

March 2, 2018

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

**INFORMATIONAL FILING – NO NOTICE REQUIRED**

**Re: California Independent System Operator Corporation  
Informational Readiness Certification for Powerex’s Participation in  
the Energy Imbalance Market  
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 Powerex Corp. (Powerex), has determined that, following market simulation and an adequate period of parallel operations, the CAISO and Powerex have met all readiness criteria specified in section 29.2(b)(7) of the CAISO tariff. In support of this determination, the CAISO hereby submits the sworn CAISO affidavit of Petar Ristanovic, Vice President of Technology, and the sworn Powerex declaration of Thomas Bechard, President and Chief Executive Officer of Powerex. This filing certifies the readiness of the CAISO and Powerex to proceed with Powerex’s participation in the CAISO’s Energy Imbalance Market (EIM) on April 4, 2018, without exception, consistent with the requirement to submit a market readiness certificate at least 30 days prior to the implementation date for an entity participating in the EIM.

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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).

## I. Background

The EIM provides entities located outside of the CAISO balancing authority area 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. The CAISO's 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 attestation 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.

On November 3, 2017, the CAISO filed four agreements that set forth the legal obligations and operational rules that will govern Powerex's participation in the EIM as a Canadian EIM Entity, and a Data Sharing Agreement between the CAISO and Powerex's parent company, the British Columbia Hydro and Power Authority (BC Hydro), pursuant to which BC Hydro will provide specified data and information to facilitate Powerex's EIM participation. As a Canadian EIM Entity, Powerex will comply with the CAISO tariff provisions applicable to EIM entities, with certain exceptions and modifications to account for Powerex's EIM participation with residual capability of the BC Hydro system. The Powerex agreements and the BC Hydro Data Sharing Agreement were all accepted by Commission letter order dated February 14, 2018.<sup>7</sup>

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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> March 16 Order 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> Letter Order dated February 14, 2018, Docket No. ER18-251.

Section 4.2.2 of the Powerex Canadian EIM Entity Agreement provides that Powerex will satisfy all applicable readiness criteria set out in section 29.2(b)(7), including, where appropriate, coordinating with BC Hydro and the CAISO to ensure satisfactory communication of relevant data and information. In other words, Powerex will be treated like all EIM entities regarding readiness certification, without exception, and is expected to coordinate with BC Hydro with respect to communication of data and information shared with the CAISO by BC Hydro pursuant to the Data Sharing Agreement.

## **II. Readiness Reporting, Determination, and Attestations**

The CAISO and Powerex ran market simulation scenarios from January 1, 2018 to January 31, 2018. Parallel (*i.e.*, financially nonbinding) operations, which began on February 1, 2018, will run through at least February 28, 2018 and, in any event, will continue to be supported and available to Powerex until April 4, 2018. During market simulation and parallel operations the CAISO and Powerex have engaged in daily discussions to track progress and confirm the status of each readiness criterion, including coordination with BC Hydro, 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>8</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 Powerex’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 Powerex, in coordination with BC Hydro, to validate performance of the systems and processes under a variety of structured scenarios. The market simulation dashboard dated January 31, 2018 demonstrated that the CAISO and Powerex were ready to enter parallel operations. Having achieved the benefits from market simulation, the CAISO and Powerex transitioned to parallel operations on February 1, 2018.

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 Powerex, in coordination with BC Hydro, 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

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<sup>8</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 Powerex entry at: <http://www.caiso.com/informed/Pages/ReleasePlanning/Default.aspx>.

Powerex to understand the interaction between resource plans, base schedules, outage management, and the CAISO full network model. This period has also allowed the CAISO to identify and resolve software issues. The dashboard posted February 21, 2018 showed the progress during initial parallel operations as additional readiness criteria were met. The final dashboard, dated March 1, 2018, 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 Powerex's compliance with criteria. The dashboard shows that all readiness criteria have been satisfied or will be satisfied by April 4, 2018.

CAISO tariff 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 Petar Ristanovic, Vice President of Technology and the sworn Powerex declaration of Thomas Bechard, President and Chief Executive Officer of Powerex, in satisfaction of this requirement.

The two corporate attestations 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 Powerex is prepared to enter financially binding production EIM operations on April 4, 2018. 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 Powerex has identified any exception to any of the readiness criteria.

Notwithstanding satisfaction of all applicable readiness criteria, one of the eight principles set out in CAISO and Powerex's Implementation Agreement has not yet been achieved. Specifically, Powerex has informed CAISO that none of the three existing default energy bid options under the CAISO tariff will "provide Powerex with sufficient flexibility to reflect the opportunity costs associated with the use of an external multi-facility hydro system with long-term multi-year

storage capability.”<sup>9</sup> Although CAISO and Powerex have agreed to a default energy bid for use on an interim basis, Powerex remains concerned of the impacts the use of the interim default energy bid may have on its participation in the EIM based on its observations when mitigation was applied during parallel operations. The CAISO understands that Powerex expects it will materially reduce its participation in the EIM during certain hours, or on certain days, when it anticipates mitigation will result in the uneconomic dispatch of its aggregate participating resource. This remedial action is likely to persist until the default energy bid is resolved and will result in a lower overall initial participation level than Powerex had originally expected. Powerex anticipates addressing this final implementation issue in conjunction with an upcoming CAISO stakeholder process commencing in the second quarter of 2018.<sup>10</sup> Both CAISO and Powerex have concluded that this remaining implementation issue will not affect Powerex’s readiness to begin participation in the EIM on April 4, 2018.

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

Parallel operations allowed the CAISO and Powerex to identify and resolve numerous input, process, and software issues prior to the commencement of financially binding operations.<sup>11</sup> The CAISO and Powerex 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 need to reflect Bonneville Power Administration (BPA) transmission system rate of change constraints associated with the use of Powerex’s transmission rights in the EIM is an important consideration with respect to Powerex parallel operations. These rate of change constraints limit the 5-minute

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<sup>9</sup> See Cal. Indep. Sys. Operator Corp., Filing of CAISO Rate Schedule No. 92, Powerex EIM Implementation Agreement at 6, Docket No. ER17-1796-000 (June 9, 2017); *id.* Att. A, Powerex EIM Implementation Agreement § 14(g).

<sup>10</sup> CAISO plans to further consider the application of the existing default energy bid structure to hydroelectric resources as part of its EIM Offer Rules initiative. See 2017 Final Policy Initiatives Roadmap at 11 (Jan. 12, 2018), *available at* <http://www.caiso.com/Documents/2018FinalPolicyInitiativesRoadmap.pdf>.

<sup>11</sup> The market quality report on parallel operations dated March 1, 2018 explains how each of these issues impacted the market results and how they were resolved by the CAISO and Powerex.

flow impact on certain BPA flowgates modeled in the market.<sup>12</sup> In production, the rate of change constraints will limit the five-minute dispatch changes of the combined set of participating resources. In parallel operations the currently participating resources' actual movement is streamed from the production system that doesn't include Powerex. Therefore, Powerex aggregate participating resources are dispatched in parallel operations to meet the combined flow limit given the actual movement of participating resources from production. This puts more stringent constraints on the 5-minute dispatch changes of Powerex aggregate participating resources in parallel operations compared to what will happen when Powerex aggregate participating resources are in production. In production, the responsibility to meet the flow impact limit on Bonneville's system will be distributed among the combined set of EIM participating resources.

Notwithstanding these differences and challenges, the CAISO validated both prices and schedules based on the data input to the market systems throughout the first 15 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 Powerex are ready to operate in production.

## **V. Attachments**

The following attachments, in addition to this transmittal letter, are provided with the instant filing:

- Attachment A: Readiness Dashboard Report;
- Attachment B: Affidavit of Petar Ristanovic;
- Attachment C: Affidavit of Thomas Bechard; and
- Attachment D: Parallel Operations Market Quality Report.

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<sup>12</sup> The CAISO and BPA coordinate the exchange of information and limits associated with modeling and managing the impact of the EIM on BPA flowgates within the BPA balancing authority area in accordance with the Coordinated Transmission Agreement. See Docket No. ER17-1493-000, Letter Order dated June 20, 2017.

## VI. 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 Powerex will notify the Commission in the event of any subsequent determination that the implementation of Powerex into the EIM on April 4, 2018 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**  
**EIM Readiness Certification for Powerex Corp.**  
**California Independent System Operator Corporation**



Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements <sup>1</sup>	Threshold	Owner	Status	Evidence	Tariff Mapping
1	Prospective EIM Entity Full Network Model Integration	Generation, Interchange and Load comparison	Load, EIM Internal Inertia and EIM External Inertias, and Generating Unit definition in the Full Network Model is consistent with the Load, EIM Internal Inertia and EIM External Inertias, 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. Discrepancies, if any, are accounted for in terms of imbalance adjustment.	CAISO	Complete	The CAISO provided reports indicating that the Generating Unit, Inertia and Load definition in the CAISO's Full Network Model is consistent with the network modeling information in the Powerex/BC Hydro network model.	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	The CAISO provided reports indicating Critical and used SCADA measurements that Powerex/BC Hydro is publishing match 99.7% to the values seen by the CAISO when excluding telemetry error measurement points that the CAISO receives from PEAK RC.	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	The CAISO provided reports indicating that the CAISO state estimator is solving on 30-second continuous basis on the IS EMS system and the solution is converging 100% of the time.	Tariff section 29.2(b)(7)(A)(iii)
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	Powerex provided an email stating that they have no non-conforming loads that meet the criteria. The CAISO confirmed.	Tariff section 29.2(b)(7)(A)(iv)
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	The CAISO provided the Agreement Checklist as evidence that all agreements are complete. Several documents listed in the Agreement Checklist were executed outside the timeframe outlined in Section 5 of the EIM BPM, but were executed in sufficient time to meet readiness.	Tariff section 29.2(b)(7)(K)(i)

<sup>1</sup> Powerex's participation in the EIM is governed by the terms and conditions of the Powerex Canadian EIM Entity Agreement. Under Section 4.2.2 of the Powerex Canadian EIM Entity Agreement, Powerex will satisfy all applicable readiness criteria, including, where appropriate, by coordination with BC Hydro and CAISO to ensure the satisfactory communication of relevant data and information to the CAISO pursuant to the CAISO-BC Hydro Data Sharing Agreement.

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements <sup>1</sup>	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 <ul style="list-style-type: none"> <li>· “100 series”– an introduction to Energy Imbalance Market training</li> <li>· “200 series”– the specific hourly and daily tasks and duties for normal operation training module; and</li> <li>· “300 series”– the assessment of market results and response to contingencies and abnormal situations training module.</li> </ul>	PWX	Complete	Powerex provided an email confirming that all necessary staff completed the mandatory training.	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"> <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	The CAISO provided an email and reports as evidence indicating that all PI tags and historical data has been delivered to the CAISO, and forecast models have been developed.	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	The CAISO provided an email and reports as evidence indicating VER forecasts have been submitted and the data flow has been demonstrated.	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	The CAISO provided an email stating that the CAISO established the flexible capacity requirements based on recent load/VER forecasts.	Tariff section 29.2(b)(7)(K)(iv)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements <sup>1</sup>	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.	PWX	Complete	Powerex elected the option under the CAISO Tariff not to rely on the CAISO Demand Forecast and will instead use BC Hydro's load forecast. As a result, the balancing test is not applicable for Powerex implementation.	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.	PWX	Complete	The CAISO provided reports indicating that Powerex has met the flexible ramping sufficiency test (both Up and Down) for at least 22 hours per day for at least 5 days.	Tariff section 29.2(b)(7)(D)(iii)
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	Powerex elected the option under the CAISO Tariff not to rely on the CAISO Demand Forecast and will instead use BC Hydro's load forecast. As a result, the capacity test is not applicable for Powerex implementation.	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	Powerex sent email evidence that this is complete. While Powerex notes it received CAISO operating procedures less than four months prior to the parallel operations date, the materials were received in sufficient time to meet readiness.	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.	PWX	Complete	Powerex reported that operating procedures are in place.	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.	PWX	Complete	Powerex provided the testing timeline summary document reflecting that all functional testing completed.	Tariff section 29.2(b)(7)(E)(i)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements <sup>1</sup>	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.	PWX	Complete	Powerex provided the testing timeline summary document reflecting that all system integration testing completed.	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.	PWX	Complete	Powerex provided an email stating that access is in place for Parallel Ops and a plan is in place for production.	Tariff section 29.2(b)(7)(E)(iii)
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	Powerex provided the testing timeline summary document reflecting that all interface testing completed.	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	Powerex provided the testing timeline summary document reflecting that day in the life testing completed.	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	While the market functionality was successfully verified for all Structured Scenarios during Market Simulation, there were three Scenarios in which Powerex and the CAISO were unable to verify the accuracy of the associated settlements statements.  Powerex and the CAISO evaluated the settlement outcomes associated with similar scenarios during Parallel Operations. Powerex provided email evidence that the settlements verification associated with the outstanding scenarios is complete. The CAISO confirmed and provided the structured scenario progress chart and execution documents as supporting evidence.	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	Powerex provided an email stating the unstructured scenarios were executed and passed validation.	Tariff section 29.2(b)(7)(I)(iv)

Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements <sup>1</sup>	Threshold	Owner	Status	Evidence	Tariff Mapping
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	PWX	Complete	The CAISO Market Quality provided market reports indicating that the market results are appropriate based on the inputs. Due to delayed timing, the market results were not approved during market simulation but this did not impact readiness.	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	The CAISO Market Quality team provided reports showing that the market simulation prices and MW schedules/dispatches that were validated by the CAISO in preparation for Parallel Operations.	Tariff section 29.2(b)(7)(I)(vi)
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	The CAISO Market Quality team provided a detailed market quality report and an email summarizing that the CAISO validated both prices and schedules and the market solution is consistent with market rules as designed.	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	Powerex provided an email stating they received Stage environment access for all the resource IDs required to support EIM participation.	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	Powerex provided an email stating that it has reviewed the Settlements Statements and is generally satisfied with the results, with the exception of the Real-Time Congestion Offset (RTCO) and Real-Time Imbalance Energy Offset (RTIEO) charge codes.  The CAISO has identified a software issue associated with the settlement treatment of the new BASE ETSR functionality that materially impacts both charge codes. The CAISO has provided email confirmation that it is satisfied with the settlements results pending a software fix to correct these particular charge codes. The CAISO has confirmed that delivery of the software fix will fully meet this threshold prior to April 4, 2018.	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	Complete	Powerex provided an email stating that this is not applicable for Powerex. The CAISO responded with agreement.	Tariff section 29.2(b)(7)(F)(ii)



Readiness Criterion Identifier	Readiness Category	Criteria	Measurable Elements <sup>1</sup>	Threshold	Owner	Status	Evidence	Tariff Mapping
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	The CAISO Market Quality produced reports and verified that the market monitoring data is available. DMM send an email confirming they also have access to the data for validation.	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	The CAISO provided an email with supporting reports stating that the CAISO has verified that the Parallel Operations ran consistently within normal CAISO disruption tolerances.	Tariff section 29.2(b)(7)(J)
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 derates, and generation out-of-service outage tickets within the required timelines.	JOINT	Complete	Powerex submitted outages in the Map Stage environment. The CAISO confirmed that these were received and processed in the CAISO systems.	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.	PWX	Complete	Powerex sent email evidence that these processes are in place.	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	PWX	Complete	Powerex sent email evidence that their staff has been trained on the communication procedures and tools.	Tariff section 29.2(b)(7)(H)(ii)
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	PWX	Complete	The CAISO has provided email confirmation that Bonneville Power Administration (BPA) and the CAISO have agreed to update the Coordinated Transmission Agreement (CTA) as required to include Powerex's EIM Participation. The CAISO has confirmed it will implement the additional modeling changes which will fully meet this threshold prior to April 4, 2018.	Tariff section 29.2(b)(7)(H)(iii)
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	PWX	Complete	Powerex provided an email listing the resources they intend to designate with ABC and that the feature has been tested.	Tariff section 29.2(b)(7)(K)(iii)

**Attachment B – Affidavit of Petar Ristanovic**  
**EIM Readiness Certification for Powerex Corp.**  
**California Independent System Operator Corporation**

Affidavit of Petar Ristanovic Certifying Readiness of  
Powerex Corp. (Powerex) to Operate as an EIM Entity

I, Petar Ristanovic, Vice President of Technology for the California Independent System Operator Corporation (CAISO), hereby certify as follows:

1. As the Vice President of 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 Powerex 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 Powerex's April 4, 2018 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 Powerex will be ready to implement Powerex into the Energy Imbalance Market on April 4, 2018.
4. I will ensure that the CAISO maintains resource commitments necessary to sustain readiness through April 4, 2018 and address any unexpected conditions that may arise before April 4, 2018 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 Powerex on April 4, 2018 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 4, 2018.

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

  
\_\_\_\_\_

Petar Ristanovic, Vice President of Technology

March 2, 2018



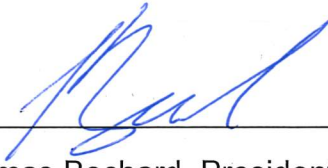
**Attachment C – Affidavit of Thomas Bechard**  
**EIM Readiness Certification for Powerex Corp.**  
**California Independent System Operator Corporation**

Declaration of Thomas Bechard Certifying Readiness of  
Powerex Corp. ("Powerex") to Operate as a Canadian EIM Entity

I, Thomas Bechard, President and Chief Executive Office of Powerex, hereby certify as follows:

1. As President and Chief Executive Officer of Powerex, I am responsible for oversight of the systems and processes that support and enable Powerex's participation in the Energy Imbalance Market ("EIM") operated by the California Independent System Operator ("CAISO"). As such, I have overall responsibility for the implementation of Powerex's entry into that market.
2. Powerex's participation in the EIM is governed by the terms and conditions of the Powerex Canadian EIM Entity Agreement. Under Section 4.2.2 of the Powerex Canadian EIM Entity Agreement, Powerex will satisfy all applicable readiness criteria, including where appropriate, by coordination with BC Hydro and CAISO to ensure the satisfactory communication of relevant data and information to the CAISO pursuant to the CAISO-BC Hydro Data Sharing Agreement.
3. 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 Energy Imbalance Market have been satisfied or are expected to be satisfied as of Powerex's April 4, 2018 implementation date.
4. 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 the CAISO and Powerex will be ready to implement Powerex into the Energy Imbalance Market on April 4, 2018.
5. I will ensure that Powerex maintains resource commitments necessary to sustain readiness through April 4, 2018 and address any unexpected conditions that may arise before April 4, 2018 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.
6. Actual implementation of Powerex on April 4, 2018 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 such unexpected issues are not resolved as of April 4, 2018.

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



---

Thomas Bechard, President and Chief Executive Officer  
Powerex Corp.

March 2, 2018

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

**EIM Readiness Certification for Powerex Corp.**

**California Independent System Operator Corporation**

# **Market Validation of Parallel Operations for Powerex Canadian EIM Entity**

**March 1, 2018**

## Contents

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## Executive Summary

Parallel operations activities of the Energy Imbalance Market (EIM) started on February 1, 2018 for purposes of evaluating the readiness of Powerex (PWRX) to participate in the EIM as a Canadian EIM Entity. The readiness criteria requires the ISO to provide a market performance report for the period of parallel operations carried out for the integration of PWRX 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 PWRX. This report encompasses both the fifteen and five-minute real-time markets.

The ISO validated both prices and schedules based on input data that was fed through the market systems during parallel operations from February 1 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 PWRX, as well as the supporting data transfers from BC Hydro to the ISO, 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 PWRX with an opportunity to go over specific day-to-day processes and activities required for the operation of the EIM. This set-up provides PWRX 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 has some 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 of 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 market resources of the prospective EIM entity (ies) may not 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 closely the market instructions. Therefore, the information regarding the resource's performance fed back to the market systems may or may not be related to the dispatch instruction issues through the parallel operations environment.
- ii) In actual operations, inertie resources require a closed loop for the market system to fully reflect the system and market conditions and inertie 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.

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.

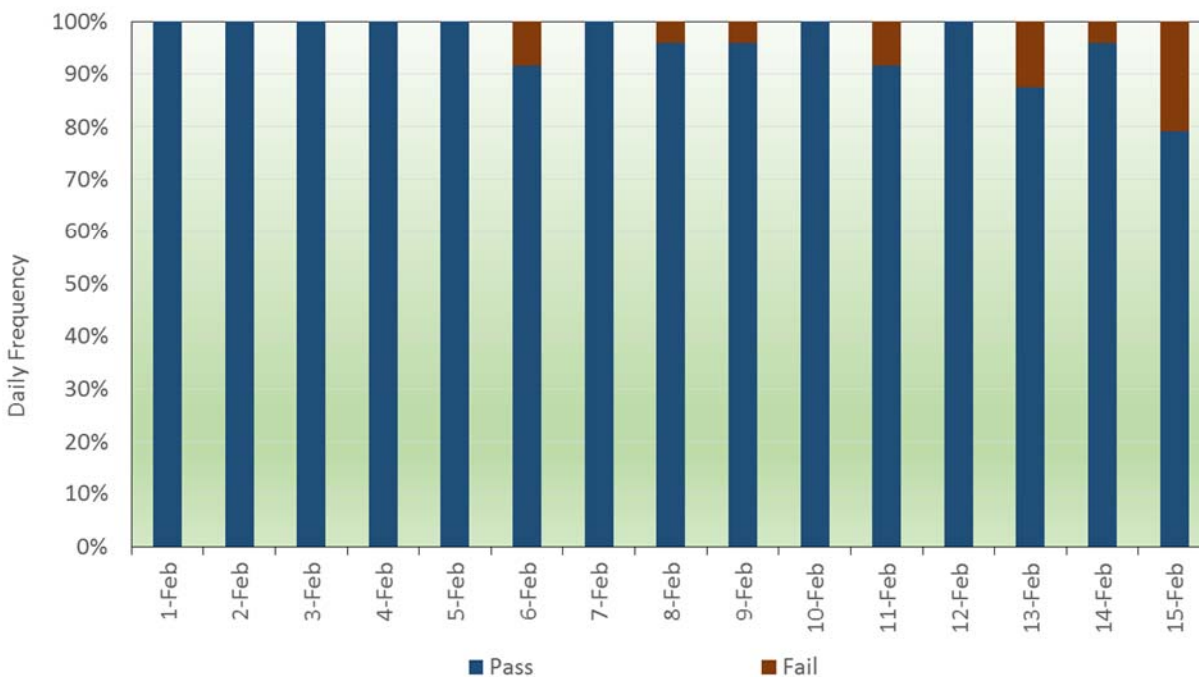


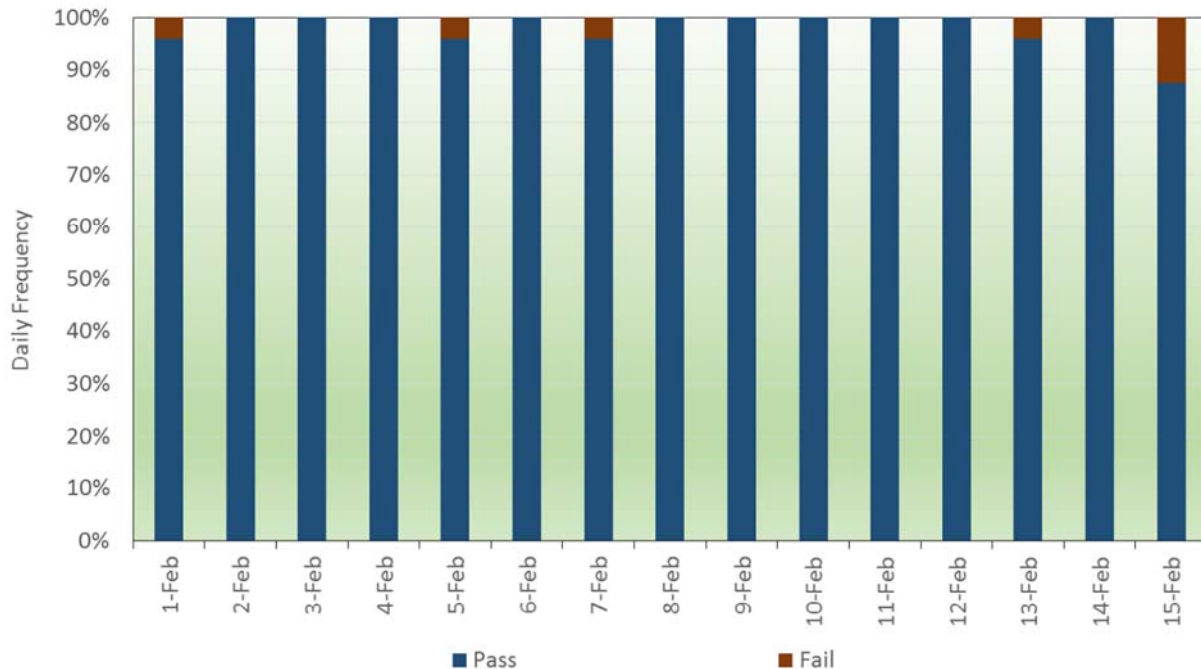
## Market Trends

PWRX has elected that BC Hydro will provide its own load forecast to support PWRX’s EIM participation instead of using a load forecast provided by ISO. Thus, ISO will not be performing the balancing test and bid range capacity test as per section 29.34(k) of the CAISO tariff. Consistent with the requirements stated in the Energy Imbalance Market BPM section 11.3.2 Resource Sufficiency Evaluations: if PWRX does not use CAISO’s forecast, then it will be subject to over-scheduling or under-scheduling penalties for actual load imbalances.

Although no balancing or capacity tests are performed for PWRX, the flexible ramp sufficiency test is performed as required by section 27.34 (m) of the ISO tariff. The flexibility test evaluates whether the Canadian EIM Entity has sufficient flexible capacity to meet its both upward and downward ramp requirements based on submitted energy at the time. Figure 1 shows the daily frequency of flex ramp up test failures observed in the first 15 days of parallel operation for PWRX, and Figure 2 shows the daily frequency of flex ramp down test failures observed in the first 15 days of parallel operations. For the first fifteen days, PWRX passed the flex ramp up test in 95.83 percent of hours and passed the flex ramp down test in 98 percent of hours. PWRX passed the flex ramp up test 100 percent of the hours on all five days between February 1 and February 5 and passed the flex ramp down test 100 percent of the hours on all five consecutive days between February 8 and February 12, satisfying the corresponding readiness criteria for this test.

**Figure 1: Daily frequency of flexible ramp up test results**



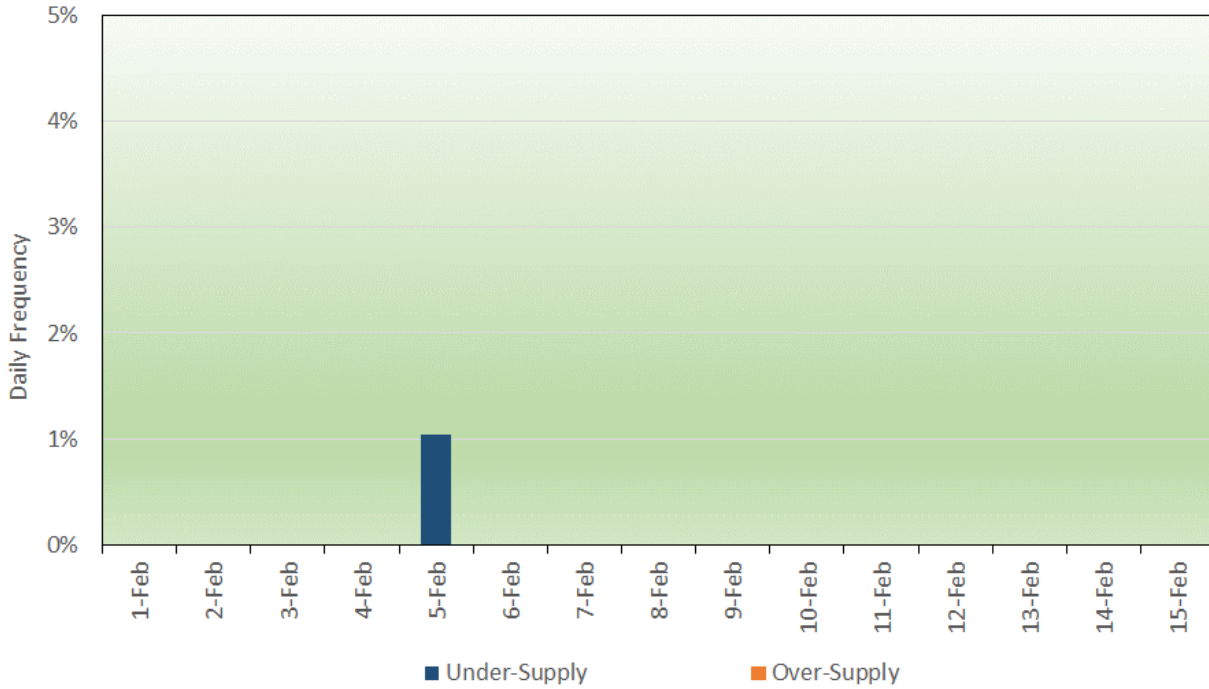
**Figure 2: Daily frequency of flexible ramp down test results**


Figures 3 and 4 shows the frequency of power balance infeasibilities for both under-generation and over-generation conditions in both the FMM and 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 PWRX has been set-up to run under the conditions reflecting the price discovery mechanism that is in effect under the transitional measurement period (the first six months in actual production system); under this functionality, when a power balance constraint is infeasible, the market will reflect the last economical signal instead of the penalty prices. During the first six months, which is a transitional period, pricing is based on the FERC Order<sup>1</sup> which grants the prospective EIM entity (here, the prospective Canadian 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 Canadian EIM Entity from getting administrative penalty prices during the first six month of gaining production experience for the timely response to inform the market about manual actions that are taken or decided outside the market to maintain reliability, such as deployment of operating reserve in response to forced outages. During the first fifteen days of parallel operations a single interval infeasibility was observed on February 5, 2018 in the fifteen-minute markets and no infeasibilities in five-minute market. The single interval infeasibility on February 5, 2018, for the fifteen-minute market occurred for the hour ending 18 interval four due to an ISO’s system issues when

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

the market application was missing base schedules for all of the PWRX's non-participating resources (non-participating resources submit base schedules but no bids) for the subsequent hour.

**Figure 3: Daily frequency of supply infeasibilities in the fifteen-minute market**



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



As a result, the market started ramping down these non-participating resources to take them offline. The next fifteen-minute market received the base-schedules for these non-participating resource, so there were no infeasibilities for the subsequent intervals.

Figures 5 and 6 show the daily average ELAP LMPs for the fifteen-minute market and the five-minute markets. The average daily prices from February 1 through February 15 in the fifteen-minute market were between \$17 and \$32.30. The average five-minute prices were between \$13 and \$22.

**Figure 5: Daily average of fifteen-minute prices**

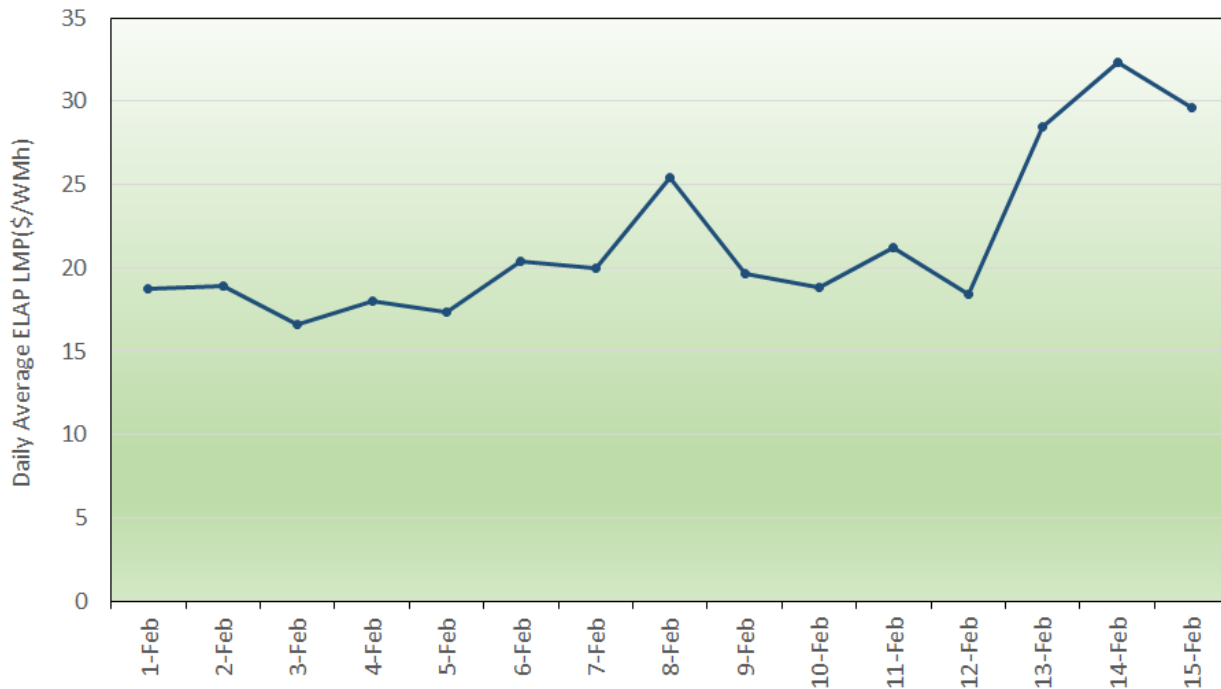
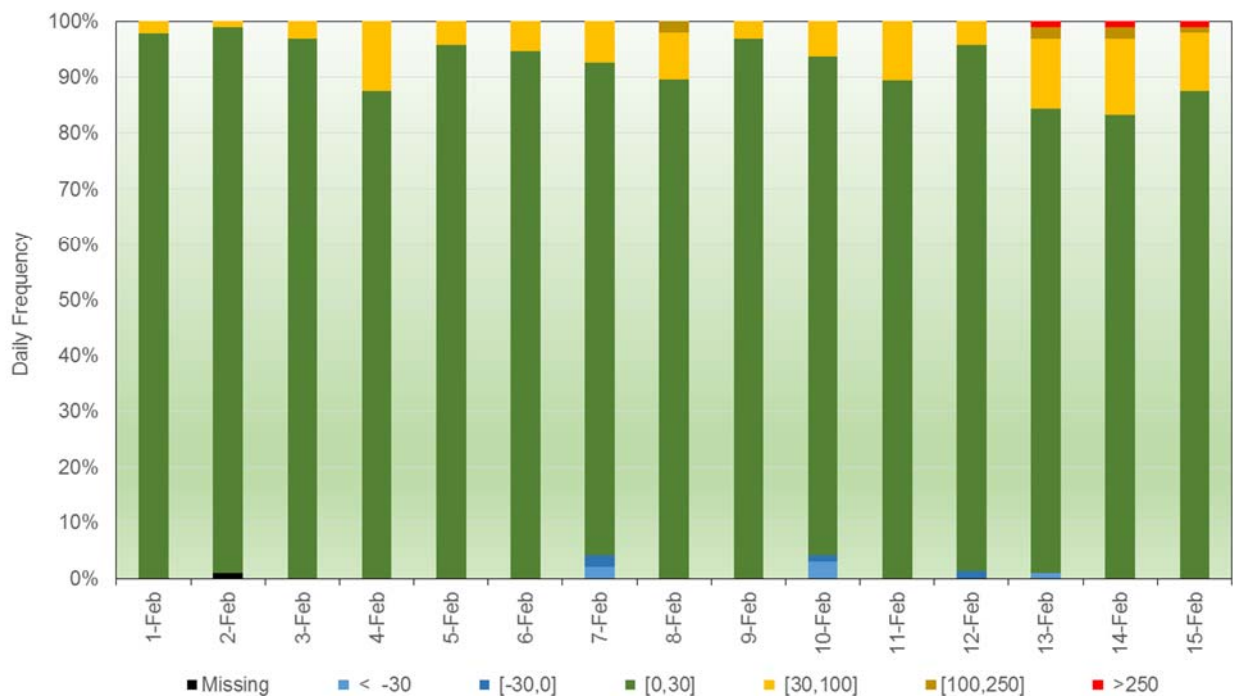


Figure 6: Daily average of five-minute prices



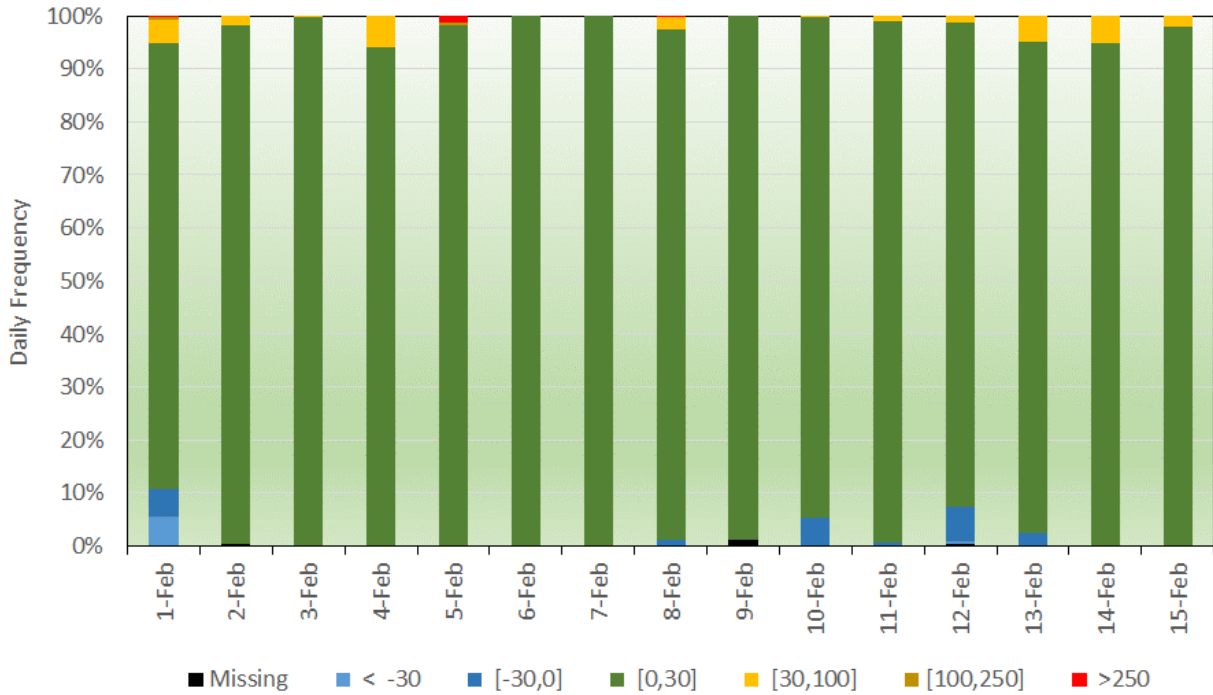
Figure 7 shows the fifteen-minute ELAP prices classified by price bins and figure 8 shows the five-minute ELAP prices classified by the same price bins.

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



For all trade dates from February 1 through February 15, 96 percent of the fifteen minute ELAP LMPs were between \$0 and \$100, at the same time, in the five-minute market, 95 percent of the ELAP LMPs were between \$0 and \$100.

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



## Market Validation Items

### 1. Rate of change congestion

The rate of change constraints may limit power flow contributions from resources or EIM transfers on interties or transmission corridors in external BAAs. During parallel operations it was identified that some of the rate of change constraint limits were too restrictive. Due to this, Available Balancing Capacity (ABC) was dispatched on some of PWRX's non-participating resources. A software issue was identified that related to pricing when ABC is dispatched on non-participating resources, this issue is described in detail in a subsequent section.

### 2. System Issues

Type of issue: Software applications

During the first fifteen days of parallel operations, PWRX and ISO observed some applications issues, which resulted in bids and base schedules not being submitted in time to the market applications. On February 5, 2018, 40 minutes before the trading hour, the market application was missing base schedules for all of the PWRX's non-participating resources (non-participating resources submit base schedules but no bids). The issue was caused by the failure of the merge process that the ISO put in place to merge the PWRX base schedules submitted on the parallel operation system with the base schedules submitted on production system for existing EIM entities. As a result, the market started ramping down these non-participating resources to take them offline. This condition resulted in power balance infeasibilities for PWRX. On February 13 hour ending one, PWRX failed the flexible ramping up test due to a system access issue that prevented submission of base schedules and bid into the ISO systems. The missing bids in the ISO system resulted in lack of upward capacity. Both of these instances were based on application issues specific to Parallel Operations and are not expected to occur in the production environment.

### 3. Price Formation

Type of issue: ABC dispatch and price formation, Buffer Interval RTPD

During parallel operations, ISO has identified two software defects that impacted price formation. First, in the fifteen-minute market, a PWRX resource price was affected by an incorrect set-up for the flex ramp constraint. Each fifteen-minute market run spans a minimum of four fifteen-minute intervals and a maximum of seven fifteen-minute intervals such that the market can issue start-up and shut-down instructions for resources (with start-up time between fifteen-minutes up to one hour) based on future changes in demand. The first interval of the multi-interval market is considered the buffer interval and the second interval is known as the binding financial interval because the resource dispatches and prices

from this interval are used for settlement purposes. There was an issue in the formulation of the flex ramp constraint in the buffer interval that impacted the price for the binding interval such that the binding interval prices were much higher than the marginal resource bid. Second, available balancing capacity (ABC) was dispatched on a non-participating resource in scheduling run in the five minute due to congestion on a rate of change constraint. When ABC is dispatched in the scheduling run, it is expected that the LMP for that resource is set by its default energy bid, however, in this case the price was set to the bid floor. A fix was identified for both issues and implemented in parallel operations.

#### 4. Software defects

Type of issue: Resource flexible ramp capacity

Most resources in the EIM are modeled as either a generator or load such that they could either consume or generate power. However, a new resource type has been introduced which can consume and generate power, this resource type is called the generic non-generating (GNG) resource. With the introduction of new resource in the EIM, the market had an issue in calculating the resource ramp capability; it was under calculating the upward ramp capacity of the GNG non-participating resource. This issue was fixed in parallel operations.

#### 5. Default energy bids and market power mitigation

Like any other EIM entity, resources for PWRX as the Candian EIM Entity are required to have a default energy bid (DEB) for the market power mitigation process and for supporting Available Balancing Capacity (ABC). These bids can be based on proxy cost, locational marginal price, or can be negotiated. Through the standard cycle, PWRX and ISO and the department of market monitoring (DMM) acting as the agent for the ISO in the negotiation and definition of negotiated DEB, the DEBs for PWRX's resources were determined. The negotiated DEB were not in place at the start of the parallel operations period since this was still a work in progress. The negotiated DEB were effectively in place starting with trading date February 17, 2018. Prior to that day, the DEBs were defaulted to use the proxy cost, which happened to be a relatively lower value. The low-price DEBs when used in the market may not have reflected the expected economics of the real-time market and may have led to PWRX to appear relatively cheaper with respect to other areas; this in turn may have influenced the direction of transfers for PWRX area when mitigation occurred.



## Conclusion

The ISO validated both prices and schedules based on input data that was fed through the market systems parallel operations from February 1 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 necessary for PWRX to participate in the EIM as a Canadian EIM Entity 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, California, this 2<sup>nd</sup> day of March, 2018.

*/s/ Grace Clark*  
Grace Clark