



March 2, 2021

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 Public Service Company of  
New Mexico's Participation in the EIM  
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.<sup>1</sup> The CAISO, in consultation with the Public Service Company of New Mexico (PNM), has determined that, following market simulation and an adequate period of parallel operations, the CAISO and PNM have met 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 PNM affidavit of Chris Olson, Senior Vice President, Utility Operations. This filing certifies the readiness of the CAISO and PNM to proceed with PNM's participation in the CAISO's Energy Imbalance Market (EIM) on April 1, 2021, without exception, consistent with the requirement to do so at least 30 days prior.

### **I. Background**

The EIM provides other balancing authority areas the opportunity to participate in the real-time market for imbalance energy that the CAISO operates in its own balancing authority area. PacifiCorp's balancing authorities were the first two balancing authorities to join the EIM beyond the CAISO balancing authority area. The CAISO's

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<sup>1</sup> 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).

EIM tariff provisions went into effect on October 24, 2014, in time for the first trading day of November 1, 2014.<sup>2</sup> In a March 16, 2015 order,<sup>3</sup> the Commission concluded that certain readiness safeguards are necessary prior to activating a prospective EIM entity in production.<sup>4</sup> 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 EIM.<sup>5</sup> Following two compliance filings, the Commission accepted the CAISO's proposed readiness criteria.<sup>6</sup> These criteria appear in section 29.2(b)(7) of the CAISO Tariff.

## II. Readiness Reporting, Determination, and Attestations

The CAISO and PNM ran market simulation scenarios from November 3, 2020 to January 29, 2021. Parallel (*i.e.*, financially nonbinding) operations, which began on January 30, 2021, will run through at least March 2, 2021 and, in any event, will continue to be supported and available to PNM until April 1, 2021. During market simulation and parallel operations, the CAISO and PNM have engaged in daily 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," showing progress towards meeting the readiness criteria.<sup>7</sup> The process of updating the readiness dashboard through this joint effort involved representatives from both organizations, including the senior officers who have attested that the parties' processes and systems are ready for PNM's participation in the EIM.

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 PNM to validate

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<sup>2</sup> 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).

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

<sup>4</sup> *Id.* at P 30.

<sup>5</sup> *Id.* n.85.

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

<sup>7</sup> 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 EIM Entities PNM entry for 2021 at: <http://www.caiso.com/informed/Pages/ReleasePlanning/Default.aspx>.

performance of the systems and processes under a variety of structured scenarios. The market simulation dashboard dated January 29, 2021 demonstrated that the CAISO and PNM were ready to enter parallel operations. Having achieved the benefits from market simulation, the CAISO and PNM transitioned to parallel operations on January 30, 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 PNM 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 PNM 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 PNM to identify and resolve software issues. The dashboard dated February 15, 2021 showed the progress during initial parallel operations as additional readiness criteria were met. The final dashboard, dated February 25, 2021, 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 PNM's compliance with criteria. The dashboard shows that all readiness criteria have been satisfied or will be satisfied by April 1, 2021.

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 PNM affidavit of Chris Olson, Senior Vice President, Utility Operations 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 PNM is prepared to enter financially binding production EIM operations on April 1, 2021. As discussed in the Market Quality Report included as Attachment D, any issues identified in the parallel operations have been resolved or will be resolved. Neither the CAISO nor PNM has identified any exception to any of the readiness criteria.

### **III. Market Quality Report on Parallel Operations**

Parallel operations allowed the CAISO and PNM to identify and resolve numerous input, process, and software issues prior to the commencement of financially binding operations.<sup>8</sup> The CAISO and PNM 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 17 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 PNM are ready to operate in production.

### **IV. Attachments**

Besides this transmittal letter, this filing includes these attachments:

- Attachment A: Readiness Dashboard Report
- Attachment B: Affidavit of Khaled Abdul-Rahman
- Attachment C: Affidavit of Chris Olson
- Attachment D: Parallel Operations Market Quality Report

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<sup>8</sup> The market quality report on parallel operations dated February 26, 2021 explains how each of these issues impacted the market results and how they were resolved by the CAISO and PNM.

## 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 PNM will notify the Commission in the event of any subsequent determination that the implementation of PNM into the EIM on April 1, 2021 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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Counsel for the California Independent System  
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**Attachment A – Readiness Dashboard Report**

**Informational Readiness Certification for the**

**Public Service Company of New Mexico’s**

**Participation in the Energy Imbalance Market**

**California Independent Systems Operator Corporation**

**March 2, 2021**

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 provided reports indicating that the Generating Unit, Intertie and Load definition in the CAISO's Full Network Model is consistent with the network modeling information in the PNM network model.	<a href="#">Tariff section 29.2(b)(7)(A)(i)</a>
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 provided reports indicating critical and used SCADA measurements PNM is publishing to the values seen by the CAISO.	<a href="#">Tariff section 29.2(b)(7)(A)(ii)</a>
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 provided reports CAISO State estimator has been solving on continuous basis on the CAISO EMS PROD system.	<a href="#">Tariff section 29.2(b)(7)(A)(iii)</a>
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	PNM confirmed that the non-conforming loads have been modeled separately from the PNM conforming load and their associated hourly base schedules are submitted to BSAP. PNM confirms that the historical actual load measurements provided does not include the non-conforming load	<a href="#">Tariff section 29.2(b)(7)(A)(iv)</a>
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	All agreements are complete with executed agreements as evidence.	<a href="#">Tariff section 29.2(b)(7)(K)(i)</a>

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.	PNM	Complete	PNM provided evidence that all necessary training has been completed.	<a href="#">Tariff section 29.2(b)(7)(B)</a>
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"> <li>Accuracy of the CAISO forecast of EIM demand based on historical actual load data for the defined EIM demand forecast boundaries.</li> <li>Identification of weather station(s) locations used in forecasting, if applicable.</li> </ul>	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	PNM provided screen shots from Forecast Monitoring showing accurate measurements to satisfy this criterion.	<a href="#">Tariff sections 29.2(b)(7)(C)(i)-(iii)</a>
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	The ISO Short-Term Forecasting team provided screen shots from Forecast Monitoring showing accurate measurements to satisfy this criterion.	<a href="#">Tariff section 29.2(b)(7)(C)(iv)</a>
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 provided confirmation it received and stored all historical data sufficient for the CAISO to perform the flexible ramp requirement.	<a href="#">Tariff section 29.2(b)(7)(K)(iv)</a>
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	PNM	Complete	PNM provided reports indicating that PNM has met the base schedule balancing criteria.	<a href="#">Tariff section 29.2(b)(7)(D)(i)</a>



Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
				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 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.	PNM	Complete	CAISO provided reports indicating that PNM has met the flexible ramping sufficiency test (both Up and Down)	<a href="#">Tariff section 29.2(b)(7)(D)(iii)</a>
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	indicating that PNM has met the capacity test capability	<a href="#">Tariff section 29.2(b)(7)(D)(ii)</a>
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	Operating procedures have been shared with PNM	<a href="#">Tariff section 29.2(b)(7)(K)(i)</a>
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.	PNM	Complete	PNM provided email and screen shots confirming that their operating procedures are complete and uploaded to Accellion	<a href="#">Tariff section 29.2(b)(7)(K)(ii)</a>
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.	PNM	Complete	PNM provided their EIM Test Results Summary document showing test cases have been executed and passed.	<a href="#">Tariff section 29.2(b)(7)(E)(i)</a>
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.	PNM	Complete	EIM Test Results Summary document showing all test cases have been executed and passed.	<a href="#">Tariff section 29.2(b)(7)(E)(ii)</a>
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.	PNM	Complete	CAISO provided evidence that all necessary PNM staff have required access for Parallel Operations. PNM confirmed the access is in place and plan is in place for production.	<a href="#">Tariff section 29.2(b)(7)(E)(iii)</a>

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
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	PNM provided the testing timeline summary document reflecting that all interface testing completed	<a href="#">Tariff section 29.2(b)(7)(E)(i)</a>
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	PNM provided the testing timeline summary document reflecting that Day-In-The-Life testing was complete and successful.	<a href="#">Tariff section 29.2(b)(7)(I)(ii)</a>
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	PNM and the ISO have successfully executed the operational components of all Structured Market Simulation Scenarios successfully. Evidence uploaded to the EIM Accellion site.	<a href="#">Tariff section 29.2(b)(7)(I)(iii)</a>
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	PNM sent an email stating that all scenarios met their intended training during Market Simulation	<a href="#">Tariff section 29.2(b)(7)(I)(iv)</a>
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	PNM	Complete	CAISO provided an email summarizing the market results during market simulation.	<a href="#">Tariff section 29.2(b)(7)(I)(v)</a>
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 provided an email indicating Market simulation prices and MWs schedules/dispatches are validated by CAISO market quality team for entry into parallel operations	<a href="#">Tariff section 29.2(b)(7)(I)(vi)</a>
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	Parallel operations prices and schedules/dispatches are validated by the CAISO market quality team	<a href="#">Tariff section 29.2(b)(7)(I)(vi)</a>
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	PNM provided the final updated schedule 1 form and an email confirming this criteria has been met.	<a href="#">Tariff section 29.2(b)(7)(I)(i)</a>
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	PNM provided evidence that they have completed validation of the settlement statements and invoices.  CAISO Settlement lead confirmed.	Tariff section 29.2(b)(7)(F)(i)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
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	Complete	PNM provided an email stating that PNM doesn't have third party customers, therefore no allocation of charges and credits is performed or applicable to fPNM	<a href="#">Tariff section 29.2(b)(7)(F)(ii)</a>
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 Validation and Analysis team and DMM provided confirmation they have sufficient data available.	<a href="#">Tariff section 29.2(b)(7)(K)(v)</a>
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 provided an email with supporting reports stating the CAISO has verified that the Parallel Operations ran consistently within normal CAISO disruption tolerances.	<a href="#">Tariff section 29.2(b)(7)(J)</a>
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	PNM submitted outages in the Map Stage environment. The CAISO confirmed that these were received and processed in the CAISO systems.	<a href="#">Tariff section 29.2(b)(7)(G)</a>
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.	PNM	Complete	PNM sent email evidence that these processes are in place.	<a href="#">Tariff section 29.2(b)(7)(H)(i)</a>
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	PNM	Complete	PNM sent email evidence that their staff has been trained on the communication procedures and tools	<a href="#">Tariff section 29.2(b)(7)(H)(ii)</a>
32	Communications between the CAISO and the prospective EIM Entity	3 <sup>rd</sup> 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	PNM	Complete	PNM provided an email confirming that PNM does not have any 3rd party transmission customers.	<a href="#">Tariff section 29.2(b)(7)(H)(iii)</a>

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements	Threshold	Owner	Status	Evidence	Tariff Mapping
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	PNM	Complete	PNM provided an email PNM systems are capable of designating ABC capacity on our participating resources	<a href="#">Tariff section 29.2(b)(7)(K)(iii)</a>

**Attachment B – Affidavit of Khaled Abdul-Rahman**

**Informational Readiness Certification for the**

**Public Service Company of New Mexico’s**

**Participation in the Energy Imbalance Market**

**California Independent Systems Operator Corporation**

**March 2, 2021**

Affidavit of Khaled Abdul-Rahman Certifying Readiness of Public Service Company of  
New Mexico (PNM) 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 PNM 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 PNM's April 1, 2021 implementation date.
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 PNM will be ready to implement PNM's implementation in the Energy Imbalance Market on April 1, 2021.
4. I will ensure that the CAISO maintains resource commitments necessary to sustain readiness through April 1, 2021 and address any unexpected conditions that may arise before April 1, 2021 that could undermine grid operation or market operation within the existing EIM Area. I will continue to monitor progress and resolve any unexpected conditions that may arise.
5. Actual implementation of PNM on April 1, 2021 is conditioned upon the lack of any unexpected and unresolved issues that could undermine grid operation or market operation within the existing EIM Area. I will update this certification in the event any unexpected issues are not resolved as of April 1, 2021.

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



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

March 2, 2021

**Attachment C – Affidavit of Chris Olson**

**Informational Readiness Certification for the**

**Public Service Company of New Mexico’s**

**Participation in the Energy Imbalance Market**

**California Independent Systems Operator Corporation**

**March 2, 2021**

Affidavit of Chris Olson certifying readiness of the  
Public Service Company of New Mexico (PNM) Implementation  
in the Energy Imbalance Market

I, Chris Olson, Senior Vice President, Utility Operations, of PNM, hereby certify as follows:

1. As the Senior Vice President, Utility Operations, I am ultimately responsible to PNM for ensuring that all the systems and processes that support and enable the PNM Balancing Authority Area to participate in EIM are established and ready for EIM operations. As such, I have overall responsibility for the implementation of PNM's entry into that market.
2. I have reviewed the readiness dashboard and find that it is accurate and complete. All applicable readiness criteria set forth in the California Independent System Operator's ("CAISO") tariff and business practice manual for the EIM have been satisfied or are expected to be satisfied as of PNM's April 1, 2021, implementation date.
3. Based on the readiness dashboard and other materials prepared for me or for those that report directly to me and my own review of relevant information and direct involvement with readiness efforts, including testing, market simulation, training and parallel operations, and barring unforeseen developments, the systems and processes of CAISO and PNM will be ready to implement PNM's participation in the EIM on April 1, 2021.
4. I will ensure that PNM maintains resource commitments necessary to sustain readiness through April 1, 2021 and address any unexpected conditions that may arise before April 1, 2021 that could undermine grid operation or market operation within the existing EIM Area. I will continue to monitor progress and resolve any unexpected conditions that may arise.
5. Actual implementation of PNM's entry on April 1, 2021 is conditioned upon the lack of any unexpected and unresolved issues that could undermine grid operation or market operation within the existing EIM Area. I will update this certification in the event any unexpected issues are not resolved as of April 1, 2021.

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



Chris Olson  
Senior Vice President, Utility Operations

February 26, 2021



**Attachment D – Parallel Operations Market Quality Report**

**Informational Readiness Certification for the**

**Public Service Company of New Mexico's**

**Participation in the Energy Imbalance Market**

**California Independent Systems Operator Corporation**

**March 2, 2021**



California ISO

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**Market Validation of Parallel Operations  
For Public Service Company of New Mexico  
(PNM) EIM Entity**

**February 26, 2021**

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## Executive Summary

Parallel operations activities of the Energy Imbalance Market (EIM) started on January 30, 2021. This effort provides an opportunity to assess the readiness of the Public Service Company of New Mexico (PNM), 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 PNM Balancing Authority Area (BAA) 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 the PNM (BAA).

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 January 30 through February 15. 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 PNM 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 PNM with an opportunity to go over specific day-to-day processes and activities required for the operation of the EIM. This set-up provides PNM 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 the 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. For the first seventeen days of parallel operations, the PNM resources were not following the ISO dispatch instructions, however, the market applications were 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 eight of the 17 days, and the other 9 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.

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 PNM'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

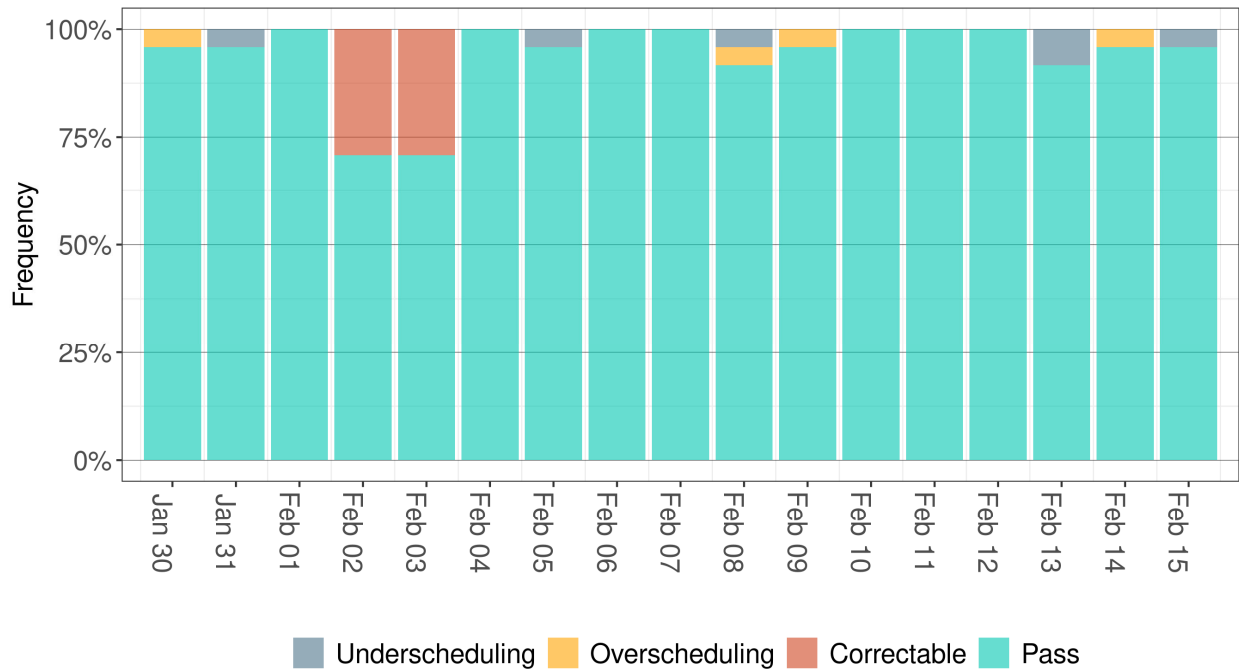
Figure 1 shows the PNM BAA's performance for the balancing test as required under section 29.34(k) of the ISO tariff. The balancing test provides a reference of how well balanced (energy supply defined by the hourly base schedules meets the demand defined by the forecast respectively) the EIM entity BAA is going to come 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 seventeen days of parallel operations, PNM passed the balancing test in 97.55 percent of hours. On February 2 and February 3, the PNM BAA failed the balancing test in 14 hours due to an ISO Balancing and Scheduling Application (BSAP) issue. Figure 1 displays these as correctable events. All EIM entities submit their base schedules to BSAP, which performs validation to ensure that base schedules are consistent with resource operating characteristics. A generating resource physical characteristics are registered with the ISO and listed in the master file application. During each trading hour, a scheduled or forced outage may reduce its operating range. Furthermore, PNM operators may choose to use manual dispatches to restrict the resource operating range due to current software limitations. The BSAP user interface displays the mismatch between the generation base schedules and other outage restriction or manual dispatch restriction. Operators use this information to adjust generation base-schedules to pass the balancing tests.

On February 2 and February 3, BSAP user interface considered a manual dispatch for PNM generating resources even though operators had canceled this manual dispatch. PNM and ISO operators identified this issue for the first balancing test failure; however, BSAP user interface results were providing inaccurate information while the PNM operators were trying to balance their system for subsequent hours. As a result, PNM failed the balancing test for 14 hours on these two days due to ISO system issue.

All other balancing failures for the PNM BAA were valid and the BAA EIM Operator used this experience during parallel operations to improve its processes and procedures to prepare for EIM-go-live.

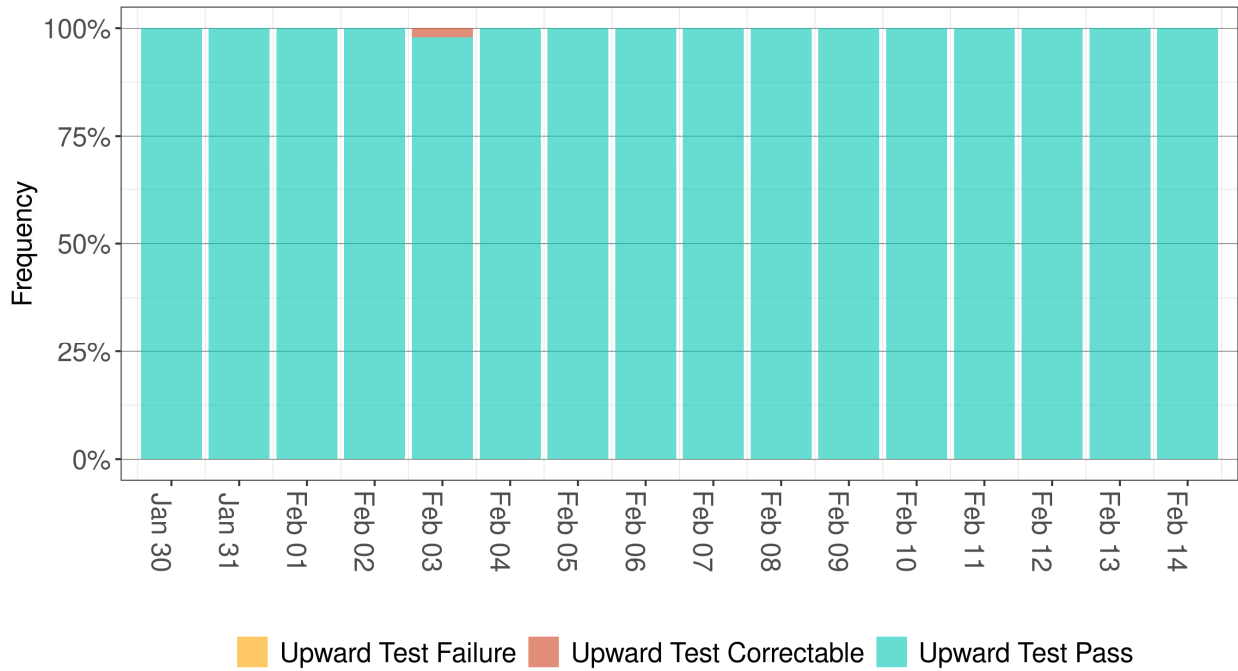
**Figure 1: Daily frequency of power balancing test results**



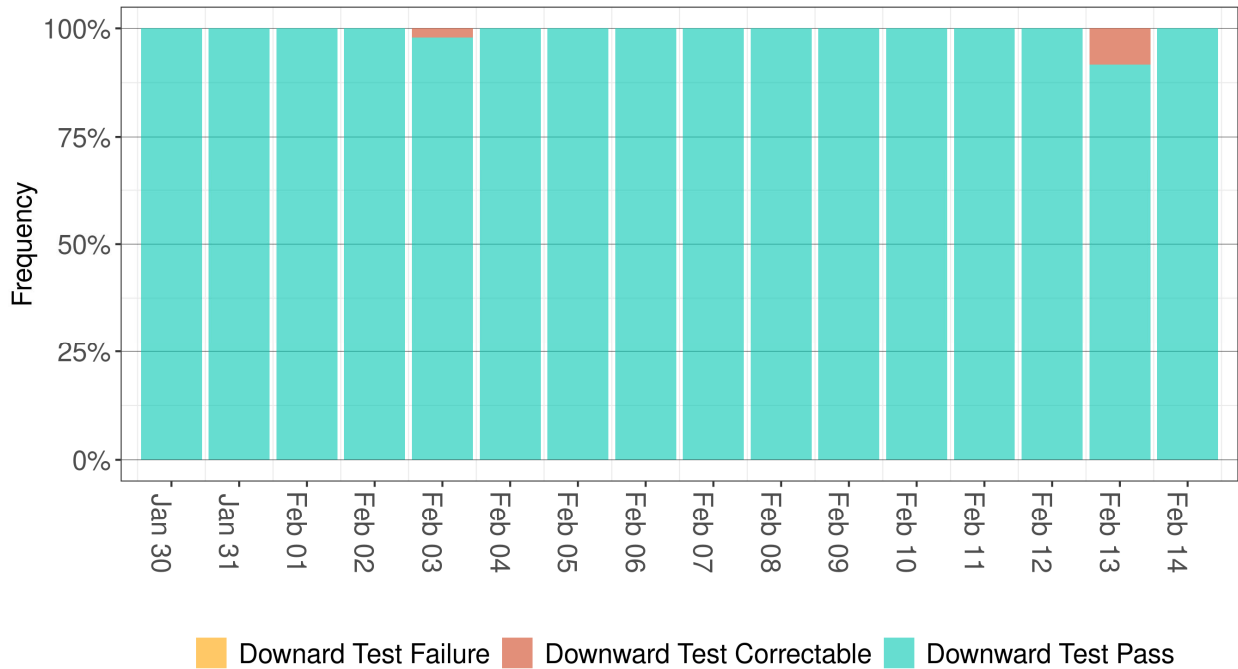
A second test carried out before running the real-time market is the bid-range capacity test. Figure 2 and Figure 3 show the PNM BAA’s performance for the bid-range capacity test up and down from January 30, until February 15. The PNM BAA passes the bid-range capacity test in all trading hours for the first seventeen days of parallel operations. Two ISO-system issues drove the bid-range capacity test of parallel operations are shown as correctable events in Figures 2 and 3.

First, on February 3, energy bids from generating resources were missing for PNM BAA and resulted in failures for both bid-range capacity up and down tests. 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 hours, an automated process transfers this bid to various applications for downstream market processes. On February 3, hour ending 12, in the ISO parallel operations environment, this automated process failed to transfer bids to the Balancing Authority Area Operations Portal (BAAOP) application that performs the capacity test, resulting in capacity test failures for PNM. Second, on February 13, for hours ending 16 and 17, the PNM load forecast was missing from the BAAOP application, which resulted in eight bid-range capacity test failures. For each fifteen-minute interval, the BAAOP compares the EIM BAA hourly energy base schedules, hourly net schedule inter-change, and the fifteen-minute demand forecast to calculate incremental or decremental fifteen-minute imbalance. On February 13, in hour ending 16 and 17, the PNM demand forecast was not provided to BAAOP, resulting in the unusually high decremental capacity requirement that drove the downward bid-range capacity test failures.

**Figure 2: Daily frequency of bid-range up capacity test results**



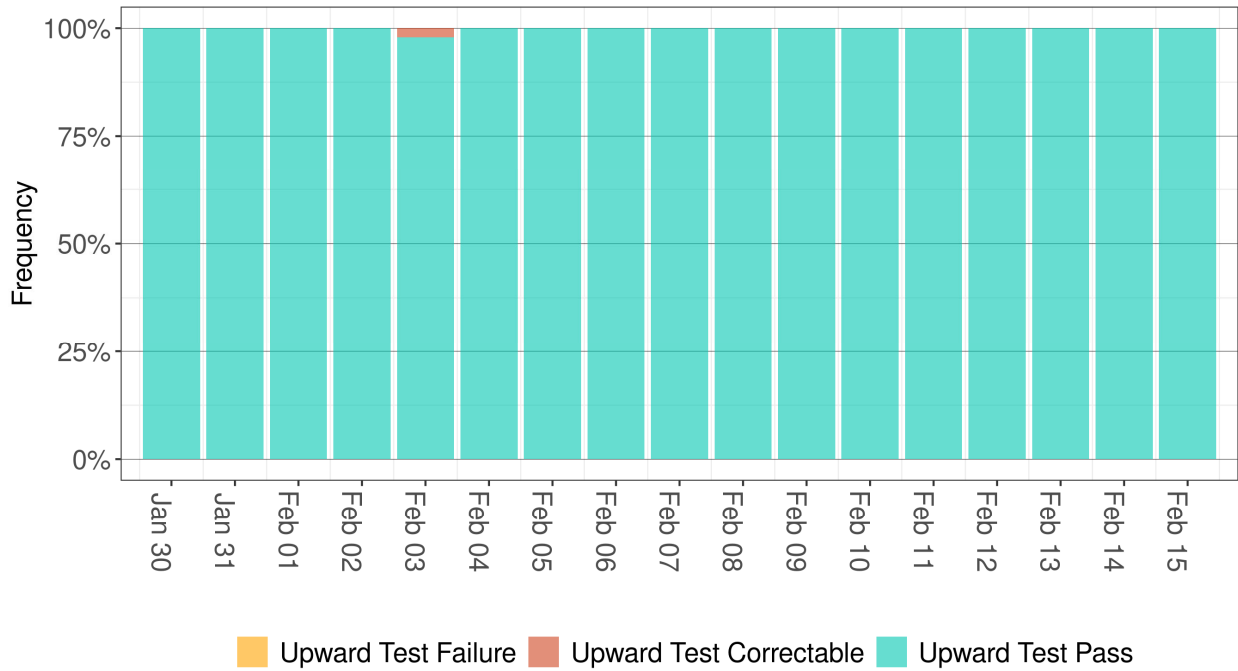
**Figure 3: Daily frequency of bid-range down capacity test results**





A third test carried out prior to 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 4 and Figure 5 show the daily frequency of flex ramp up and down test failures observed in the first seventeen days of parallel operation for the PNM BAA. From January 30 through February 15, PNM passed in 100 percent of the hours both the upward and downward flex ramp test. Two system issues affected the PNM's flexible ramp sufficiency test results, which are represented as correctable events in both Figure 4 and Figure 5. On February 3 and February 13, PNM failed the bid-range capacity test due to ISO parallel operations system issues that were described in the prior section. When an EIM BAA fails the bid-range capacity test, it automatically fails the flexible ramp sufficiency test. Since the ISO system issue resulted in the bid-range capacity test failure, the flexible ramp sufficiency failure is also classified as a correctable event.

**Figure 4: Daily frequency of flexible ramp up test results**



**Figure 5: Daily frequency of flexible ramp down test results**

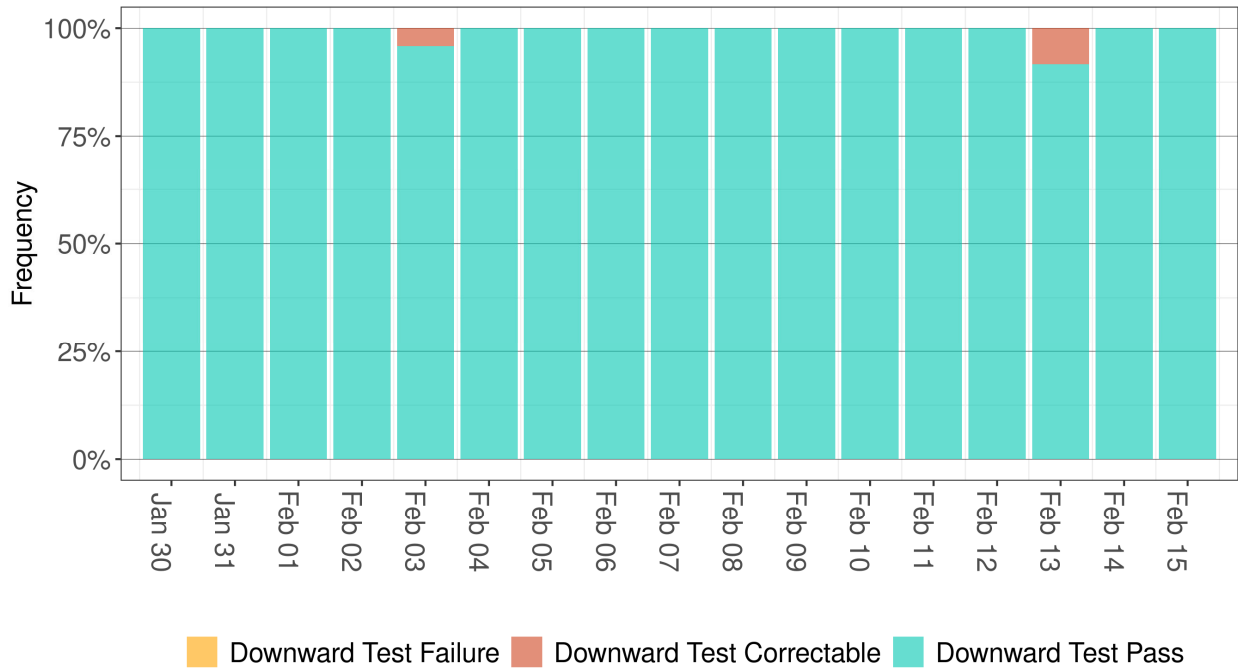
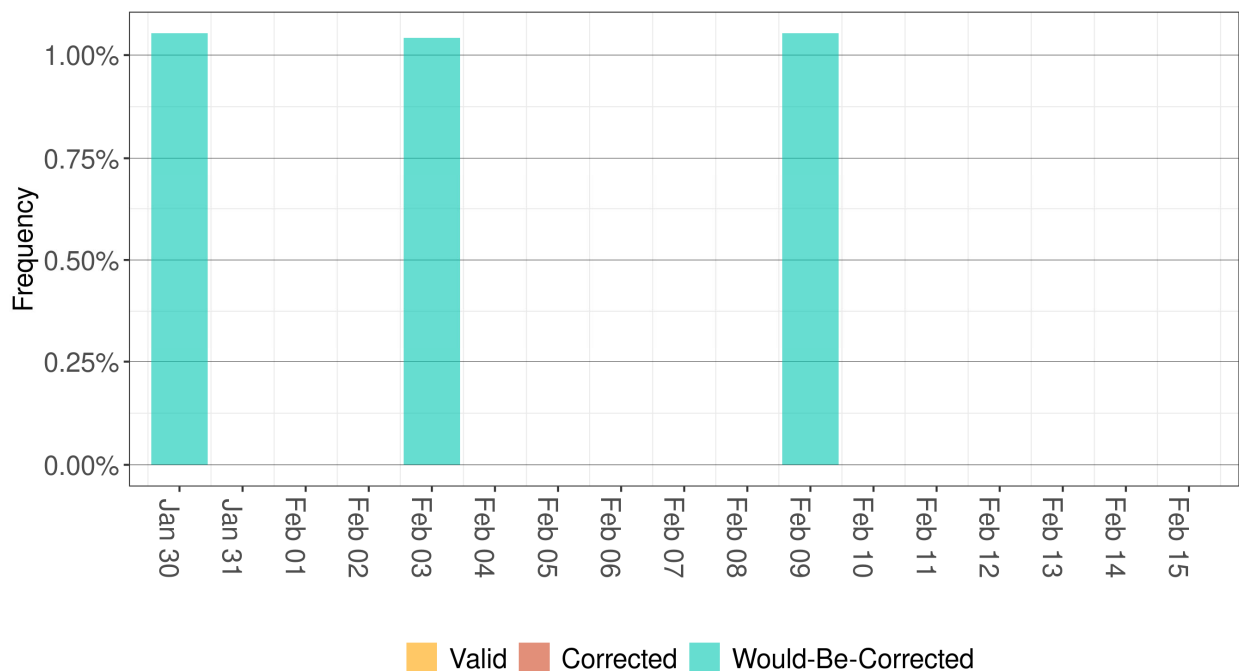


Figure 6 and 7 show the frequency of power balance constraint infeasibilities for under-generation generation conditions in both the fifteen-minute market (FMM) and real-time dispatch (RTD) markets. The power balance constraint infeasibilities are pegged to the corresponding penalty prices, of \$1000/MWh for under-supply infeasibilities, and about -\$150/MWh for over-supply infeasibilities. However, during parallel operations, the EIM market for PNM 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 Order<sup>1</sup>, 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 months. 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.

**Figure 6: Daily frequency of under-supply infeasibilities in the fifteen-minute market**

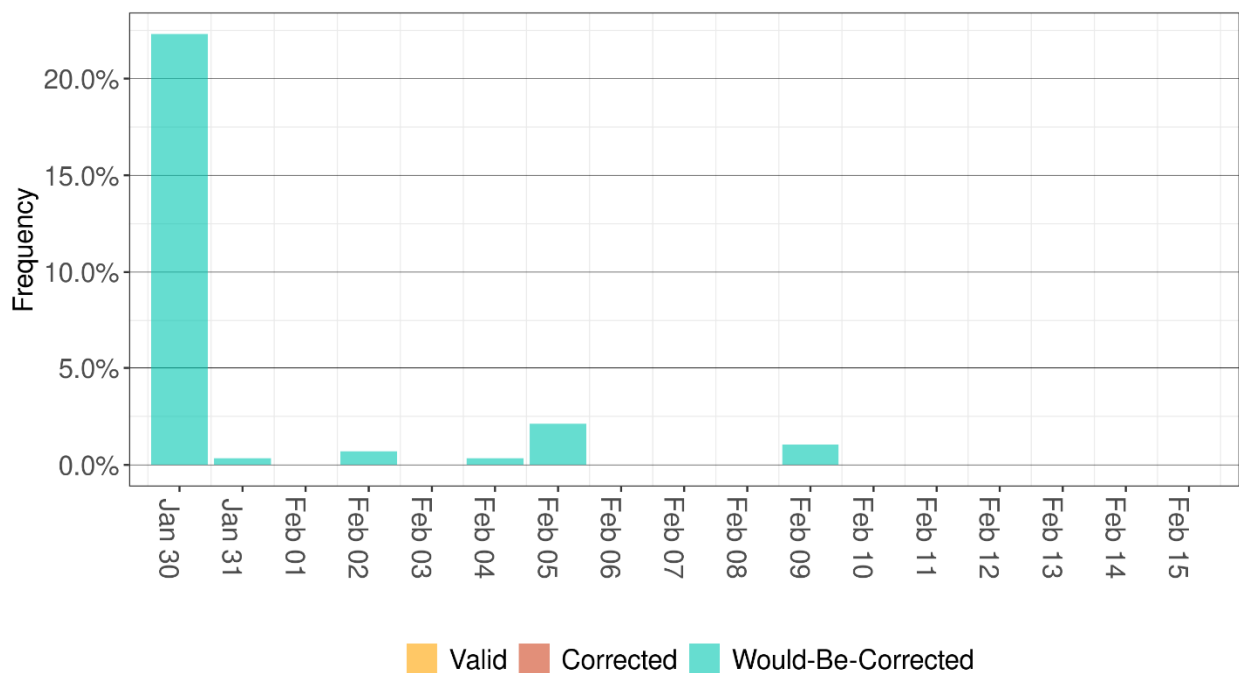


From January 30 until February 15 there were no valid under-supply infeasibilities for the PNM BAA in the FMM market. A data input error or software defect drove all the under-supply infeasibilities in the PNM BAA. The incorrect network topology set-up for the PNM BAA and lack of telemetry information for some

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

specific PNM generating resources drove the under-supply infeasibilities on January 30. Several PNM resources were disconnected in the market model even though they were online and producing energy. They were disconnected in the market model because the market was receiving incorrect switch position information from the field. For others, the market model had an incorrect mapping for the incoming switch position information. On February 3, the PNM BAA failed the bid-range capacity test and the flexible ramp sufficiency test due to an ISO system issue. These incorrect test failures and some of the generating units being disconnected from the market model drove the under-supply infeasibilities on February 3. The infeasibilities on February 9 were due to an issue with a failing the hourly pre-dispatch market for hour ending 13, which led to the initial conditions for all MSGs to be set to zero. After these MSGs were shut down, and with several of them having long minimum down times, they were not available afterwards, leading to under-supply infeasibilities. The section of Market Validation items describes both issues.

**Figure 7: Daily frequency of under-supply infeasibilities in the RTD market**



For the RTD market, PNM had no valid under-supply power balance infeasibility. The incorrect network topology issues that drove the fifteen-minute market under-supply infeasibilities on January 30, also drove the under-supply infeasibilities in the five-minute market between January 30 and February 5. On February 9, the under-supply infeasibility in the five-minute market was driven by the same issue that drove the under-supply infeasibilities in the fifteen-minute market. The previous paragraph describes this issue.

Figure 8 shows the daily average ELAP locational marginal prices (LMPs) for the FMM and the RTD. The average daily prices from January 30 through February 15 in FMM were ranging between \$24/MWh to \$156.79/MWh. The average daily RTD prices were ranging between \$14.05/MWh to \$188.09/MWh.

**Figure 8: Daily average prices in the real-time markets**

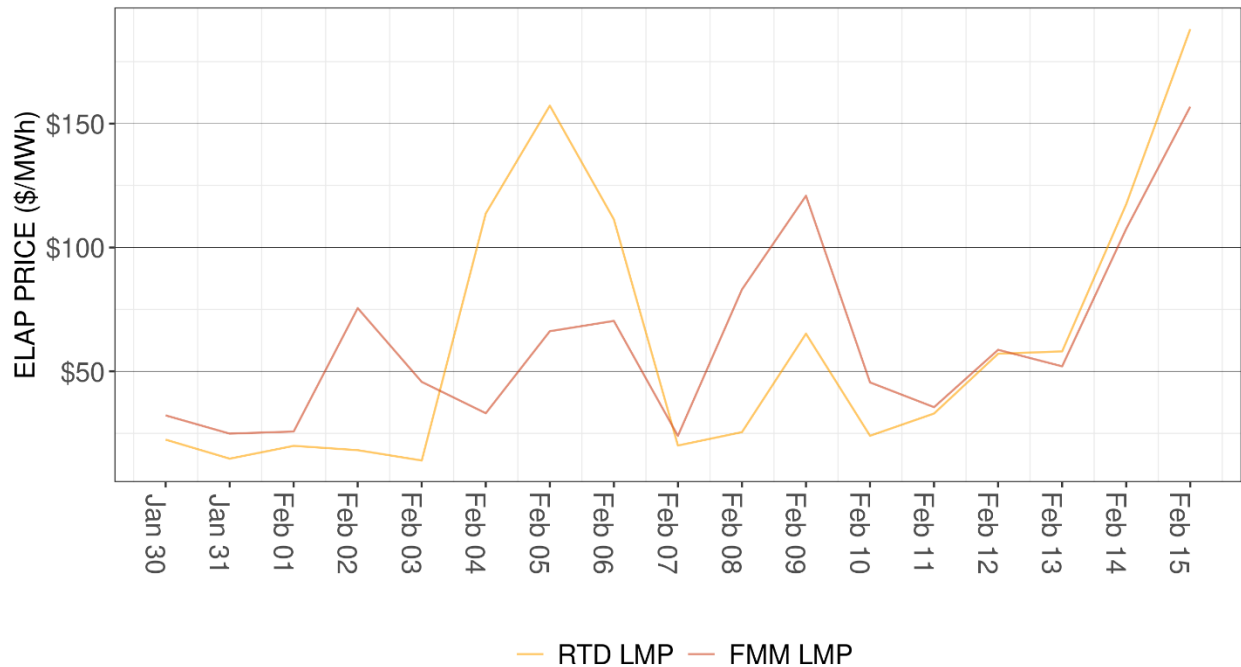
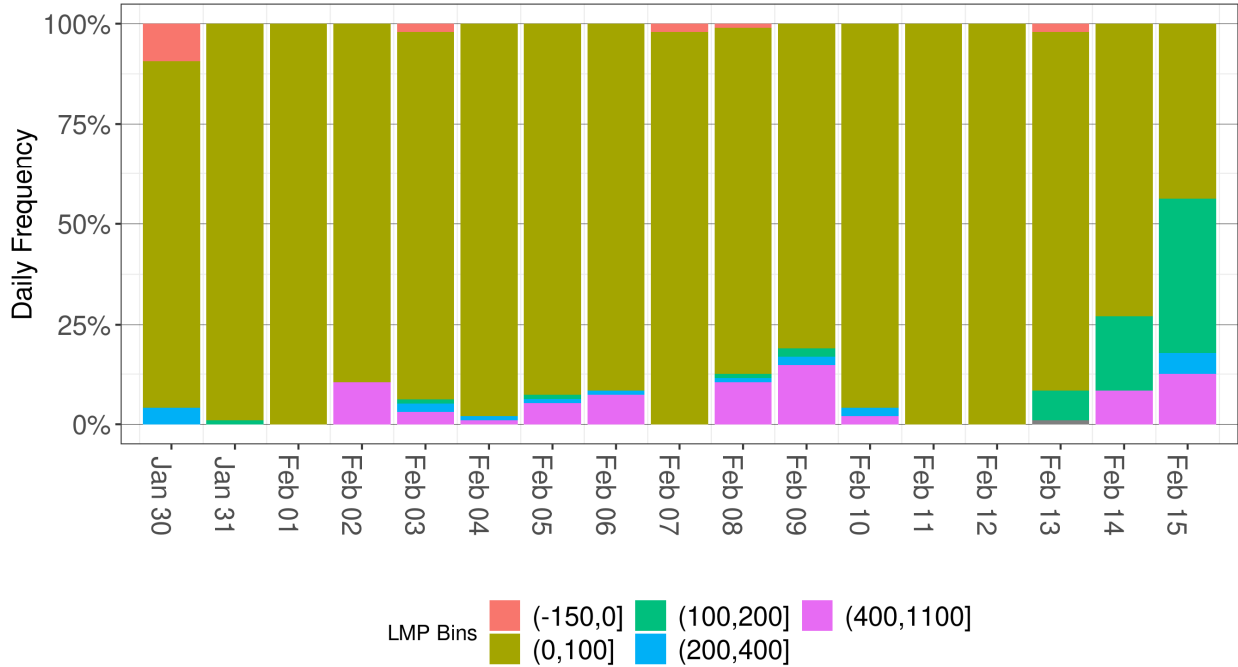
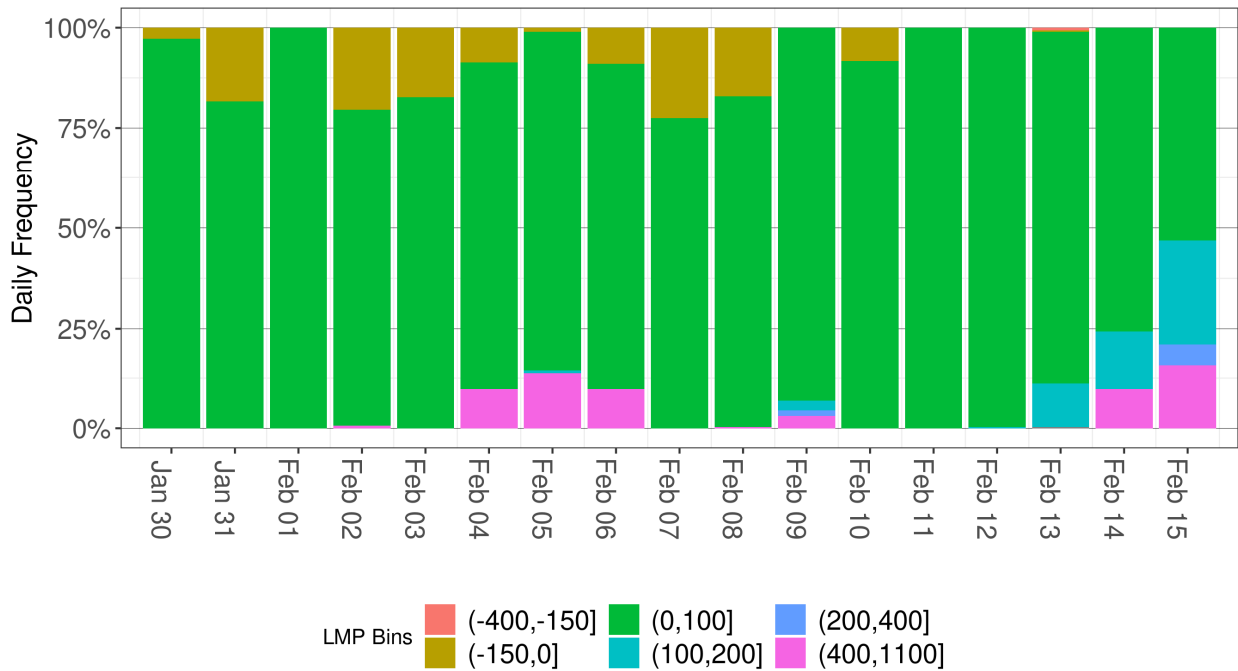


Figure 9 and 10 show the FMM ELAP prices and the RTD ELAP prices for the PNM BAA classified by price bins. For all trade dates from January 30, through February 15, about 89 percent of the FMM intervals observed prices between \$0/MWh and \$100/MWh. At the same time, 85 percent of the RTD prices were between \$0/MWh and \$100/MWh.

**Figure 9: Daily frequency of FMM prices organized by price ranges**

**Figure 10: Daily frequency of RTD 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 February 3, 2021, hour ending 12, in the ISO parallel operations environment, this automated process failed to transfer bids for several BAAs, including PNM BAA, 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 PNM failed the bid-range capacity test and hence the flexible ramp sufficiency test. 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 a production environment where all bids come to the market from one source.

### 2. Software Defects

During parallel operations, the ISO identified two software defects and a software set-up that affected PNM's market solutions.

#### a. MSG Initial Condition Issue

On February 9, 2021, a fifteen-minute market failed to generate a feasible solution, and the operators used the advisory solution from the prior fifteen-minute market. All EIM BAA resources would receive an advisory interval solution in such events. The next fifteen-minute market must use the advisory solution as the initial starting point to determine optimal dispatches. However, due to a software issue, the application set all multistage generating (MSG) resources initial condition to offline, thereby shutting down all MSG resources. In the absence of the software issue, all MSG resources would have remained online in the market. This software issue resulted in one under-supply power balance infeasibility in the fifteen-minute market and three under-supply power balance infeasibilities in the five-minute market. The fix for this issue is actually on production, but the uplift patch of the Parallel Operation environment was missing this fix at the start of parallel operation because the production fix came after the parallel operation started.

#### b. BSAP Manual Dispatch

All EIM entities submit their base schedules to BSAP, which performs validation to ensure that base schedules are consistent with resource operating characteristics. The generating resource physical characteristics are registered and maintained in the ISO master file application. During each trading hour, a scheduled or forced outage may reduce its operating range. Furthermore, PNM operators may choose to use manual dispatches to restrict the resource operating range due to current software limitations. The BSAP user interface displays the mismatch between the generation base schedules

and other outage restriction or manual dispatch restriction. Operators use this information to adjust generation base-schedules to pass the balancing tests. On February 2 and February 3, BSAP user interface considered a manual dispatch for PNM generating resources even though operators had canceled this manual dispatch. Currently, BSAP system does not receive any updates to existing manual dispatch for EIM BAAs. For instance, if an EIM BAA operator creates an exceptional dispatch with the start time of today and end time of two days from today. Subsequently, if the operator cancels the manual dispatch, the BSAP will continue to use this manual dispatch in its user interface displays even though it should exclude this manual dispatch. PNM failed the balancing test for 14 hours on February 2 and February 3 due to this issue.

The ISO has reported these two issues to the market application vendor and expects they will be addressed before PNM joins the EIM market.

## Conclusion

The ISO validated both prices and schedules based on input data fed through the market systems parallel operations from January 30 through February 15. 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 PNM 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 2nd day of March, 2021.

*/s/ Jacqueline Meredith*

Jacqueline Meredith  
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