



April 1, 2022

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

INFORMATIONAL FILING-NO NOTICE REQUIRED

**Re: California Independent System Operator Corporation
Informational Readiness Certification for the Bonneville Power
Administration's Participation in the WEIM
Docket No. ER15-861-000**

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits this informational filing in compliance with section 29.2(b)(6) of the CAISO tariff.¹ The CAISO, in consultation with the Bonneville Power Administration (BPA), has determined that, following market simulation and an adequate period of parallel operations, the CAISO and BPA have met or will meet all readiness criteria specified in section 29.2(b)(7). In support of this determination the CAISO hereby submits the sworn CAISO affidavit of Khaled Abdul-Rahman, Vice President of Power System and Market Technology, and the sworn BPA affidavit of Joel D. Cook, Chief Operating Officer. This filing certifies the readiness of the CAISO and BPA to proceed with BPA's participation in the CAISO's Western Energy Imbalance Market (WEIM) on May 3, 2022, consistent with the requirement to do so at least 30 days prior.

I. Background

The WEIM provides other balancing authority areas the opportunity to participate in the real-time market for imbalance energy that the CAISO operates

¹ The Commission has determined that readiness certifications are considered informational filings and will not be noticed for comment. See *Cal. Indep. Sys. Operator Corp.*, 153 FERC ¶ 61,205 at P 86 and n.173 (2015); see also *Cal. Indep. Sys. Operator Corp.*, 155 FERC ¶ 61,283 at P 8 (2016).

in its own balancing authority area. The CAISO's WEIM tariff provisions went into effect on October 24, 2014, in time for the first trading day of November 1, 2014.² In a March 16, 2015 order,³ the Commission concluded that certain readiness safeguards are necessary prior to activating a prospective EIM Entity in production.⁴ Accordingly, the Commission directed the CAISO to include provisions in its tariff to ensure the readiness of any new EIM Entity. The Commission further required that the certification of market readiness include a sworn affidavit from an officer of the CAISO and an officer of the prospective EIM Entity attesting that both have prepared and made ready the systems and processes for the new EIM Entity to commence financially binding participation in the WEIM.⁵ Following two compliance filings, the Commission accepted the CAISO's proposed readiness criteria.⁶ These criteria appear in section 29.2(b)(7) of the CAISO Tariff.

II. Readiness Reporting, Determination, and Attestations

The CAISO and BPA ran market simulation scenarios from October 1, 2021 to November 30, 2021. Parallel (*i.e.*, financially nonbinding) operations, which began on December 1, 2021, ran with BPA through February 8, 2022, was briefly suspended while Avista and Tacoma were implemented into the WEIM on March 2, 2022, and resumed on March 8, 2022. Parallel operations will continue to be supported and available to BPA until May 3, 2022, at which point the CAISO and BPA expect that production operation will begin.

During market simulation and parallel operations the CAISO and BPA have engaged in regular discussions to track progress and confirm the status of each readiness criterion, and the CAISO has regularly reported on readiness status in market forum discussions and publicly posted a table or "dashboard,"

² See *Cal. Indep. Sys. Operator Corp.*, 147 FERC ¶ 61,231 (2014) (June 19 Order) (conditionally accepting tariff revisions to implement Energy Imbalance Market); *Cal. Indep. Sys. Operator Corp.*, 149 FERC ¶ 61,058 (2014) (order denying requests for rehearing, granting in part and denying in part requests for clarification, and conditionally accepting tariff revisions on compliance with regard to order listed above); Commission Letter Order, 149 FERC ¶ 61,005 (Oct. 2, 2014) (order granting CAISO request to extend effective date of Energy Imbalance Market tariff revisions from September 23, 2014, to October 24, 2014, for trading day November 1, 2014).

³ *Cal. Indep. Sys. Operator Corp.*, 150 FERC ¶ 61,191 (2015) (March 16 Order).

⁴ March 16 Order at P 30.

⁵ *Id.* n. 85.

⁶ *Cal. Indep. Sys. Operator Corp.*, 153 FERC ¶ 61,205 (2015).

showing progress towards meeting the readiness criteria.⁷ The process of updating the readiness dashboard through this joint effort involved representatives from both organizations, including senior representatives involved in the process leading to attestation that the parties' processes and systems are ready for BPA's participation in the WEIM.

The market simulation confirmed system functionality and connectivity by identifying issues and software variances in advance of implementation that have since been resolved. In addition, market simulation permitted the CAISO and BPA to validate performance of the systems and processes under a variety of structured scenarios. The market simulation dashboard dated December 7, 2021 demonstrated that the CAISO and BPA were ready to enter parallel operations. Having achieved the benefits from market simulation, the CAISO and BPA transitioned to parallel operations on December 1, 2021.

The parallel operations phase is designed to test performance of the systems and processes in a financially non-binding environment using historical data and information from production systems to the maximum extent possible. The CAISO and BPA have engaged in parallel operations to examine capabilities at different times and conditions (morning ramp, evening ramp, low load and peak load). Doing so has permitted BPA to understand the interaction between resource plans, base schedules, outage management, manual dispatch, and the CAISO full network model. This period has also allowed the CAISO and BPA to identify and resolve software issues. The dashboards, dated December 7, 2021, December 17, 2022, January 4, 2022, January 14, 2022, February 1, 2022, February 17, 2022, and March 4, 2022, track the progress during parallel operations as additional readiness criteria were met. The most recent dashboard, dated March 24, 2022, is included as Attachment A.

The dashboard sets forth each of the readiness criteria in the tariff, the metrics by which the CAISO measures satisfaction of the criteria, and the actions or status that demonstrate BPA's compliance with criteria. The dashboard shows that all readiness criteria have been satisfied or will be satisfied by May 3, 2022, with one criterion shown as "on track." While BPA and the CAISO have collaboratively worked to satisfy the readiness criteria, they wish to acknowledge that BPA is still working on criterion 26 regarding BPA's ability to sub-allocate WEIM charges and credits to its transmission customers consistent with Attachment Q of BPA's tariff and applicable rate schedules. BPA's vendor has delivered code for sub-allocation which BPA and its vendor are working collaboratively to validate and accept. BPA expects this work to be complete by

⁷ More information on the status of these other reports consistent with CAISO tariff section 29.2(b)(8) is available on the CAISO website under the Spring 2022 release, Western EIM Bonneville Power Administration entities at:

<https://www.caiso.com/informed/Pages/ReleasePlanning/Default.aspx>.

May 3, 2022 and in any event before Bonneville issues its first WEIM bill to transmission customers currently scheduled for June 25, 2022.

BPA has also implemented a new outage management system that became operational on March 8, 2022. This system is necessary for BPA's participation in the WEIM, and BPA is still testing some WEIM functionality with the system. BPA continues to monitor and gain experience with technical implementation of this system and is resolving issues as they arise, and complete WEIM functionality. BPA expects the outage management system, including all WEIM functionality, to be operational when Bonneville goes live on May 3, 2022.

BPA has a final "go/no-go" decision on April 19, 2022. If BPA determines that its system(s) necessary to sub-allocate costs, as described above, will not be ready by June 25, 2022, or other issues remain that would undermine grid or market operations at go-live, the CAISO and BPA will supplement this filing.

In any event, Section 29(b)(6) requires that a senior officer of the CAISO and a prospective EIM Entity attest: (1) 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 Implementation Date; (2) to any known issues requiring resolution prior to the Implementation Date in accordance with section 29.2(b)(8); (3) 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 (4) that the 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. Attachments B and C, respectively, contain the sworn CAISO affidavit of Khaled Abdul-Rahman, Vice President of Power System and Market Technology and the sworn BPA affidavit of Joel D. Cook, Chief Operating Officer in satisfaction of this requirement.

The affidavits are based upon the engagement by these senior officers in assessing the readiness criteria as reported in the dashboard, including supporting documentation. The CAISO believes that the market simulation and parallel operations to date demonstrate that BPA is prepared to enter financially binding production WEIM operations on May 3, 2022, as explained above.

III. Market Quality Report on Parallel Operations

Parallel operations allowed the CAISO and BPA to identify and resolve numerous input, process, and software issues prior to the commencement of

financially binding operations.⁸ The CAISO and BPA worked diligently during parallel operations to identify the cause of the infeasibilities that arose. The attached Market Quality Report demonstrates that the majority of the power balance infeasibilities identified during the period of parallel operations associated with the readiness determination were caused by input data issues, some of which are unique to the parallel operations environment and software issues, all of which have been or will be resolved by the implementation date.

The CAISO validated both prices and schedules based on the data input to the market systems throughout the first 38 days of parallel operations. This validation demonstrates that the market solution produced is as expected and consistent with the market rules as designed based on the input data. The analysis conducted for the report accounts for the fact that input data may be influenced by limitations inherent in the parallel operations environment and these limitations may affect the quality of the solution. When factors affecting the input data are controlled for, the numerical quality of the market solution is good and indicates that the systems and processes of BPA are ready to operate in production.

IV. Attachments

- Attachment A: Readiness Dashboard Report
- Attachment B: Affidavit of Khaled Abdul-Rahman
- Attachment C: Affidavit of Joel D. Cook
- Attachment D: Parallel Operations Market Quality Report

⁸ The market quality report on parallel operations dated March 25, 2022 explains how each of these issues impacted the market results and how they were resolved by the CAISO and BPA.

V. Conclusion

The CAISO respectfully requests that the Commission accept this certification as consistent with section 29.2(b)(6) of the CAISO tariff. The CAISO or BPA will notify the Commission in the event of any subsequent determination that the implementation of BPA into the WEIM on May 3, 2022 should be delayed, the reason for the delay, the new implementation date if it can be determined, and whether a portion or all of this certification needs to be reissued.

Respectfully submitted,

By: /s/ John C. Anders

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Attachment A – Readiness Dashboard Report

Informational Readiness Certification for

Bonneville Power Administration’s

Participation in the Energy Imbalance Market

California Independent Systems Operator Corporation

April 1, 2022

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
1	Prospective EIM Entity Full Network Model Integration	Generation, Interchange and Load comparison	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 exported prospective EIM 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. Any Discrepancies are accounted for in terms of imbalance adjustment	CAISO	Complete	CAISO EMS team generated data and provided screen shots that proved that the averages for EIM BAA load generation and interchange values are within tolerances during the specified measured dates.	Tariff section 29.2(b)(7)(A)(i)
2	Prospective EIM Entity Full Network Model Integration	Comparison of SCADA measurement	SCADA measurements used in prospective EIM 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	CAISO	Complete	CAISO EMS team provided screen shots from EMS that showed the average deviation between telemetered values (SCADA).	Tariff section 29.2(b)(7)(A)(ii)
3	Prospective EIM Entity Full Network Model Integration	State Estimator solution	CAISO state estimator solution is equivalent or superior to the prospective EIM 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	CAISO	Complete	CAISO EMS team provided a report showing that the State Estimator is solving for BPA including unit level SCADA vs State Estimator estimates, and an analysis comparing total deviation/total actual MW.	Tariff section 29.2(b)(7)(A)(ii i)
4	Prospective EIM Entity Full Network Model Integration	Non-Conforming Load, Behind-the-Meter Generation, Pseudo Ties, and Dynamic Schedules	Physical representation of the prospective EIM 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 transmission service provider and path operator information that supports EIM Transfers and Real-Time Dispatch in the Energy Imbalance Market, as applicable	Prospective EIM Entity major non-conforming loads > 5% of prospective EIM Entity total actual load in MW are modeled separately from conforming load in market model	CAISO	Complete	CAISO completed their analysis and provided an email with results, stating the criteria have been met.	Tariff section 29.2(b)(7)(A)(i v)
5	Agreements	Execution of Necessary Agreements	The prospective EIM Entity has executed all necessary agreements.	The prospective EIM Entity will execute all agreements, as outlined in Section 5 of the EIM BPM within the required timelines outlined in Section 5.	JOINT	Complete	CAISO provided evidence that all contracts have been executed.	Tariff section 29.2(b)(7)(K)(i)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
6	Operations Training	Completion of mandatory training courses	Prospective EIM Entity operators who will have responsibility for EIM operations, transactions and settlements, will complete CAISO training modules.	Prospective EIM Entity operators will Complete training and close-of-training assessment in the appropriate timeframes as outlined in “100 series”– an introduction to 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.	BPA	Complete	BPA provided an email confirming that all EIM training is complete, including evidence of all who attended training. CAISO training lead confirmed that training is complete for BPA.	Tariff section 29.2(b)(7)(B)
7	Forecasting Capability	Load forecast capability	Definition of EIM demand forecast boundaries based on the conforming and non-conforming load characteristics, as applicable. <ul style="list-style-type: none"> Accuracy of the CAISO forecast of EIM demand based on historical actual load data for the defined EIM demand forecast boundaries. Identification of weather station(s) locations used in forecasting, if applicable. 	All Plant Information (PI) tags and historical data for defined load area(s), and non-conforming load, if applicable, compared with load forecasts provided from CAISO (if CAISO load forecast used).	CAISO	Complete	CAISO Short Term Forecasting team provided reports and screen shots from the forecast monitoring showing accuracy measurements.	Tariff sections 29.2(b)(7)(C)(i)-(iii)
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. EIM Entity provides to CAISO real-time MW production PI tags.	CAISO	Complete	CAISO Short Term Forecasting team provided reports and screen shots from the forecast monitoring showing accuracy measurements.	Tariff section 29.2(b)(7)(C)(iv)
9	Forecasting Capability	Flexible capacity requirements	CAISO has established flexible capacity requirements for the prospective EIM Entity Balancing Authority Area and the combined EIM Area including the prospective EIM Entity	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.	CAISO	Complete	CAISO short term forecasting team provided evidence that the ISO is getting stable estimates of the data that feeds the calculation for the Flexible Ramp Product Uncertainty.	Tariff section 29.2(b)(7)(K)(iv)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
10	Balanced Schedules	Base schedule balancing capability	The prospective EIM Entity Scheduling Coordinator demonstrates its ability to balance EIM demand and EIM supply for the prospective EIM 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 prospective EIM Entity to indicate a reasonable threshold as it applies to a given EIM Entity and indicate the potential implications of a swing from 5% over to 5% under forecast in one hour to the next.	BPA	Complete	BPA provided CMRI reports as evidence that this criterion was met in Market Simulation. CAISO Market Quality team provided daily market reports that show the criterion was met for Parallel Operations.	Tariff section 29.2(b)(7)(D)(i)
11	Balanced Schedules	Flexible ramping sufficiency test capability	The prospective EIM 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.	BPA	Complete	BPA provided CMRI reports as evidence that this criterion was met in Market Simulation. CAISO Market Quality team provided daily market reports that show the criterion was met for Parallel Operations.	Tariff section 29.2(b)(7)(D)(ii i)
12	Balanced Schedules	Capacity test capability	The prospective EIM 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 EIM Entity to meet its capacity requirements.	CAISO	Complete	BPA provided CMRI reports as evidence that this criterion was met in Market Simulation. CAISO Market Quality team provided daily market reports that show the criterion was met for Parallel Operations.	Tariff section 29.2(b)(7)(D)(ii)
13	Operating Procedures	CAISO operating procedures (relevant to EIM operations)	The prospective EIM Entity signs CAISO non-disclosure agreement and receives appropriate CAISO "public" and "restricted" operating procedures	Operating procedures NDA signed by the prospective EIM Entity. The prospective EIM Entity receives CAISO operating procedures four months prior to the parallel operations date.	JOINT	Complete	CAISO Training lead provided an email stating that an NDA is no longer required as all operating procedures are now posted on the public site.	Tariff section 29.2(b)(7)(K)(i)
14	Operating Procedures	Prospective EIM Entity operating procedures	The prospective EIM Entity operating procedures are defined, updated, and tested for the EIM Entity Scheduling Coordinator	The prospective EIM Entity operating procedures are updated tested and implemented prior to parallel operations date.	BPA	Complete	BPA confirmed that operating procedures are defined and tested.	Tariff section 29.2(b)(7)(K)(ii)
15	System Readiness & Integration	Functional Testing	The prospective EIM Entity and the CAISO will test the functional and system elements in accordance with functional and system testing documentation posted on the CAISO website	All tasks identified in the functional and system testing documentation are complete and will not have any issues deemed significant. Any exceptions will be explained or have an interim solution that is functionally equivalent.	BPA	Complete	BPA provided evidence indicating that this testing is complete. CAISO confirmed.	Tariff section 29.2(b)(7)(E)(i)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
16	System Readiness & Integration	System Integration	The prospective EIM Entity and CAISO will test system integration testing in accordance with the system integration testing documentation posted on the CAISO website	All tasks identified in the system integration testing documentation are complete and will not have any issues deemed significant. Any exceptions will be explained or have an interim solution that is functionally equivalent.	BPA	Complete	BPA provided evidence indicating that this testing is complete. CAISO confirmed.	Tariff section 29.2(b)(7)(E)(ii)
17	System Readiness & Integration	The prospective EIM Entity system access complete	All prospective EIM Entity employees who require system access to perform EIM-related job functions identified and have necessary certificates.	All prospective EIM Employees performing job functions for EIM market are identified. All CAISO issued certificates are requested within the appropriate timeframes. All identified employees provided the necessary EIM system access certificates.	BPA	Complete	BPA sent an email confirming they have established CAISO system access for all who need access and have a plan in place for provisioning access in production. CAISO customer support team confirmed the access is in place.	Tariff section 29.2(b)(7)(E)(ii)
18	System Readiness & Integration	ISO - prospective EIM Entity interfaces	Data interfaces between prospective EIM Entity's systems and CAISO systems are tested	ISO and prospective EIM Entity identify significant data interface issues. EIM Entity and CAISO executives to approve exceptions.	JOINT	Complete	BPA provided evidence indicating that this testing is complete. CAISO confirmed.	Tariff section 29.2(b)(7)(E)(i)
19	Market Simulation	Day in the life simulation	The prospective EIM Entity operators are able to meet the market timelines	The prospective EIM Entity grid operations staff complete end-to-end daily market workflow with no critical defects.	JOINT	Complete	BPA provided evidence indicating that this testing is complete. CAISO confirmed.	Tariff section 29.2(b)(7)(I)(ii)
20	Market Simulation	Structured scenarios simulation	The prospective EIM Entity operators execute and pass all structured scenarios provided by CAISO	All significant issues resolved or have an interim solution that is functionally equivalent.	JOINT	Complete	BPA confirmed that all structured scenarios were executed successfully and validated through settlement statements. CAISO team responded that they concur.	Tariff section 29.2(b)(7)(I)(iii)
21	Market Simulation	Unstructured scenarios simulation	The prospective EIM Entity operators execute and pass all unstructured scenarios provided by prospective EIM Entity	All significant issues resolved or have an interim solution that is functionally equivalent.	JOINT	Complete	BPA provided an email that they would have no formal unstructured scenarios.	Tariff section 29.2(b)(7)(I)(iv)
22	Market Simulation	Market results reports	Market results are appropriate based on inputs	The prospective EIM Entity and CAISO executive project sponsors approve the market results reports during market simulation	BPA	Complete	CAISO Market Quality team provided evidence that the market results are appropriate based on input.	Tariff section 29.2(b)(7)(I)(v)
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 operations	CAISO	Complete	CAISO Market Quality team provided evidence that prices are appropriate based on input.	Tariff section 29.2(b)(7)(I)(vi)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
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	CAISO	Complete	CAISO Market Quality team provided an analysis report on the Market Solution, prices, and quality of data during Parallel Operations	Tariff section 29.2(b)(7)(I)(vi)
24	Market Simulation	The prospective EIM Entity Identification	Validation of SCID's and Resource ID's	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	JOINT	Complete	BPA and CAISO teams sent emails verifying that SCIDs and resource IDs are established and tested.	Tariff section 29.2(b)(7)(I)(i)
25	Settlements	ISO Settlement Statements and Invoices published to the prospective EIM Entity and EIM 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.	JOINT	Complete	BPA's new Settlement system validation is lagging. Validation is expected to complete in February 2022.	Tariff section 29.2(b)(7)(F)(i)
26	Settlements	The prospective EIM Entity settlement statements and invoices reflect accurate allocations to the prospective EIM Entity customers prior to financially binding operations.	Verification that settlement statements and invoices accurately reflects system and market data	The prospective EIM Entity settlement statements and invoices that allocate charges and credits to its customers accurately reflect system and market data during parallel operations.	JOINT	On Track	BPA's new Settlement system validation is lagging. Validation is expected to complete in mid-April 2022.	Tariff section 29.2(b)(7)(F)(ii)
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.	CAISO	Complete	CAISO Market Quality team provided an email verifying that they are able to see the data they require to complete their analysis. Daily reports are being provided. DMM sent an email confirming that they are able to access the data to complete their analysis.	Tariff section 29.2(b)(7)(K)(v)
28	Parallel Operations Plan	Deployment plan	Parallel operations run consistently and in accordance with the timeframe set forth in the prospective EIM Entity specific parallel operation plan	Parallel operations runs consistently within normal production CAISO Market disruption tolerances.	CAISO	Complete	CAISO management provided an email attesting that Parallel Operations ran consistently within normal tolerances, and cited the market quality team's analysis report.	Tariff section 29.2(b)(7)(J)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
29	Outage Management System	Transmission and generation outage submittal and retrieval	The prospective EIM Entity will verify its ability to submit and retrieve outage information with the CAISO	The prospective EIM Entity validate their ability to submit and retrieve transmission out-of-service outages, generation Pmax derates, generation Pmin rerates, and generation out-of-service outage tickets within the required timelines.	JOINT	Complete	BPA submitted several outages and submitted outage IDs to CAISO for review. CAISO confirmed their accuracy.	Tariff section 29.2(b)(7)(G)
30	Communications between the CAISO and the prospective EIM 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 EIM Entities business processes before the start of market simulation.	BPA	Complete	BPA provided an email confirming they have implemented processes and procedures for voice and electronic messaging.	Tariff section 29.2(b)(7)(H)(i)
31	Communications between the CAISO and the prospective EIM Entity	Communication tools	Staff are trained on communication procedures and tools	The prospective EIM Entity operations staff 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	BPA	Complete	BPA provided an email confirming that training on communications tools has been completed.	Tariff section 29.2(b)(7)(H)(ii)
32	Communications between the CAISO and the prospective EIM Entity	3 rd party transmission service provider	The third party transmission service provider information that supports EIM 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 EIM Entity through parallel operations	BPA	Complete	BPA provided an email stating they have no cases where BPA is reliant on third party transmission for generation within the BA to get to the load.	Tariff section 29.2(b)(7)(H)(ii)
33	EIM Available Balancing Capacity	Identification of EIM Available Balancing Capacity	Participating resources and non-participating resources for 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	BPA	Complete	BPA sent an email confirming they have tested the Available Balancing Capacity feature.	Tariff section 29.2(b)(7)(K)(ii)

Attachment B – Affidavit of Khaled Abdul-Rahman

Informational Readiness Certification for

Bonneville Power Administration’s

Participation in the Energy Imbalance Market

California Independent Systems Operator Corporation

April 1, 2022



Affidavit of Khaled Abdul-Rahman Certifying Readiness of the Bonneville Power Administration (BPA) Implementation in the Energy Imbalance Market

I, Khaled Abdul-Rahman, Vice President of Power Systems and Market Technology for the California Independent System Operator Corporation (CAISO), hereby certify as follows:

1. As the Vice President of Power Systems and Market Technology, I am responsible for the systems and processes that support and enable the Energy Imbalance Market and, as such, I have responsibility for the implementation of BPA into that market.
2. I have reviewed the readiness dashboard and find that it is accurate and complete. All readiness criteria set forth in the CAISO's tariff and business practice manual have been satisfied or are expected to be satisfied as of BPA's May 3, 2022 implementation date as explained more fully in BPA's certification of readiness.
3. Based on the readiness dashboard and other materials and my own review of relevant information and direct involvement with the readiness efforts, including testing, market simulation, training and parallel operations, and barring unforeseen developments, the systems and processes of the CAISO and BPA will be ready for BPA's implementation in the Energy Imbalance Market on May 3, 2022.
4. I will ensure that the CAISO maintains resource commitments necessary to sustain readiness through May 3, 2022 and address any unexpected conditions that may arise before May 3, 2022 that could undermine grid operation or market operation within the existing EIM Area or BPA's readiness. I will continue to monitor progress and resolve any unexpected conditions that may arise.
5. Actual implementation of BPA on May 3, 2022 is conditioned upon the lack of any unexpected and unresolved issues that could undermine grid operation or market operation within the existing EIM Area or BPA's readiness. I will update this certification in the event any unexpected issues are not resolved as of May 3, 2022.

I hereby declare under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief:

DocuSigned by:
Khaled Abdul-Rahman
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Khaled Abdul-Rahman, Vice President, Power Systems and Market Technology

March 30, 2022

Attachment C – Affidavit of Joel Cook

Informational Readiness Certification for

Bonneville Power Administration’s

Participation in the Energy Imbalance Market

California Independent Systems Operator Corporation

April 1, 2022

Affidavit of Joel D. Cook Certifying Readiness of the
Bonneville Power Administration Implementation
in the Energy Imbalance Market

I, JOEL D. COOK, Chief Operating Officer, of the Bonneville Power Administration (“Bonneville”), a Federal Power Marketing Administration, hereby certifies as follows:

1. As Chief Operating Officer, I have overall responsibility for the implementation of the systems and processes necessary for Bonneville’s entry into the California Independent System Operator’s (CAISO) Western Energy Imbalance Market (EIM).
2. I have reviewed the readiness dashboard and find that it is accurate and complete. All applicable readiness criteria set forth in the CAISO’s tariff and business practice manual for the EIM have been satisfied or, as qualified below, are expected to be satisfied as of Bonneville’s May 3, 2022, EIM implementation (or “go-live”) date.
3. While Bonneville and the CAISO have collaboratively worked to satisfy nearly all of the readiness criteria, I want to acknowledge that Bonneville is still working on Readiness Criterion No. 26 which requires Bonneville to verify that it can properly sub-allocate EIM charges and credits to its transmission customers consistent with Attachment Q of Bonneville’s tariff and applicable rate schedules. Bonneville’s vendor has delivered code for sub-allocation which Bonneville and its vendor are working collaboratively to validate and accept. I expect this work to be complete by May 3, 2022, but no later than when Bonneville issues its first EIM bill to transmission customers currently scheduled for June 25, 2022.
4. I also note that Bonneville implemented a new outage management system on March 8, 2022. This system is necessary for Bonneville’s participation in the EIM, and some EIM functionality is still in testing. Although the system is now operational, Bonneville continues to monitor and gain experience with technical implementation of this system and is working to resolve issues as they arise, and complete EIM functionality. I expect the outage management system, including all EIM functionality, to be operational when Bonneville goes live on May 3, 2022.
5. Except as qualified by sections 3 and 4 above, based on the readiness dashboard, other materials prepared for me or for those that report directly to me, and my own review of relevant information and involvement with readiness efforts, including testing, market simulation, and training and parallel operations, the systems and processes of Bonneville will be ready to implement Bonneville’s participation in the EIM on May 3, 2022.
6. I will ensure that Bonneville maintains resource commitments necessary to sustain market readiness through May 3, 2022. I will also continue to monitor

and resolve the issues set forth in sections 3 and 4 above as well as any other issues that may arise before May 3, 2022, that could undermine grid or market operation.

7. Bonneville has a final “go/no-go” decision on April 19, 2022. If Bonneville determines that its system(s) necessary to sub-allocate costs, as described in section 3 above, will not be ready by June 25, 2022, or other issues remain that would undermine grid or market operations at go-live, it will supplement this filing.
8. In closing, I am appreciative of the collaborative working relationship Bonneville has experienced with the CAISO. Moreover, Bonneville has also been the benefactor of significant input from its Federal partners (the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation), other EIM Entities, customers, and other regional stakeholders.

I hereby declare under penalty of perjury that the foregoing statements are true and correct to the best of my knowledge, information, and belief.

Dated this day of March 30, 2022.

Joel D. Cook Digitally signed by Joel D.
Cook
Date: 2022.03.30
08:10:06 -07'00'

Joel D. Cook
Chief Operating Officer
Bonneville Power Administration

Attachment D – Parallel Operations Market Quality Report

Informational Readiness Certification for

Bonneville Power Administration's

Participation in the Energy Imbalance Market

California Independent Systems Operator Corporation

April 1, 2022

**Market Validation of Parallel Operations
For Bonneville Power Administration (BPA) EIM
Entity**

March 25, 2022

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Executive Summary

Parallel operations activities of the Energy Imbalance Market (EIM) started on December 1, 2021. This effort provides an opportunity to assess the readiness of the Bonneville Power Administration (BPA), the prospective Energy Imbalance Market (EIM) Entity, to participate in the EIM. One of the readiness criteria require the ISO to provide a market performance report for the period of parallel operations carried out for the integration of BPA into the real-time energy imbalance market. This report fulfills that requirement and summarizes the main findings of market validation carried out by the ISO with an emphasis on the EIM results for BPA.

The ISO validated both prices and schedules as part of the overall market performance based on input data that fed to the market systems parallel operations from December 1, 2021 through January 7, 2022. This validation demonstrates that the market solution produced is as expected and consistent with the market rules as designed, recognizing that the input data may be influenced by limitations inherent in the parallel operating environment and these limitations may affect the quality of the solution. When factors affecting the input data are controlled for, the quality of the market solutions are as expected and indicate that the systems and processes of BPA are capable of operating in production.

Background and Scope

The intent of parallel operations is to run the market to simulate as close as practically possible actual operating conditions of the system, and to provide BPA with an opportunity to go over specific day-to-day processes and activities required for the operation of the EIM. This set-up provides BPA and the ISO with an opportunity to test their systems and procedures in advance of financially binding market operations.

Although closely resembling actual operations, parallel operations have some inherent limitations that need to be considered when evaluating market results, including the following:

- i) The real-time market requires a set of data inputs to run. In actual real-time market operations, many of these inputs are dynamic, dependent on the participants' resources actual performance, and following instructions. For example, in an actual operating environment, telemetry received from resources gives the information to the ISO system of the operating status of the units, which are changing dynamically and interact with the market systems as the conditions change. During parallel operations, these iterative and interactive data processes are limited because the resources of the prospective EIM entity are not yet required to follow their five-minute dispatch instruction. Similarly, if telemetry from actual production is used, there may be a potential for mismatches between what the actual system is running with versus what the market is projecting due to units potentially not following market instructions. Therefore, the information regarding the resource's performance feedback to the market systems may or may not be related to the dispatch instruction issues through the parallel operations environment. The market application was operated in two configurations. The first configuration used the resource actual telemetry as the input but the resources were not following the market instructions. The second configuration was an echo-back system, which fed back the resource dispatch operating target as its telemetry thereby creating a scenario of a perfect response by resources for every dispatch instruction. The first configuration, using actual telemetry, was used in six of the 38 days, and the other 32 days used the echo-back system for all or part of the day.
- ii) In actual operations, inertia resources require a closed loop for the market system to fully reflect the system and market conditions and inertia schedules eventually need to be tagged in order to reflect the system data flows. For parallel operations, it is not possible to replicate fully the actual tagging process, which may pose an additional challenge based on the data that is fed into the market system.
- iii) During parallel operations, the market participant is still defining its resources' data, including characteristics and bids, which consist of three-part bids used for generation resources that require careful consideration of start-up, minimum load and energy bid costs. During this

period, the participant is also learning the impacts of the resources constraints on the actual operations of the market.

- iv) During the period of parallel operations, the prospective EIM entities bids and base schedules are merged with the bids and base schedules from the current production systems to simulate the actual production environment. The process of combining information from two systems needs some time to synchronize the data flow across various applications.
- v) From December 24, 2021 to January 3, 2022, both BPA resources focus on parallel operations and support for parallel operations by the California ISO were suspended due to holidays. Some bids and schedules were entered ahead of time but the monitoring of the environment was drastically reduced, and thus the results during this time period do not reflect the same quality of solution as the rest of the period.

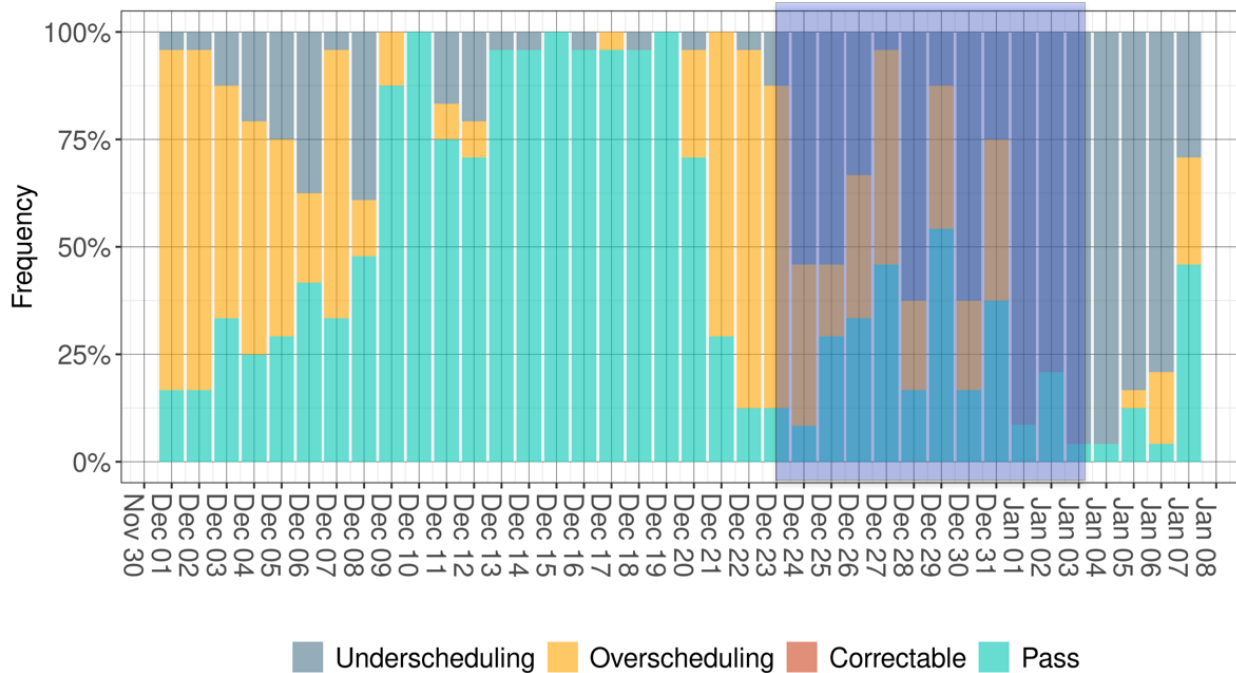
These factors, among others, have an effect on the market results and the quality of the solution. Therefore, conclusions on the quality of the market results must consider the input data and the inherent set-up for parallel operations to avoid misleading conclusions about the actual functionality and robustness of the market. The Market Trends section provides metrics that capture BPA's market performance during parallel operations; also, it includes various system issues that were identified during parallel operations and that affected market performance. The Market Validation items section provide a summary of issues identified during parallel operations.

Market Trends

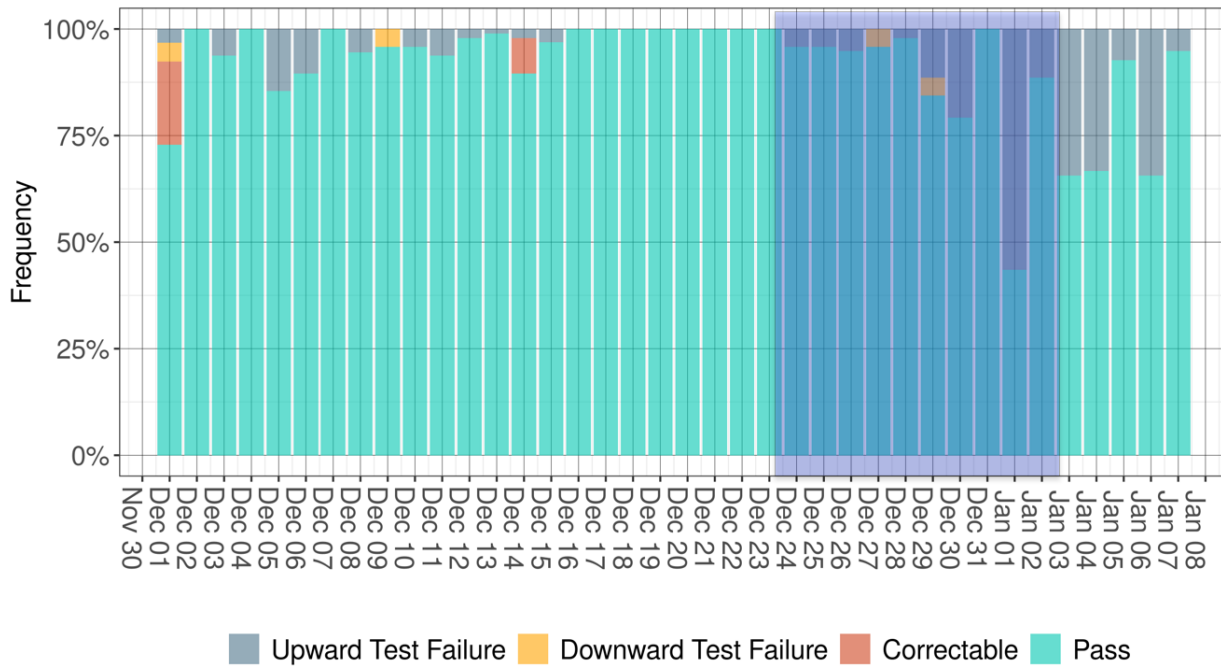
Figure 1 shows the BPA BAA's performance for the balancing test as required under section 29.34(k) of the ISO tariff for the period of December 1, 2021 until January 7, 2022. The balancing test provides a reference of how well balanced (energy supply defined by the hourly base schedules meets the demand defined by the forecast respectively) the EIM entity BAA is going to be into the real-time energy imbalance market. Having a large percentage of positive imbalance means the real-time market will be the last resort to balance the area incrementally. The incremental balancing of supply will come from the bid-in capacity made available in the market in addition to the base schedule or EIM transfers between the participating EIM entities' BAAs. During the first 38 days of parallel operations, BPA passed the balancing test in 66.63 percent of hours. By discounting the period of parallel operations without support, BPA passed 67.03 percent of the hours. The performance of passing the balancing test was consistent through the two-week time frame. The Balancing failures that occurred were related to various data submission issues and differences in operations forecast methodology that BPA was testing during parallel operations to determine which forecast method yielded the best results. The data submission issues included software issues on the vendor's side for outages. The primary driver for balancing failures was the testing of operations forecast methods. BPA has created the capability to base schedule to two different values, one based on the CAISO-generated BAA forecast and one based on an internal forecast of obligations in

the BAA. The market results of using the internal calculation is impacted by deviations in production schedule submittal timelines since BPA is not yet in the EIM. BPA is currently using the CAISO-generated BAA forecast in Parallel Operations. BPA will continue to evaluate forecast results and intends to eventually change to using the internal forecast.

Figure 1: Daily frequency of power balancing test results



A second test carried out before running the real-time market is the bid-range capacity test. Figure 2 shows the BPA BAA’s performance for the bid-range capacity test for December 1, 2021 through January 7, 2022. All EIM market participants use Scheduling Infrastructure and Business Rules (SIBR) application to submit bids to the ISO market. After the deadline to submit bids for each trading hour, an automated process transfers these bids to various applications for downstream market processes. On December 1 and December 14, in the ISO parallel operations environment, this automated process failed to transfer bids to the BAAOP application that performs the capacity test, resulting in capacity test failures for BPA. In Figure 2, any failed tests affected by this issue are represented as correctable events because it was a result of ISO automation process failure. With the correctable events removed from the count of failures BPA passed 84.88 percent of the tests over parallel operations period. By discounting the period of parallel operations without support, BPA passed 95.76 percent of the hours.

Figure 2: Daily frequency of bid range capacity test results


A third test carried out before running the real-time market is the flexible ramp sufficiency test, as required by section 29.34 (m) of the ISO tariff. The flexibility test evaluates whether the EIM entity has sufficient flexible ramp capacity to meet its both upward and downward ramp requirements based on optimized resource schedules before the trading hour. Figure 3 shows the daily frequency of flex ramp test failures observed in the first 38 days of parallel operation for the BPA BAA. From December 1 through January 7, BPA passed the flexible ramp up tests in 92.40 percent of the hours and passed the flex ramp down test 99.34 percent of the hours. The same system issues that affected the bid-range capacity tests also affected BPA’s flex ramp sufficiency tests on December 1 and December 14. These are represented as correctable events in Figure 3. By discounting the period of parallel operations without support, BPA passed 96.34 percent and 99.15 percent of the hours for the upward and down test, respectively.

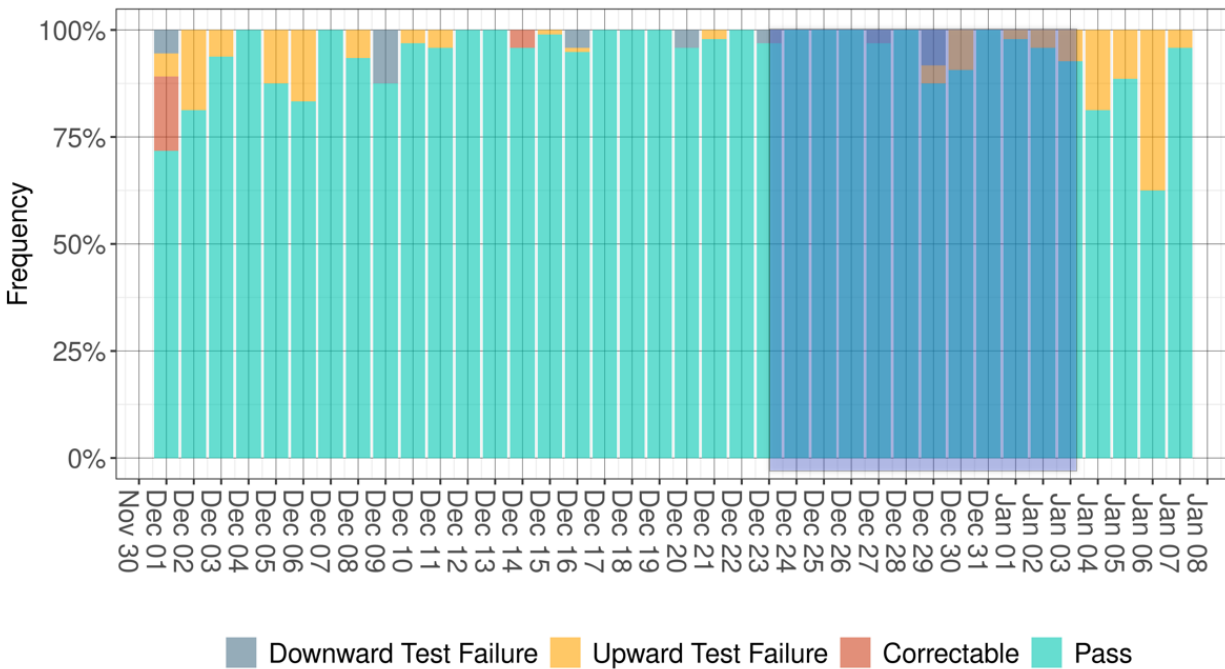
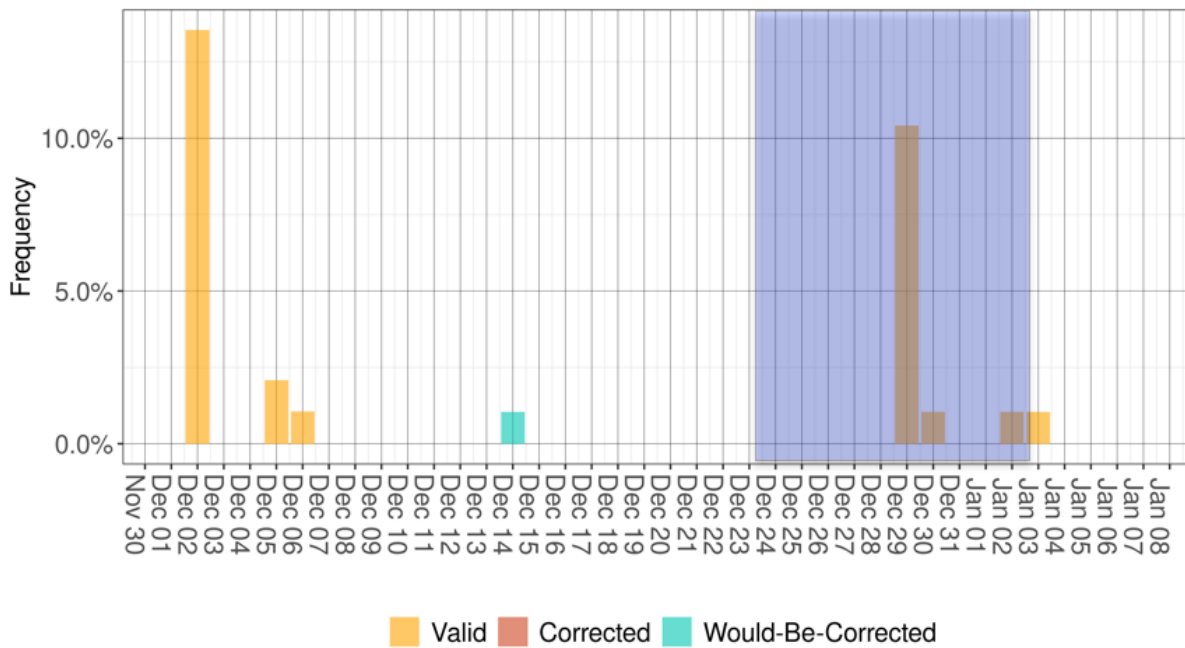
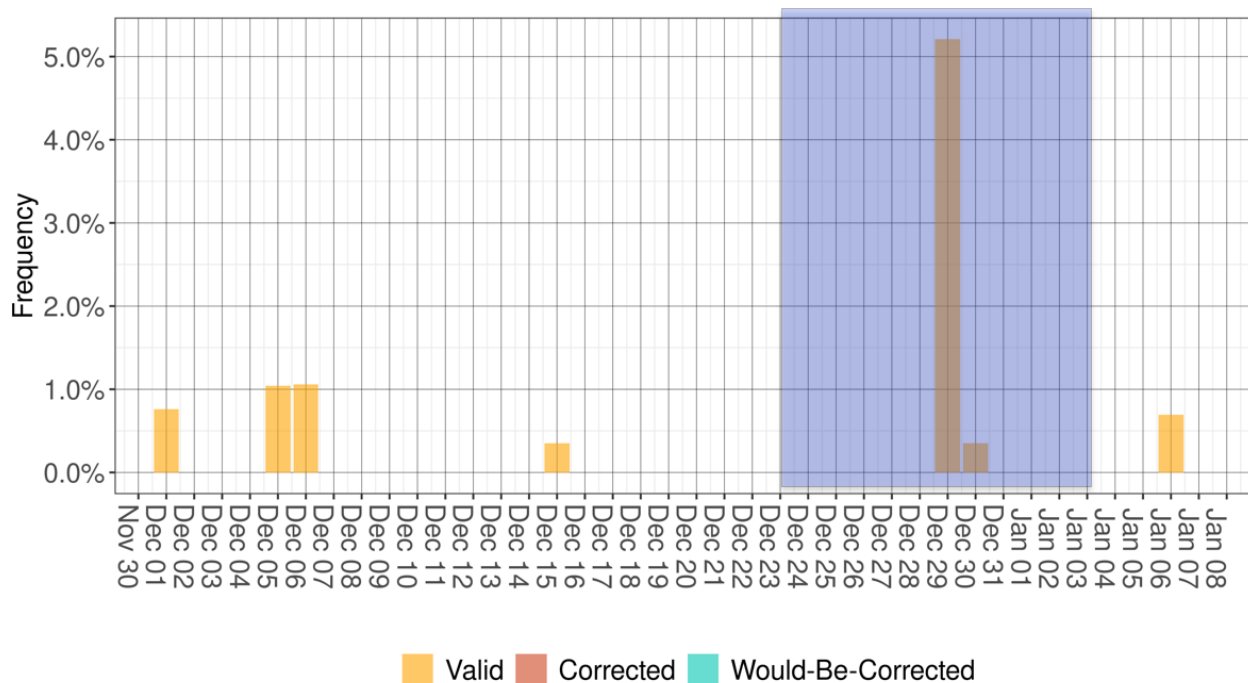
Figure 3: Daily frequency of flexible ramp test results


Figure 4 and 5 shows the frequency of power balance constraint infeasibilities for under-generation conditions in both the Fifteen Minute Market (FMM) and real-time dispatch (RTD) markets. The power balance constraint infeasibilities are pegged to the corresponding penalty prices, of \$1,000/MWh (or \$2,000 for certain conditions under implementation of FERC order 831) for under-supply infeasibilities, and about -\$150/MWh for over-supply infeasibilities. However, during parallel operations, the EIM market for BPA has been set-up to run under the conditions reflecting the price discovery mechanism that is in effect under the transitional period (the first six months in an actual production system). Under this functionality, when its power balance constraint is infeasible, the market will reflect the last economic signal instead of the penalty prices. The first six months transitional period pricing is based on the FERC Order¹, which grants the prospective EIM entity the time to re-adjust and fine-tune its systems, processes, and procedures to avoid conditions that trigger administrative penalty prices due to false under-supply or over-supply conditions. The transition period pricing also shields the prospective EIM entity from getting administrative penalty prices during the first six month. This period allows the entity to gain production experience in dealing with timely response to inform the market about operators’ manual actions that are taken or decided outside the market to maintain the EIM entity BAA reliability or balancing needs such as deployment of operating reserve in response to forced outages.

¹ *Calif. Ind. System Op.*, 153 FERC ¶ 61,104 (2015).

Figure 4: Daily frequency of supply infeasibilities in the fifteen-minute market


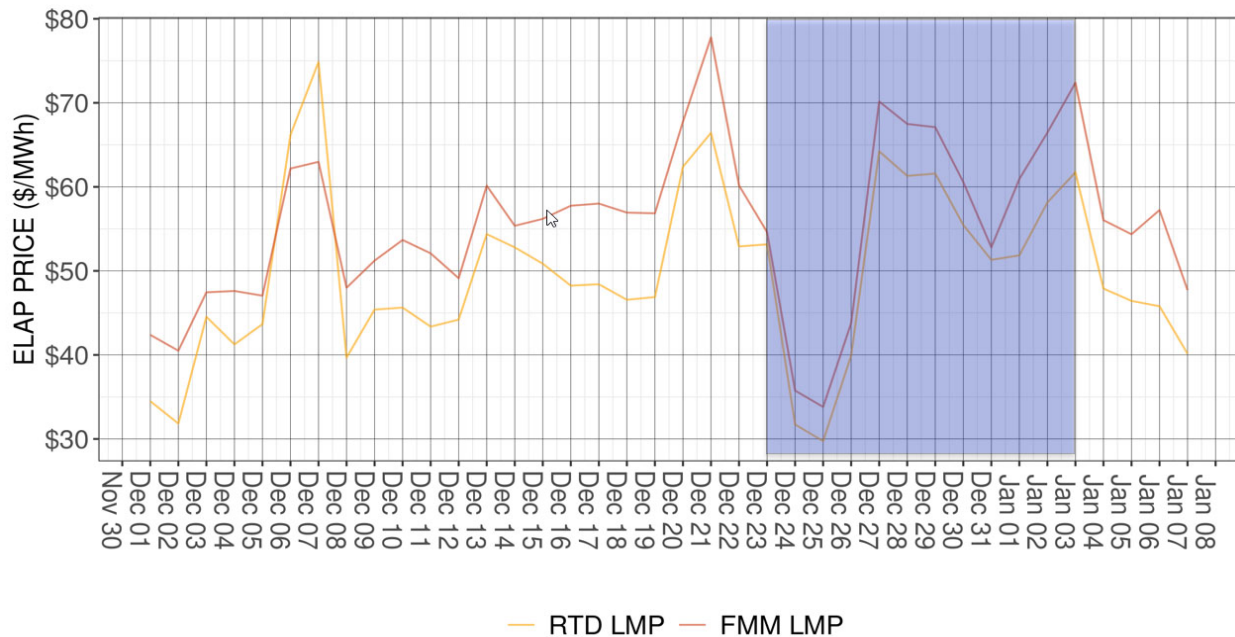
From December 1, 2021 through January 7, 2022 for the FMM, BPA had 30 valid under-supply power balance infeasibilities; however, 13 of these infeasibilities occurred between December 24, 2021 to January 3, 2022, during which time parallel operations was not being fully supported.

Figure 5: Daily frequency of supply infeasibilities in the five-minute market


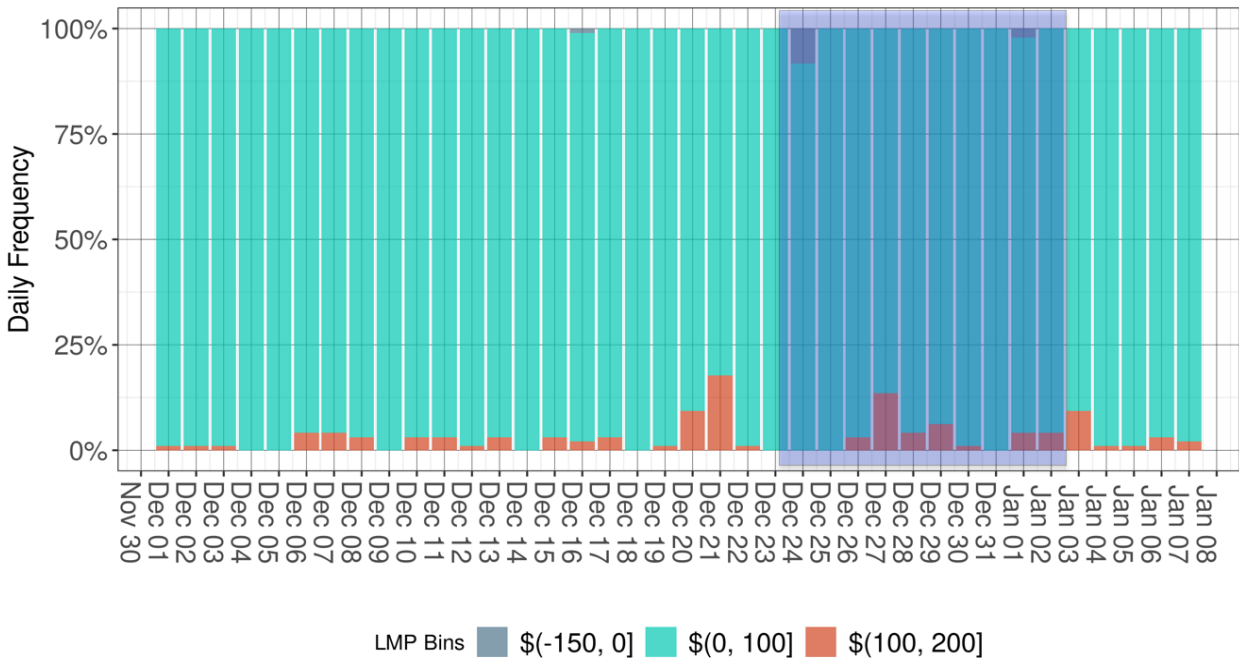
For the five-minute market, BPA had seven trade dates with valid under-supply power balance infeasibilities. These infeasibilities were driven by one main reason. BPA was testing automation for manual dispatches that makes adjustments to their non-participating resources for possible inter-tie purchase or sales. In this testing, it was identified that the automation is not taking into account the ramping between hours from the manual dispatch level to the base schedule. As a result, there was large changes in output for the non-participating resource at the hourly boundary. Because of these large changes, the participating resources are ramping as much as possible to compensate for the loss of the energy. With the ramp capability and available transfers there wasn't enough supply to compensate, which lead to undersupply shortages. BPA implemented a software change to the API for manual dispatch to resolve this issue.

The Figure 6 shows the daily average ELAP locational marginal prices (LMPs) for the fifteen-minute market and the five-minute market. The average daily prices from December 1, 2021 through January 7, 2022 in the fifteen-minute market were between \$40.76/MWh and \$75.09/MWh. The average five-minute prices were between \$34.94/MWh and \$68.29/MWh.

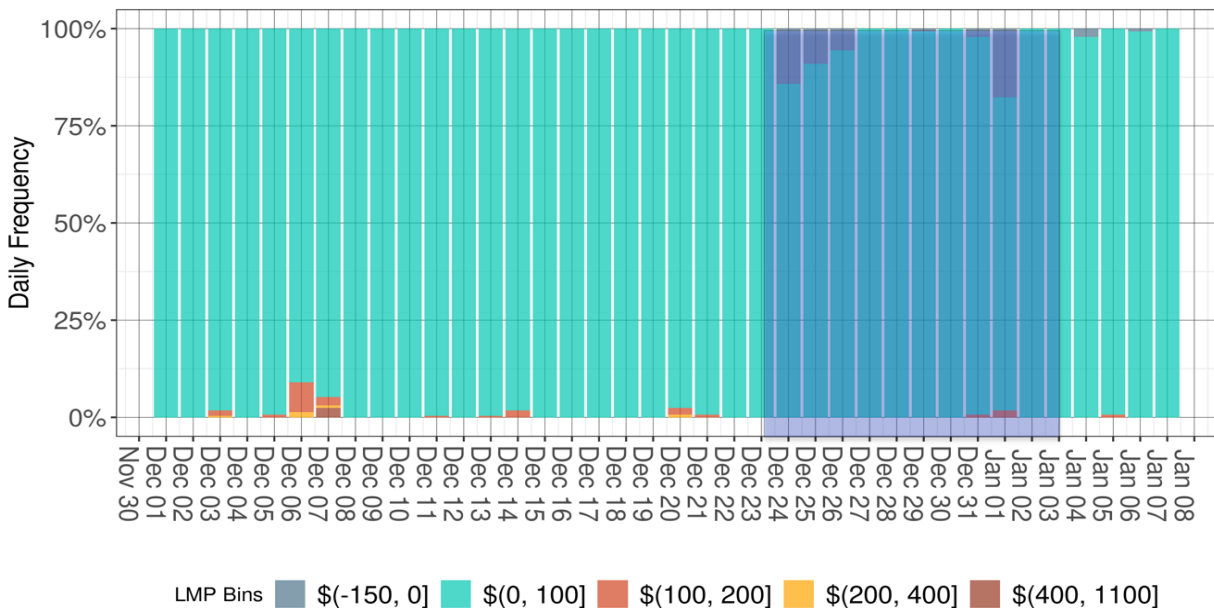
Figure 6: Daily average of fifteen-minute market and five-minute market prices



Figures 7 and 8 show the FMM and RTD ELAP prices for the BPA BAA classified by price bins.

Figure 7: Daily frequency of fifteen-minute prices organized by price ranges


For all trade dates from December 1, 2021 through January 7, 2022 about 97 percent of the FMM intervals observed prices were between \$0/MWh and \$100/MWh. At the same time, 98 percent of the five-minute prices were between \$0/MWh and \$100/MWh.

Figure 8: Daily frequency of five-minute prices organized by price ranges


Market Validation Items

1. Parallel Operation bid transfer Issue

All EIM market participants use Scheduling Infrastructure and Business Rules (SIBR) application to submit bids to the ISO market. After the deadline to submit bids for each trading hour, an automated process transfers all the bids to various applications for downstream market processes. On December 1, 2021, hours ending 10, 15 and 17, and on December, 14 hour ending 18, in the ISO parallel operations environment, this automated process failed to transfer bids for several BAAs, including BPA, to other market applications. The real-time base schedule and resource sufficiency tests use the corresponding EIM BAA's bids to perform bid-range capacity test and the flexible ramp sufficiency test. Because the bids were missing due to the system issue, all the balancing areas, including BPA, failed the bid-range capacity test most intervals of the flexible ramp sufficiency tests. The automated process is controlled via an in-house developed tool to facilitate the parallel operation set up and is not used or needed in the production environment, where all bids come to the market from one source.

Resolution: This was an issue in a tool used within the setup of parallel operations only and therefore is not a production issue.

2. Uncertainty Requirement

During the first part of parallel operations the uncertainty requirement that is used to for the flex sufficiency tests and the flex ramp product requirement are based upon a similar area size and VER fleet. During this first part of parallel operations data is being gather based on the load forecast and VER for to calculate the uncertainty requirement used in the second half of parallel operations. Because the first half was based upon another area requirements, this could be leading to additional capacity needs to pass the flex sufficiency tests along with increased energy and flex ramp price.

3. Power Balance infeasibilities

These infeasibilities were driven by one main reason. BPA was testing automation for manual dispatches that makes adjustments to their non-participating resources for possible inter-tie purchase or sales. In this testing, it was identified that the automation is not taking into account the ramping between hours from the manual dispatch level to the base schedule. As a result, there was large changes in output for the non-participating resource at the hourly boundary. Because of these large changes, the participating resources are ramping as much as possible to compensate for the loss of the energy. With the ramp capability and available transfers there wasn't enough supply to compensate, which lead to undersupply shortages. BPA implemented a software change to the API for manual dispatch to resolve this issue.

Conclusion

The ISO validated both prices and schedules based on input data fed through the market systems parallel operations from December 1, 2021 through January 7, 2022. This validation demonstrates that the market solution produced is as expected and consistent with the market rules as designed, recognizing that the input data may be influenced by limitations inherent in the parallel operating environment and these limitations may affect the quality of the solution. When factors affecting the input data are fixed or controlled for, the quality of the market solutions are as expected and indicate that the systems and processes of BPA are capable of operating in production.

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom, CA this 1st day of April, 2022.

1st Jacqueline Meredith

Jacqueline Meredith
California ISO
250 Outcropping Way
Folsom, CA 95630