UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	))	Docket No. EL14-22

INFORMATIONAL REPORT OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION ON NATURAL GAS AND ELECTRIC COORDINATION

I. Introduction

The California Independent System Operator Corporation (CAISO) files this informational report on natural gas and electric coordination consistent with the directives of the Federal Energy Regulatory Commission.[1] This report provides an overview of the CAISO's recent efforts to improve natural gas and electric coordination through both its operating practices and market rules. This report also provides information on the time required for the CAISO to publish day-ahead market results, the causes for delays, and the steps the CAISO is taking to mitigate delays. Finally, this report identifies operational challenges related to natural gas and electric coordination that affected natural gas-fired generators in the CAISO's balancing authority area during 2018. The report identifies mitigation efforts the CAISO took in connection with these challenges.

[1] *Cal. Indep. Sys. Operator Corp.,* 153 FERC ¶ 61,315 (2015) (*December 2015 Order*) at P 45.

II. Background

On April 16, 2015, the Commission adopted a final rule – Order No. 809 – that revised the Commission's regulations relating to the scheduling of transportation service on interstate natural gas pipelines.[2] As part of Order No. 809, the Commission modified the timely nomination cycle for natural gas scheduling from 11:30 a.m. Central Time to 1:00 p.m. Central Time.[3] In separate proceedings, the Commission also directed each independent system operator and regional transmission operator to: (1) adjust the time at which it posts the results of its day-ahead energy market and reliability unit commitment process (or equivalent) to a time that is sufficiently in advance of the timely and evening nomination cycles to allow natural gas-fired resources to procure natural gas supply and pipeline transportation capacity to serve their obligations; or (2) show cause why such changes are not necessary.

The CAISO submitted a compliance filing to demonstrate why it does not need to change the timing of its day-ahead market close and publication of market results, notwithstanding the Commission's adoption of changes to scheduling practices of interstate natural gas pipelines in Order No. 809. The CAISO's current day-ahead energy market closes at 10:00 a.m. Pacific Time (*i.e.*12:00 p.m. Central Time) and the CAISO publishes its market results at 1:00 p.m. Pacific Time (*i.e.* 2:00 p.m. Central Time). The CAISO argued that its current day-ahead scheduling process provides sufficient opportunity for natural

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[2] *Coordination of the Scheduling Processes of Interstate Natural Gas Pipelines and Public Utilities*, 151 FERC ¶ 61,049 (Order No. 809) (2015).

[3] *Id.* at P 87.

gas-fired resources to secure natural gas and pipeline transportation services. After obtaining stakeholder feedback, the CAISO concluded that maintaining the current timing for day-ahead market close and publication of market results was more reliable, more efficient, and less disruptive than the alternative of moving the timing of this process to earlier in the day.

In its *December 2015 Order*, the Commission accepted the CAISO's compliance filing but directed the CAISO to submit an annual informational report to explain ongoing efforts to improve natural gas-electric coordination, including efforts to improve solve times of its day-ahead market. The Commission's *December 2015 Order* stated that the CAISO's informational report should also identify whether any natural gas-fired generators within the CAISO experienced operational challenges related to gas and electric coordination issues, and identify what actions the CAISO undertook to mitigate such events.

III. Coordination activities between electric and natural gas systems remain a significant focus of the California ISO and affected stakeholders

As the Commission is aware, the CAISO has modified its practices to improve coordinated operation with gas pipeline system operators serving natural gas-fired resources in its balancing authority area. This coordination includes seasonal planning, outage coordination, sharing of information about expected gas burns, and real-time communications between electric and natural-gas system operators. The CAISO now coordinates these communications to help understand the potential impact of a contingency or operating limitation on flow impacts across interconnected gas pipeline systems. The CAISO also hosts face-to-face meetings with gas pipeline operators to facilitate discussions of forecasted system conditions and reliability issue.

Over the past year, the CAISO has expanded and evolved its natural gas burn report it shares with gas pipeline operators pursuant to non-disclosure agreements. We now use an automated process that allows gas pipeline operators to access locational information in relation to their gas systems. This most recent improvement allows each gas pipeline operator to automate their data downloads, and ensures reliable and secure transmission of the information.

The CAISO has also worked with multiple entities to address ongoing gas constraints at the Aliso Canyon Gas Storage Facility (Aliso Canyon) as well as other potential gas infrastructure constraints.[4] During 2018, the CAISO and Southern California Gas Company (SoCalGas) coordinated on a regular basis to ensure that dispatch of electric generation does not create or acerbate pressure issues on SoCalGas' system. Although storage capacity at Alison Canyon has increased, the CAISO expects that Aliso Canyon will continue to have limited operability; and coordination measures will remain necessary to address gas system limitations the CAISO anticipates to experience in 2019 and beyond.

[4] On November 26, 2018, the Commission issued an order granting in part and rejecting in part the CAISO's request to extend mitigation measures to address gas system limitations related to the limited operability of the Aliso Canyon gas storage facility. FERC's order rejected the CAISO's proposal to extend tariff revisions regarding gas price scalars, finding that the use of gas price scalars over the past year were not effective, weakened market power mitigation and increased bid cost recovery for the period that they were active. The remaining mitigation measures will remain in effect until December 31, 2019. *Cal. Indep. Sys. Operator Corp.*, 165 FERC ¶ 61,161 (2018).

Gas pipeline outages on the SoCalGas system continue to heighten the need for this coordination.

A. The CAISO is exploring electric and gas market rule changes to advance coordination between electric and natural gas systems

The CAISO continues to work with stakeholders to develop commitment cost and default energy bid enhancements to allow suppliers to have greater bidding flexibility to reflect their gas costs with appropriate market power mitigation.[5] This initiative will achieve these benefits by increasing the flexibility for market participants to submit commitment cost bids, subject to mitigation; adding flexibility to negotiate commitment cost reference levels; creating the ability for suppliers to request adjustments to reference levels; and changing minimum load offers from daily to hourly. The purpose of these enhancements is to allow suppliers to more accurately reflect cost expectations, including expected natural gas costs that reflect gas system operational constraints. The CAISO now anticipates implementing these rules in the fall of 2019.

In other matters, the CAISO worked with gas customers of SoCalGas to request an extension of daily balancing settlement rules on SoCalGas' system. Under these rules, SoCalGas uses operational flow order procedures to require end-use customers to balance their daily supply and demand within a narrow tolerance on certain days to avert gas curtailment and potential electric grid outages. On November 8, 2018, the California Public Utilities Commission

[5] More information about this initiative is available at the following website: http://www.caiso.com/informed/Pages/StakeholderProcesses/CommitmentCosts_DefaultEnergyBidEnhancements.aspx.

(CPUC) adopted a decision extending the terms of this settlement agreement through a final Commission decision in SoCalGas Triennial Cost Allocation Proceeding (CPUC Application 18-07-024), which is anticipated in early 2020.[6]

In addition, the CAISO has actively participated in recent CPUC proceedings examining whether to modify SoCalGas' operational flow order (OFO) noncompliance penalties. The CPUC opened these proceedings in response to motions by Southern California Edison Company (SCE) and the Southern California Generation Coalition (SCGC) to cap certain OFO noncompliance penalties at $5/Decatherm. SCE and SCGC's requested cap would be a significant reduction from the currently effective $25/Decatherm noncompliance penalties. SCE and SCGC asserted that the current noncompliance penalties "appear to be a significant contributor to the substantial recent increases in SoCalGas Citygate and corresponding CAISO wholesale power prices without providing a meaningful increase in gas and electric system reliability."[7] The CAISO filed comments explaining that the CAISO energy markets experienced significant price spikes in July 2018 during and shortly after the OFO events identified by SCE and SCGC. The CAISO also cautioned that modifications to the OFO noncompliance penalties may have complex interactions with the electricity wholesale market and that any changes should be considered holistically to minimize unintended consequences.

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[6] *See* California Public Utilities Commission Decision 18-11-009. http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M241/K245/241245909.PDF

[7] *See* SCE and SCGC Joint Petition for Modification, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M221/K841/221841663.PDF.

The CPUC requested additional factual information from SoCalGas regarding historical OFO events. SoCalGas provided this historical information on December 2, 2018. The CPUC plans to have either an evidentiary hearing, or technical workshops to discuss whether to modify the OFO noncompliance penalties. The CAISO plans to participate in these processes as necessary. The CPUC is targeting a decision on the OFO noncompliance penalty issue prior to the summer 2019 season.

B. The CAISO continues to work with state authorities and adjacent balancing authorities to explore electric reliability issues arising from gas system constraints

Over the course of 2018, the CAISO worked with California state regulatory authorities and adjacent balancing authorities to examine operational impacts of the limited capabilities to inject and withdraw natural gas into and from Alison Canyon. Specifically, the CAISO worked with the California Public Utilities Commission, California Energy Commission, and the Los Angeles Department of Water and Power (LADWP) to develop a 2018-19 risk assessment report.[8] In short, the report determined that Southern California continues to face reliability challenges to its energy system this coming winter, primarily due to continuing outages and reduced capacity on key natural gas transmission pipelines. SoCalGas remains unable to meet its 1-in-10-year peak cold day forecast gas demand of 4.965 billion cubic feet (Bcf) without Aliso Canyon, and its ability to

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[8] *See* May 19, 2017 Aliso Canyon Risk Assessment Technical Report Summer 2017 submitted in California Energy Commission Integrated Energy Resource Planning Docket 17-IEPR-11 http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN217639_20170519T104800_Aliso_Canyon_Risk_Assessment_Technical_Report_Summer_2017_Asses.pdf

provide gas through the delivery system — often called send-out — is largely the same this winter as a year ago.

The report states that if there are any extreme cold weather events, there may be insufficient gas supplies to meet demand even when relying on withdrawals from all storage fields including Aliso Canyon. The largest risk to the system is not from a single day with high gas demand. The greatest risk is from multiple high demand days that draw down storage inventories to a point where there is insufficient withdrawal capacity to meet gas demand later in the winter. Similar to last year, this upcoming winter certain natural gas transmission pipelines that SoCalGas relies on to serve its customers are out of operation or operating at reduced capacity. In addition, LADWP is planning maintenance on electricity transmission lines to reduce reliability risks that were postponed last year.

IV. The CAISO continues to work to improve its day-ahead market publication time

The CAISO acknowledges that the timing of its day-ahead market process creates challenges for gas procurement and nominations to meet CAISO commitments or dispatches. The CAISO's day-ahead market publication time of 1:00 p.m. Pacific Time does not provide day-ahead market schedules in advance of the gas timely nomination cycle – the most liquid trading period for the next gas day. As a result, gas-fired generators may need to procure natural gas to meet the CAISO day-ahead market schedules in the evening nomination cycle to the extent they did not anticipate day-ahead market schedules and procure gas in advance. The CAISO recognizes the importance of ensuring that it issue its day-ahead market results by 1:00 p.m. Pacific Time to allow entities to procure gas in the evening nomination cycle. Figure 1 provides the trend of publication times since October 2015 through November 2017. The flat line reflects the target of 1:00 p.m. Pacific Time to publish day-ahead market results, while the dots in blue reflect the daily publication time for a trade date. A blue dot above the red line represents the CAISO did not meet its publication time target. In many instances, the CAISO published day-ahead market results in advance of its target time of 1:00 p.m. Pacific Time.

Figure 1
Publication Time for Day-Ahead Market Results

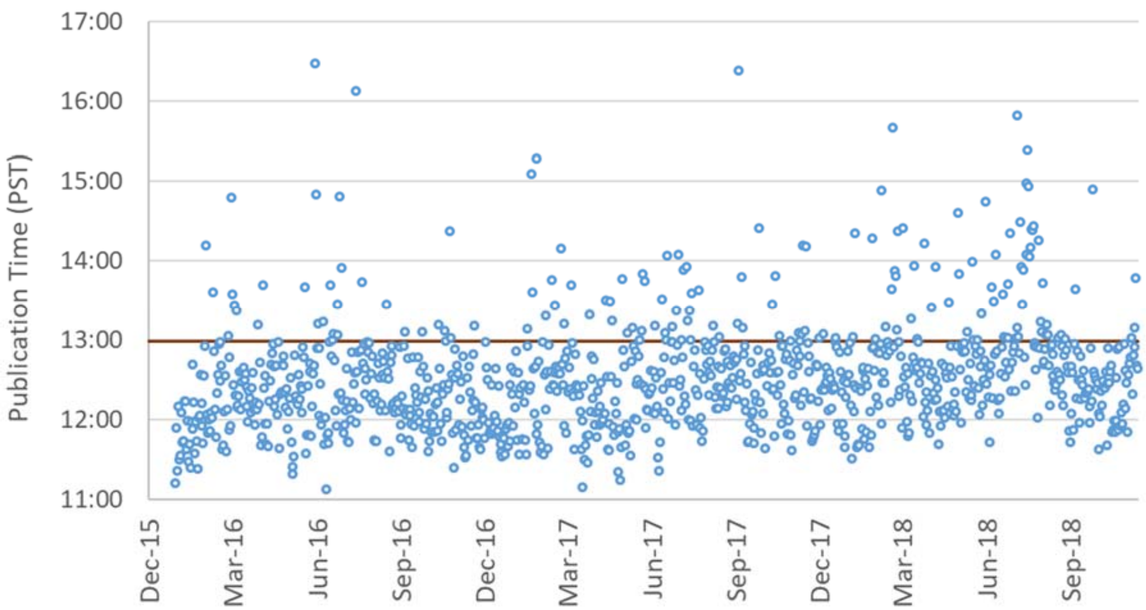
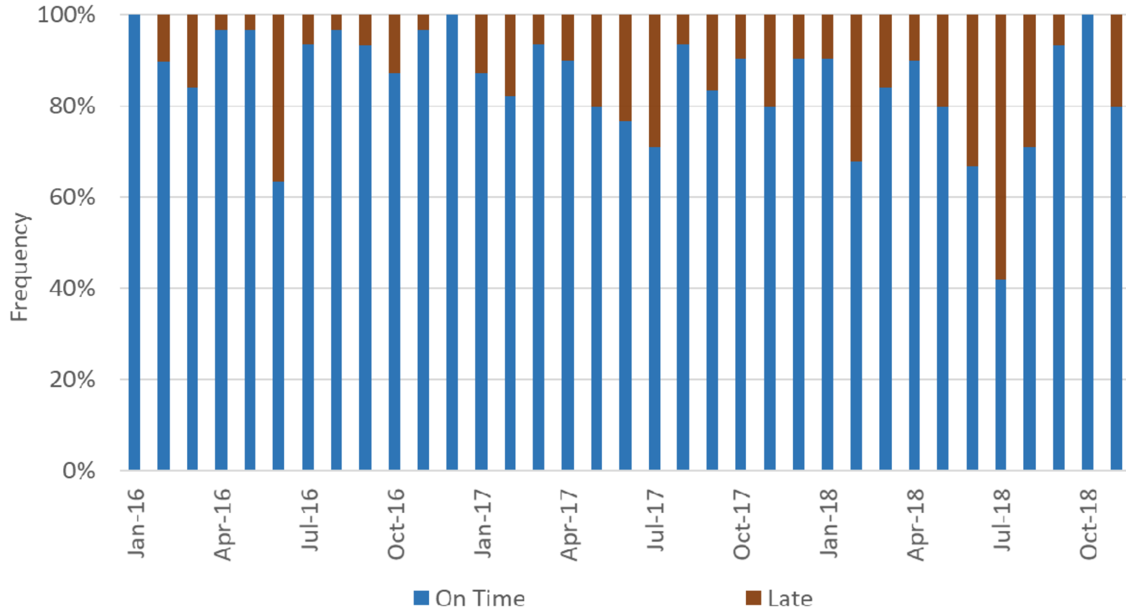


Figure 2 reflects a monthly summary of the frequency that the CAISO published its day-ahead market results on time (blue bars) and the frequency the CAISO has published day-ahead market results late (red bars).

Figure 2
Monthly Summary of Timely Day-Ahead Market Results



Since January 1, 2016 through November 15, 2018, the CAISO published day-ahead market results on time for 85.3% of operating days. There is a variety of reasons why the CAISO does not always publish day-ahead market results on time. These reasons include:

- **Incorrect input data:** The market relies on a set of different data inputs, including data related to external balancing authority areas. The input data in some cases may reflect errors that can result in an erroneous or infeasible market solution. During the market run, the CAISO must attempt to resolve these issues and may re-run certain portions of the day-ahead market. In some extreme cases, the CAISO may need to rerun all of its day-ahead market processes. Incorrect input data may include default switch positions, quality of data for load distribution, constraint definitions and enforcements, transmission limits, or outages.

- **Software issues:** There are instances when software upgrades, or network model upgrades, or a software defect renders market solutions incorrect. In some of these instances, the issue may interfere with the CAISO completing the day-ahead market run (*i.e.* not obtaining a solution). In other cases, the CAISO's software may identify an available solution that reflects pricing errors. The CAISO will re-run the market if it cannot obtain a solution and attempt to resolve any pricing issues before publishing the day-ahead market solution to avoid after the fact price correction. Another factor related to software is slower market run times, which results from software or hardware issues or incorporating complicated market constraints. A further level of interaction that has been empirically observed is during summer times, when there are higher loads and potentially more transmission constraints binding, the market is more complex and the system may take longer run times to achieve a solution.
- **Direct Current Solution:** Another instance that has resulted in the CAISO publishing day ahead market results after 1:00 p.m. Pacific Time is when the market produces a direct current (DC) solution. The CAISO aims to obtain market results with an alternate current (AC) solution, but the CAISO's market software will solve with a DC

> solution at times because of issues involving converging power flows under an AC solution. When this happens, the CAISO will seek to resolve these DC solutions in order to publish market results based on an AC solution. This effort can require re-running the market process from the beginning, which may result in the CAISO publishing day-ahead market results late.

Based on performance of recent years, the CAISO has taken various actions to publish day-ahead market results earlier. To reduce solve times, the CAISO has upgraded its market hardware and enhanced the constraint formulations in the market for committing resources. The CAISO has also expanded its validation work for the day-ahead market by undertaking some of this work well in advance of the day-ahead market run. This effort seeks to identify and resolve issues prior to running the financially binding market. The CAISO has added more detailed information to its full network model to reflect operations of adjacent balancing authority areas joining the western EIM. This information has improved the ability to identify power flows that may create anomalous market results. Finally, the CAISO continues to work on improving the data quality it uses to reflect load distribution factors and transmission switch positions in the network model. This specific condition was a factor leading to late publications in the summer of 2018. Currently, the CAISO is working on enhancing the load zones used in the market to distribute the load; this effort will reflect more closely the load movements that are typically observed in costal versus inland areas under more extreme weather conditions.

V. Operational challenges related to gas and electric coordination issues have occurred in 2018

Throughout the course of 2018, the ongoing constraint of SoCalGas Line 232-2 and Line 4000 along with the restricted availability to withdraw natural gas from Aliso Canyon storage facility affected natural gas-fired generators in the CAIOS's balancing authority area. From February 20 until March 7, 2018, cold weather resulted in high gas usage and a gas curtailment watch for electric generators in the Southern California area. During this time, the CAISO implemented measures to allow affected generators to scale their bids. The CAISO also manually re-dispatched resources and implemented the use of its maximum gas burn constraint nomogram to maintain system reliability while recognizing the limited availability of the SoCalGas and SDG&E gas pipeline systems.

In the last week of July 2018, Southern California again experienced high gas prices. During this period, the CAISO system experienced the highest electric loads of the year, exceeding 45,000 MW at the peak. These high gas prices in Southern California had a direct impact on the CAISO's electricity market. Energy prices were correspondingly higher across the system. Furthermore, with higher gas prices only in Southern California, the market dispatched resources and created market flows from the north to the south part of the CAISO system, leading to congestion and creating higher electric prices in Southern California. The CAISO did not see the need to curtail or displace resources from Southern California based on gas pressure information it received from SoCalGas. In addition, there were no targeted gas curtailments.

The CAISO did not activate its bid scalar Aliso Canyon mitigation measures, which at the time, consisted of enabling the gas scalars of 175 percent of commitment costs and 125 percent for default energy bids. The CAISO also did not activate its maximum gas burn constraint for natural gas-fired resources on the SoCalGas system.

VI. Conclusion

The CAISO plans to refine its market rules in 2019 to allow suppliers to more accurately reflect cost expectations in their supply bids, including expected gas costs and potential costs due to gas system operational constraints. The CAISO will continue to work with affected parties to coordinate reliable electric and natural gas system operations as well as to improve its ability to consistently publish day-ahead market results by 1:00 p.m. Pacific Time.

Respectfully submitted,

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Dated: December 17, 2018

CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon all of the parties listed on the official service list for the captioned proceeding, 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 17th day of December 2018.

/s/ Anna Pascuzzo
Anna Pascuzzo