (hourly) wind generation data for years 2019 – 2021 are bucketized into 4 quartiles based on daily average wind generation values within a given month (see worksheet “Wind Summary”). This implies each day for the calendar year of 2019 through 2021 is categorized into one of the 4 quartiles based on daily average wind generation, for a given month-year. Note: Historical wind generation data for PGE owned wind facilities can be found in Doc #12.
4. EIM factor calculation uses the historical relationship between EIM prices and Mid-C prices to generate a factor, which is multiplied with the Mid-C price to simulate EIM prices. Note: Historical EIM price and Mid-C price data is broken down using the criteria: hour-month, weekday type and wind quartile.

$$(EIM\ Factor) = (EIM\ Price)_{historical} \div (Mid-C\ Price)_{historical}$$

$$(EIM\ Price)_{2023} = (Mid-C\ Price)_{2023} \times (EIM\ Factor)$$

5. To exclude outliers from the historical data, hourly EIM factors are calculated and then, by month, an inter-quartile range for the hourly EIM factors was determined. This range was used as a boundary criterion to scrub historical data for outliers (see worksheet “Exclude Criteria”).
6. On the “Raw Data” worksheet, time series historical data and all calculated fields are consolidated.
7. On the “EIM FACTOR” worksheet, an average EIM price and average Mid-C price is calculated using the following breakdown of data: month, hour, weekday type (weekday vs. Sunday) and wind quartile. Using these average EIM and average Mid-C price, an average EIM factor is calculated within the above-described breakdown.
 - a. Note: In the instance that data were excluded due to the “exclude criteria” calculation, and this results in no valid price for use in that particular month / hour / weekday type / wind quartile; this will result in an EIM Factor of 1.0 for that period.
8. This average EIM factor then translates into an 8760 timeseries for the test year of 2023 on the “Input for Sub-Hrly wkbk” worksheet.

Flex Award Savings Forecast

Doc #13 takes the three-year simple average of historical settlement data from 2019 to 2021, determining the flex award savings in the 2023 forecast (Doc #18).

GHG Benefits

Doc #14 calculates the GHG benefit from EIM.

1. “Weighted Rate and Benefit” worksheet: Calculates the Implied Emission Rate (see Row 5), reports emission rates (see Row 7 – 10), and reports carbon cost forecast (see Row 14 for ICE price and Row 18 for CCO cost). The forecast

benefit calculation for Hydro, Port Westward, Carty, and Coyote is provided beginning at row 23.

Note: For ICE prices, see Doc #15, CB0 contract under CCA futures.

- a. Total forecast Benefit is reported in cell B21 (and subsequently entered into Doc # 18).
2. “GHG Award and Price Detail” worksheet: 15-minute GHG award and price detail used to calculate award-weighted GHG award price and GHG allowance price.
3. “2021 GHG Allowance Price” worksheet: Daily GHG Allowance Prices reported by CAISO. See OASIS report named **Greenhouse Gas Allowance Index Prices**. <http://oasis.caiso.com/>
4. “2021 Resource GHG Awards” worksheet: Resource GHG awards (MWh).

Note: Doc #16 revises the historical GHG award quantity in October and November based on the outage schedule for the days that Round Butte units will be in full outage. The reduced award quantity is used in Doc #13.

Grid Management Charges

Doc #17 escalates 2021 settlement data by approximately 4.1% (i.e., MONET’s inflation rate of 2.05% applied twice to reach 2023 dollar equivalent), which sets the Grid Management Charges in the 2023 forecast (Doc #17).

Summary

The 2023 forecast for the EIM benefit is summarized in Doc #18.

The EIM value will be updated in the April 2023 filing.

Source Documents

Within the Sub-Hourly Dispatch folder:

1. “01_EIM_Sub-Hourly Dispatch Savings Forecast-2023AUT_NovUpdate”, work paper calculates the sub-hourly dispatch savings based on MONET results.
2. “02Calculation Logic_BJ.txt”, logic for MONET purchase - EIM sale methodology.
3. “03Calculation Logic_BL.txt”, logic for MONET sale - EIM purchase methodology.
4. “04Calculation Logic_BK.txt”, logic for MONET purchase – EIM purchase methodology
5. “05Calculation Logic_BM.txt”, logic for MONET sale – EIM sale methodology
6. “06FINAL_Hydro Limit Summary_2023.xlsx”, transaction detail used to determine the limits that hydro resources should have for EIM purchases and sales.
7. “07FINAL_Thermal Limit Summary_2023.xlsx”, transaction detail used to determine the limits that thermal resources should have for EIM purchases and sales.
8. “08_2023 AUT Hourly Diag”, MONET output file used in the sub-hourly dispatch savings forecast workpaper.

Within the EIM Price Factor sub-folder:

9. "09_EIM_Price_Factor_2023_AUT.xlsx", outboard calculations for EIM price factor.
10. "10_2019_2021 EIM Prices.xlsx", historical EIM price data.
11. "11_2019-2021 Powerdex Prices", historical Mid-C price data.
12. "12_2019-2021_Hourly_Wind_Data", historical wind generation data for PGE facilities.

Within the main EIM folder:

13. "13_Flex Award Savings Forecast_MFR_4-01-22 Filing.xlsx", work paper used as basis for flex award savings in 2023 forecast.
14. "14_GHG_workpaper_MFR_11-07-2022 Filing.xlsx", work paper calculates the GHG benefit from EIM.
15. "15_icecleared_physenvoptions_2022_10_13.xlsx", ICE CCA prices as of 10/13/2022.
16. "16_Deschutes Outage_2021 Award Data_MFR_4-01-22 Filing.xlsx", work paper revises the historical GHG award quantity in October and November based on the outage schedule for the days that Round Butte units will be in full outage
17. "17_2023 GMC Charge Forecast_MFR_04-01-22.xlsx", workpaper used as a basis for Grid Management Charges in 2023 forecast.
18. "18_EIM_2022AUT_Summary_11-07-2022.xlsx", EIM benefit net of charges for MONET input.

MONET Inputs

On the "PC Input" worksheet:

- The annual 2023 AUT Western EIM net benefit is entered in cell F1625, 1/12 this annual value is used as the monthly values in cells K1625:V1625. Note: value in cell F1625 is linked to the Lydia 2.2 toggle and updates based on if Lydia 2.0 versus Lydia 2.2 is active in the model.

On the "PGE Contracts" worksheet:

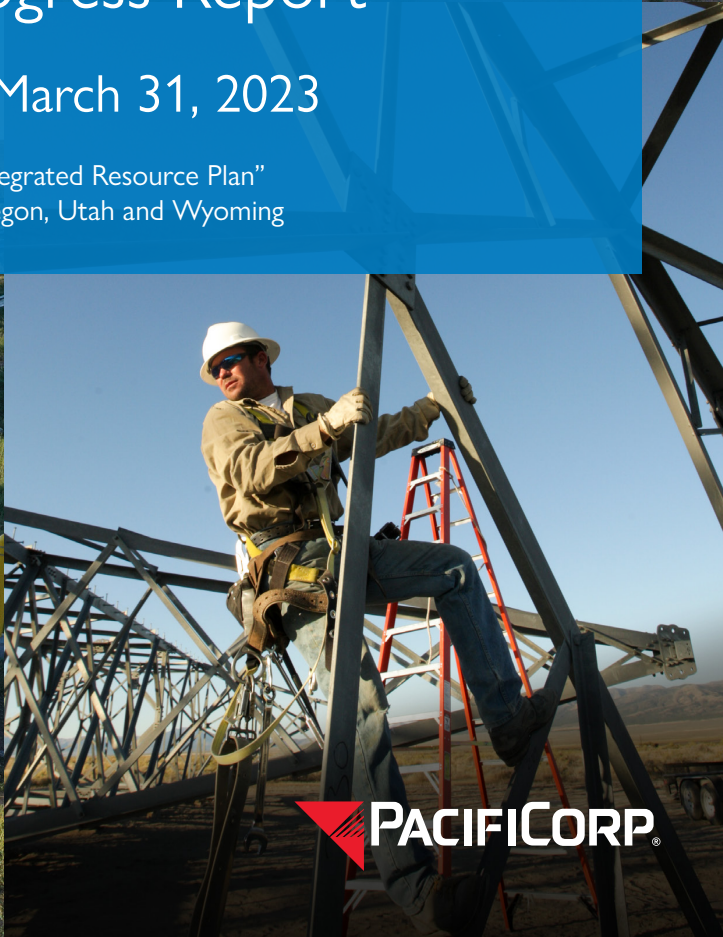
- The monthly EIM values are linked to row 47.



Washington 2021 Integrated Resource Plan Two-Year Progress Report

Volume II | March 31, 2023

Also filed as “2023 Integrated Resource Plan”
in California, Idaho, Oregon, Utah and Wyoming



APPENDIX F – FLEXIBLE RESERVE STUDY

Introduction

While PacifiCorp had significant increases in both wind and solar capacity on its system in 2021, there has not yet been time to collect and assess sufficient historical data that includes this expanded output. Therefore, for the 2023 IRP, PacifiCorp is continuing to use the methodology developed in its 2021 Flexible Reserve Study (FRS), which relied upon historical data from 2018-2019, as discussed below.¹

The 2021 Flexible Reserve Study (FRS) estimated the regulation reserve required to maintain PacifiCorp’s system reliability and comply with North American Electric Reliability Corporation (NERC) reliability standards. Because the FRS methodology accounts for changes in PacifiCorp’s resource mix, both the quantity and cost of reserves has been updated for the 2023 IRP, as reported herein.

PacifiCorp operates two balancing authority areas (BAAs) in the Western Electricity Coordinating Council (WECC) NERC region--PacifiCorp East (PACE) and PacifiCorp West (PACW). The PACE and PACW BAAs are interconnected by a limited amount of transmission across a third-party transmission system and the two BAAs are each required to comply with NERC standards. PacifiCorp must provide sufficient regulation reserve to remain within NERC’s balancing authority area control error (ACE) limit in compliance with BAL-001-2,² as well as the amount of contingency reserve required to comply with NERC standard BAL-002-WECC-2.³ BAL-001-2 is a regulation reserve standard that became effective July 1, 2016, and BAL-002-WECC-3 is a contingency reserve standard that became effective June 28, 2021. Regulation reserve and contingency reserve are components of operating reserve, which NERC defines as “the capability above firm system demand required to provide for regulation, load forecasting error, equipment forced and scheduled outages and local area protection.”⁴

Apart from disturbance events that are addressed through contingency reserve, regulation reserve is necessary to compensate for changes in load demand and generation output to maintain ACE within mandatory parameters established by the BAL-001-2 standard. The FRS estimates the amount of regulation reserve required to manage variations in load, variable energy resources⁵

¹ 2021 IRP Volume II, Appendix F (Flexible Reserve Study):

<https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021-irp/Volume%20II%20-%2009.15.2021%20Final.pdf>

² NERC Standard BAL-001-2, <https://www.nerc.com/pa/Stand/Reliability%20Standards/BAL-001-2.pdf>, which became effective July 1, 2016. ACE is the difference between a BAA’s scheduled and actual interchange and reflects the difference between electrical generation and Load within that BAA.

³ NERC Standard BAL-002-WECC-3, <https://www.nerc.com/pa/Stand/Reliability%20Standards/BAL-002-WECC-3.pdf>, which became effective June 28, 2021. BAL-002-WECC-3 removed the requirement that at least 50% of contingency reserves be held as “spinning” resources, as this was deemed redundant with frequency response requirements under BAL-003-2.

⁴ Glossary of Terms Used in NERC Reliability Standards:

https://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf, updated March 8, 2023.

⁵ VERs are resources that resources that: (1) are renewable; (2) cannot be stored by the facility owner or operator; and (3) have variability that is beyond the control of the facility owner or operator. *Integration of Variable Energy*

The results of the analysis are shown in Table F.3 below.

Table F.3 – Summary of Stand-alone Regulation Reserve Requirements

Scenario	Stand-alone Regulation Forecast (aMW)	Capacity (MW)	Stand-alone Regulation Forecast (%)
Non-VER	106	1,304	8.2%
Load	334	10,094	3.3%
VER - Wind	457	2,745	16.7%
VER - Solar	159	1,080	14.8%
Total	1,057		

Portfolio Diversity and EIM Diversity Benefits

The EIM is a voluntary energy imbalance market service through the CAISO where market systems automatically balance supply and demand for electricity every fifteen and five minutes, dispatching least-cost resources every five minutes.

PacifiCorp and CAISO began full EIM operation on November 1, 2014. Several additional participants have since joined the EIM, and more participants are scheduled to join in the next several years. PacifiCorp’s participation in the EIM results in improved power production forecasting and optimized intra-hour resource dispatch. This brings important benefits including reduced energy dispatch costs through automatic dispatch, enhanced reliability with improved situational awareness, better integration of renewable energy resources, and reduced curtailment of renewable energy resources.

The EIM also has direct effects related to regulation reserve requirements. First, because of EIM participation, PacifiCorp has improved data used in the analysis contained in this FRS. The data and control provided by the EIM allow PacifiCorp to achieve the portfolio diversity benefits described in the first part of this section. Second, the EIM’s intra-hour capabilities across the broader EIM footprint provide the opportunity to reduce the amount of regulation reserve necessary for PacifiCorp to hold, as further explained in the second part of this section.

Portfolio Diversity Benefit

The regulation reserve forecasts described above independently ensure that the probability of a reliability violation for each class remains within the reliability target; however, the largest deviations in each class tend not to occur simultaneously, and in some cases, deviations will occur in offsetting directions. Because the deviations are not occurring at the same time, the regulation reserve held can cover the expected deviations for multiple classes at once and a reduced total quantity of reserve is sufficient to maintain the desired level of reliability. This reduction in the reserve requirement is the diversity benefit from holding a single pool of reserve to cover deviations in Solar, Wind, Non-VERs, and Load. As a result, the regulation reserve forecast for the portfolio can be reduced while still meeting the reliability target. In the historical period, portfolio diversity from the interactions between the various classes results in a regulation reserve

requirement that is 36% lower than the sum of the stand-alone requirements, or approximately 679 MW.

EIM Diversity Benefit

In addition to the direct benefits from EIM’s increased system visibility and improved intra-hour operational performance described above, the participation of other entities in the broader EIM footprint provides the opportunity to further reduce the amount of regulation reserve PacifiCorp must hold.

By pooling variability in load and resource output, EIM entities reduce the quantity of reserve required to meet flexibility needs. The EIM also facilitates procurement of flexible ramping capacity in the fifteen-minute market to address variability that may occur in the five-minute market. Because variability across different BAAs may happen in opposite directions, the flexible ramping requirement for the entire EIM footprint can be less than the sum of individual BAA requirements. This difference is known as the “diversity benefit” in the EIM. This diversity benefit reflects offsetting variability and lower combined uncertainty. This flexibility reserve (uncertainty requirement) is in addition to the spinning and supplemental reserve carried against generation or transmission system contingencies under the NERC standards.

The CAISO calculates the EIM diversity benefit by first calculating an uncertainty requirement for each individual EIM BAA and then by comparing the sum of those requirements to the uncertainty requirement for the entire EIM area. The latter amount is expected to be less than the sum of the uncertainty requirements from the individual BAAs due to the portfolio diversification effect of forecasting a larger pool of load and resources using intra-hour scheduling and increased system visibility in the hypothetical, single-BAA EIM. Each EIM BAA is then credited with a share of the diversity benefit calculated by CAISO based on its share of the stand-alone requirement relative to the total stand-alone requirement.

The EIM does not relieve participants of their reliability responsibilities. EIM entities are required to have sufficient resources to serve their load on a standalone basis each hour before participating in the EIM. Thus, each EIM participant remains responsible for all reliability obligations. Despite these limitations, EIM imports from other participating BAAs can help balance PacifiCorp’s loads and resources within an hour, reducing the size of reserve shortfalls and the likelihood of a Balancing Authority ACE Limit violation. While substantial EIM imports do occur in some hours, it is only appropriate to rely on PacifiCorp’s diversity benefit associated with EIM participation, as these are derived from the structure of the EIM rather than resources contributed by other participants.

Table F.4 below provides a numeric example of uncertainty requirements and application of the calculated diversity benefit.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Table of Contents

29.	Energy Imbalance Market.....	2
29.1	General Provisions.....	2
29.2	EIM Entity and EIM Sub-Entity Access to the Real-Time Market	4
29.3	[Not Used].....	16
29.4	Roles and Responsibilities.....	16
29.5	[Not Used].....	27
29.6	Communications	27
29.7	EIM Operations Under Normal and Emergency Conditions.....	28
29.8	[Not Used].....	34
29.9	Outages and Critical Contingencies.....	34
29.10	Metering and Settlement Data.....	37
29.11	Settlements and Billing for EIM Market Participants.....	38
29.12	Creditworthiness.....	55
29.13	Dispute Resolution	55
29.14	Uncontrollable Forces, Indemnity, Liabilities, and Penalties.....	55
29.15	[Not Used].....	55
29.16	[Not Used].....	55
29.17	EIM Transmission System	55
29.18	[Not Used].....	59
29.19	[Not Used].....	59
29.20	Confidentiality.....	59
29.21	[Not Used].....	59
29.22	Miscellaneous Provisions in Addition to Section 22.....	59
29.23	[Not Used].....	59
29.24	[Not Used].....	59
29.25	[Not Used].....	59
29.26	Transmission Rates and Charges.....	59
29.27	CAISO Markets and Processes.....	60
29.28	Inter-SC Trades.....	62
29.29	[Not Used].....	62
29.30	Bid and Self-Schedule Submission for CAISO Markets.....	62
29.31	Day-Ahead.....	63
29.32	Greenhouse Gas Regulation and EIM Bid Adders.....	63
29.33	[Not Used].....	66
29.34	EIM Operations	66
29.35	Market Validation and Price Correction	86
29.36	[Not Used].....	86
29.37	Rules of Conduct.....	86
29.38	Market Monitoring.....	86
29.39	EIM Market Power Mitigation.....	87
29.40	[Not Used].....	88
29.41	[Not Used].....	88
29.42	[Not Used].....	88
29.43	[Not Used].....	88
29.44	Flexible Ramping Product.....	88

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

29. Energy Imbalance Market

29.1 General Provisions.

- (a) **Operation of EIM.** Pursuant to Section 29, the CAISO shall expand operation and settlement of the Real-Time Market to provide for the purchase and sale of balancing Energy in any Balancing Authority Area for which the Balancing Authority executes an EIM Entity Agreement with the CAISO.
- (b) **EIM Tariff Obligations.** EIM Market Participants shall comply with –
 - (1) the provisions of Section 29; and
 - (2) other provisions of the CAISO Tariff that apply to the extent such provisions –
 - (A) expressly refer to Section 29 or EIM Market Participants;
 - (B) are cross referenced in Section 29; or
 - (C) are not limited in applicability to the CAISO Controlled Grid, the CAISO Balancing Authority Area, or CAISO Markets other than the Real-Time Market.
- (c) **Inconsistency Between Provisions.** If there is an inconsistency between a provision in Section 29 and another provision of the CAISO Tariff regarding the rights or obligations of EIM Market Participants, the provision in Section 29 shall prevail to the extent of the inconsistency.
- (d) **Suspension of EIM Entity Participation.**
 - (1) **Temporary Suspension.** The CAISO may, within 60 days following an EIM Entity Implementation Date for an EIM Entity, and pursuant to the terms of a Market Notice, temporarily suspend the participation of that EIM Entity in the Real-Time Market for a period not to exceed 60 days if market or system operational issues adversely impact any portion of the EIM Area, provided that the ISO may continue operation of the Real-Time Market without the participation of the EIM Entity for a reasonable additional period of time in order to implement a resolution of the market or system operational issues.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (2) **CAISO Termination.** If the CAISO is not able to identify a resolution of the EIM-related market or system operational issues within 60 days after issuance of the Market Notice of temporary suspension of EIM participation by an EIM Entity, the CAISO may, upon issuance of a subsequent Market Notice, terminate participation by the EIM Entity in the Real-Time Market and may extend the suspension of EIM participation by the EIM Entity for a time sufficient to process the termination of the EIM Entity Agreement.
- (3) **Reinstatement.**
- (A) **After Temporary Suspension.** The CAISO may reinstate EIM operations after a temporary suspension of EIM participation by an EIM Entity by issuing a Market Notice announcing the intended reinstatement no less than 5 days in advance of the reinstatement date.
- (B) **After CAISO Termination.** The CAISO may only reinstate EIM operations with respect to an EIM Entity after termination of EIM participation by an EIM Entity pursuant to a filing accepted by FERC.
- (4) **EIM Entity Action.** In the event the CAISO issues a Market Notice of the temporary suspension of EIM participation by an EIM Entity, the EIM Entity shall continue to submit EIM Base Schedules and the associated meter data to enable continued operation of the Real-Time Market until the CAISO issues a subsequent Market Notice either that –
- (i) the cause of the temporary suspension has been resolved and the EIM Entity has been reinstated, in which case EIM participation by the EIM Entity shall return to normal; or
- (ii) EIM participation by the EIM Entity has been terminated.
- (5) **CAISO Action.** In the event the CAISO issues a Market Notice of the temporary suspension of EIM participation by an EIM Entity, the CAISO shall –
- (i) prevent EIM Transfers and separate the EIM Entity Balancing Authority Area from operation of the Real-Time Market in the EIM Area in

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- accordance with the provisions of the Business Practice Manual for the Energy Imbalance Market;
- (ii) suspend Settlement of Real-Time Market charges with respect to the EIM Entity in accordance with the provisions of the Business Practice Manual for the Energy Imbalance Market; and
 - (iii) issue a subsequent Market Notice either that (i) the cause of the temporary suspension has been resolved and the EIM Entity has been reinstated, in which case EIM participation by the EIM Entity shall return to normal, or (ii) EIM participation by the EIM Entity has been terminated.

29.2 EIM Entity and EIM Sub-Entity Access to the Real-Time Market

- (a) **In general.** The CAISO shall –
 - (1) provide open and non-discriminatory access to the Real-Time Market, including the Energy Imbalance Market, in accordance with the provisions of the CAISO Tariff; and
 - (2) make available for use in the Real-Time Market the transmission capacity that is available in Real-Time –
 - (A) on the CAISO Controlled Grid; and
 - (B) for which an EIM Entity or EIM Sub-Entity provides EIM Transmission Service Information pursuant to Section 29.17.
- (b) **Implementation of Access as an EIM Entity.**
 - (1) **EIM Implementation Agreement.** A Balancing Authority that wishes to become an EIM Entity must first execute an EIM Implementation Agreement with the CAISO that establishes –
 - (A) the activities the parties must undertake to enable the Balancing Authority to participate in the Real-Time Market;
 - (B) the EIM Entity Implementation Date;
 - (C) the implementation fee the Balancing Authority must pay to the CAISO for the start-up costs the CAISO incurs to accommodate the participation

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- of the Balancing Authority in the Real-Time Market as provided in the agreement; and
- (D) the obligation of the Balancing Authority to enter into an EIM Entity Agreement governing its participation in the Real-Time Market.
- (2) **FERC Approval.** The EIM Entity Implementation Date must be not less than six months and not more than twenty-four months after the date that the EIM Implementation Agreement between the CAISO and the Balancing Authority is accepted by FERC.
- (3) **Implementation Period.** The CAISO shall in its discretion determine the EIM Entity Implementation Date based on the complexity and compatibility of the Balancing Authority's transmission and technology systems with the CAISO systems and the planned timing of the CAISO's implementation of software enhancements.
- (4) **Market Simulation and Parallel Operations.** The CAISO and the prospective EIM Entity shall engage in –
- (A) a market simulation that accounts for the prospective EIM Entity's implementation circumstances sufficient to meet the readiness criteria set forth in Section 29.2(b)(7); and
- (B) at least 30 days of parallel operations representing the Energy Imbalance Market to support the CAISO and the prospective EIM Entity's readiness certification required by section 29.2(b)(6), an adequate period of which must occur prior to the readiness determination required by section 29.2(b)(5).
- (5) **Readiness Determination.** No later than 30 days prior to the prospective EIM Entity Implementation Date as established by the EIM Implementation Agreement, the CAISO will determine, in consultation with the prospective EIM Entity, whether the systems and processes of the prospective EIM Entity will be ready for the prospective EIM Entity's participation in the Energy Imbalance

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Market according to the criteria set forth in Section 29.2(b)(7) as measured by the thresholds specified in the Business Practice Manual for the Energy Imbalance Market, or consistent with any exceptions to thresholds, for certifying the prospective EIM Entity's readiness.

(6) **Readiness Certification.**

(A) **Certification.** The CAISO and the prospective EIM Entity shall each file a market readiness certificate with FERC at least 30 days prior to the EIM Entity Implementation Date in which a senior office of each entity attests –

- (i) that the processes and systems of the prospective EIM entity have satisfied or will have satisfied the readiness criteria set forth in Section 29.2(b)(7) as of the EIM Entity Implementation Date;
- (ii) to any known issues requiring resolution prior to the EIM Entity Implementation Date in accordance with section 29.2(b)(8);
- (iii) to any exceptions from the established thresholds specified in the Business Practice Manuals, and that despite such exceptions the criteria were met or will be met as specified in 29.2(b)(7); and
- (iv) that the EIM Entity Implementation Date is conditional on the resolution of the known issues identified in the certificates and any unforeseen issues that undermine the satisfaction of the readiness criteria set forth in Section 29.2(b)(7).

(B) **Delay or Re-Certification.** If, subsequent to readiness certification pursuant to Section 29.2(b)(6)(A), the CAISO or the prospective EIM Entity determines that it cannot proceed with implementation on the EIM Entity Implementation Date, the CAISO or the prospective EIM Entity will notify FERC of the delay, the reason for the delay, the new EIM Entity Implementation Date if it can be determined, and whether it will need to re-issue a portion or all of the readiness certification.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (7) **Readiness Criteria.**
- (A) **Prospective EIM Entity Full Network Model Integration.** The network model data of the prospective EIM Entity is integrated into the Full Network Model such that –
- (i) the Load, EIM Internal Intertie and EIM External Interties and Generating Unit definition in the Full Network Model is consistent with the Load, EIM Internal Intertie and EIM External Interties and Generating Unit definition in the prospective EIM Entity network model file that it delivered to the CAISO;
 - (ii) the SCADA measurements used in the prospective EIM Entity's EMS model match the measurements observed by the CAISO through the CAISO EMS;
 - (iii) the State Estimator solution is equivalent or superior to the prospective EIM Entity's state estimator solution for its Balancing Authority Area; and
 - (iv) the physical representation of the prospective EIM Entity network matches the Base Market Model that accounts for non-conforming load, behind-the-meter generation, Pseudo-Ties, and Dynamic Schedules, and third party transmission service provider and path operator information that the CAISO agrees is used to support EIM Transfers and Real-Time Dispatch in the Energy Imbalance Market, as applicable.
- (B) **Operations Training.** Prior to the start of parallel operations as set forth in Section 29.2(b)(4), all operations staff identified by the prospective EIM Entity who will have responsibility for EIM operations, transactions and settlements, have completed –
- (i) the introduction to Energy Imbalance Market training module;

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (ii) the specific hourly and daily tasks and duties for normal operation training module; and
 - (iii) the assessment of market results and response to contingencies and abnormal situations training module.
- (C) **Forecasting Capability.** The CAISO and, to the extent the prospective EIM Entity will use its own forecasts or is otherwise required to provide forecasting information to the CAISO, the prospective EIM Entity have demonstrated their respective forecasting capability through –
- (i) the definition of EIM Demand forecast boundaries based on the conforming and non-conforming Load characteristics, as applicable;
 - (ii) the accuracy of the CAISO forecast of EIM Demand based on historical actual Load data for the defined EIM Demand forecast boundaries;
 - (iii) the identification of weather stations locations used in forecasting, as applicable;
 - (iv) the identification of the source of Variable Energy Resource forecasts pursuant to Section 29.11(j); and
 - (v) the identification of the source of Hybrid Resource forecasts pursuant to Section 29.11(j).
- (D) **Balanced Schedules.** The prospective EIM Entity's Scheduling Coordinator has demonstrated it has the –
- (i) ability to balance EIM Demand and EIM Supply for the prospective EIM Entity's Balancing Authority Area;
 - (ii) ability to pass the capacity test, as set forth in Section 29.34(l); and
 - (iii) ability to pass the flexible ramping sufficiency test, as set forth in Section 29.34(m).

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (E) **System Readiness and Integration.**
- (i) **Readiness.** The prospective EIM Entity and the CAISO have tested the functional and system elements in accordance with functional and system testing documentation posted on the CAISO Website.
 - (ii) **System Integration.** The prospective EIM Entity and the CAISO have tested system integration testing in accordance with the system integration testing documentation posted on the CAISO Website.
 - (iii) **Certificates.** The prospective EIM Entity has issued all necessary certificates to its employees that require system access to perform EIM-related job functions.
- (F) **Settlements.** The CAISO and the prospective EIM Entity have demonstrated that –
- (i) the CAISO Settlement Statements and Invoices match the operational data published to stakeholders or fed into the settlement system and the resulting calculations correspond to the formulas defined in the CAISO Tariff and applicable Business Practice Manuals during market simulation and parallel operations; and
 - (ii) the Settlement Statements and Invoices of the prospective EIM Entity allocating charges and credits to its customers accurately reflect system and market data during parallel operations.
- (G) **Outage Management System.** The prospective EIM Entity has verified its ability to submit and retrieve accurate and correct outage information to and from the CAISO within the required timelines.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (H) **Communications between the CAISO and the prospective EIM Entity.**
- (i) **Messaging.** The process and procedures used for voice and electronic messaging between the prospective EIM Entity and the CAISO are identified and incorporated into the prospective EIM Entity's operating procedures before the start of market simulation specified in Section 29.2(b)(4)(A).
 - (ii) **Training.** The operations staff identified by the prospective EIM Entity who will have responsibility for EIM operations, transactions and settlements are trained on the relevant Operating Procedures and tools used for EIM related communications before the start of parallel operations specified in Section 29.2(b)(4)(B).
 - (iii) **Third Party Transmission Service Providers.** Third party transmission service provider and path operator information that the CAISO agrees is used to support EIM Transfers and Real-Time Dispatch is made available by the CAISO to the prospective EIM Entity during parallel operations.
- (I) **Market Simulation.**
- (i) **Prospective EIM Entity Identification.** The CAISO has established and the prospective EIM Entity has tested all necessary SCIDs and Resource IDs established for the prospective EIM Entity's Balancing Authority Area.
 - (ii) **Day in the life simulation.** The prospective EIM Entity operations staff identified by the prospective EIM Entity who will have responsibility for EIM grid operations, have completed end-to-end daily market workflow with no critical defects.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (iii) **Structured scenarios simulation.** The prospective EIM Entity operations staff identified by the prospective EIM Entity who will have responsibility for EIM operations, transactions and settlements, have executed and passed all structured scenarios provided by CAISO with all significant issues resolved.
- (iv) **Unstructured scenarios simulation.** The prospective EIM Entity operations staff identified by the prospective EIM Entity who will have responsibility for EIM operations, transactions and settlements, have executed and passed all unstructured scenarios provided by the prospective EIM Entity, with significant issues resolved.
- (v) **Market results reports.** Market results are appropriate based on inputs, and the prospective EIM Entity and CAISO executive project sponsors approve the results.
- (vi) **Market quality review.** The CAISO prices are validated based on input data for parallel operations specified in Section 29.2(b)(4)(B).
- (J) **Parallel Operations Plan.** The period of parallel operations specified in Section 29.2(b)(4)(B) runs consistently and in accordance with the prospective EIM Entity specific parallel operations plan.
- (K) **Additional Criteria**
 - (i) **Execution of Necessary Agreements.** The prospective EIM Entity has complied with Section 29.4(c)(2) and executed any necessary agreements for operating as an EIM Entity, including any non-disclosure agreements required for the exchange of information.
 - (ii) **Operating Procedures.** Prior to the start of parallel operations

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

pursuant to Section 29.2(b)(4)(B), the CAISO and the prospective EIM Entity have defined, completed, and tested operating procedures for the prospective EIM Entity and its Scheduling Coordinator's participation in the Energy Imbalance Market.

- (iii) **Identification of EIM Available Balancing Capacity.** The prospective EIM Entity has identified EIM Participating Resources and non-participating resources that it intends to designate in the EIM Resource Plan as EIM Available Balancing Capacity.
- (iv) **Flexible Capacity Requirements.** The CAISO has received and stored all historical data from the prospective EIM Entity necessary and sufficient for the CAISO to perform the flexible ramp requirement, and the CAISO has established flexible capacity requirements for the prospective EIM Entity's Balancing Authority Area and for the combined EIM Area including the prospective EIM Entity.
- (v) **Monitoring.** Sufficient and adequate data is available to the CAISO and the Department of Market Monitoring to enable market monitoring as of the Implementation Date.

- (8) **Readiness Reporting.** The CAISO shall report on the CAISO Website periodically, but not less than monthly during market simulation pursuant to Section 29.2(b)(4)(A) and not less than twice a month during parallel operations pursuant to Section 29.2(b)(4)(B), on progress towards achieving the readiness criteria in Section 29.2(b)(7), including providing information explaining any exceptions to or deviations from the readiness thresholds granted according to the standards and procedures for granting exceptions or deviations set forth in the Business Practice Manual for the Energy Imbalance Market, and the reasons

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

therefore, and publish such reports on its website in advance of and in support of the certificate to be filed pursuant to Section 29.2(b)(6).

(c) **Access as an EIM Sub-Entity.**

(1) **EIM Sub-Entity Qualification.** An electric utility that wishes to become an EIM Sub-Entity must—

- (A) be an electric utility embedded within an EIM Entity Balancing Authority Area and not receive long-term wholesale full requirements services from the EIM Entity;
- (B) own a distribution system or transmission facilities directly connected to a transmission system embedded in the EIM Entity Balancing Authority Area for the purpose of providing—
 - (i) regulated electric service to eligible retail or wholesale customers, or
 - (ii) serve eligible customers in its capacity as a Local Publicly Owned Electric Utility;
- (C) own or control one or more resources for the primary purpose of serving its eligible customers; and
- (D) obtain authorization from the EIM Entity in whose Balancing Authority Area the prospective EIM Sub-Entity is located.

(2) **EIM Entity Authorization.** An EIM Entity may elect at its sole discretion whether or not to authorize participation by an EIM Sub-Entity within its Balancing Authority Area, which may encompass—

- (A) no electric utility regardless of whether one or more electric utilities in its Balancing Authority Area meets the qualifications in Section 29.2(c)(1);
- (B) all electric utilities that meet the qualifications in Section 29.2(c)(1) and seek to become EIM Sub-Entities; or
- (C) some electric utilities that meet the qualifications in Section 29.2(c)(1), and seek to become EIM Sub-Entities, provided the EIM Entity finds that

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

there is a supportive existing and accepted contractual or tariff based practice for imbalance energy accounting within its Balancing Authority Area that distinguishes the EIM Sub-Entity from its other transmission service customers.

- (3) **EIM Sub-Entity Implementation Agreement.** An electric utility that has been authorized by the EIM Entity to participate as an EIM Sub-Entity in accordance with 29.2(c)(2) and wishes to become an EIM Sub-Entity must also execute an EIM Sub-Entity Implementation Agreement with the CAISO that establishes—
- (A) the electric utility meets the CAISO qualifications for participation as an EIM Sub-Entity in Section 29.2(c)(1);
 - (B) the EIM Sub-Entity Implementation Date, which—
 - (i) the CAISO shall in its discretion determine based on the complexity and compatibility of the transmission and technology systems and the planned timing of the CAISO's implementation of software enhancements, and
 - (ii) must be not less than twelve months and not more than twenty-four months after CAISO confirms that the electric utility meets the CAISO qualifications for participation as an EIM Sub-Entity;
 - (C) the implementation fee deposit the electric utility must pay to the CAISO for the estimated start-up costs the CAISO will incur to partition the EIM Sub-Entity from the EIM Entity Balancing Authority Area, subject to true-up based on actual costs incurred in accordance with the EIM Sub-Entity Implementation Agreement;
 - (D) the obligation of the electric utility to enter into an EIM Sub-Entity Agreement governing its participation in the Real-Time Market; and
 - (E) the obligation of the EIM Sub-Entity to either execute the EIM Sub-Entity Scheduling Coordinator Agreement, or retain the services of an entity that has executed the EIM Sub-Entity Scheduling Coordinator

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Agreement.

- (4) **EIM Sub-Entity Implementation Activities.** The CAISO and the prospective EIM Sub-Entity will engage in –
- (A) project management planning and tracking of all implementation tasks, issues and risks through regular meetings and status reports following a detailed project schedule outlining all the steps leading to the market simulation, parallel operations and participation;
 - (B) authorization and certification processes associated with execution of the required agreements and any applicable tariff changes necessary for participation;
 - (C) integration of the network model data with the CAISO's Full Network Model, including connectivity testing and Full Network Model verification prior to market simulation testing;
 - (D) integration and access to non-production environments for integration and testing of market data exchange and modification of prospective EIM Sub-Entity operating and bid-to-bill systems associated with participation, including system integration, security and functional testing of all impacted systems and processes followed by market simulation according to a CAISO test plan outlining scenarios, a timeline and expected actions prior to testing;
 - (E) review and approval of information and processes to confirm the Meter Data meets all requirements necessary for the implementation and Settlement of the prospective EIM Sub-Entity, including any associated testing;
 - (F) training events including computer based training modules for various roles and responsibilities, train-the-trainer courses which include hands-on scenario trainings with application tools, and optional participation in modeling workshops and other tracks as appropriate to prepare for

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

transition to production.

- (5) **Readiness Reporting.** The CAISO shall report on the CAISO Website periodically, but not less than once during market simulation on progress towards completing the implementation activities in Section 29.2(c)(4) and once again during parallel operations confirming completion of the implementation activities in Section 29.2(c)(4).
- (6) **Readiness Determination.** No later than 10 days prior to the prospective EIM Sub-Entity Implementation Date as established in the EIM Sub-Entity Implementation Agreement, the CAISO will determine, in consultation with the EIM Entity and the prospective EIM Sub-Entity, whether the systems and processes of the EIM Entity and the prospective EIM Sub-Entity will be ready for the prospective EIM Sub-Entity's participation in the Energy Imbalance Market.

29.3 [Not Used]

29.4 Roles and Responsibilities

- (a) **CAISO Balancing Authority Obligations.**
 - (1) **Reliability Responsibilities.** Nothing in Section 29 shall alter the CAISO's responsibilities under the other sections of the CAISO Tariff, under any agreement not required by Section 29, or under NERC Reliability Standards or any other Applicable Reliability Criteria as the Balancing Authority for the CAISO Balancing Authority Area and the transmission operator for the CAISO Controlled Grid.
 - (2) **Operating Responsibilities.** During any interruption of the normal operation of the Real-Time Market, the CAISO as Balancing Authority shall remain responsible for managing the resources in its Balancing Authority Area and the flows on transmission lines internal to the CAISO Balancing Authority Area, including imports and exports, for the duration of the interruption.
- (b) **EIM Entity.**
 - (1) **Balancing Authority Obligations.**

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (A) **EIM Entity as Balancing Authority.** An EIM Entity must be a Balancing Authority registered and certified as such under the applicable authorities.
 - (B) **Reliability Responsibilities.** Nothing in Section 29 shall alter an EIM Entity's responsibilities under NERC Reliability Standards as the Balancing Authority for the EIM Entity Balancing Authority Area and, to the extent applicable, as the transmission operator for transmission facilities within its Balancing Authority Area.
 - (C) **Operating Responsibilities.** During any interruption of the normal operation of the Real-Time Market, the EIM Entity as Balancing Authority shall remain responsible in accordance with Section 29.7 for managing the resources in its Balancing Authority Area and the flows on internal transmission lines, including imports into and exports out of its Balancing Authority Area, for the duration of the interruption.
 - (D) **Inadvertent Energy.** An EIM Entity remains responsible for tracking inadvertent Energy and administering the payback of inadvertent Energy for its Balancing Authority Area through processes established by WECC.
- (2) **EIM Entity Agreement.** An EIM Entity must execute an EIM Entity Agreement no later than ninety (90) days before the EIM Entity Implementation Date.
 - (3) **EIM Entity Obligations.** An EIM Entity shall –
 - (A) perform the obligations of an EIM Entity in accordance with the EIM Entity Agreement, Section 29, and other provisions of the CAISO Tariff that by their terms apply to EIM Entities, subject to the limitations specified in Section 29.1(b)(2)(C);
 - (B) ensure that each EIM Transmission Service Provider in its Balancing Authority Area has provisions in effect in the EIM Transmission Service Provider's transmission tariff, as necessary or applicable, to enable

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- operation of the Real-Time Market in its Balancing Authority Area;
 - (C) qualify as or secure representation by no more than one EIM Entity Scheduling Coordinator;
 - (D) review and validate information about available transmission capacity submitted to it by an EIM Transmission Service Provider and transmit such validated information to its EIM Entity Scheduling Coordinator;
 - (E) provide the CAISO and its EIM Entity Scheduling Coordinator with information regarding the transmission capacity available to the Real-Time Market, including any information regarding Transmission Constraints of which it is aware;
 - (F) define Load Aggregation Points in its Balancing Authority Area;
 - (G) determine and inform the CAISO which resource types are eligible to participate in the Real-Time Market as resources and which transmission service providers or holders of transmission rights are EIM Transmission Service Providers; and
 - (H) inform the CAISO whether or not the EIM Entity intends to utilize the CAISO's Demand Forecast consistent with Section 29.34(d).
- (4) **EIM Entity Termination of EIM Participation.**
- (A) **EIM Entity Agreement.** An EIM Entity that wishes to terminate participation in the Real-Time Market must terminate the EIM Entity Agreement pursuant to its terms.
 - (B) **Notice.** Delivery to the CAISO of a written notice of termination pursuant to the terms of the EIM Entity Agreement shall represent the commitment by the EIM Entity to undertake all necessary preparations to disable the Real-Time Market within the EIM Entity Balancing Authority Area.
 - (C) **Actions Following Notice.** Upon receipt of such notice, the CAISO shall undertake all necessary preparations to disable the Real-Time

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Market within the EIM Entity Balancing Authority Area, as outlined in the Business Practice Manual for the Energy Imbalance Market, including issuance of a Market Notice within five Business Days after receipt of such notice and termination of any EIM Sub-Entities within the EIM Entity Balancing Authority Area.

(5) **EIM Entity Corrective Actions.** If the EIM Entity takes corrective action, subject to the provisions of an open access transmission tariff, to address an issue with EIM implementation or EIM operation, or the EIM Entity issues a notice of termination –

(A) the EIM Entity shall take those actions provided in Section 29.1(d)(4) during the implementation of its corrective action; and

(B) the CAISO shall issue a Market Notice in accordance with Section 29.1(d)(1) and take those actions provided in Section 29.1(d)(5) during the implementation of the EIM Entity corrective action.

(c) **EIM Entity Scheduling Coordinator.**

(1) **Certification.** An EIM Entity Scheduling Coordinator must meet or have met the certification requirements in Section 4.5.1 for a Scheduling Coordinator.

(2) **EIM Entity Scheduling Coordinator Agreement.** An EIM Entity Scheduling Coordinator must enter an EIM Entity Scheduling Coordinator Agreement with the CAISO, which shall satisfy the obligation to enter a Scheduling Coordinator Agreement under Section 4.5.1 with regard to its representation of the EIM Entity.

(3) **Representation.** An EIM Entity Scheduling Coordinator-

(A) may represent a Market Participant other than an EIM Entity, but only if it enters a Scheduling Coordinator Agreement under Section 4.5.1 with regard to such Market Participant;

(B) may not also be an EIM Participating Resource Scheduling Coordinator

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- or a Scheduling Coordinator for a Participating Generator, Participating Load, or Demand Resource Provider, unless the EIM Entity Scheduling Coordinator is a transmission provider subject to the standards of conduct set forth in 18 C.F.R. § 358; and
- (C) may represent more than one EIM Entity if it has certified to the CAISO in the manner described in the Business Practice Manual for the Energy Imbalance Market that it has informed each EIM Entity of the multiple representation.
- (4) **Obligations.** An EIM Entity Scheduling Coordinator shall-
- (A) perform the obligations of an EIM Entity Scheduling Coordinator under the EIM Entity Scheduling Coordinator Agreement and Section 29;
 - (B) perform the obligations of a Scheduling Coordinator under provisions of the CAISO Tariff described in Section 29.1(b);
 - (C) register in the manner set forth in the Business Practice Manual for the Energy Imbalance Market all non-participating resources in the Balancing Authority Area of each EIM Entity that it represents and update such information in a timely manner;
 - (D) verify in the manner set forth in the Business Practice Manual for the Energy Imbalance Market that all EIM Resources within the Balancing Authority Area of each EIM Entity represented by the EIM Entity Scheduling Coordinator have been registered with the CAISO;
 - (E) submit the Interchange schedules for the EIM Entity and any EIM Sub-Entity within its Balancing Authority Area with other Balancing Authorities at the defined Interchange scheduling locations, including creating and processing E-Tags in accordance with NERC, North American Energy Standards Board, and WECC standards and business practices for bilateral schedules between Balancing Authority Areas that are arranged no less than 20 minutes in advance of the Dispatch Interval of the Real-

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- Time Market in which the Interchange will occur and that are included in an EIM Resource Plan;
- (F) match E-Tags and manage schedule curtailments at the defined Interchange scheduling locations with other Balancing Authorities;
 - (G) provide EIM Transmission Service Information in accordance with Section 29.17;
 - (H) settle all financial obligations arising out of the Real-Time Market for the EIM Entity, including financial settlement with non-participating resources and non-participating load within the EIM Entity Balancing Authority Area;
 - (I) submit EIM Base Schedules, EIM Resource Plans and other required information on behalf of the EIM Entity;
 - (J) register with the CAISO, consistent with the provisions in the Business Practice Manual for the Energy Imbalance Market, all non-participating resources that the EIM Entity Scheduling Coordinator may designate as EIM Available Balancing Capacity in its EIM Resource Plan; and
 - (K) create with the CAISO a Default Energy Bid consistent with the rules specified in Section 39.7.1 for all non-participating resources that the EIM Entity Scheduling Coordinator may designate as EIM Available Balancing Capacity in the EIM Resource Plan.
- (5) **Governmental Entities.** Notwithstanding Section 29.4(c)(3)(B), a governmental entity that is an EIM Entity Scheduling Coordinator may also be an EIM Participating Resource Scheduling Coordinator or a Scheduling Coordinator for resources participating in the CAISO Markets if it agrees to comply with standards of conduct equivalent to those set forth in 18 C.F.R. § 358.
- (d) **EIM Participating Resources.**
- (1) **Eligibility.** The owner or operator of an EIM Resource is eligible to become an

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

EIM Participating Resource if the EIM Resource –

- (A) meets the eligibility requirements established by the EIM Entity in whose Balancing Authority Area the resource is located or scheduled or to which it may be dynamically transferred; and
- (B) is capable of delivering Energy, Curtailable Demand, Demand Response Services, or similar services within the time specified by Section 29 for the Real-Time Market in which its EIM Participating Resource Scheduling Coordinator will submit Bids.

(2) **EIM Participating Resource Agreement.** An EIM Participating Resource must execute an EIM Participating Resource Agreement.

(3) **Obligations.** An EIM Participating Resource shall –

- (A) perform the obligations of an EIM Participating Resource under the EIM Participating Resource Agreement and Section 29;
- (B) perform the obligations applicable to Market Participants and resources under the provisions of the CAISO Tariff described in Section 29.1(b); and
- (C) if it represents a Generating Unit, Load of a Participating Load, Proxy Demand Resource, or other qualified resource, perform the obligations required for the resource under the provisions of the CAISO Tariff described in section 29.1(b).

(e) **EIM Participating Resource Scheduling Coordinator.**

(1) **Certification.** An EIM Participating Resource Scheduling Coordinator must be either an existing Scheduling Coordinator or must meet or have met the certification requirements in Section 4.5.1 for a Scheduling Coordinator.

(2) **EIM Participating Resource Scheduling Coordinator Agreement.** An EIM Participating Resource Scheduling Coordinator must enter an EIM Participating Resource Scheduling Coordinator Agreement with the CAISO, which shall satisfy the obligation to enter a Scheduling Coordinator Agreement under Section 4.5.1

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

with regard to its representation of the EIM Participating Resource.

- (3) **Representation.** An EIM Participating Resource Scheduling Coordinator-
- (A) may represent a Market Participant other than an EIM Participating Resource, but only if it enters a Scheduling Coordinator Agreement under Section 4.5.1 with regard to such Market Participant;
 - (B) may not also be an EIM Entity Scheduling Coordinator unless the EIM Participating Resource Scheduling Coordinator is a transmission provider subject to the standards of conduct set forth in 18 C.F.R. § 358; and
 - (C) may represent more than one EIM Participating Resource.
- (4) **Obligations.** An EIM Participating Resource Scheduling Coordinator must –
- (A) perform the obligations of an EIM Participating Resource Scheduling Coordinator under the EIM Participating Resource Scheduling Coordinator Agreement and Section 29;
 - (B) perform the obligations of a Scheduling Coordinator under the provisions of the CAISO Tariff described in Section 29.1(b);
 - (C) ensure that the entity it represents has obtained any transmission service necessary to participate in the Energy Imbalance Market under the terms of the CAISO Tariff or the tariff of another transmission service provider, as applicable;
 - (D) register in the manner set forth in the Business Practice Manual for the Energy Imbalance Market all EIM Participating Resources that it represents, provide such information to the EIM Entity Scheduling Coordinator, and update such information with the CAISO in a timely manner.
- (5) **Governmental Entities.** Notwithstanding Section 29.4(e)(3)(B), a governmental entity that is an EIM Participating Resource Scheduling Coordinator may also be an EIM Entity Scheduling Coordinator if it agrees to comply with standards of

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

conduct equivalent to those set forth in 18 C.F.R. § 358.

(f) **EIM Sub-Entity.**

(1) **EIM Sub-Entity Agreement.** A prospective EIM Sub-Entity must execute an EIM Sub-Entity Agreement no later than ninety (90) days before its EIM Sub-Entity Implementation Date.

(2) **EIM Sub-Entity Obligations.** An EIM Sub-Entity shall –

(A) perform the obligations of an EIM Sub-Entity in accordance with the EIM Sub-Entity Agreement, Section 29, and other provisions of the CAISO Tariff that apply to EIM Sub-Entities, subject to the limitations specified in Section 29.1(b)(2)(C);

(B) verify that tariff or contractual arrangements with the EIM Entity for the Balancing Authority Area in which it is located, as necessary or applicable, are in place to enable operation of the Real-Time Market in its sub-area;

(C) qualify as or secure representation by no more than one EIM Sub-Entity Scheduling Coordinator;

(D) define the Load Aggregation Point for the EIM Sub-Entity; and

(E) unless prohibited from using its own Demand Forecast by the EIM Entity for its Balancing Authority Area, inform the CAISO whether or not the EIM Sub-Entity intends to use the CAISO's Demand Forecast consistent with Section 29.34(d) and, as applicable, provide the EIM Entity with its Demand Forecast.

(3) **EIM Sub-Entity Termination of Participation.**

(A) **EIM Sub-Entity Agreement.** An EIM Sub-Entity that wishes to terminate participation in the Real-Time Market as an EIM Sub-Entity must terminate the EIM Sub-Entity Agreement pursuant to its terms.

(B) **Notice.** Delivery to the CAISO of a written notice of termination pursuant to the terms of the EIM Sub-Entity Agreement shall represent the

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

commitment by the EIM Sub-Entity to undertake all necessary preparations to disable the EIM Sub-Entity within the EIM Entity Balancing Authority Area.

- (C) **Actions Following Notice.** Upon receipt of such notice, the CAISO shall undertake all necessary preparations to disable the EIM Sub-Entity within the EIM Entity Balancing Authority Area and transition responsibility to the EIM Entity, as outlined in the Business Practice Manual for the Energy Imbalance Market.

(g) **EIM Sub-Entity Scheduling Coordinator.**

- (1) **Certification.** An EIM Sub-Entity Scheduling Coordinator must meet or have met the certification requirements in Section 4.5.1 for a Scheduling Coordinator.
- (2) **EIM Sub-Entity Scheduling Coordinator Agreement.** An EIM Sub-Entity Scheduling Coordinator must enter an EIM Sub-Entity Scheduling Coordinator Agreement with the CAISO, which shall satisfy the obligation to enter a Scheduling Coordinator Agreement under Section 4.5.1 with regard to its representation of the EIM Sub-Entity.
- (3) **Representation.** An EIM Sub-Entity Scheduling Coordinator-
- (A) may represent a Market Participant other than an EIM Sub-Entity, but only if it enters a Scheduling Coordinator Agreement under Section 4.5.1 with regard to such Market Participant;
- (B) may not also be an EIM Participating Resource Scheduling Coordinator or a Scheduling Coordinator for a Participating Generator, Participating Load, or Demand Resource Provider, unless the EIM Sub-Entity Scheduling Coordinator is a transmission provider subject to the standards of conduct set forth in 18 C.F.R. § 358; and
- (C) may represent more than one EIM Sub-Entity if it has certified to the CAISO in the manner described in the Business Practice Manual for the Energy Imbalance Market that it has informed each EIM Sub-Entity of the

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

multiple representation.

- (4) **Obligations.** An EIM Sub-Entity Scheduling Coordinator shall-
- (A) perform the obligations of an EIM Sub-Entity Scheduling Coordinator under the EIM Sub-Entity Scheduling Coordinator Agreement and Section 29;
 - (B) perform the obligations of a Scheduling Coordinator under provisions of the CAISO Tariff described in Section 29.1(b);
 - (C) register in the manner set forth in the Business Practice Manual for the Energy Imbalance Market all EIM Sub-Entity non-participating resources that it represents in the EIM Entity Balancing Authority Area and update such information with the CAISO in a timely manner;
 - (D) verify in the manner set forth in the Business Practice Manual for the Energy Imbalance Market that all Sub-Entity EIM Resources within the EIM Entity Balancing Authority Area represented by the EIM Sub-Entity Scheduling Coordinator have been registered with the CAISO;
 - (E) update the Full Network Model according to Section 29.17(a) if authorized by the EIM Entity and notice to the EIM Entity is provided;
 - (F) submit transmission Outages in accordance with Section 29.9(b) if authorized by the EIM Entity;
 - (G) submit EIM Manual Dispatch instructions for EIM Resources and non-participating resources they represent if authorized by the EIM Entity;
 - (H) settle all financial obligations arising out of the Real-Time Market for the EIM Sub-Entity, including financial settlement with non-participating resources and non-participating load it represents within the EIM Entity Balancing Authority Area;
 - (I) submit EIM Base Schedules, EIM Resource Plans and other required information on behalf of the EIM Sub-Entity;
 - (J) ensure all EIM Resources and Demand within the EIM Sub-Entity area

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- are metered in accordance with Section 29.10;
- (K) register with the CAISO, consistent with the provisions in the Business Practice Manual for the Energy Imbalance Market, all non-participating resources that the EIM Entity Scheduling Coordinator may designate as EIM Available Balancing Capacity in its EIM Resource Plan; and
 - (L) create with the CAISO a Default Energy Bid consistent with the rules specified in Section 39.7.1 for all non-participating resources that the EIM Entity Scheduling Coordinator may designate as EIM Available Balancing Capacity in the EIM Resource Plan.
- (5) **Governmental Entities.** Notwithstanding Section 29.4(g)(3)(B), a governmental entity that is an EIM Sub-Entity Scheduling Coordinator may also be an EIM Participating Resource Scheduling Coordinator or a Scheduling Coordinator for resources participating in the CAISO Markets if it agrees to comply with standards of conduct equivalent to those set forth in 18 C.F.R. § 358.

29.5 [Not Used]

29.6 Communications

- (a) **EIM Entity and EIM Sub-Entity.** The EIM Entity or EIM Sub-Entity, as applicable, shall meet the technical and communication requirements specified in the Business Practice Manual for the Energy Imbalance Market, which shall be based on the Inter-Control Center Communication Protocol and Reliability Standards.
- (b) **EIM Communications and OASIS.** Section 6 shall govern communications and information availability regarding the participation of EIM Market Participants in the Real-Time Market except that –
 - (1) references to internal resources shall be deemed to include EIM Resources;
 - (2) references in Sections 6.2.2.1 and 6.5.2.1 to the CAISO Controlled Grid and references in Sections 6.5.4.2.2(a) and 6.5.5.1.1 to CAISO Balancing Authority Area shall be deemed references to the EIM Area; and

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (3) the provisions of Section 6.3.1 that authorize the CAISO to communicate directly with Generators and Demand Response Providers to ensure System Reliability shall not apply to Generators and Demand Response Providers in the EIM Entity's Balancing Authority Area or pseudo-tied from an external Balancing Authority Area to the EIM Entity Balancing Authority Area.
- (c) **Loss of Communications.**
- (1) **Procedures.** The CAISO and each EIM Entity, EIM Sub-Entity, EIM Entity Scheduling Coordinator, and EIM Sub-Entity Scheduling Coordinator shall establish procedures to address an interruption of Real-Time Market communications, which shall include steps to be taken to restore communications and address any impact on system or market operations as provided in Section 29.
- (2) **Responsibilities.** An EIM Entity or EIM Sub-Entity that loses communication with the CAISO remains responsible for managing its Balancing Authority Area or EIM Sub-Entity area imbalance needs without balancing Energy from the Real-Time Market, and EIM Entities and EIM Sub-Entities shall have communication procedures to address such circumstances.
- (d) **Variable Energy Resource Forecast Communications.** If the EIM Participating Resource Scheduling Coordinator for a Variable Energy Resource elects to use an independent forecasting service, it must make data transfer arrangements with the CAISO for the CAISO to receive the forecast in a format and on a schedule set forth in the Business Practice Manual for the Energy Imbalance Market.
- (e) **Hybrid Resource Forecast Communications.** If the EIM Participating Resource Scheduling Coordinator for a Hybrid Resource elects to use an independent forecasting service, it must make data transfer arrangements with the CAISO for the CAISO to receive the forecast in a format and on a schedule set forth in the Business Practice Manual for the Energy Imbalance Market.

29.7 EIM Operations Under Normal and Emergency Conditions.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (a) **CAISO Controlled Grid Operations.** Section 7 shall not apply to EIM Market Participants in their capacities as such.
- (b) **Normal EIM Operations.** The CAISO shall administer the transmission capacity made available to the Real-Time Market to manage Energy imbalances in the EIM Area under normal operations.
- (c) **Load Curtailment.** The CAISO will not issue Dispatch Instructions to an EIM Entity Scheduling Coordinator or an EIM Sub-Entity Scheduling Coordinator with respect to Load or Demand that has not been bid into the Real-Time Market.
- (d) **Dispatch Instructions for EIM Participating Resources.** The CAISO will not issue Dispatch Instructions to an EIM Participating Resource Scheduling Coordinator with respect to Supply that has not been bid into the Real-Time Market.
- (e) **EIM Transfers.** The CAISO shall manage EIM Transfers as aggregate Dynamic Schedules with each EIM Entity Balancing Authority Area, which –
 - (1) shall not require individual resource E-Tags;
 - (2) shall not constitute inadvertent Energy;
 - (3) shall reflect intra-hour incremental EIM Transfers between the CAISO Balancing Authority Area and each EIM Entity Balancing Authority Area;
 - (4) shall be updated by the CAISO within 60 minutes after the end of each Operating Hour to include the integrated Energy during the hour for the sum of all EIM Transfers between each Balancing Authority Area in the EIM Area in accordance with WECC business practices for purposes of inadvertent Energy accounting; and
 - (5) shall be subsequently updated as necessary consistent with the requirements of WECC, NERC, and North American Energy Standards Board standards and business practices.
- (f) **Dynamic Imbalance Schedule to Net EIM Transfers.** The CAISO will –
 - (1) model changes in the net five-minute scheduled EIM Transfers that result from Real-Time Dispatch as a Dynamic Schedule between the CAISO and EIM Entity

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

for AGC control accuracy; and

- (2) calculate the dynamic net scheduled EIM Transfers for the CAISO and each EIM Entity Balancing Authority Area and derive from these dynamic net scheduled EIM Transfers the Dynamic Schedules on EIM Internal Interties for E-Tag purposes.

(g) **EIM Manual Dispatch.**

- (1) The EIM Entity may issue an EIM Manual Dispatch to an EIM Participating Resource or a non-participating resource in its Balancing Authority Area, outside of the Market Clearing of the Real-Time Market, when necessary to address reliability or operational issues in the EIM Entity Balancing Authority Area that the CAISO is not able to address through normal economic Dispatch and Congestion Management. The EIM Entity may issue an EIM Manual Dispatch to any EIM Participating Resource or a non-participating resource in its Balancing Authority Area regardless of whether an EIM Sub-Entity Scheduling Coordinator has rights to issue an EIM Manual Dispatch to such EIM Participating Resource or non-participating resource.
- (2) If authorized by the EIM Entity, the EIM Sub-Entity may issue an EIM Manual Dispatch to an EIM Participating Resource or a non-participating resource for which it is registered as the EIM Sub-Entity Scheduling Coordinator when necessary to address reliability or operational issues in its service territory that the CAISO is not able to address through normal economic Dispatch and Congestion Management, provided that such ability by the EIM Sub-Entity shall not prevent the EIM Entity from issuing an EIM Manual Dispatch to any EIM Participating Resource or a non-participating resource in its Balancing Authority Area, and the most recent EIM Manual Dispatch shall take precedence over any prior EIM Manual Dispatch issued to the EIM Participating Resource. Any financial or operational impact on an EIM Sub-Entity resulting from an EIM Manual Dispatch issued by the EIM Entity shall be resolved in accordance with

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

the applicable tariff or contractual arrangements between the EIM Entity and the EIM Sub-Entity.

(h) **EIM Entity and EIM Sub-Entity Actions in Response to an EIM Manual Dispatch.** If

the EIM Entity or EIM Sub-Entity issues an EIM Manual Dispatch to address circumstances on its system –

- (1) the EIM Entity shall immediately inform the CAISO, as specified in the Business Practice Manual for the Energy Imbalance Market, if the EIM Entity Balancing Authority Area is under manual operation;
- (2) the EIM Entity or EIM Sub-Entity shall immediately inform the CAISO of the EIM Manual Dispatch issued to any EIM Participating Resource or non-participating resource by submitting the EIM Manual Dispatch instruction for the affected resource to the CAISO as specified in the Business Practice Manual for the Energy Imbalance Market; and
- (3) the EIM Entity or EIM Sub-Entity remains responsible for informing the Reliability Coordinator of the circumstances creating the need for the EIM Manual Dispatch and may enforce Transmission Constraints, as may be required.

(i) **CAISO Actions in Response to Notification of EIM Manual Dispatch.** Upon receipt of notice of an EIM Manual Dispatch, the CAISO shall –

- (1) reflect the EIM Manual Dispatch in the Real-Time Market;
- (2) disregard an EIM Manual Dispatch in the determination of the Locational Marginal Price; and
- (3) treat an EIM Manual Dispatch to an EIM Participating Resource or non-participating resource as FMM or RTD Instructed Imbalance Energy for Settlement.

(j) **EIM Disruption.**

(1) **Declaration.** The CAISO may declare an interruption of EIM Entity participation in the Real-Time Market when in its judgment –

- (A) operational circumstances (including a failure of the Real-Time Market

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

operation to produce feasible results in the EIM Area or other CAISO Market Disruption) in the EIM Area have caused or are in danger of causing an abnormal system condition in the CAISO Balancing Authority Area or an EIM Balancing Authority Area that requires immediate action to prevent loss of Load, equipment damage, or tripping system elements that might result in cascading Outages, or to restore system operation to meet Applicable Reliability Criteria; or

- (B) communications between the CAISO and EIM Market Participants are disrupted and prevent an EIM Entity, EIM Entity Scheduling Coordinator, EIM Sub-Entity, EIM Sub-Entity Scheduling Coordinator, or EIM Participating Resource Scheduling Coordinator from accessing CAISO systems to submit or receive information.

(2) **CAISO Response to EIM Disruption.** If the CAISO declares an interruption of EIM Entity participation in the Real-Time Market, the CAISO may in its judgment, among other things-

- (A) separate the affected EIM Entity Balancing Authority Area from the EIM Area and maintain the Real-Time Market for other Balancing Authority Areas in the EIM Area by enforcing a net transfer constraint for the affected Balancing Authority Area to separate it from the remainder of the EIM Area;
- (B) reduce or suspend EIM Transfers between one or more Balancing Authority Areas in the EIM Area;
- (C) instruct one or more EIM Entities to maintain system balance within their Balancing Authority Area without RTM Dispatch; or
- (D) in addition or as an alternative, use market results in the Real-Time Market in accordance with Section 7.7.9 or take any of the actions specified in Section 7.7.6 with respect to the Real-Time Market, except that if Section 7.7.6 calls for the use of Day-Ahead Market results, the

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

CAISO will use:

- (i) the price specified in the EIM Entity's open access transmission tariff as the LMP;
 - (ii) the EIM Entity's or EIM Sub-Entity's EIM Base Schedule as the schedule;
 - (iii) the EIM Bid Adder from the most recent corresponding interval that is available as the EIM Bid Adder; and
 - (iv) the emissions rate set by the California Air Resources Board for an unspecified source multiplied by the daily Greenhouse Gas Allowance Price.
- (3) **EIM Entity Responsibility.** In response to an interruption of EIM Entity participation in the Real-Time Market by the CAISO, all EIM Entities shall follow NERC Reliability Standards applicable to their roles as Balancing Authorities in an effort to alleviate operational and system conditions and restore routine operations.
- (4) **EIM Entity and EIM Sub-Entity Scheduling Coordinator Responsibility.** All EIM Entity Scheduling Coordinators and EIM Sub-Entity Scheduling Coordinators shall promptly inform the CAISO of actions taken by the EIM Entities and EIM Sub-Entities they represent in response to an interruption of EIM Entity or EIM Sub-Entity participation in the Real-Time Market by the CAISO through updates to their EIM Base Schedules, Interchange E-Tags, transmission limit adjustments, or Outage and derate information, as applicable.
- (5) **System Restoration.** The CAISO shall reinstate normal operation of the Real-Time Market in the EIM Area at such time as it determines that the conditions that caused the interruption of EIM Entity or EIM Sub-Entity participation in the Real-Time Market have been resolved.
- (k) **Congestion Management and Unscheduled Flow.**
- (1) **Inability to Resolve Congestion.** The CAISO will provide information to EIM

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Entities about Congestion that the Real-Time Market cannot resolve.

- (2) **Initiation of Unscheduled Flow Procedures.** The CAISO or an EIM Entity may initiate WECC's unscheduled flow mitigation procedure if applicable for conditions in its Balancing Authority Area.
- (3) **EIM Entity Action.** When the WECC unscheduled flow mitigation procedure is initiated, each EIM Entity shall adjust its schedules as determined by the WECC procedure and immediately inform the CAISO of the changes, as well as any affected EIM Sub-Entities.
- (4) **CAISO Action.** When WECC's unscheduled flow mitigation procedure is initiated, the CAISO shall reflect the affected EIM Market Participant schedules in the Real-Time Market as determined by the WECC procedure, EIM Entity, EIM Sub-Entity, CAISO Operating Procedures, and Business Practice Manuals for the CAISO Balancing Authority Area and EIM Entity Balancing Authority Areas.

29.8 [Not Used]

29.9 Outages and Critical Contingencies.

- (a) **Applicability of Section 9.** Section 9 shall not apply to EIM Market Participants except as referenced in Section 29.9.
- (b) **Transmission Scheduled Outages.**
 - (1) **Responsibility.** The EIM Entity shall be responsible for performing engineering studies with regard to, and modeling and approving, Outages on transmission facilities for maintenance purposes within the EIM Entity Balancing Authority Area, including making any necessary arrangements for this purpose regarding the transmission capacity made available by an EIM Transmission Service Provider to the Real-Time Market. The EIM Entity may delegate its responsibilities under this Section 29.9(b) to an EIM Sub-Entity within its Balancing Authority Area with regard to transmission facilities for which the EIM Sub-Entity acts as the transmission operator, provided that the EIM Entity shall

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

notify the CAISO of the delegation in accordance with the timelines and procedures in the Business Practice Manual for the Energy Imbalance Market.

- (2) **Notice.** The EIM Entity Scheduling Coordinator or, if delegated under Section 29.9(b)(1), the EIM Sub-Entity Scheduling Coordinator shall submit notice of transmission Outages approved by the EIM Entity or EIM Sub-Entity to the CAISO by the means set forth in the Business Practice Manual for the Energy Imbalance Market and at least seven Business Days prior to the planned Outage.
 - (3) **Notice of Modification.** The EIM Entity Scheduling Coordinator or, if delegated under Section 29.9(b)(1), the EIM Sub-Entity Scheduling Coordinator may submit a notice of modification of an approved transmission Outage and any resulting updates to EIM Intertie limits to the CAISO by the means set forth in the Business Practice Manual for the Energy Imbalance Market and in accordance with the deadlines set forth in Section 9 and Section 29.9.
 - (4) **Contents of Notice.** The EIM Entity Scheduling Coordinator and EIM Sub-Entity Scheduling Coordinator notices of approved transmission Outages shall include
 -
 - (A) the start and finish date for each Outage for maintenance purposes; and
 - (B) such information other than start and finish date as is required in Section 9.3.6 for transmission operators seeking approval of Outages.
- (c) **Generation Maintenance Outages.**
- (1) **Responsibility.** The EIM Entity shall be responsible for performing engineering studies with regard to, and modeling and approving, Outages of EIM Resources and non-participating resources for maintenance purposes within the EIM Entity Balancing Authority Area. The EIM Entity may delegate its responsibilities under this Section 29.9(c) to an EIM Sub-Entity within its Balancing Authority Area with regard to EIM Resources and non-participating resources for which the EIM Sub-Entity acts as the EIM Sub-Entity Scheduling Coordinator, provided that the EIM Entity shall notify the CAISO of the delegation in accordance with the timelines

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

and procedures in the Business Practice Manual for the Energy Imbalance Market.

- (2) **Notice.** The EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator shall submit notice of Outages of EIM Resources and non-participating resources approved by the EIM Entity or EIM Sub-Entity to the CAISO by the means set forth in the Business Practice Manual for the Energy Imbalance Market and at least seven Business Days prior to the planned Outage.
- (3) **Contents of Notice.** The EIM Entity Scheduling Coordinator and EIM Sub-Entity Scheduling Coordinator notices of approved Outages of EIM Resources and non-participating resources shall include-
 - (A) the start and finish date for each Outage for maintenance purposes; and
 - (B) such information other than start and finish date as is required in Section 9.3.6 for Operators seeking approval of Generating Unit Outages.

(d) **Actions Regarding Scheduled Outages.**

- (1) **CAISO Evaluation of Scheduled Outages.** The CAISO will implement the transmission and Generation Outages approved by the EIM Entity or EIM Sub-Entity through the Day-Ahead Market process and will inform the EIM Entity and EIM Sub-Entity Scheduling Coordinator where applicable of any anticipated overloads.
- (2) **EIM Entity and EIM Sub-Entity Action.** Based on the information provided by the CAISO to the EIM Entity Scheduling Coordinator and EIM Sub-Entity Scheduling Coordinator, the EIM Entity and EIM Sub-Entity shall have the opportunity to take action to adjust or cancel Outages as it determines to be necessary.
- (3) **Notice to Reliability Coordinator.**
 - (A) **EIM Entity and EIM Sub-Entity Responsibility.** The EIM Entity and EIM Sub-Entity are responsible for informing the Reliability Coordinator of scheduled Outages.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (B) **CAISO Facilitation.** Upon request of an EIM Entity or EIM Sub-Entity, and without assuming any liability, the CAISO may provide a third party Reliability Coordinator with Outage information submitted to the CAISO by the EIM Entity or EIM Sub-Entity on behalf of the EIM Entity or EIM Sub-Entity.
- (e) **Forced Outages.** An EIM Entity Scheduling Coordinator and an EIM Sub-Entity Scheduling Coordinator shall comply with the reporting provisions of Section 9 with regard to Forced Outages of transmission facilities within the EIM Entity Balancing Authority Area or within the EIM Sub-Entity area they represent and an EIM Participating Resource Scheduling Coordinator shall comply with the reporting provisions of Section 9 with regard to Forced Outages of Generating Units it represents as EIM Resources.
- (f) **Transmission Limits.** An EIM Entity Scheduling Coordinator must notify the CAISO by the means specified in the Business Practice Manual for the Energy Imbalance Market with respect to transmission limits on the transmission capacity made available to the Real-Time Market within the EIM Entity Balancing Authority Area that need to be enforced in the Real-Time Market, including-
- (1) physical MVA or MW limits under base case and contingencies;
 - (2) scheduling limits for EIM Intertie transactions based on E-Tags; and
 - (3) contractual limits on Transmission Interfaces where the EIM Transmission Service Provider has transmission rights.

29.10 Metering and Settlement Data.

- (a) **Telemetry Requirements.** The EIM Entity shall ensure that each EIM Resource and non-participating resource in an EIM Entity Balancing Authority Area that is not a Generating Unit or is a Generating Unit with a rated capacity of 10 MW or greater (including each aggregated resource with a total rated capacity of 10 MW or greater) and each EIM Intertie has telemetry meeting the requirements of the Business Practice Manual for the Energy Imbalance Market.
- (b) **Metering for Settlement Purposes.** The EIM Entity shall ensure that each EIM

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Participating Resource and non-participating resource in an EIM Entity Balancing Authority Area becomes either a CAISO Metered Entity or a Scheduling Coordinator Metered Entity and complies with the requirements of Section 10 except as provided in Section 29.10(c). The EIM Sub-Entity will include the EIM Entity on Schedule 3 or 5 of the applicable meter service agreement to give the EIM Entity access to the EIM Sub-Entity Meter Data.

- (c) **Exception to Requirements of Section 10.3.9.** In the absence of metering standards set by a Local Regulatory Authority, EIM Participating Resources and non-participating resources in an EIM Entity Balancing Authority Area may qualify as Scheduling Coordinator Metered Entities without the need for third party certification if the CAISO determines that the applicable metering standards meet or exceed the standards for CAISO Metered Entities.
- (d) **Interchange Meter Data.** Metering for Settlement purposes is required for all EIM Interties.
- (e) **EIM Energy Imbalance with an External Balancing Authority Area.** For each EIM External Intertie Bid that clears the FMM resulting in a 15-minute EIM External Intertie schedule –
 - (1) the EIM Entity Scheduling Coordinator must submit to the CAISO the corresponding hourly transmission profile and 15-minute Energy profiles from the respective E-Tags, which must reflect the Point of Receipt and Point of Delivery that was declared in the FMM Bid submittal, at least 20 minutes before the start of the Operating Hour; and
 - (2) the EIM Entity Scheduling Coordinator must provide an updated Energy profile to the extent required by Section 30.5.7.

29.11 Settlements and Billing for EIM Market Participants.

- (a) **Applicability.** Section 29.11, rather than Section 11, shall apply to the CAISO Settlement with EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, and EIM Participating Resource Scheduling Coordinators, except as

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

otherwise provided, but not to other Scheduling Coordinators.

(b) **Imbalance Energy.**

(1) **FMM Instructed Imbalance Energy.**

(A) **Calculation.**

(i) **EIM Participating Resources.** The CAISO will calculate an EIM Participating Resource's FMM Instructed Imbalance Energy in the same manner as it calculates FMM Instructed Imbalance Energy under Section 11.5.1.1, except that references to the Day-Ahead Schedule in the relevant Appendix A definitions shall be deemed references to the EIM Base Schedule and that the CAISO will include any Energy from an EIM Manual Dispatch of the EIM Participating Resource in the FMM that is identified by the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator prior to the start of the FMM.

(ii) **Non-Participating Resources.** The CAISO will calculate the FMM Instructed Imbalance Energy of non-participating resources in an EIM Entity Balancing Authority Area in the same manner as it calculates FMM Instructed Imbalance Energy under Section 11.5.1.1, except that references to the Day-Ahead Schedule in the relevant Appendix A definitions shall be deemed references to the EIM Base Schedule and that the CAISO will include any Energy from an EIM Manual Dispatch or EIM Auto-Match of the EIM non-participating resource in the FMM that is identified by the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator prior to the start of the FMM.

(B) **Settlement.** The CAISO will settle –

(i) the FMM Instructed Imbalance Energy with the EIM Participating Resource Scheduling Coordinator for EIM Participating

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Resources; and

- (ii) with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator for non-participating resources in an EIM Entity Balancing Authority Area.

(2) **RTD Instructed Imbalance Energy.**

(A) **Calculation.**

- (i) **EIM Participating Resources.** The CAISO will calculate an EIM Participating Resource's RTD Instructed Imbalance Energy in the same manner in which it calculates RTD Instructed Imbalance Energy under Sections 11.5.1.2 and 11.5.5, except that the CAISO will include any Energy from an EIM Manual Dispatch of the EIM Participating Resource in the RTD that is identified by the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator.
- (ii) **Non-Participating Resources.** The CAISO will calculate the RTD Instructed Imbalance Energy of non-participating resources in an EIM Entity Balancing Authority Area in the same manner in which it calculates RTD Instructed Imbalance Energy under Section 11.5.1.2 and 11.5.5, except that the CAISO will include any Energy from an EIM Manual Dispatch or EIM Auto-Match of the EIM non-participating resource in the RTD that is identified by the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator.

(B) **Settlement.** The CAISO will settle the RTD Instructed Imbalance Energy –

- (i) with the EIM Participating Resource Scheduling Coordinator for EIM Participating Resources; and
- (ii) with the applicable EIM Entity Scheduling Coordinator or EIM

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Sub-Entity Scheduling Coordinator for non-participating
resources in an EIM Entity Balancing Authority Area.

(3) **Uninstructed Imbalance Energy.**

(A) **EIM Participating Resources.**

- (i) **Calculation.** For EIM Participating Resources and an EIM Entity Balancing Authority Area's dynamic import/export schedules with external resources, the CAISO will calculate Uninstructed Imbalance Energy in the same manner in which it calculates Uninstructed Imbalance Energy under Section 11.5.2.1.
- (ii) **Settlement.** The CAISO will settle the Uninstructed Imbalance Energy with the EIM Participating Resource Scheduling Coordinator, the EIM Entity Scheduling Coordinator, or the EIM Sub-Entity Scheduling Coordinator, as applicable.

(B) **Non-Participating Resources.**

- (i) **Calculation.** For non-participating resources in an EIM Entity Balancing Authority Area, the CAISO will calculate Uninstructed Imbalance Energy in accordance with Section 11.5.2, except that the CAISO will treat an EIM Base Schedule as a Day-Ahead Schedule and the CAISO will treat an EIM Manual Dispatch and an EIM Auto-Match as a Dispatch Instruction.
- (ii) **Settlement.** The CAISO will settle the Uninstructed Imbalance Energy for non-participating resources in an EIM Entity Balancing Authority Area at the applicable RTD Locational Marginal Price in accordance with Section 11.5.2.1 with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator and will treat EIM Balancing Authority Demand in the same manner as the CAISO treats CAISO Demand under that Section.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

(C) **Non-Participating Load.**

- (i) **Calculation.** For non-participating Load in an EIM Entity Balancing Authority Area, the CAISO will calculate Uninstructed Imbalance Energy in accordance with Section 11.5.2.2, except that the CAISO will determine deviations based on the EIM Base Load Schedule.
- (ii) **Settlement.** The CAISO will settle Uninstructed Imbalance Energy for non-participating Load in an EIM Entity Balancing Authority Area at the applicable Default LAP Hourly Real-Time Price in accordance with Section 11.5.2.2 with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator and will treat EIM Balancing Authority Demand in the same manner as the CAISO treats CAISO Demand under that Section.

(D) **EIM Base Schedules Below PMin.**

- (i) **Calculation.** For deviations from an EIM Base Schedule below PMin submitted by an EIM Entity Scheduling Coordinator or an EIM Participating Resource Scheduling Coordinator, the CAISO will calculate Uninstructed Imbalance Energy in accordance with Section 11.5.2 as if the EIM Resource had received a Dispatch Instruction to PMin based upon the submission of an Energy Self-Schedule.
- (ii) **Settlement.** The CAISO will settle Uninstructed Imbalance Energy for deviations from an EIM Base Schedule below PMin in an EIM Entity Balancing Authority Area at the applicable RTD Locational Marginal Price in accordance with Section 11.5.2.1 with the applicable EIM Entity Scheduling Coordinator or EIM Participating Resource Scheduling Coordinator.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

(c) **Unaccounted For Energy of EIM Entities.**

(1) **Calculation.** The CAISO will calculate Unaccounted For Energy for each EIM Entity Balancing Authority Area as the difference between metered Demand, and the sum of the metered Supply and the metered values at the interties, adjusted for losses.

(2) **Settlement.**

(A) **Unaccounted for Energy Settlement.** The CAISO will settle Unaccounted For Energy with the applicable EIM Entity Scheduling Coordinator at the applicable Hourly Real-Time LAP price.

(B) **Election Not to Settle Unaccounted for Energy.** Annually, an EIM Entity Scheduling Coordinator that submits metered Demand through Meter Data calculated without End-Use Meters may elect to not settle Unaccounted For Energy through the CAISO Markets, in which case –

- (i) the CAISO will apply a zero-percent Transmission Losses factor when calculating the Initial EIM base load schedule per section 29.34(g); and
- (ii) the EIM Entity Scheduling Coordinator will apply a zero-percent Transmission Losses factor when calculating their metered Demand.

(d) **Charges for Over- and Under-Scheduling of EIM Entities.**

(1) **Under-Scheduling Charges.**

(A) **Level 1 Charge.** If, during any Trading Hour, the metered Demand within an EIM Entity Balancing Authority Area exceeds the EIM Base Schedule of Supply submitted by the EIM Entity by more than 5% but less than or equal to 10% and by at least 2 MW, the CAISO shall settle with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator for all Uninstructed Imbalance Energy at the relevant Load Aggregation Point at a price that is 125% of the Hourly

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Real-Time LAP Price.

(B) **Level 2 Charge.** If, during any Trading Hour, the metered Demand within an EIM Entity Balancing Authority Area exceeds the EIM Base Schedule of Supply submitted by the EIM Entity by more than 10% and by at least 2 MW, the CAISO shall settle with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator for all Uninstructed Imbalance Energy at the relevant Load Aggregation Point at a price that is 200% of the Hourly Real-Time LAP price.

(2) **Over-Scheduling Charges.**

(A) **Level 1 Charge.** If, during any Trading Hour, the metered Demand within an EIM Entity Balancing Authority Area is less than the EIM Base Schedule of Supply submitted by the EIM Entity by more than 5% but less than or equal to 10% and by at least 2 MW, the CAISO shall settle with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator for all Uninstructed Imbalance Energy at the relevant Load Aggregation Point at a price that is 75% of the Hourly Real-Time LAP Price.

(B) **Level 2 Charge.** If, during any Trading Hour, the metered Demand within an EIM Entity Balancing Authority Area is less than the EIM Base Schedule of Supply submitted by the EIM Entity by more than 10% and by at least 2 MW, the CAISO shall settle with the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator for all Uninstructed Imbalance Energy at the relevant Load Aggregation Point at a price that is 50% of the Hourly Real-Time LAP Price.

(3) **Distribution of Revenues.**

(A) **Apportionment.** The CAISO will calculate the total daily excess revenues received from under-scheduling charges and over-scheduling charges under Section 29.11(d)(1) and (2) and apportion them to

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Balancing Authority Areas in the EIM Area that were not subject to either under-scheduling or over-scheduling charges during the Trading Day according to metered Demand.

- (B) **Allocation.** The CAISO will allocate –
- (i) the amounts apportioned to EIM Entity Balancing Authority Areas pursuant to Section 29.11(d)(3)(A) to the applicable EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator; and
 - (ii) the amounts apportioned to the CAISO Balancing Authority Area pursuant to Section 29.11(d)(3)(A) to Scheduling Coordinators in the CAISO Balancing Authority Area according to metered Demand.
- (4) **Exemption.** An EIM Entity will be exempt from under-scheduling and over-scheduling charges under Section 29.11(d)(1) and (2) if it uses the Demand Forecast prepared by the CAISO in its EIM Resource Plan and it approves EIM Base Schedules for its resources within +/- 1% of the CAISO Demand Forecast, as determined according to the Business Practice Manual for the Energy Imbalance Market. This exemption will not apply to an EIM Entity that permits any EIM Sub-Entity located within its Balancing Authority Area to submit its own Demand Forecast.
- (e) **Neutrality Accounts.**
- (1) **In General.** The CAISO will collect neutrality amounts from EIM Market Participants to recover differences in Real-Time Market payments made and Real-Time Market payments received.
 - (2) **Real-Time Congestion Offset.** The CAISO will assess EIM Entity Scheduling Coordinators a Real-Time Congestion Offset allocation calculated pursuant to Section 11.5.4.1.1.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (3) **Real-Time Imbalance Energy Offset Allocation.** The CAISO will assess EIM Entity Scheduling Coordinators a Real-Time Imbalance Energy Offset allocation calculated pursuant to Section 11.5.4.1.
 - (4) **Real-Time Marginal Cost of Losses Offset.** The CAISO will allocate the Real-Time Marginal Cost of Losses Offset to EIM Entity Scheduling Coordinators pursuant to Section 11.5.4.1.2.
 - (5) **Other Neutrality Adjustments.** The CAISO will levy additional charges on or make additional payments to EIM Market Participants as adjustments in accordance with Section 11.14.
- (f) **Real-Time Bid Cost Recovery.**
- (1) **In General.** The CAISO will provide EIM Participating Resources RTM Bid Cost Recovery.
 - (2) **Calculation of Real-Time Bid Cost Recovery.** The CAISO will calculate Real-Time Bid Cost Recovery in accordance with Section 11.8.4, except that the CAISO will treat a non-zero EIM Base Schedule of an EIM Participating Resource as an IFM Self-Schedule and the corresponding intervals as IFM self-commitment intervals.
 - (3) **Application of Real-Time Performance Metric.**

The CAISO will adjust the RTM Energy Bid Cost, the RTM Market Revenues, and RTM Minimum Load Costs determined pursuant to Section 29.11(f)(2) by multiplying the Real-Time Performance Metric with those amounts for the applicable Settlement Interval pursuant to the rules specified in Section 11.8.4.4 and its subsections, except that the CAISO will treat an EIM Base Schedule as a Day-Ahead Schedule.
 - (4) **Allocation of EIM Entity RTM Bid Cost Uplift.**
 - (A) **Calculation of Charge.** The Net RTM Bid Cost Uplift will be determined for each EIM Entity Balancing Authority Area in accordance with the

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

methodology set forth in Section 11.8.6.

- (B) **Settlement.** The CAISO will assess the Net RTM Bid Cost Uplift calculated for each EIM Entity Balancing Authority Area to the applicable EIM Entity Scheduling Coordinator in accordance with Section 11.8.6.6.(ii).

(g) **EIM Sub-Entity Implementation Cost.**

The CAISO will charge electric utilities that enter into an EIM Sub-Entity Implementation Agreement pursuant to Section 29.2(c) a fee to cover the actual costs the CAISO incurs to separate the EIM Sub-Entity from the EIM Entity Balancing Authority Area. The EIM Sub-Entity is responsible for actual costs incurred by the CAISO in conducting implementation activities.

- (1) The EIM Sub-Entity will provide the CAISO a \$260,000 deposit for the implementation of the EIM Sub-Entity at the time of the request. The CAISO shall draw from the EIM Sub-Entity's deposit to cover actual costs incurred during implementation. Whenever the implementation costs exceed the deposit(s) received, the CAISO will invoice the EIM Sub-Entity for an additional deposit in \$25,000 increments.
- (2) Invoices shall be due no later than thirty (30) days after the date of receipt. Any invoice payment past due will accrue interest, per annum, calculated in accordance with 5 C.F.R. 1315.10.
- (3) All eligible refunds will be processed following the CAISO's generally accepted accounting practices, including batch deposit refund disbursements. Any deadline for CAISO action will be tolled to the extent the EIM Sub-Entity has not provided the CAISO with the appropriate documents to facilitate the EIM Sub-Entity's refund.

- (h) **EIM Initial Fee.** The CAISO will charge Balancing Authority Areas that enter into an EIM Implementation Agreement pursuant to Section 29.2(b) an initial fee to cover a share of the capital and operations and maintenance costs associated with setting up the Real-

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Time Market to accommodate the participation of the Balancing Authority as an EIM Entity. The fee will be established by the EIM Implementation Agreement entered into pursuant to Section 29.2(b)(1) as accepted by FERC.

(i) **EIM Administrative Charge.**

- (1) **In General.** The CAISO will charge EIM Market Participants an EIM Administrative Charge consisting of the real-time portions of the Market Services Charge and the System Operations Charge.
- (2) **Market Services Charge.** The Market Services Charge shall be the product of the Market Services Charge for each Scheduling Coordinator as calculated according to the formula in Appendix F, Schedule 1, Part A, the real-time market percentage as calculated in the cost of service study according to Appendix F, Schedule 1, Part A, and the sum of Gross FMM Instructed Imbalance Energy (excluding FMM Manual Dispatch Energy) and Gross RTD Instructed Imbalance Energy (excluding RTD Manual Dispatch Energy Standard Ramping Deviation, Ramping Energy Deviation, Residual Imbalance Energy, and Operational Adjustments).
- (3) **System Operations Charge.** The System Operations Charge shall be the product of the System Operations Charge for each Scheduling Coordinator, as calculated according to the formula in Appendix F, Schedule 1, Part A, the real-time market percentage as calculated in the cost of service study conducted according to Appendix F, Schedule 1, Part A, and the absolute difference between metered energy and the EIM Base Schedules.
- (4) **Minimum EIM Administrative Charge.** The CAISO will calculate the minimum EIM Administrative Charge as the product of the sum of the real-time activities associated with market services charge and the real-time activities chart associated with system operations, as well as –
 - (A) five percent of the total gross absolute value of Supply of all EIM Market Participants; plus

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (B) five percent of the total gross absolute value of Demand of all EIM Market Participants.
- (5) **Withdrawing EIM Entity.** If the EIM Entity notifies the CAISO of its intent to terminate participation in the Energy Imbalance Market and requests suspension of the Energy Imbalance Market in its Balancing Authority Area under Section 29.4(b)(4), the CAISO will charge the EIM Entity the minimum EIM Administrative Charge calculated under Section 29.11(i)(4) during the notice period.
- (6) **Application of Revenues.** The CAISO will apply revenues received from the EIM Administrative Charge against the costs to be recovered through the Grid Management Charge as described in Appendix F, Schedule 1, Part A.
- (j) **Variable Energy Resource and Hybrid Resource Forecast Charge.**
- (1) **In General.** The CAISO will charge EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, and EIM Participating Resource Scheduling Coordinators a fee for the Variable Energy Resource or Hybrid Resource forecasting services in accordance with Appendix F, Schedule 4.
- (2) **Waiver.** The CAISO will waive the Variable Energy Resource or Hybrid Resource forecast charge if an EIM Entity or EIM Sub-Entity has an independent forecast for its Variable Energy Resources or Hybrid Resource and provides the independent forecast to the CAISO.
- (k) **Transmission Service.** The CAISO will charge EIM Market Participants for transmission service according to Section 29.26.
- (l) **Settlement.** With regard to the CAISO's assessment and payment of charges to, and collection of charges from, EIM Market Participants pursuant to Sections 11 and 29.11, the CAISO shall assess, pay and collect such charges, address disputed invoices, assess, pay and collect Settlement-related fees and charges, including those under Sections 11.21, 11.28, and 11.29, and make any financial adjustments in accordance with the terms and schedule set forth in Section 11.
- (m) **Charges Related to RTM Participation of Interties.** In the event that an EIM Entity

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

enables participation in the Real-Time Market on EIM External Interties, the EIM Entity Scheduling Coordinator shall also be subject to any applicable charges under Sections 11.31 and 11.32.

- (n) **EIM Transfers and Settlement for Contingency Reserve Obligations.** The CAISO shall allocate Operating Reserve Obligations to EIM Entity Scheduling Coordinators for EIM Transfers as follows –
- (1) EIM Entity Scheduling Coordinators will receive a payment equal to three (3) percent of the hourly MW EIM Transfer into the CAISO Balancing Authority Area multiplied by the hourly user rate for Spinning Reserves and Non-Spinning Reserves, as calculated per Section 11.10.3.3 and 11.10.4.3, respectively; and
 - (2) EIM Entity Scheduling Coordinators will receive a charge equal to three (3) percent of the hourly MW EIM Transfer out of the CAISO Balancing Authority Area multiplied by the hourly user rate for Spinning Reserves and Non-Spinning Reserves, as calculated per Section 11.10.3.3 and 11.10.4.3, respectively.
- (o) **Application of Persistent Deviation Metric.**
The CAISO will modify the Bid Cost Recovery calculations described in Section 29.11(f) and Residual Imbalance Energy payments in Section 11.5.5 as described in Section 11.17, except that the CAISO will treat an EIM Base Schedule as a Day-Ahead Schedule.
- (p) **Flexible Ramping Product.** The CAISO will allocate and settle payments and charges for the Flexible Ramping Product according to Section 11.25, where the CAISO will consider EIM Base Schedules of non-participating resources as Self-Schedules.
- (q) **EIM Transfer System Resource Settlement Information.** The CAISO will provide EIM Entities with non-binding Settlement information associated with Energy transfer schedule changes from their respective base schedules between EIM Entity Balancing Authority Areas.
- (r) **EIM Transfer System Resource Settlement.**
- (1) **EIM Transfer System Resource Registration.** The CAISO will provide each EIM Entity with financially binding Settlement of Energy transfer schedule

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

changes from its respective base schedules between EIM Entity Balancing Authority Areas, and will –

- (A) establish for each EIM Entity that shares an EIM Internal Intertie a to/from EIM Transfer system resource pricing location in their respective EIM Entity Balancing Authority Area;
- (B) associate with each to/from EIM Transfer system resource pricing location, a unique base EIM Transfer system resource that accounts for Energy transfer schedule changes between EIM Entity Balancing Authority Areas;
- (C) require each EIM Entity Scheduling Coordinator to submit EIM Base Schedules and E-Tags that identifies Energy transfer schedule changes at the registered base EIM Transfer system resource; and
- (D) reject EIM Base Schedule changes at the to/from EIM Transfer system resource pricing location not associated with the registered base EIM Transfer system resource.

(2) **Settlement for EIM Transfer System Resource Changes.** The CAISO will settle EIM Transfer system resource changes established pursuant to Section 29.11(r)(1) as –

- (A) FMM Instructed Imbalance Energy or RTD Instructed Energy based on the Settlement Interval in which the E-Tag is received, without regard for other Energy types identified in Sections 11.5.1.1 or 11.5.2.2, or as an Operational Adjustment if the E-Tag is received after the end of the Operating Hour for purposes of Energy accounting in accordance with the applicable WECC business practices;
- (B) based on the difference between the E-Tag and the EIM Transfer system resource base schedule;
- (C) at the relevant FMM or RTD Locational Marginal Price at each unique EIM Transfer system resource pricing location associated with the base

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

EIM Transfer system resource; and

(D) including any contribution that the base EIM Transfer system resource might have on the RTM Bid Cost Recovery pursuant to Section 29.11(f).

(s) **EIM Entity Access to EIM Sub-Entity Settlement Information.**

An EIM Entity shall have access to CAISO Settlement Statements and Invoices for all EIM Sub-Entities within the Balancing Authority Area for that EIM Entity.

(t) **Revenue and Surcharges for the Assistance Energy Transfer Product.**

The revenue from assistance Energy transfers paid by a participating Balancing Authority Area in the EIM Area that has elected to receive assistance Energy in accordance with Section 29.34(n)(3), *i.e.*, the EIM Assistance Energy Transfer Surcharge, will be calculated, allocated and distributed as follows—

(1) Assistance Energy Transfer Surcharge.

(A) Calculation. If a Balancing Authority Area in the EIM Area receives an assistance Energy transfer, then the EIM Assistance Energy Transfer Surcharge will apply to the lower of the quantities specified in Section 29.11(t)(1)(A)(i) or (ii):

(i) the higher of the quantity of the failure of the upward capacity test in Section 29.34(l) or the upward flexibility test in Section 29.34(m), or

(ii) the quantity of net EIM Transfers excluding base scheduled transfers as identified on all after-the-fact E-Tags associated with EIM Transfers into the participating Balancing Authority Area.

(a) If the EIM Assistance Energy Transfer Surcharge is applied to the assistance Energy transfers received by an EIM Entity pursuant to Section 29.11(t)(1)(A)(ii), then the quantity of EIM Transfers subject to the EIM Assistance

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Energy Transfer Surcharge will be adjusted to reflect the EIM Upward Available Balancing Capacity as a credit.

- (b) If the EIM Assistance Energy Transfer Surcharge is applied to the assistance Energy transfers received by the CAISO pursuant to Section 29.11(t)(1)(A)(ii), then the quantity of EIM Transfers subject to the EIM Assistance Energy Transfer Surcharge will be adjusted to reflect the sum of all Regulation Up (adjusted for Regulation non-compliance quantities) within the CAISO Balancing Authority Area as a credit.

(B) Allocation. The revenue collected through the EIM Assistance Energy Transfer Surcharge from participating Balancing Authority Areas in the EIM Area that fail the upward capacity test in Section 29.34(l) or the upward flexibility test in Section 29.34(m) will be allocated, pro rata, to all other Balancing Authority Areas in the EIM Area with net EIM Transfers, excluding base scheduled transfers, in the export direction if such Balancing Authority Areas passed the upward capacity test in Section 29.34(l) and the upward flexibility test in Section 29.34(m). A Balancing Authority Area is eligible for a revenue allocation even if it has not elected to receive assistance Energy transfers.

(C) Distribution. The revenue collected through the EIM Assistance Energy Transfer Surcharge will be allocated to the net exporting Balancing Authority Areas in the EIM Area that pass the upward capacity test in Section 29.34(l) and the upward flexibility test in

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Section 29.34(m) in accordance with Section 29.11(t)(2) will be distributed as follows:

- (1) to the EIM Entity Scheduling Coordinators for sub-allocation according to its OATT, or
- (2) to the CAISO for sub-allocation to Scheduling Coordinators that provide incremental Energy net of FMM Instructed Imbalance Energy, RTD Instructed Imbalance Energy, and Uninstructed Imbalance Energy excluding non-Participating Load.

(2) Assistance Energy Transfer Surcharges.

- (A)** Any assistance Energy transfer surcharges allocated to the net importing Balancing Authority Areas in the EIM Area that fail the upward capacity test in Section 29.34(l) or the upward flexibility test in Section 29.34(m) will be allocated to the EIM Entity Scheduling Coordinator for sub-allocation according to its OATT. Any assistance Energy transfer charges allocated to the CAISO Balancing Authority Area will be sub-allocated based on Measured Demand, excluding Demand associated with ETC or TOR Self-Schedules for which a RTM Congestion Credit was provided as specified in Section 11.5.7, and excluding Demand associated with ETC, Converted Right, or TOR Self-Schedules for which an IFM Congestion Credit was provided as specified in Section 11.2.1.5; regardless of whether an MSS Operator has elected gross or net Settlement, Scheduling Coordinators for MSS Operators will receive their allocation based on the MSS Aggregation Net Non-ETC/TOR Measured Demand.

(3) Applicable Period for Assistance Energy Transfer Surcharges and Distribution of Collected Amounts. Upon termination of the assistance Energy

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

transfer product as provided in Section 29.34(n)(3)(C), and final Settlement and Billing for the assistance Energy transfer product, this Section 29.11(t) will terminate.

29.12 Creditworthiness

- (a) **Requirements.** EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, and EIM Participating Resource Scheduling Coordinators shall comply with the credit and other requirements of Section 12.
- (b) **Credit Default.** In the event of a failure to satisfy the credit or other requirements in Section 12, the consequences specified in Section 12 shall apply to EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, and EIM Participating Resource Scheduling Coordinators.

29.13 Dispute Resolution

- (a) **Invoices.** Confirmation and validation of any dispute associated with the participation of EIM Market Participants in the Real Time Market is subject to Section 11.29.8 and shall be managed through the CAISO's customer inquiry, dispute, and information system and as provided in the Business Practice Manual for the Energy Imbalance Market.
- (b) **Other Disputes.** EIM Market Participants shall be subject to dispute resolution pursuant to Section 13.

29.14 Uncontrollable Forces, Indemnity, Liabilities, and Penalties

The provisions of Section 14 regarding Uncontrollable Forces, indemnity, liability, and penalties shall apply to the participation of EIM Market Participants in the Real-Time Market.

29.15 [Not Used]

29.16 [Not Used]

29.17 EIM Transmission System

- (a) **Information.** Each EIM Entity, and any EIM Sub-Entity authorized by the EIM Entity to perform one or more of the following tasks, shall –
 - (1) deliver EIM Transmission Service Information to the CAISO regarding the network topology information associated with transmission capacity that it owns,

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

controls, or has a contractual entitlement to that may be used in the Real-Time Market;

- (2) deliver EIM Transmission Service Information to the CAISO regarding the network topology information associated with transmission capacity that each other EIM Transmission Service Provider owns, controls, or has a contractual entitlement to within the EIM Entity Balancing Authority Area that may be used in the Real-Time Market;
 - (3) update the EIM Transmission Service Information no less frequently than the timelines for updates to the Full Network Model as provided in the CAISO Tariff and Business Practice Manual for the Energy Imbalance Market; and
 - (4) ensure that the EIM Transmission Service Information is accurate and complete.
- (b) **Effectiveness.** The EIM Transmission Service Information shall only be used for operation of the CAISO Markets in accordance with the procedures set forth in the Business Practice Manual for the Energy Imbalance Market.
- (c) **Availability.** Each EIM Entity and EIM Sub-Entity shall ensure that all EIM Transmission Service Providers in its Balancing Authority Area or EIM Sub-Entity area make available for use in the Real-Time Market transmission capacity that is included in the EIM Transmission Service Information and that is not otherwise encumbered, reserved, scheduled, or being used by its transmission customers or by others.
- (d) **Information on Availability.** Each EIM Entity Scheduling Coordinator and EIM Sub-Entity Scheduling Coordinator shall inform the CAISO in the manner and by the deadlines specified in the Business Practice Manual for the Energy Imbalance Market regarding the availability of the transmission capacity identified in the EIM Transmission Service Information for use in the Real-Time Market.
- (e) **EIM Transfer Limit.** A Balancing Authority that has entered into an EIM Implementation Agreement to become an EIM Entity shall establish and inform the CAISO of the maximum EIM Transfer limit at least ninety days prior to the EIM Entity Implementation Date in accordance with the Business Practice Manual for the Energy Imbalance Market.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (f) **EIM Transfer Availability.**
- (1) **In General.** The ISO will model individual constraints for each EIM Transfer limit submitted by each EIM Entity that makes transmission available on an EIM Internal Intertie.
 - (2) **Use of Interchange Transmission Rights.** The EIM Entity Scheduling Coordinator shall determine the EIM Transfer limit made available for use in the Real-Time Market through interchange transmission rights and communicate that limit to the CAISO prior to the start of the next Dispatch Interval in accordance with the procedures and timelines for submission and acceptance in the Business Practice Manual for the Energy Imbalance Market.
 - (3) **Use of Available Transfer Capability.** The EIM Entity Scheduling Coordinator shall determine the EIM Transfer limit made available to the Real-Time Market through available transfer capability in accordance with its tariff and communicate that limit to the CAISO prior to the start of the next Dispatch Interval in accordance with the procedures and timelines for submission and acceptance in the Business Practice Manual for the Energy Imbalance Market.
 - (4) **Multiple EIM Transfer Limits.** If there are two or more EIM Entity Balancing Authority Areas that share the same EIM Internal Intertie, the CAISO's Security Constrained Economic Dispatch in the Real-Time Unit Commitment and Real-Time Dispatch will enforce the individual EIM Transfer limit for each EIM Entity Balancing Authority Area while allowing Energy to wheel through the EIM Entity Balancing Authority Areas based on the transmission made available for use in the Real-Time Market.
 - (5) **EIM Transfers and CAISO Scheduling Points.** EIM Transfers shall compete for Available Transfer Capability at interties that are an EIM Internal Intertie and a CAISO Scheduling Point.
 - (6) **EIM Transfer Limit Constraints.** The CAISO's Security Constrained Economic

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Dispatch in the Real-Time Unit Commitment and Real-Time Dispatch shall enforce the EIM Transfer limit and the associated physical limit at each EIM Internal Intertie.

(g) **EIM Transfer Schedule Cost.**

- (1) **In General.** The CAISO's Security Constrained Economic Dispatch in the Fifteen Minute Market and Real-Time Dispatch shall use an EIM Transfer schedule cost associated with EIM Transfers at each EIM Internal Intertie to determine the optimal scheduling path for EIM Transfers, which in all intervals shall be less than \$0.01.
- (2) **Objectives.** The CAISO shall use the lowest EIM Transfer schedule cost determined based upon the objectives of –
 - (A) maximizing the use of the transmission capacity made available for EIM Transfers in both the Fifteen-Minute Market and Real-Time Dispatch;
 - (B) minimizing the number of E-Tags required to comply with the WECC scheduling practices; and
 - (C) minimizing the impact of outages or curtailments on the E-Tags used to account for EIM Transfers based on historical outage and curtailment data for each EIM Internal Intertie.
- (3) **EIM Transfer Schedule Cost Publication.** The CAISO will publish the EIM Transfer schedule cost associated with each EIM Internal Intertie in the Business Practice Manual for the Energy Imbalance Market.
- (4) **EIM Transfer Schedule Cost Adjustment.** The CAISO may adjust the EIM Transfer schedule costs to maintain the path priorities established by the criteria in Section 29.17(g)(2) when an EIM Entity Balancing Authority Area is added or subtracted from the EIM Area, as seasonal transmission system ratings change, or the transmission system topology changes.
- (5) **Locational Marginal Price.** The CAISO will reflect the EIM Transfer schedule

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

cost in the Marginal Cost of Congestion.

29.18 [Not Used]

29.19 [Not Used]

29.20 Confidentiality

The confidentiality provisions of Section 20 shall apply to participation of EIM Market Participants in the Real-Time Market.

29.21 [Not Used]

29.22 Miscellaneous Provisions in Addition to Section 22.

Section 22 and the additional miscellaneous provisions of Section 29.22 shall apply to the Energy Imbalance Market.

- (a) **Tax Liability.** To the extent that the CAISO would incur any tax liability as a result of the participation of EIM Market Participants in the Real-Time Market, as market operator or as central counterparty to Energy Imbalance Market transactions, for example, the CAISO will pass those taxes on to the EIM Entity Scheduling Coordinator for the EIM Entity area where the transactions triggered the tax liability.
- (b) **Purchasing Selling Agent.** Neither the CAISO nor the EIM Entity is a “Purchasing Selling Entity” for purposes of E-Tagging or EIM Transfers, nor shall either be listed as a “Purchasing Selling Entity” for purposes of E-Tagging or EIM Transfers.
- (c) **Title to Energy.** Title to Energy in the Real-Time Market passes directly from the entity that holds title when the Energy enters the CAISO Controlled Grid or the transmission system of an EIM Transmission Service Provider, whichever is first following Dispatch, to the entity that removes the Energy from the CAISO Controlled Grid or the transmission system of a EIM Transmission Service Provider, whichever last precedes delivery to Load.

29.23 [Not Used]

29.24 [Not Used]

29.25 [Not Used]

29.26 Transmission Rates and Charges.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (a) **Transmission Charges for CAISO Facilities.**
- (1) **Access Charge.** Transmission service charges for Real-Time Market transactions serving Load within the CAISO Balancing Authority Area that use the CAISO Controlled Grid are governed by Section 26.
- (2) **Wheeling Access Charge.** EIM Transfers from the CAISO Controlled Grid to another EIM Entity Balancing Authority Area using the contractual or ownership rights of an EIM Entity shall not constitute Wheeling Out and shall not be subject to the Wheeling Access Charge under Section 26.
- (b) **Non-CAISO Facilities.** The determination and charges for transmission service for Real-Time Market transactions on facilities that are part of the contractual or ownership rights made available to the Real-Time Market by an EIM Transmission Service Provider through an EIM Entity or EIM Sub-Entity will be the responsibility of the EIM Entity or EIM Sub-Entity that made the facilities available, except that the EIM Entity or EIM Sub-Entity shall ensure that no EIM Transmission Service Provider imposes a separate charge for EIM Transfers that use its facilities, provided that charges for transmission service in excess of contractual limits shall not be considered a separate charge.

29.27 CAISO Markets and Processes.

- (a) **In General.** Except as provided in subsection (b) of this section, the provisions of Section 27 that are applicable to the Real-Time Market shall apply to EIM Market Participants.
- (b) **Transition Period for New EIM Entities.**
- (1) **Transmission Constraint Relaxation.** For a period of six months following the Implementation Date of a new EIM Entity, the provisions of Section 27.4.3.2 and the second sentence of Section 27.4.3.4 shall not apply to constraints that are within Balancing Authority Areas of the new EIM Entity or affect EIM Transfers between the Balancing Authority Areas of the new EIM Entity and any other EIM Entity that is subject to this subsection (b). For those intervals that experience infeasibilities described in those provisions, the CAISO shall instead determine

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

prices consistent with the provisions of Sections 27, 34, and Appendix C, that would apply in the absence of Section 27.4.3.2 and the second sentence of Section 27.4.3.4.

- (2) **Flexible Ramping Product.** For a period of six months following the EIM Entity Implementation Date of a new EIM Entity, when the transmission and/or power balance constraints as specified in Sections 27.4.3.2 and 27.4.3.4, respectively, are relaxed, the CAISO shall set the Flexible Ramping Product parameter for pricing purposes, for the new EIM Entity Balancing Authority Area, at an amount between and including \$0 and \$0.01.
 - (3) **Extension of Transition Period Pricing.** Any extensions of the initial six-month transition period, as approved by the Federal Energy Regulatory Commission, are specified below. Sixty days prior to the expiration of the transition period, the CAISO will post on the CAISO website an assessment of whether an extension of the transition period, for up to an additional six months, is needed for the applicable EIM Entity. The CAISO will post an update to such assessment prior to the expiration of the transition period should there be any changes to its posted conclusions.
 - (A) [reserved]
 - (4) **Reports.** During the term of the transition period, the CAISO will submit monthly reports with the Commission on the infeasibilities observed in the applicable EIM Entity Balancing Authority Area, the nature of the issues causing the infeasibility
- (c) **Automated EIM Mirror.** If the CAISO updates an Interchange E-Tag for a schedule change outside of the Market Clearing of the Real-Time Market for System Resources and Scheduling Points and the associated energy is generated at, wheeled through, or consumed at an EIM Entity Balancing Authority Area, the CAISO will automatically EIM Mirror the schedule change using the relevant EIM Mirror System Resource in accordance with the procedures specified in the Business Practice Manual for the Energy Imbalance Market.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (d) **Base GDFs for Aggregated EIM Non-Participating Resources.** The CAISO will allow base Generation Distribution Factor submission for aggregate EIM non-participating resources through the submission of EIM Base Schedules and will distribute the base schedule and any imbalances of aggregate EIM non-participating resources using the submitted base GDFs, if available, or otherwise the registered default base GDFs for the resource in the Master File, normalized for Outages and remedies adopted to address the issues identified.

29.28 Inter-SC Trades

EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, and EIM Participating Resource Scheduling Coordinators may not submit Inter-SC Trades.

29.29 [Not Used]

29.30 Bid and Self-Schedule Submission for CAISO Markets.

- (a) **In General.** The provisions of Section 30 that are applicable to the Real-Time Market, as supplemented by Section 29.30, shall apply to EIM Market Participants.
- (b) **Start-Up and Minimum Load.** For the determination of Proxy Start-Up Costs and Proxy Minimum Load Costs, the CAISO will utilize the Market Services Charge and System Operations Charge reflected in the EIM Administrative Charge.
- (c) **EIM Available Balancing Capacity Energy Bid Curve for EIM Participating Resources.** For each Trading Hour, the CAISO will apply Energy Bids submitted for EIM Participating Resources, which may be subject to mitigation pursuant to Section 29.39, towards the EIM Available Balancing Capacity as provided in Section 29.30(e).
- (d) **EIM Available Balancing Capacity Bids Used for EIM Available Balancing Capacity Served by Non-Participating Resources.** The CAISO will create an Energy Bid Curve based on the Default Energy Bid established by the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator and the CAISO pursuant to Section 29.4(c)(4)(K) for all non-participating resources that the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator may identify as EIM Available Balancing Capacity, and will apply such bids to the EIM Available Balancing Capacity as provided in Section 29.30(e).

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (e) **Treatment of Energy Bid Curves for EIM Available Balancing Capacity.** For each Trading Hour the CAISO will allocate the categories of the EIM Resource Plan specified in Section 29.34(e)(3)(C) and (D) as follows.
- (1) **Upward Capacity.** For upward capacity above the EIM Base Schedule, the CAISO will –
- (A) allocate the Spinning and Non-Spinning Reserves down from the upper regulating limit as registered in the Master File, taking into account any PMax rerates; and then
- (B) allocate EIM Upward Available Balancing Capacity to the Energy Bid Curve starting at the highest value of the Energy Bid Curve that does not overlap with Spinning or Non-Spinning Reserves.
- (2) **Downward Capacity.** For downward capacity below the EIM Base Schedule, the CAISO will allocate EIM Downward Available Balancing Capacity to the Energy Bid Curve starting at its lowest value, taking into account any PMin rerates.
- (3) **Remaining Capacity.** The CAISO will use any remaining portion of the Energy Bid Curve after the allocations in Section 29.30(e)(1) and 29.30(e)(2) for Dispatch under any condition, except that for non-participating resources the CAISO will adjust the EIM Upward Available Balancing Capacity and EIM Downward Available Balancing Capacity towards the EIM Base Schedule so that there will not be any remaining capacity for Dispatch.

29.31 Day-Ahead.

EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators and EIM Participating Resource Scheduling Coordinators may not submit Bids in the CAISO's Day-Ahead Market on behalf of EIM Market Participants that they represent in their capacity as an EIM Entity Scheduling Coordinator, EIM Sub-Entity Scheduling Coordinator, or EIM Participating Resource Scheduling Coordinator.

29.32 Greenhouse Gas Regulation and EIM Bid Adders.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (a) **EIM Bid Adders.**
- (1) **In General.** EIM Participating Resources will have an opportunity to recover costs of compliance with California Air Resources Board greenhouse gas regulations, which may include the cost of allowances, uncertainty on the final resource specific emission factor, and other costs of greenhouse gas regulation compliance.
- (2) **EIM Bid Adder.**
- (A) **Bid Submission.** EIM Participating Resource Scheduling Coordinators for EIM Participating Resources located in an EIM Entity Balancing Authority Area outside of California may submit an EIM Bid Adder as a separate hourly Bid component to recover costs of compliance with California Air Resources Board greenhouse gas regulations, which must include a price and quantity and the price portion of which must be equal to or less than 110% of the EIM Participating Resource's greenhouse gas maximum compliance cost as determined in accordance with section 29.32(a)(3).
- (B) **Default Treatment.** If an EIM Participating Resource located in an EIM Entity Balancing Authority Area outside of California does not submit an EIM Bid Adder, the CAISO will assume that the EIM Participating Resource will not be selected for delivery to the CAISO Balancing Authority Area.
- (3) **Determination of EIM Greenhouse Gas Maximum Cost.** Each day the CAISO will determine the greenhouse gas maximum compliance cost for each EIM Participating Resource located in an EIM Entity Balancing Authority Area outside of California as set forth in the EIM Business Practice Manual, based on:
- (A) the EIM Resource's highest incremental heat rate; the applicable Greenhouse Gas Allowance Price; and the EIM Participating Resource's emission rate, as set forth in the applicable U.S. Environmental

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- Protection Agency publication and registered in the Master File; or
- (B) a price determined in accordance with the negotiated rate option procedures in section 39.7.1.3.1; or,
- (C) with respect to, and only with respect to, Bids at EIM External Interties, the carbon dioxide equivalent emission rate of the resource with the highest such rate in the WECC region and the applicable Greenhouse Gas Allowance Price index.
- (4) **EIM Bid Adder Price.** The price included in the EIM Bid Adder shall not be less than \$0/MWh and the sum of the price component of the EIM Bid Adder and the Energy cost portion of the Bid cannot exceed \$1000/MWh.
- (b) **Consideration of EIM Bid Adders in Market Clearing.**
- (1) **Dispatch of EIM Participating Resources with Nonzero Bid Adders.** The CAISO's Security Constrained Economic Dispatch in the Real-Time Unit Commitment and Real-Time Dispatch shall take into account EIM Bid Adders in selecting Energy produced by EIM Participating Resources located in an EIM Entity Balancing Authority Area outside of California for import into the CAISO Balancing Authority Area or other EIM Entity Balancing Authority Areas in California up to the associated MW quantity included in the EIM Bid Adder, but not when selecting EIM Participating Resources to serve Load outside of the combined area of the CAISO Balancing Authority Area and other EIM Entity Balancing Authority Areas within California.
- (2) **EIM Participating Resources EIM Bid Adder MW Quantity.** The CAISO's Real-Time Unit Commitment and Real-Time Dispatch will limit the maximum EIM Bid Adder MW quantity of an EIM Participating Resource to a value equal to the EIM Participating Resource's dispatchable Bid range between the EIM Participating Resource's Base Schedule and the EIM Participating Resource's effective upper economic Bid, considering any applicable derates and ancillary services capacity reservations, for the relevant Operating Hour.

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (3) **Dispatch of EIM Participating Resources Bid Adders of Zero.** The CAISO's Security Constrained Economic Dispatch in the Real-Time Unit Commitment and Real-Time Dispatch shall not dispatch EIM Participating Resources outside the CAISO Balancing Authority Area for delivery into the CAISO Balancing Authority Area or other EIM Entity Balancing Authority Areas in California if the MW quantity included in the EIM Bid Adder is zero.
- (c) **Effect on Locational Marginal Price.** Using the methodology described in Appendix C, the CAISO will include the Marginal Greenhouse Gas Cost as a negative component in the Locational Marginal Prices for EIM Entity Balancing Authority Areas not subject to a greenhouse compliance obligation under the regulations administered by the California Air Resources Board in addition to those specified in Appendix C and Section 27.
- (d) **Notice to EIM Participating Resource.** The CAISO will notify the EIM Participating Resource Scheduling Coordinator through the Dispatch Instruction of the megawatt quantity of any Energy of an EIM Participating Resource located in an EIM Entity Balancing Authority Area outside of California that is deemed to have been imported into the CAISO Balancing Authority Area or other EIM Entity Balancing Authority Areas in California as a result of the Market Clearing of the Real-Time Market.
- (e) **Compensation.** The CAISO will allocate the Net Imbalance Energy Export optimally to EIM Participating Resource Scheduling Coordinators and will distribute Greenhouse Gas Emission Cost Revenues to EIM Participating Resources pursuant to that allocation.
- (f) **Reporting Requirements.** The CAISO will report to each EIM Participating Resource Scheduling Coordinator the portion of the FMM Energy Schedule and the portion of RTD Energy Dispatch that is associated with Energy deemed to have been imported to the CAISO Balancing Authority Area or other EIM Entity Balancing Authority Areas in California from all EIM Resources as part of the Real-Time Market results publication from each of its EIM Resources.

29.33 [Not Used]

29.34 EIM Operations

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (a) **In General.** Section 34, as supplemented by provisions in Section 29.34, will govern the operation of the Real-Time Market within the EIM Area.
- (b) **Applicability.** EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, and EIM Participating Resource Scheduling Coordinators will submit EIM Base Schedules and other necessary information to the CAISO for use in the Real-Time Market pursuant to Section 29.34 and not pursuant to Section 34.
- (c) **Submission Deadlines.** If an EIM Entity Scheduling Coordinator, EIM Sub-Entity Scheduling Coordinator, or EIM Participating Resource Scheduling Coordinator fails to submit an EIM Base Schedule according to the timelines established in this Section 29.34, the CAISO will not accept the EIM Base Schedule or use it in the Real-Time Market.
- (d) **Demand Forecast.**
 - (1) **In General.** In accordance with procedures set forth in the Business Practice Manual for the Energy Imbalance Market, the CAISO shall develop short-term and mid-term Demand Forecasts by Demand Forecast zone within each EIM Entity Balancing Authority Area, separately from the CAISO Balancing Authority Area.
 - (2) **Short Term Forecast.** The CAISO's short-term Demand Forecast for an EIM Entity Balancing Authority Area shall produce a value every five minutes for the duration of the CAISO's Dispatch horizon, which has five-minute granularity and extends several Dispatch Intervals.
 - (3) **Mid-Term Forecast.** The CAISO's mid-term Demand Forecast for an EIM Entity Balancing Authority Area shall produce hourly values for the next hour through the next 7 days.
 - (4) **EIM Entity Scheduling Coordinator Demand Forecast.**
 - (A) **In General.** An EIM Entity Scheduling Coordinator, and if permitted by the EIM Entity for its Balancing Authority Area, an EIM Sub-Entity Scheduling Coordinator, may opt to provide a non-binding EIM Entity

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Demand Forecast, net of behind-the-meter Generation that is not registered as an EIM Resource, as part of the hourly EIM Base Schedules.

- (B) **Timing and Scope.** The EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator must provide any such Demand Forecasts by 10:00 a.m. for the next 7 days.
 - (C) **Updates.** The EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator must update any such Demand Forecast for each Operating Hour and the following 6 to 10 hours and submit the update to the CAISO no later than 75 minutes prior to the start of that Operating Hour, as part of its hourly EIM Base Schedule submission.
 - (D) **Effect on Bid Requirement.** If the EIM Entity Demand Forecast or EIM Sub-Entity Demand Forecast is less than the CAISO Demand Forecast, then the EIM Entity's or EIM Sub-Entity's EIM Resource Plan must include sufficient Bids to cover the difference in Demand Forecasts.
- (5) **Posting.** Between 6:00 p.m. of the seventh day prior to the start of the Operating Day and 6:00 p.m. of the day prior to the Operating Day, the CAISO shall post and update hourly Demand Forecasts by Demand Forecast zone.
- (e) **EIM Resource Plan.**
- (1) **In General.** By 10:00 a.m. of the day preceding the Operating Day, the EIM Entity Scheduling Coordinators and, if permitted by the EIM Entity, EIM Sub-Entity Scheduling Coordinators on behalf of non-participating resources and EIM Participating Resource Scheduling Coordinators on behalf of EIM Participating Resources, must submit all applicable components of the EIM Resource Plan as set forth in Section 29.34(e)(3).
 - (2) **Scope.** The EIM Resource Plan components must cover a seven day horizon (with hourly detail for each resource) beginning with the Operating Day.
 - (3) **Contents.** The EIM Resource Plan shall comprise –

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (A) EIM Base Schedules of EIM Entities, EIM Sub-Entities as applicable, and EIM Participating Resources;
 - (B) Energy Bids (applicable to EIM Participating Resources only);
 - (C) EIM Upward Available Balancing Capacity;
 - (D) EIM Downward Available Balancing Capacity;
 - (E) EIM Reserves to Meet NERC/WECC Contingency Reserves Requirements; and
 - (F) if the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator is not relying on the CAISO's Demand Forecast, a Demand Forecast.
- (4) **Contents of EIM Base Schedules.** EIM Base Schedules of EIM Entities and EIM Sub-Entities must include hourly-level Demand Forecasts for EIM Demand, hourly-level schedules for resources, including any hourly-level schedules below PMin that the EIM Entity seeks an accounting for, and, for EIM Entities only, hourly-level scheduled Interchanges.
- (5) **Adjustment Prior to Submission of Real-Time EIM Base Schedules.** The EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator may adjust the components of the EIM Resource Plan prior to the submission of Real-Time EIM Base Schedules up to 75 minutes before the Operating Hour.
- (f) **Real-Time EIM Base Schedules.**
- (1) **In General.**
 - (A) **Initial Submission.** EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, EIM Participating Resource Scheduling Coordinators, and non-participating resources in the EIM Entity Balancing Authority Area that wish to submit real-time hourly EIM Base Schedules, or, with regard to non-participating resources, wish to submit EIM Base Schedule information pursuant to Section 29.34(f)(4), must submit such schedules or other information consistent with the

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

requirements of the Business Practice Manual for the Energy Imbalance Market and at least 75 minutes before the start of the Operating Hour.

- (B) **Interim Revisions.** EIM Entity Scheduling Coordinators, EIM Sub-Entity Scheduling Coordinators, EIM Participating Resource Scheduling Coordinators, and non-participating resources in the EIM Entity Balancing Authority Area may revise hourly Real-Time EIM Base Schedules, or, with regard to non-participating resources, revise EIM Base Schedule information submitted pursuant to Section 29.34(f)(4), meeting the requirements of the Business Practice Manual for the Energy Imbalance Market at or before 55 minutes before the start of the Operating Hour.
- (C) **Final Revision.** EIM Entity Scheduling Coordinators may further revise hourly Real-Time EIM Base Schedules, including EIM Base Schedules for EIM Sub-Entities and EIM Participating Resources, at or before 40 minutes before the start of the Operating Hour, provided that any financial or operational impact resulting from such EIM Base Schedule changes for an EIM Sub-Entity shall be resolved in accordance with the applicable tariff or contractual arrangements between the EIM Entity and the EIM Sub-Entity.
- (2) **EIM Base Schedule for EIM Participating Resources.** The EIM Base Schedule for each EIM Participating Resource must be within the Economic Bid range of the submitted Energy Bids for each Operating Hour for EIM Resources, which the CAISO will make available to the EIM Entity without price information, provided that an EIM Participating Resource Scheduling Coordinator may also include Energy below PMin in an EIM Base Schedule.
- (3) **EIM Base Schedule for Imports and Exports.** EIM Base Schedules must –
- (A) disaggregate Day-Ahead import/export schedules between the EIM Entity Balancing Authority Area and the CAISO Balancing Authority Area;

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- (B) identify the relevant EIM Interties for imports and exports to an EIM Entity Balancing Authority Area from Balancing Authority Areas other than the CAISO Balancing Authority Area; and
- (C) include approved, pending, and adjusted E-Tags for imports and exports.
- (4) **EIM Base Schedule Aggregation.** In response to a request by an EIM Entity Scheduling Coordinator or an EIM Sub-Entity Scheduling Coordinator, the CAISO will establish an electronic interface by which non-participating resources, Loads, and other customers of the EIM Entity or EIM Sub-Entity may submit EIM Base Schedule information to the EIM Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator and to the CAISO.
- (g) **Initial EIM Base Load Schedule.** The CAISO will derive an initial EIM Base Load Schedule for each EIM Entity and EIM Sub-Entity from the Demand Forecasts used for the EIM Entity Balancing Authority Area and EIM Sub-Entity area, estimated Transmission Losses, and an assumed Load distribution, pursuant to the methodology set forth in the Business Practice Manual for the Energy Imbalance Market.
- (h) **Energy Bids.** EIM Participating Resource Scheduling Coordinators may submit Energy Bids in accordance with the timelines, processes, and requirements applicable to other resources submitting Energy Bids under Section 34.
- (i) **Interchange Schedules with Other Balancing Authorities.**
 - (1) **In General.** EIM Entity Scheduling Coordinators must submit Interchange Schedules with other Balancing Authority Areas at the relevant EIM Interties and must update these Interchange Schedules with any adjustments, when applicable, as part of the hourly EIM Resource Plan revision.
 - (2) **Economic Bidding of EIM Intertie Transactions.** An EIM Participating Resource Scheduling Coordinator may bid a transaction at an EIM External Intertie into the FMM if the EIM Entity supports economic bidding of EIM External Intertie transactions and the relevant transmission service providers or path

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

operators support 15-minute scheduling at the EIM External Intertie under FERC Order No. 764.

- (j) **CAISO Validation and Feasibility Test.** The CAISO Markets systems will validate the initial EIM Resource Plan by 1:00 p.m. on the day before the Operating Day, and within 15 minutes of the submission of EIM Base Schedules or adjustments to EIM Base Schedules, the CAISO will validate the EIM Resource Plan and notify the EIM Entity Scheduling Coordinator-
- (1) if the EIM Resource Plan is not balanced;
 - (2) if the EIM Resource Plan provides insufficient Flexible Ramping Product capacity to meet requirements determined pursuant to Section 29.34(m); and
 - (3) if the CAISO anticipates Congestion based on the submitted EIM Resource Plans.
- (k) **EIM Resource Sufficiency Evaluation – Balancing Test.**
- (1) **EIM Base Schedule Adjustment.** If, after the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules according to Section 29.34(f)(1)(c), Supply in the EIM Base Schedules does not balance the Demand Forecast, the CAISO will adjust the Demand in the EIM Base Schedule to equal Supply.
 - (2) **EIM Base Schedule Balancing Test.** The EIM Base Schedules of Supply included in the EIM Resource Plan must balance the Demand Forecast for each EIM Entity Balancing Authority Area.
 - (A) An EIM Entity Balancing Authority Area will be balanced if the sum of Supply from the EIM Base Schedules, including Interchange with other Balancing Authority Areas, is within one percent above or below the total Demand Forecast that the EIM Entity Scheduling Coordinator has decided to use for the associated EIM Entity Balancing Authority Area.
 - (B) An EIM Entity Balancing Authority Area will be out of balance if the sum of Supply from the EIM Base Schedules, including Interchange with other

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Balancing Authority Areas, is more or less than one percent above or below the total Demand Forecast the EIM Entity Scheduling Coordinator has decided to use for the associated EIM Entity Balancing Authority Area.

- (C) If an EIM Entity Scheduling Coordinator elects to use the CAISO Demand Forecast and is not balanced as determined in Section 29.34(k)(2)(B) or the EIM Entity Scheduling Coordinator elects to use their own demand forecast, then the EIM Entity Balancing Authority Area will be assessed for over-scheduling or under-scheduling charges pursuant to Section 29.11(d)(3).
- (D) A Balancing Authority Area in the EIM Area that is not subject to the balancing test in this Section 29.34(k) will not be eligible for revenue apportionment and allocation pursuant to Section 29.11(d)(3).

(I) **EIM Resource Sufficiency Evaluation – Capacity Test.**

- (1) **Requirement.** The Supply, as applicable and as detailed in Business Practice Manuals, included in—
 - (A) the EIM Resource Plan must meet the Demand Forecast for each EIM Entity Balancing Authority Area, and
 - (B) the RUC Schedules, the HASP Advisory Schedules and HASP Intertie Block Schedules or the FMM Schedules must meet the Demand Forecast for the CAISO Balancing Authority Area.
- (2) **Supply and Demand Forecast.** Conditions and actions in the Real-Time Market will affect what Supply will be counted and what Demand Forecast will be referenced in the capacity test performed in accordance with this Section 29.34(l) and, in some cases as noted below, both this capacity test and the flexibility test performed in accordance with Section 29.34(m).
 - (A) For purposes of this Section 29.34(l) and also for purposes of Section 29.34(m) with respect to Sections 29.34(l)(2)(A)(iii) and 29.34(l)(2)(A)(iv),

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Supply counted in the capacity test will also include—

- (i) a Short Start Unit with a Bid in the RTM through the upcoming hour that is offline in the last fifteen minute interval before the hour under evaluation provided the Short Start Unit has remaining Start-Ups in the day including the hour under evaluation;
- (ii) a Multi-Stage Generating Resource configuration that can reach another configuration within the timeframe for it to be counted as available in accordance with Section 29.34(l)(1)(A)(i), provided the resource has remaining in-state transitions to that MSG Configuration in the day including the hour under evaluation;
- (iii) a Multi-Stage Generating Resource transitioning between MSG Configurations or a Short Start Unit moving through a Forbidden Operating Region in the hour under evaluation, in both the capacity test and the flexibility test performed in accordance with Section 29.34(m) ; or
- (iv) a Non-Generator Resource or storage device maximum and minimum output in the hour under evaluation based upon its State of Charge as monitored by the CAISO in the last fifteen minute interval before the hour under evaluation, and its Bids to charge or discharge Energy in the hour under evaluation, in both the capacity test and the flexibility test performed in accordance with Section 29.34(m).

(B) For purposes of this Section 29.34(l) and also for purposes of Section 29.34(m) with respect to Section 29.34(l)(2)(B)(iii), Supply counted in the capacity test will not include—

- (i) a Short Start Unit with a Bid in the RTM which received a Start-Up Instruction before the hour under evaluation and has failed to

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

- initiate Start-Up;
- (ii) a Short Start Unit that is on Outage during the hour under evaluation or has returned from an Outage but is unable to Start-Up within the hour under evaluation; or
 - (iii) an Import Bid or Export Bid for delivery to or export from the CAISO Balancing Authority Area without a transmission profile in a submitted E-Tag that supports its Interchange Schedule by T-40, in both the capacity test and the flexibility test for the CAISO Balancing Authority Area performed in accordance with Section 29.34(m).
- (C) Supply from a resource counted in accordance with Section 29.34(l)(2)(A)(i) may be adjusted by the CAISO in accordance with the timelines and procedures provided in the Business Practice Manual for the Energy Imbalance Market to address significant overcounting of Supply available to the Real-Time Market, provided that the overcounting has been identified, supported with analysis and documented by the CAISO.
- (D) Demand response under a demand response program administered in an EIM Entity Balancing Authority Area that does not otherwise qualify as an EIM Resource, *i.e.*, count as Supply, may be accounted for through a corresponding EIM Entity adjustment to their Demand Forecast, which will then be referenced in the capacity test performed in accordance with this Section 29.34(l), the flexibility test performed in accordance with Section 29.34(m), and the balancing test performed in accordance with Section 29.34(k), provided the EIM Entity submits an attestation to the CAISO in accordance with the procedures and timelines in the Business Practice Manual for the Energy Imbalance Market that certifies adjustments made to its Demand Forecast will correspond to expected

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

increases or reductions in demand provided by the demand response.

(3) **Insufficient Supply.** An EIM Resource Plan or the CAISO equivalent, as applicable and as detailed in Business Practice Manuals, shall be deemed to have insufficient Supply to pass the capacity test if—

(A) the sum of EIM Base Schedules of Supply and the sum of the incremental or decremental offers in the Energy Bid range from EIM Participating Resources above or below their EIM Base Schedule, including Interchange with other Balancing Authority Areas, is not sufficient to meet the total Demand Forecast that the EIM Entity Scheduling Coordinator has decided to use for the associated EIM Entity Balancing Authority Area, and

(B) the sum of Supply and the sum of the incremental or decremental offers in the Energy Bid range above or below the RUC Schedules, the HASP Advisory Schedules and HASP Intertie Block Schedules or the FMM Schedules is not sufficient to meet the total Demand Forecast for the CAISO Balancing Authority Area, provided that the benefit of the exclusion of the export schedules which may be curtailed in accordance with Section 34.12.4(a) or 34.12.4(b) will be reflected in the upward capacity test results for the CAISO Balancing Authority Area.

(m) **EIM Resource Sufficiency Evaluation – Flexibility Test.**

(1) **Review.**

(A) **EIM Entity Balancing Authority Areas.** The CAISO will review the EIM Resource Plan for an EIM Entity Balancing Authority Area pursuant to the process set forth in the Business Practice Manual for the Energy Imbalance Market and verify that it has sufficient Bids for Ramping capability, accounting for Sections 29.34(l)(2)(A)(iii), 29.34(l)(2)(A)(iv), 29.34(l)(2)(B)(iv) and 29.34(l)(2)(D), to meet the EIM Entity Balancing Authority Area upward and downward Ramping requirements within a

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

one percent or one MW tolerance, as adjusted pursuant to Sections 29.34(m)(2), (3), and (5).

(B) **CAISO Balancing Authority Area.** The CAISO will review the RUC Schedules, the HASP Advisory Schedules and HASP Intertie Block Schedules or the FMM Schedules in the CAISO Balancing Authority Area pursuant to the process set forth in the Business Practice Manual for the Energy Imbalance Market and verify that it has sufficient Bids for Ramping capability, accounting for Sections 29.34(l)(2)(A)(iii), 29.34(l)(2)(A)(iv) and 29.34(l)(2)(B)(iv), to meet the CAISO Balancing Authority Area upward and downward Ramping requirements within a one percent or one MW tolerance, as adjusted pursuant to Sections 29.34(m)(2), (3), and (5), provided that the benefit of the exclusion of export schedules which may be curtailed in accordance with Section 34.12.4(a) or 34.12.4(b) will be reflected in the results of the upward flexibility test for the CAISO Balancing Authority Area.

(C) **Power Balance Constraint and Load Conformance Considerations.** The CAISO, pursuant to the process set forth in the Business Practice Manual for the Energy Imbalance Market, will consider the quantity of any power balance constraint relaxation in the Real-Time Market solution, while excluding from consideration any constraint relaxation due to Load conformance in the Real-Time Market solution, in the determination of whether sufficient Bids for Ramping capability are available to meet the upward and downward Ramping requirements in accordance with this Section 29.34(m)(1).

(2) **Determination of EIM Diversity Benefit.** The CAISO will calculate separately the upward and downward EIM diversity benefit as the difference between the sum of the upward and downward Uncertainty Requirements for all Balancing Authority Areas in the EIM Area, and the Uncertainty Requirement for the EIM

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Area.

- (3) **Effects of EIM Diversity Benefit.** For each Balancing Authority Area in the EIM Area, the CAISO will reduce the upward and downward Uncertainty Requirements by the Balancing Authority Area's pro rata share of the upward and downward EIM diversity benefit in the EIM Area as may be limited by –
 - (A) the available net import EIM Transfer capability into that Balancing Authority Area in the case of an upward Uncertainty Requirement; and
 - (B) the available net export EIM Transfer capability from that Balancing Authority Area in the case of a downward Uncertainty Requirement.
- (4) **Determination of Flexible Ramping Sufficiency Credit.** The CAISO will calculate for each Balancing Authority Area in the EIM Area, the upward flexible Ramping sufficiency credit as the outgoing EIM Transfer from that area and the downward flexible Ramping sufficiency credit as the incoming EIM transfer into that area.
- (5) **Effect of Flexible Ramping Sufficiency Credit.** The CAISO will reduce the upward Uncertainty Requirement of a Balancing Authority Area in the EIM Area by its upward flexible Ramping sufficiency credit, and will reduce the downward Uncertainty Requirement of a Balancing Authority Area in the EIM Area by its downward flexible Ramping sufficiency credit.
- (n) **Effect of EIM Resource Capacity or Flexibility Insufficiency.**
 - (1) **Insufficient Capacity.** If, after the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules as provided in Section 29.34(f)(1)(c), the EIM Resource Plan or the CAISO equivalent has insufficient Supply as determined according to Section 29.34(l)-
 - (A) the CAISO will not include the EIM Entity Balancing Authority Area or the CAISO Balancing Authority Area in the Uncertainty Requirement of the EIM Area; and
 - (B) the CAISO will hold the EIM Transfer limit into or from the EIM Entity

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Balancing Authority Area or the CAISO Balancing Authority Area, as specified in Section 29.34(n)(2), at the less restrictive of the value for the last 15-minute interval with sufficient Supply or the hourly Real-Time EIM Base Schedule corresponding to the 15-minute interval with insufficient Supply.

- (C) To facilitate procurement of the Flexible Ramping Product within the existing RTUC processes and along the time intervals for RTUC runs set forth in Section 34.3.1 and further explained in the Business Practice Manual for Market Operations, and solely for the purpose of this subsection 29.34(n)(1), the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules to allow for procurement of the Flexible Ramping Product for the first fifteen-minute interval of each hour will be that provided in Section 29.34(f)(1)(B) and the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules to allow for procurement of the Flexible Ramping Product for the remaining intervals of each hour will be that provided in Section 29.34(f)(1)(C).

- (2) **Insufficient Flexible Ramping Capacity.** If, after the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules or the CAISO equivalent as provided in Section 29.34(f)(1)(c), the CAISO determines-

- (A) that an EIM Entity Balancing Authority Area or the CAISO Balancing Authority Area has insufficient upward Ramping capacity according to Section 29.34(m), the CAISO will take the actions described in Section 29.34(n)(1)(A) and (B) in the upward and into the EIM Entity BAA or CAISO BAA direction; and
- (B) that an EIM Entity Balancing Authority Area or the CAISO Balancing Authority Area has insufficient downward Ramping capacity according to Section 29.34(m), the CAISO will take the actions described in Section 29.34(n)(1)(A) and (B) in the downward and from the EIM Entity BAA or

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

CAISO BAA direction.

- (C) To facilitate procurement of the Flexible Ramping Product within the existing RTUC processes and along the time intervals for RTUC runs set forth in Section 34.3.1 and further explained in the Business Practice Manual for Market Operations, and solely for the purpose of this subsection 29.34(n)(2), the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules to allow for procurement of the Flexible Ramping Product for the first fifteen-minute interval of each hour will be that provided in Section 29.34(f)(1)(B) and the final opportunity for the EIM Entity to revise hourly Real-Time EIM Base Schedules to allow for procurement of the Flexible Ramping Product for the remaining intervals of each hour will be that provided in Section 29.34(f)(1)(C).

(3) Assistance Energy Transfers.

- (A) In General.** A Balancing Authority Area in the EIM Area may obtain assistance Energy transfers into its Balancing Authority Area prior to December 31, 2025 if its Scheduling Coordinator has submitted to the Master File a designation to accept automatically incremental EIM Transfer imports and pay the associated EIM Assistance Energy Transfer Surcharge following the failure of the upward capacity test in Section 29.34(l) or the upward flexibility test in Section 29.34(m) in accordance with the timelines and procedures included in the Business Practice Manual for the Energy Imbalance Market. Consistent with the requirements in the Business Practice Manual, the CAISO will issue a Market Notice prior to the CAISO Balancing Authority Area accepting assistance Energy transfers as provided in this section, with such election to remain in effect unless the CAISO issues a Market Notice at least 5 Business Days prior to withdrawing or resuming its participation.
- (B) Assistance Energy Transfer Product.** If a participating Balancing

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Authority Area in the EIM Area has opted-in to receive assistance Energy transfers consistent with the process requirements set forth in the Business Practice Manuals and the participating Balancing Authority Area fails the upward capacity test in Section 29.34(l) or the upward flexibility test in Section 29.34(m) then—

- (i) the Balancing Authority Area will not be subject to the capacity test or flexibility test failure consequences in Section 29.34(n);
- (ii) the Balancing Authority Area will pay the EIM Assistance Energy Transfer Surcharge according to Section 29.11(t).

(C) Sunset Period. This tariff Section 29.34(n), together with Section 29.11(t), will terminate on December 31, 2025.

(o) Transmission Constraint Relaxation. If an EIM Entity Scheduling Coordinator's approved EIM Resource Plan does not have sufficient Bids to resolve Congestion, the CAISO will relax the relevant Transmission Constraints in the Market Clearing and the EIM Entity will become responsible for managing its congested Transmission Constraints through other means, and the CAISO will determine prices for Congestion consistent with Transmission Constraint relaxation parameters established in the Business Practice Manual for the Energy Imbalance Market until the Transmission Constraint is no longer binding in the Real-Time Market.

(p) Operating Reserves.

(1) Schedules.

(A) EIM Entity Responsibility. Each EIM Entity is responsible for its contingency reserves, or share of such contingency reserves under the terms of a reserve sharing group agreement, and it and the reserve sharing group are responsible for deploying operating reserves, including regulating reserves, in conformance with NERC and WECC requirements.

(B) EIM Entity Scheduling Coordinator Responsibility. The EIM Entity

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

Scheduling Coordinator shall –

- (i) include any Energy deployed from reserves in the hourly EIM Base Schedules, if time permits, in which case they will be settled in the Real-Time Market;
- (ii) otherwise include the Energy deployed from reserves as EIM Manual Dispatches, if time does not permit;
- (iii) immediately inform the CAISO of events requiring Dispatch of operating reserves and resource EIM Base Schedule adjustments in response to contingencies;
- (iv) if a resource's actual response differs from the resource EIM Base Schedule adjustment, provide a resource EIM Base Schedule update showing the actual resources dispatched during the event by no later than 1:00 a.m. seven days after the Operating Day in which the event occurred; and
- (v) inform the CAISO of the amount of resource capacity that is reserved for contingency reserve responsibility by either ensuring that an Energy Bid for the resource is below the maximum operating limit of the resource or reducing the maximum operating limit of the resource.

(C) **CAISO Actions.**

- (i) **Prior to Update.** Until the CAISO receives resource operating limit updates from an EIM Entity Scheduling Coordinator, the CAISO will continue to send Dispatch Instructions based upon pre-event operating limits.
- (ii) **After Update.** After EIM Base Schedule updates are received and Dispatches in the Real-Time Market reflect the updated Self-Schedules and operating limits, the CAISO shall account for the Dispatches in the net scheduled Interchange values that it

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

provides to EIM Entity Scheduling Coordinators.

(2) **Updates to Data for Reserve Sharing Event.**

(A) **Responsibilities.** Immediately following a reserve sharing event impacting the EIM Entity Balancing Authority Area-

(i) the EIM Entity must submit information regarding the assistance provided, including impacts to Balancing Authority Area Load schedules for each participant involved in the reserve sharing event; and

(ii) the EIM Entity Scheduling Coordinator or EIM Sub-Entity Scheduling Coordinator must submit to the CAISO EIM Manual Dispatch instructions for resources in the EIM Entity Balancing Authority Area deployed in response to the reserve sharing event, pursuant to the reserve sharing group's criteria.

(B) **Offsets.** Until 1:00 a.m. seven days following the reserve sharing event impacting the EIM Entity Balancing Authority Area, the EIM Entity may offset the Load schedules created by the reserve sharing event by entering resource to Load schedules, reflecting generation resources actually utilized to assist in the event.

(q) **Variable Energy Resources and Hybrid Resources.** Provisions of Section 34 specifically applicable to Variable Energy Resources and Eligible Intermittent Resources appear in Sections 34.1.3, 34.1.6, 34.2.2, 34.5.1. 34.13.2. Provisions of Section 34 specifically applicable to Hybrid Resources appear in Section 34.1.6.3. The CAISO shall provide EIM Entities with access to review the forecast of all Variable Energy Resources in its Balancing Authority Area as outlined in the Business Practice Manual for the Energy Imbalance Market.

(r) **Use of EIM Available Balancing Capacity.**

(1) **In General.** The CAISO will use EIM Available Balancing Capacity identified in the EIM Resource Plan to address power balance constraint infeasibilities in the

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

EIM Balancing Authority Area for which the EIM Available Balancing Capacity is designated by the responsible EIM Entity Scheduling Coordinator, while simultaneously participating in Congestion Management.

- (2) **Resource Sufficiency Evaluations.** The CAISO will not apply the EIM Available Balancing Capacity towards its evaluation of the resource sufficiency tests specified in Section 29.34(k), (l), and (m).
- (3) **Real-Time Market Scheduling Run.** In each interval of the Real-Time Market, the CAISO will use the EIM Available Balancing Capacity in the run of the market optimization used to establish scheduling priorities by-
 - (A) adding a penalty price factor to EIM Available Balancing Capacity Energy Bid prices so that the EIM Available Balancing Capacity is dispatched to address power balance violations, after Effective Economic Bids submitted for EIM Participating Resources in the respective EIM Balancing Authority Area not associated with the EIM Available Balancing Capacity have cleared, while respecting the economic merit order of the EIM Available Balancing Capacity Energy Bid prices;
 - (B) enforce a constraint that prevents the release of EIM Upward Available Balancing Capacity in excess of the difference between the EIM Entity's demand and the supply of Effective Economic Bids cleared within the applicable EIM Balancing Authority Area, minus the import transfer into that EIM Balancing Authority Area; and
 - (C) enforce a constraint that prevents the release of EIM Downward Available Balancing Capacity in excess of the difference between the supply of Effective Economic Bids cleared within the applicable EIM Balancing Authority Area and the EIM Entity's demand, minus the export transfer out of that EIM Balancing Authority Area.
- (4) **Real-Time Market Pricing Run.** For each interval of the Real-Time Market, in

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

the run of the market optimization used to set binding schedules and prices, the CAISO will –

- (A) use the EIM Available Balancing Capacity released in the run of the market optimization to establish scheduling priorities based on the Energy Bid Curves for EIM Participating Resources and non-participating resources created pursuant to Sections 29.30(c) and (d), respectively;
- (B) change the Demand Forecast for the EIM Balancing Authority Area by a small tolerance to allow for price determination;
- (C) clear the Real-Time Market and establish prices based on the pricing parameters in Sections 27.4.3.2 and 27.4.3.4, if the amount of EIM Available Balancing Capacity released in the scheduling run is not sufficient to clear the potential infeasibility identified in the scheduling run.

(s) **EIM Auto-Match.**

- (1) **Designation.** An EIM Entity may submit a designation to the Master File of EIM non-participating resources, up to the number specified in the Business Practice Manual, in its Balancing Authority Area to automatically match import/export schedule changes outside of the Market Clearing of the Real-Time Market because of changes to E-Tags at one or more designated EIM Interties or Scheduling Points, up to the number designated in the Business Practice Manual for the Energy Imbalance Market.
- (2) **Duration of Designation.** Any designation under paragraph (1) of this subsection shall remain in effect until the EIM Entity notifies the CAISO that it is terminating the designation by a submission to the Master File.
- (3) **CAISO Actions in Response to Intertie Schedule Change.** If an EIM Entity designates a non-participating resource under paragraph (1) of this subsection, the CAISO, upon identification of an associated EIM Intertie or Scheduling Point

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

schedule change outside of the Market Clearing of the Real-Time Market, shall –

- (A) reflect a matching schedule change to the EIM non-participating resource in the Real-Time Market using the EIM Auto-Match feature; and
- (B) omit the EIM Intertie or Scheduling Point schedule change from the historical intertie schedule over/under-scheduling histogram for the determination of additional capacity test requirements for relevant EIM Balancing Authority Area(s) under Sections 29.34(l)(4)(B) and 29.34(m)(6)(ii) that are registered for EIM Auto-Match in accordance with the procedures specified in the Business Practice Manual for the Energy Imbalance Market.

29.35 Market Validation and Price Correction

Market validation and price correction for the Energy Imbalance Market shall be governed by Section 35, except that, for a period not to exceed 90 days after an EIM Entity Implementation Date, the time allowed for the CAISO's correction of Real-Time Market prices shall be 10 Business Days.

29.36 [Not Used]

29.37 Rules of Conduct

All EIM Market Participants shall be subject to the provisions of Section 37 except for Section 37.2.

29.38 Market Monitoring

The CAISO Department of Market Monitoring shall provide market monitoring services for the participation of EIM Market Participants in the Real-Time Market, including –

- (a) monitoring markets administered by the CAISO for actual or potential ineffective market rules, market abuses, market power, violations of FERC or CAISO Market rules prohibiting provision of false information, or market manipulation;
- (b) coordinating with CAISO business units that review and monitor the performance and quality of the CAISO Markets;
- (c) providing recommendations about potential market design flaws or ineffective market rules to the CAISO and FERC; and
- (d) referring a matter to FERC if the Department of Market Monitoring determines there is

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

sufficient credible evidence that a violation of FERC or CAISO Market rules has occurred.

29.39 EIM Market Power Mitigation.

- (a) **EIM Market Power Mitigation Procedure.** The CAISO shall apply the Real-Time Local Market Power Mitigation procedure in Section 39.7 to the Energy Imbalance Market, including EIM Transfer constraints into an EIM Entity Balancing Authority Area on an EIM Internal Intertie, except as provided in Section 29.39.
- (b) **Competitive Path Assessment.** The CAISO shall conduct the competitive path assessment to determine for each EIM Entity Balancing Authority Area whether a path is competitive or non-competitive, consistent with Section 39.7.2, except that –
 - (1) EIM Participating Resource Scheduling Coordinators shall submit information required by the CAISO to perform the competitive path assessment;
 - (2) the competitive path assessment shall not exclude EIM Participating Resources from the test used to determine the competitiveness of Transmission Constraints on the basis that they may be net buyers of Energy in the Real-Time Market; and
 - (3) the CAISO may establish different Reference Buses for each Balancing Authority Area, which need not be within the Balancing Authority Area, for calculating the LMP decomposition which is used to trigger Bid mitigation, based on the topology of each Balancing Authority Area and consideration of the bus at which the Marginal Cost of Congestion component of Locational Marginal Prices is least influenced by market power.
- (c) **Locational Marginal Price Decomposition.** The CAISO shall perform the Locational Marginal Price decomposition within each EIM Entity Balancing Authority Area using the results of the competitive path assessment and the Congestion pricing results of the pre-market run to determine which resources may have local market power due to Congestion on a non-competitive Transmission Constraint, consistent with Section 34.2.3 and 39.7.
- (d) **Default Energy Bids.** The CAISO shall use the methods and standards set forth in Section 39.7 to determine Default Energy Bids for EIM Participating Resources, except

California Independent System Operator Corporation
Fifth Replacement Electronic Tariff

that the CAISO will use the Market Services Charge and System Operations Charge reflected in the EIM Administrative Charge.

29.40 [Not Used]

29.41 [Not Used]

29.42 [Not Used]

29.43 [Not Used]

29.44 Flexible Ramping Product

The CAISO will procure flexible ramping product for the Energy Imbalance Market as set forth in Section 44, except that the CAISO will consider the EIM Base Schedules of non-participating resources as Self-Schedules for the calculation of Flexible Ramping Product requirements.