**UNITED STATES OF AMERICA**
**BEFORE THE**
**FEDERAL ENERGY REGULATORY COMMISSION**

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

# 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 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 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 any delays, and the steps the CAISO is taking to mitigate any delays. Finally, this report identifies certain operational challenges related to gas and electric coordination issues that affected natural gas-fired generators in the CAISO's balancing authority area during 2017. The report identifies mitigation efforts the CAISO took in connection with these challenges.

## 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

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

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 gas-fired resources to secure natural gas and pipeline transportation services. The CAISO asserted there was no evidence to reflect that under normal conditions natural gas-fired resources participating in the CAISO markets cannot obtain gas

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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.

transportation service to support their day-ahead electric schedules.  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 has experienced any operational challenges related to gas and electric coordination issues, and identify what actions the CAISO undertook to mitigate such events.

## III. Electric and natural gas coordination remains a significant priority for the CAISO

Over the last several years, the CAISO has refined its operational practices to ensure coordinated operation of electric and gas systems and it has proposed additional measures to address ongoing gas constraints at the Aliso Canyon Gas Storage facility (Aliso Canyon) as well as other potential gas infrastructure constraints.  This coordination includes seasonal planning, outage coordination, sharing of information about expected gas burns, and real-time communications between electric and gas operators.  Recent experience has provided more insight with respect to how gas system limitations intersect with electric system operations.  For example, during 2017, 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. The CAISO also enhanced its tools to provide more granular gas burn information to pipeline operators, including providing gas burn information during operating day based on the results of its fifteen-minute market. In some instances, the CAISO utilized a maximum gas constraint as part of clearing the day-ahead electric market to recognize pressure constraints on SoCalGas' system. 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 2018 and beyond. Gas pipeline outages will heighten the need for this coordination.

### A. The CAISO has requested authority to continue to use measures to mitigate reliability impacts of natural gas infrastructure constraints

During 2017, the CAISO held a stakeholder process to examine maintaining certain temporary mitigation measures associated with managing the constraints at Aliso Canyon and making other mitigation measures permanent. The CAISO filed these tariff revisions in September 2017. The CAISO proposed two sets of tariff changes. The first set consisted of measures the CAISO proposed to extend through November 30, 2018, to provide market participants greater flexibility to reflect in their bids higher incremental and start-up and minimum load costs due to the Aliso Canyon gas constraints. The CAISO explained it only requires the continued effectiveness of these provisions until the CAISO implements more permanent measures it will propose in its commitment cost and default energy bid enhancements stakeholder initiative.  The second set of tariff revisions involved mitigation measures the CAISO proposed to make permanent.  The CAISO proposed to make permanent the authority to adopt a market constraint limiting the maximum gas burn of a group of generators in any part of the CAISO and western energy imbalance market (EIM) entity balancing authority areas.  In November 2017, the Commission accepted the CAISO's request to extend temporary mitigation measure until November 30, 2018, but rejected without prejudice the CAISO's proposal to make permanent certain other measures, including the use of a maximum burn gas market constraint in any part of the CAISO and western EIM entity balancing authority areas.[4]  On December 1, 2017, the CAISO filed tariff revisions to request authority to re-implement for another year the authority to use the maximum gas constraint in southern California as well as other measures for which it had proposed to make permanent consistent with the Commission's prior acceptance of these measures.[5]  The CAISO requested an effective date of December 16, 2017, and an order by December 15, 2017.  This filing remains pending before the Commission.

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4 *Cal. Indep. Sys. Operator Corp.*, 161 FERC ¶ 61,232 (2017).

5 *See* CASIO tariff amendment filed in Commission Docket ER18-375: https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14769635.

### B. The CAISO is developing new commitment cost and default energy bid structures to help manage natural gas price volatility

As referenced in section III.A, the CAISO has worked with stakeholders to develop several commitment cost and default energy bid enhancements to allow suppliers to have greater bidding flexibility while protecting against market power.[6] The initiative will achieve these benefits by introducing market-based bids for commitment costs, subject to mitigation, extending the CAISO's authority 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 gas costs and potential costs due to gas system operational constraints.

### C. The CAISO continues to support rules that support reliable pipeline operations

In other matters, the CAISO worked with SoCalGas and its customers 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 30, 2017, the California Public Utilities Commission

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

adopted a decision extending the terms of this settlement agreement through November 30, 2018.[7]

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

Over the course of 2017, the CAISO has also worked with California state regulatory 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 risk assessment report for summer 2017.[8] These entities prepared the report with input from SoCalGas. In short, the report determined that the CAISO and LADWP's ability to meet the 1-in-10 year peak summer electric load is dependent on the amount SoCalGas system can rely on capability of storage facilities other than Aliso Canyon. The assessment determined that with sufficient storage supply rates from SoCalGas' Honor Rancho, La Goleta, and Playa del Rey storage facilities, the CAISO and LADWP could meet their 1-in-10 year summer peak load, assuming high use and availability of electric system transmission imports. Nonetheless, the report determined that electric load could still be at risk if the electric system is not fully available, if electric supplies are

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[7] *See* California Public Utilities Commission Decision 17-11-021 issued December 1, 2017: http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=200036470

[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

limited, or due to other outages that affect the amount of gas delivered to SoCalGas' system. In such circumstances, gas supplies from Aliso Canyon would be necessary to reduce the shortfall to avoid interruption of electric service.

More recently, these same entities developed a risk assessment report for winter 2017-2018.[9] This assessment concludes that southern California faces new challenges and greater uncertainty compared to last winter. The primary challenge this upcoming winter is that certain natural gas transmission pipelines that SoCalGas relies on to serve its customers are out of operation. Moreover, maintenance on electricity transmission lines to reduce reliability risks begins February 1, 2018. The assessment finds that natural gas reserves at Aliso Canyon will likely be needed and, under extreme cold weather events, there may be insufficient gas supplies to meet demand even relying on withdrawals from all of SoCalGas' storage facilities. The largest risk to the electric system is not from a single day with high gas demand, and instead is from multiple days of higher demand – coupled with additional contingencies –that may draw down storage inventories to a point where storage could not be used to meet gas demand later in the winter.

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[9] *See* November 28, 2017 Aliso Canyon Risk Assessment Technical Report 2017-18 Supplement submitted in California Energy Commission Integrated Energy Resource Planning Docket 17-IEPR-11 http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-11/TN221863_20171128T103411_Aliso_Canyon_Winter_Risk_Assesment_Technical_Report_201718_Supp.pdf.

## 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 does not fully align with the timing of the day-ahead gas nomination cycles. This imposes 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**

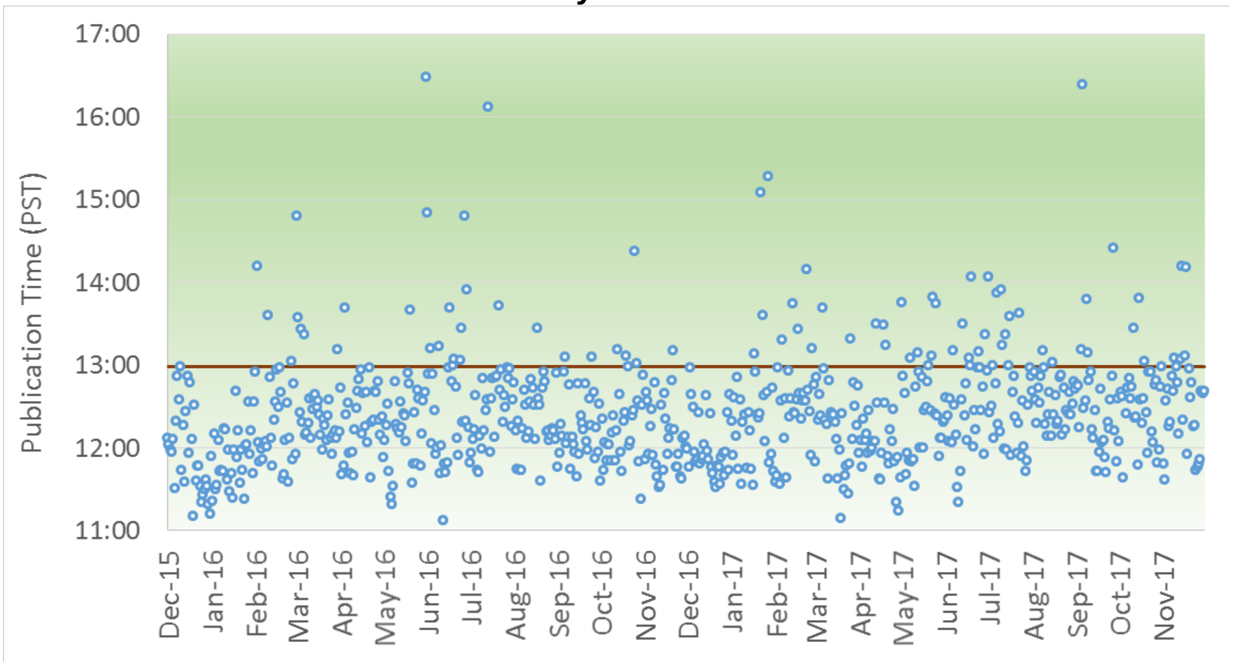
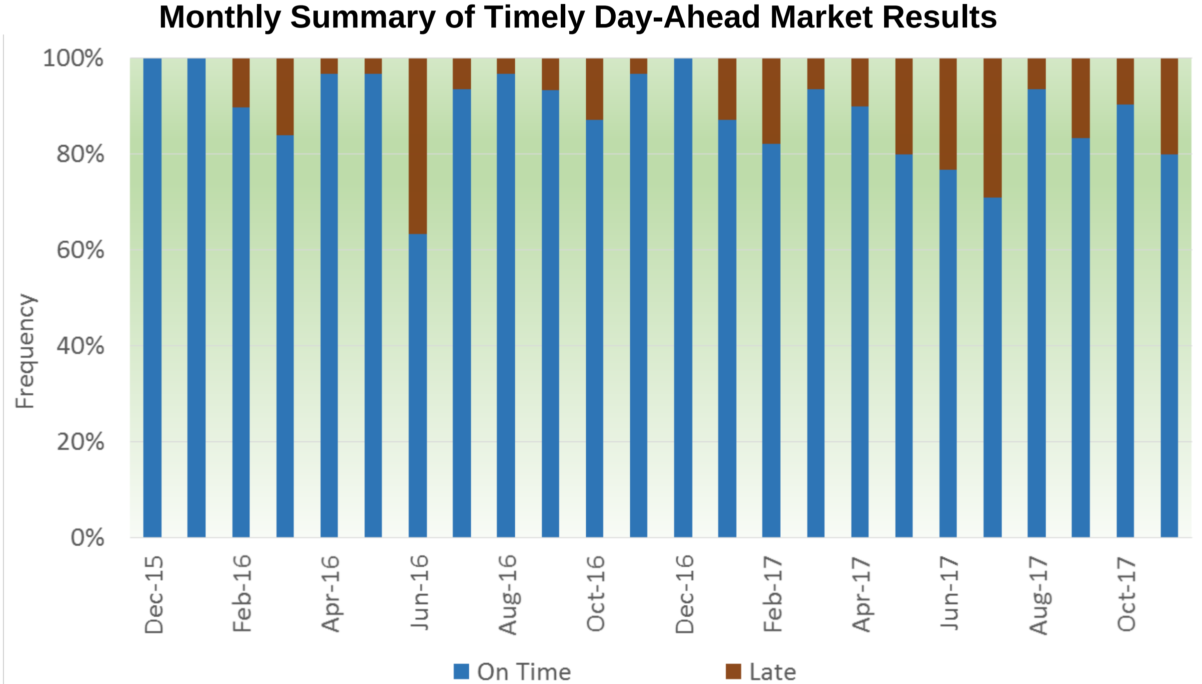



Figure 2 reflects a monthly summary of the frequency that the CAISO published its day-ahead market results on time (blue bars) and the frequency the CAISO has published day-ahead market results late (red bars).

**Figure 2**
**Monthly Summary of Timely Day-Ahead Market Results**



Since December 1, 2015 through November 31, 2017, the CAISO published day-ahead market results on time for 88.6% of operating days. There are 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 definition, 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.

- **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.

Starting in 2015, the CAISO has taken various actions to publish day-ahead market results earlier. To reduce solve times, the CAISO upgraded its market hardware and enhanced the constraint formulations in the market for committing resources. The CAISO 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 also 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 has improved the quality of data it uses to reflect load distribution factors and transmission switch positions in the network model.  These efforts have increased the frequency of publishing day-ahead market results on time and in many cases in advance of its target time of 1:00 p.m. Pacific Time.

## V. Operational challenges related to gas and electric coordination issues have occurred in 2017 and the CAISO has taken steps to mitigate these events

Throughout the course of 2017, there were no unplanned natural gas curtailments affecting gas fired electric generation within the CAISO balancing authority area.  Pipeline operators issue operational flow orders and critical notices to manage operational reliability of their systems, but through communication and sharing of timely information electric generation did not experience curtailments for lack of available fuel.  The following examples illustrate the efforts of the CAISO and pipeline operators to mitigate challenging operating conditions for natural gas fired generators operating in the CAISO's balancing authority area.  The examples are illustrative and coordination between the CASIO and pipeline operators serving gas-fired generators remains ongoing.

In January 2017, CAISO implemented gas burn constraints in its markets to limit the gas burn by electric generation in Southern California Edison Company (SCE) and San Diego Gas & Electric Company (SDG&E) areas.  The CAISO took this action in part to respond to natural gas curtailment watches issued by SoCalGas arising from cold temperatures and forecasted high gas demand.  During these times, the CAISO communicated closely with SoCalGas operations. SoCalGas also withdrew gas from Aliso Canyon on January 24-25 to maintain gas pressures in its system and no gas curtailments occurred.

In late August and early September, 2017, SoCalGas issued a System Curtailment Watch as a result of high natural gas demand for electric generation due to prolonged above normal temperatures throughout the western United States. Again, the CAISO communicated closely with SoCalGas operations during this time. SoCalGas managed high demand with operational flow orders and notifications to customers to maintain schedules. Gas curtailments were not necessary.

In September 2017, Kern River Gas issued a Forced Majeure notice for its pipeline facility. The CAISO communicated closely with Kern River Gas operations during this event and shared scheduled gas burn information. Kern River Gas managed the reduced capacity in its system with notifications to customers to hold to scheduled burn rates. Gas curtailments were not necessary.

Starting in October 2017, SoCalGas experienced an unplanned outage on two transmission lines limiting supply into Los Angeles Basin. SoCalGas has managed these outages with operational flow orders and notifications to customers to maintain schedules. The CAISO is monitoring gas supply capability on a daily basis and communicates daily with SoCalGas operations to manage these current gas constraints.

## VI. Conclusion

The CAISO appreciates the Commission's ongoing support of electric and gas coordination activities undertaken by independent system operators and regional transmission operators. The CAISO will continue to work with affected parties to coordinate reliable electric and natural gas system operations as well as continue to work to improve its ability to consistently publish day ahead market results by 1:00 p.m. Pacific Time.

Dated: December 14, 2017

Respectfully submitted,

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## 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 14th day of December 2017.

/s/ Grace Clark
Grace Clark