

June 30, 2021

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

Re: California Independent System Operator Corporation

**Annual Informational Filing – Usage of Maximum Gas Burn
Constraint**

Docket No. ER20-273-___

Dear Secretary Bose:

On October 31, 2019, the California Independent System Operator Corporation (CAISO) filed a tariff amendment to address the effects of limitations on the natural gas system in Southern California on the CAISO's ability to operate the electric grid reliably by permanently adopting a maximum gas constraint and related tariff provisions. By order issued December 30, 2019, the Commission accepted this tariff amendment and directed the CAISO to submit annual informational filings containing information on its usage of the maximum gas burn constraint, and its impacts on CAISO's markets, beginning on June 30, 2020, as discussed in the body of the order.¹ This filing provides the requested information regarding use of the gas nomogram during the 2020 calendar year.

In general, this informational filing demonstrates the following:

- The CAISO uses the maximum gas burn constraint as necessary to reduce natural gas usage in Southern California when the natural gas system operator identifies potential constrained conditions.
- The natural gas burn constraint may increase Real Time Congestion Offset (RTCO) in some circumstances, but it does not appear to be the sole or

¹ *Cal. Indep. Sys. Operator Corp.*, 169 FERC ¶ 61,253 (2019) (December 30 Order).

- primary driver of RTCO.
- The CAISO updated the maximum gas burn constrain logic to distribute the daily maximum gas volume to hourly maximum gas volumes based on an assigned forecast zone. This enhancement allows CAISO operators the option to use net load shaping.

The CAISO has served copies of this filing on all the parties to the service list for this proceeding. In addition, the CAISO is posting this filing on the CAISO website.

The CAISO intends to post on its website any subsequent analysis related to the impacts of the maximum gas burn constraint on the CAISO markets when the constraint is enforced.

If there are any questions concerning this filing, please contact the undersigned.

Respectfully submitted,

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Aliso Canyon Informational Report

June 30, 2021

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Introduction

The CAISO files this informational report pursuant to FERC's order issued on December 30, 2019 in Docket No. ER20-273. The report covers the information related to the CAISO's use of constraints that limit the maximum amount of natural gas that can be burned by natural gas-fired resources in the Southern California Gas Company and San Diego Gas & Electric Company gas regions for the period from June 1, 2020 to May 30, 2021.

The CAISO enforced the maximum gas constraint in day-ahead market (DAM) and real-time market (RTM) on four different occasions for several days from June to October 2020 to manage actual and anticipated gas curtailments for planned outages on the gas system.

Maximum Gas Burn Constraint

The CAISO enforced the maximum gas burn constraint on several different occasions in 2020 due to planned curtailments on the gas system.

June 2020

SoCalGas issued a planned curtailment notice for the southern gas system due to maintenance work at the Blythe compressor station, severely limiting the imports into the southern gas system. Due to this planned curtailment, the CAISO enforced the gas burn constraint for the southern gas system. The southern gas system includes SDGE and East of Moreno gas forecast zones. This set of curtailment was in effect from May 29 to June 12, 2020. This report covers the dates June 1 to June 12, which are the dates that fall into the reporting period. The gas restriction provided by SoCalGas was a daily limitation for all the generators in the southern system. This daily limitation distributed the gas use across all the hours of the day by a ratio of hourly load forecast to daily load forecast.

Figure 1 below shows the maximum gas burn constraint profile with the limits and the cleared flows on the constraint in both the integrated forward market (IFM) that is part of the Day Ahead Market (DAM), and the real-time dispatch (RTD) which is part of RTM. The constraint did bind across all three markets, IFM, fifteen-minute market (FMM) and Real-Time Dispatch (RTD) for a few intervals, generally during peak hours in the evening, *i.e.* from HE 18 to HE 22. The constraint was binding in the real time market for about

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8% of intervals in which it was enforced. In addition, the constraint was binding in about 13% of intervals in the DAM for the period of June 1 to June 12. When the shadow prices of the gas constraints reaches \$1000/MWh, this shadow price reflects that the constraint was infeasible and the market had to relax the gas constraint. This may happen when the available generation movements are insufficient to meet the expected limit. As shown in Figure 1, this condition may be a more typical occurrence in the real-time market where there is inherently less flexibility and ramp speed to meet the expected limits.

Figure 1: Maxburn gas constraint enforced in June

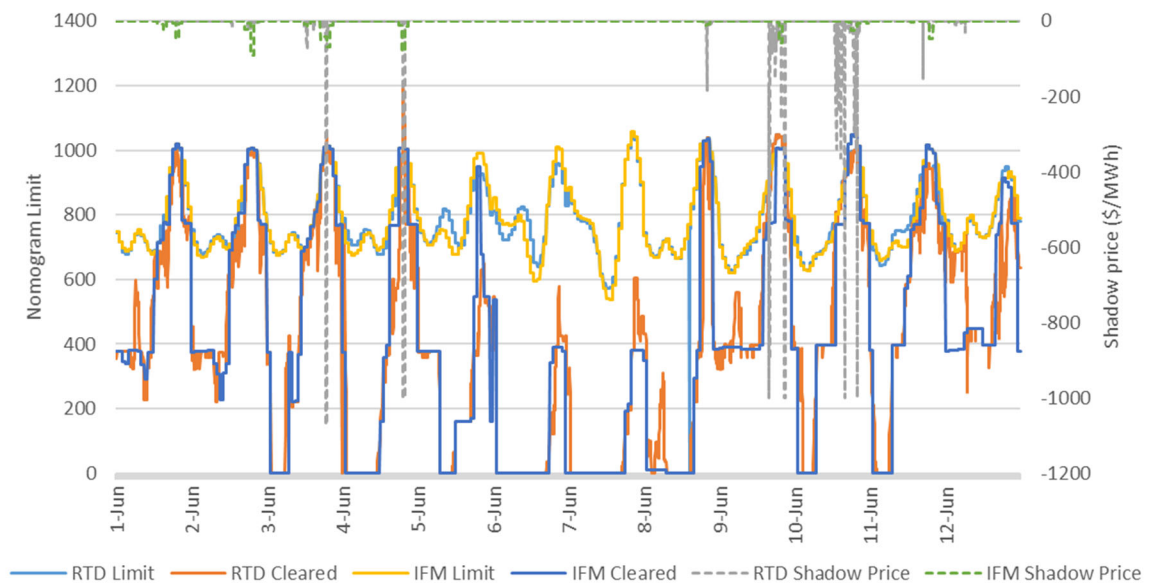


Figure 2: Sample day gas burn comparison in June

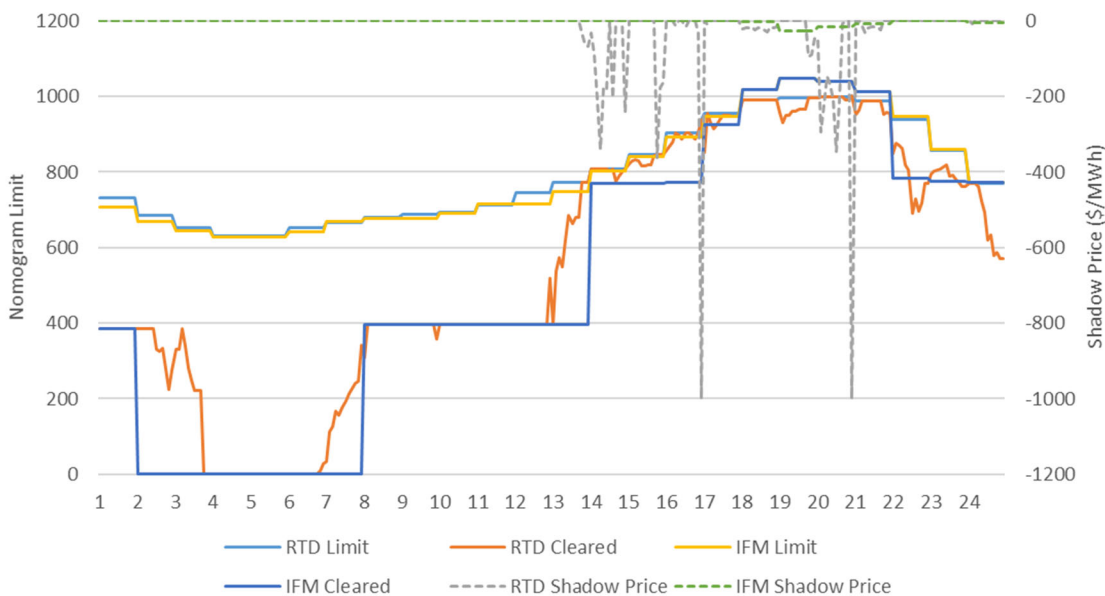
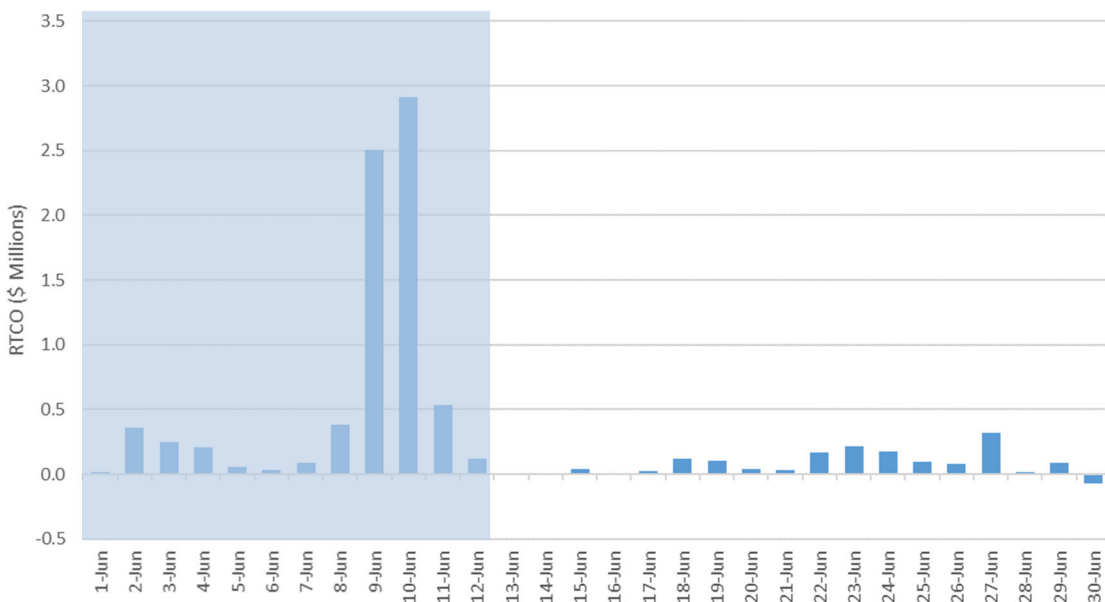


Figure 2 shows a sample day of gas burn comparison across IFM and RTD time markets with their shadow prices to provide more granular picture. It shows the gross load shape of the constraint limit based on the ratio of hourly gross load forecast to daily load forecast.

Figure 3: Real-time congestion offset in June



In the past, there has been concern regarding the gas nomogram’s impact on the CAISO’s market settlements. Figure 3 shows the daily trend of the real-time congestion offset (RTCO) in the CAISO market. By correlating the time of use for the gas constraint
CAISO

with the trend of the congestion offset, there may be a relationship between changes to the congestion offset and gas constraint enforcement. For this period, in particular, there was a relatively high RTCO in June 9 and 10 when the constraint was binding with maximum \$1000/MWh shadow prices from hour ending 16 to hour ending 21.

The congestion offsets for June 9 and 10 were about \$2.5 million and \$2.9 million, respectively. The congestion offset accrued about \$850,000 in HE 20 on both days. Because the RTCO is a reflection of other factors such as congestion on transmission constraints, the CAISO cannot necessarily attribute all the changes in RTCO to enforcing the gas constraint. For instance, on these days there was also local area congestion on certain 500kV transmission constraints as well as outages that may have contributed to high congestion offsets. The maximum gas constraint may have had an indirect impact on the congestion offsets for these days, especially June 10, as the constraint was infeasible and shadow prices reached a maximum of \$1000/MWh in HE 21. During the other days between June 1 and June 12, the instances of high RTCO did not correlate with high shadow prices of gas constraint.

July 2020

In July 2020, SoCal Gas issued a planned curtailment from July 17 to July 20 for the complete southern gas system. The southern gas system includes the SDGE and East of Moreno gas forecast zones. Due to gas system issues, the CAISO employed the gas constraint after SoCal Gas informed it of concerns with the gas system curtailments in the southern gas system. The CAISO enforced the gas constraint for four days in all the markets starting on July 17. With a daily limit, the CAISO distributed it across the hours by a ratio of hourly load forecast to the daily load forecast. This logic creates the gas burn constraint with a gross load shape; this limit is shown in the green and grey dotted lines for DA and RTM, respectively, in Figure 4. The gas constraint was binding in about 9% and 0.4% of the time when enforced in DAM and RTM, respectively. The constraint was generally binding in HE 19 to HE 20 (evening peak hours) in DA.

Figure 5 shows the daily trend of RTCO in CAISO market. The congestion offset was generally low during the days when the maximum gas constraint was enforced. The constraint was binding only in 0.4% of the intervals with a maximum shadow price of -\$2.09/MWh. Based on these low shadow prices and the lack of an RTCO trend change, the maximum gas constraint had minimal impact on the congestion offset for these days.

This constraint was enforced in the DA market from July 17 to July 20. In RTD, the constraint was enforced from July 17 to July 20 HE 9, based on the information provided by the gas company. Maintenance work had ended by that time and therefore did not enforce the nomogram further in the RTM. However, by the time the CAISO determined the maintenance work had ended, CAISO had already executed the IFM and had already enforced the constraint for the full trading day of July 20.

Figure 4: Maxburn gas constraint enforced in July

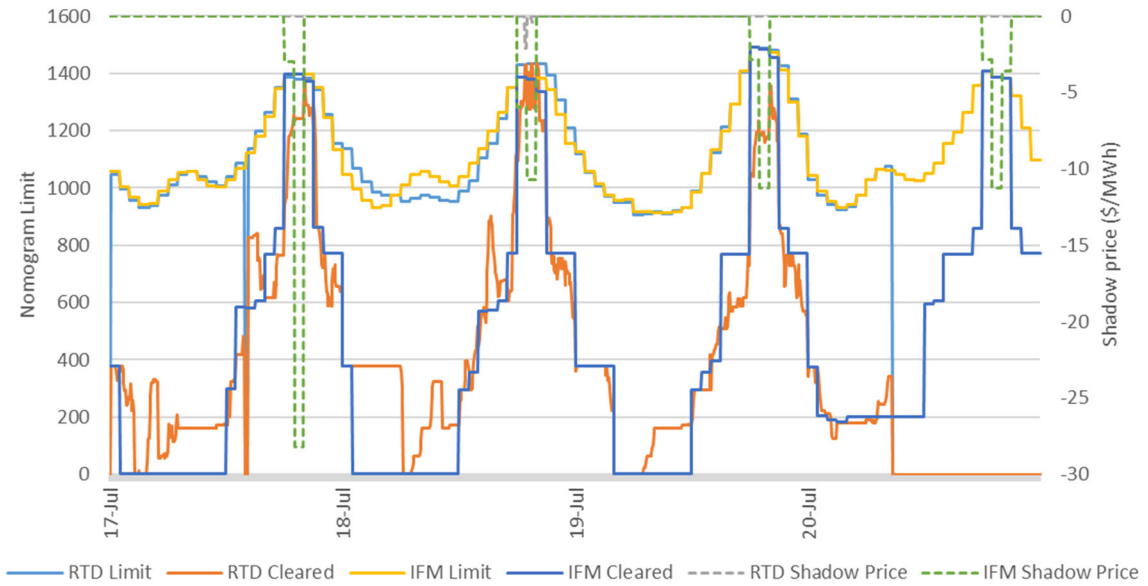
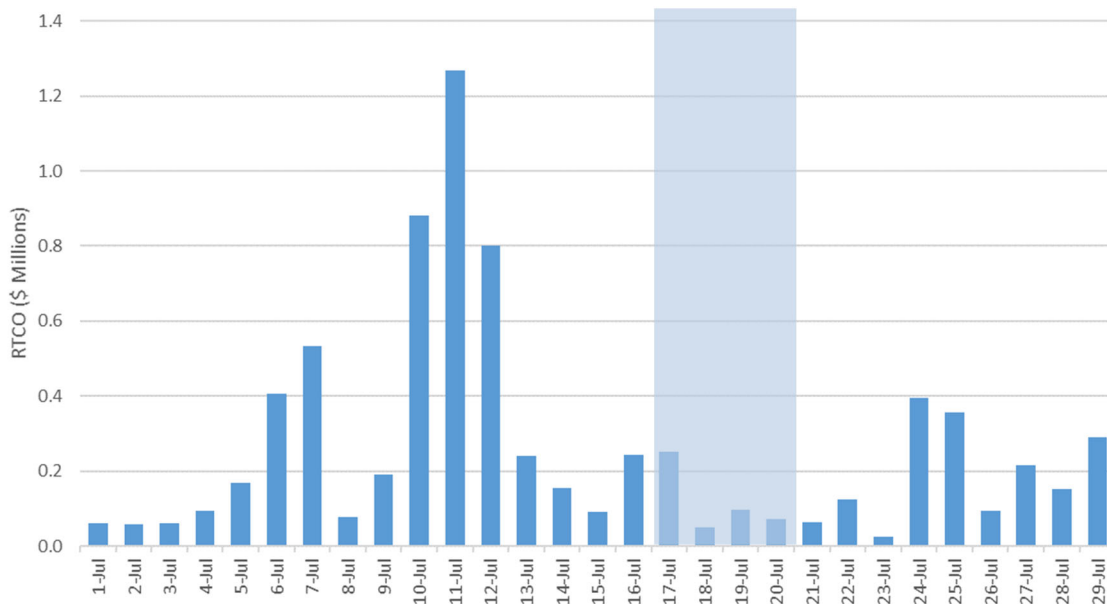


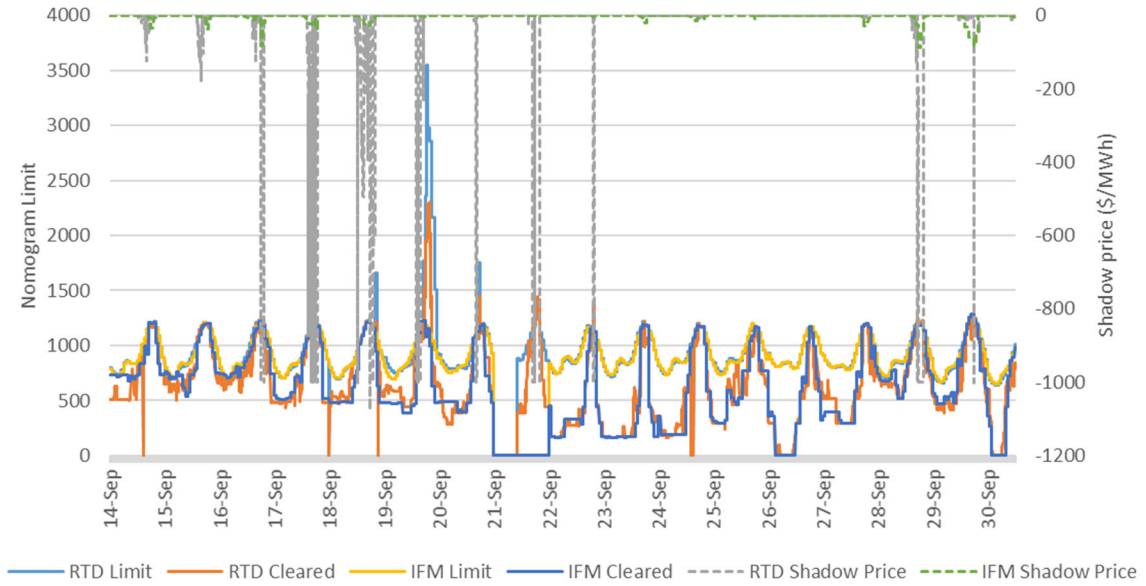
Figure 5: Real-time congestion offset in July



September 2020

SoCal Gas issued another planned curtailment for the southern gas system due to maintenance/inspection on line L2001 and limited the southern section to 223Mcf/d, severely limiting gas imports into the southern gas system. Due to this planned curtailment, the CAISO enforced the gas burn constraint for the southern gas system. The southern gas system includes SDGE and EOM gas forecast zones. This set of curtailments was in effect from September 14 to October 24. This section covers the maximum gas constraint from September 14 to September 30. The instances for October are covered in the next section. The gas restriction provided by SoCal Gas was a daily limitation for all the generators in the southern system. This daily limitation distributed across all the hours of the day by a ratio of hourly load forecast to daily load forecast as shown in Figure 6.

Figure 6: Maxburn gas constraint enforced in September



The constraint was binding generally during the evening peak hours from HE 16 to HE 22. The constraint was binding in the RTM for about 11% of intervals in which it was enforced. In addition, the constraint was binding in about 22% of intervals in the DAM for the period of September 14 to September 30.

Figure 7: Sample day gas burn comparison in September

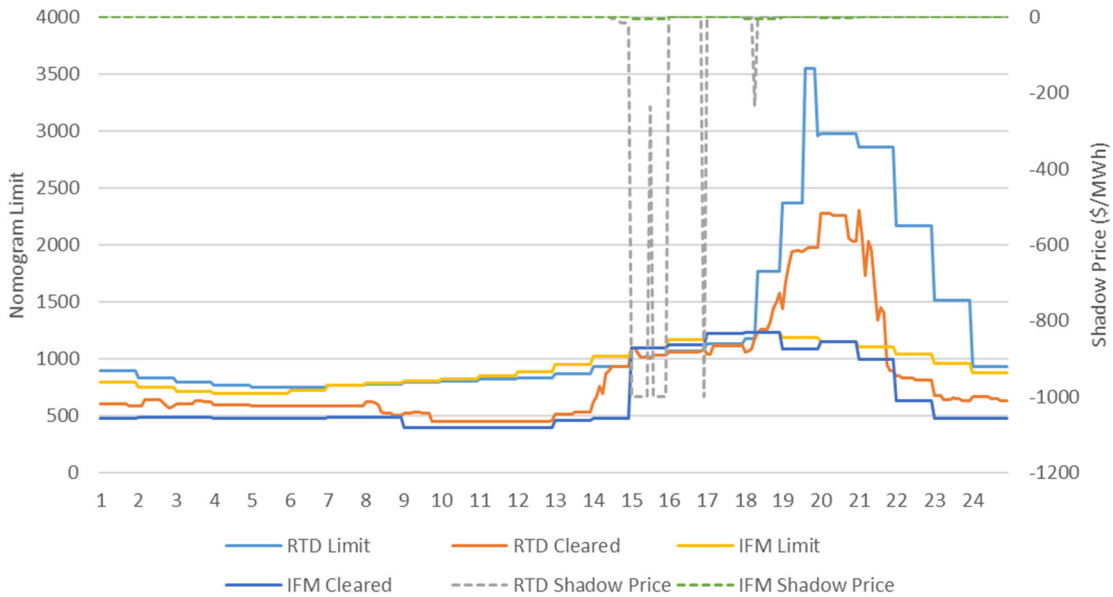
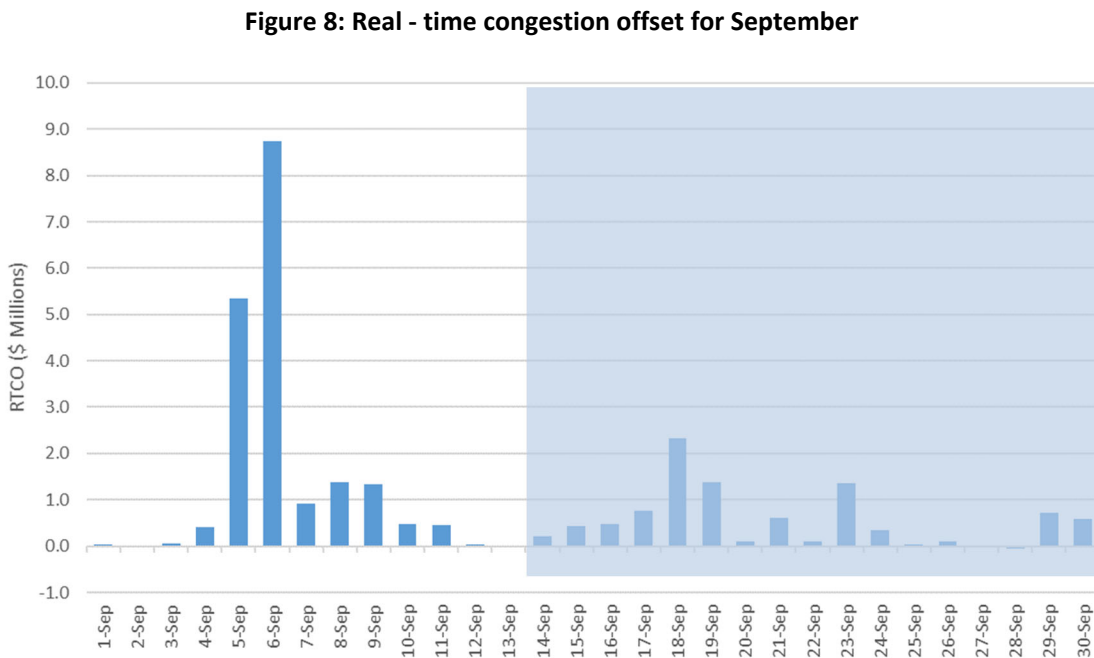


Figure 7 shows the gas burn comparison between the RTM and the DAM for a sample day along with shadow prices. It shows the gross load shape of the constraint limit based on the ratio of hourly gross load forecast to daily load forecast. The gas constraint was infeasible in several real-time intervals as shown with the shadow prices at about \$1000/MWh. This occurred in intervals before the peak hour.

Figure 8 shows the RTCO trend for the month of September through mid-October and highlights the periods in which the gas constraint was used in the CAISO’s markets.



The gas constraint did not seem to have any meaningful impact on RTCO from September 24 to September 28. However, there may have been some impact for the high RTCO in September 18 and 19 when the constraint was binding with maximum \$1000/MWh shadow prices from hour ending 13 to hour ending 21. The congestion offset for September 18 and 19 in particular was about \$2.3 million and \$1.3 million respectively. The congestion offset accrued about \$358,000 and \$560,000 on HE 20 for September 18 and 19 respectively. There are other factors contributing to such high congestion offsets. There was local area congestion on certain 500kV transmission constraints as well as outages contributing to such high congestion offsets. The maximum gas constraint had a minimum impact on the congestion offsets for these days.

October 2020

Finally, as described in the previous section, SoCal Gas issued planned curtailment for the southern gas system due to maintenance/inspection on line L2001 and limited the southern section to 223Mcf/d, severely limiting the imports into the southern gas system. This set of curtailments was in effect from September 14 to October 23. This section covers the curtailment from October 1 to October 23. The gas restrictions provided by SoCal gas was a daily limitation for all the generators in the southern system. This daily limitation distributed across all the hours of the day by a ratio of hourly load forecast to daily load forecast as shown in Figure 9.

Figure 9 Maxburn gas constraint enforced in October

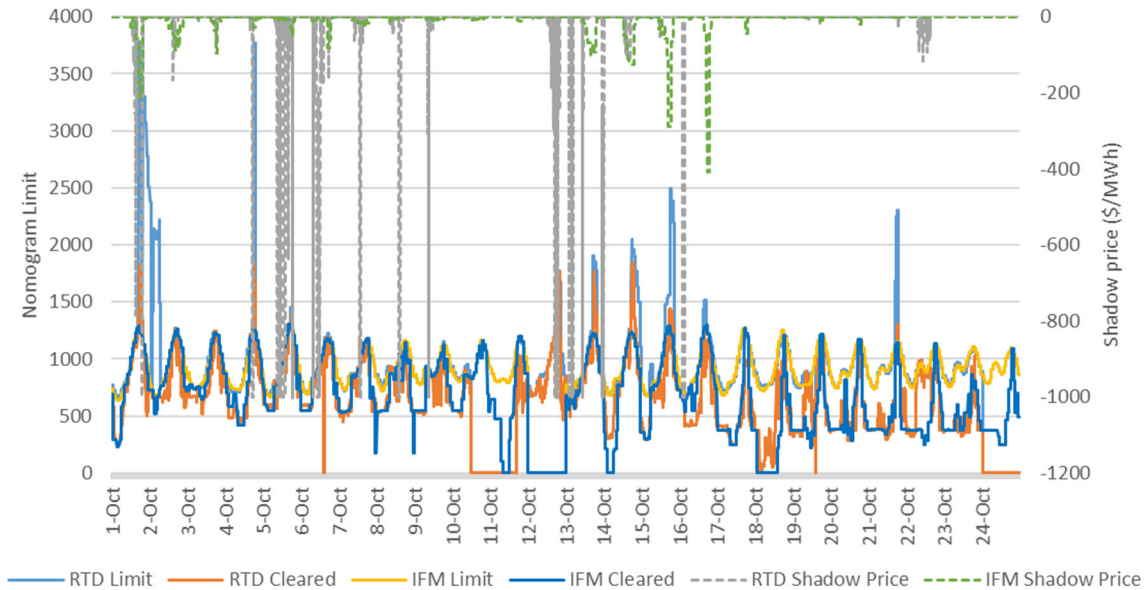
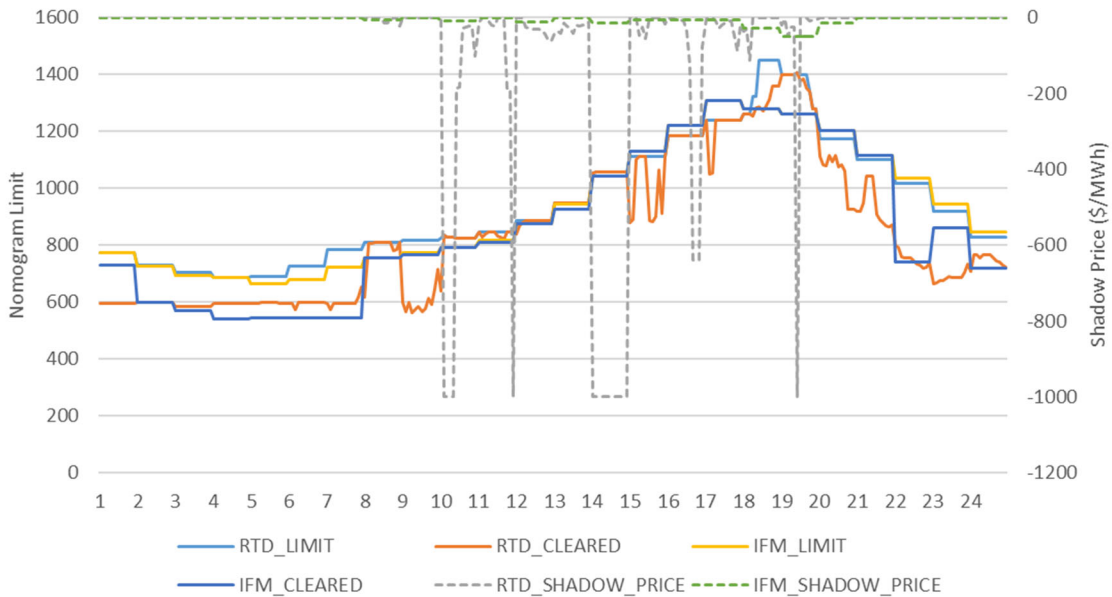


Figure 10 Sample day gas burn comparison in October



The constraint was binding generally during the evening peak hours from HE 14 to HE 20. The constraint was binding in the RTM for about 11% of intervals in which it was enforced. In addition, the constraint was binding in about 27% of intervals in the DAM for the period of October 1 to October 24. The constraint was infeasible in several intervals prior to the peak hour. This constraint was enforced in the DAM from October 1 to October 24. In RTD, the constraint was enforced from October 1 to October 24 HE 1, based on the information provided by the gas company. Maintenance work has ended by that time and therefore the CAISO did not enforce the constraint further in the RTM. However, by the time CAISO determined the maintenance work had ended, the CAISO had already executed the IFM and had already enforced the constraint for the full trading day of October 24.

Figure 10 shows the gas burn comparison between the real time market and the day ahead market for a sample day along with shadow prices. It shows the gross load shape of the constraint limit based on the ratio of hourly gross load forecast to daily load forecast.

Figure 11 Real - time congestion offset for October

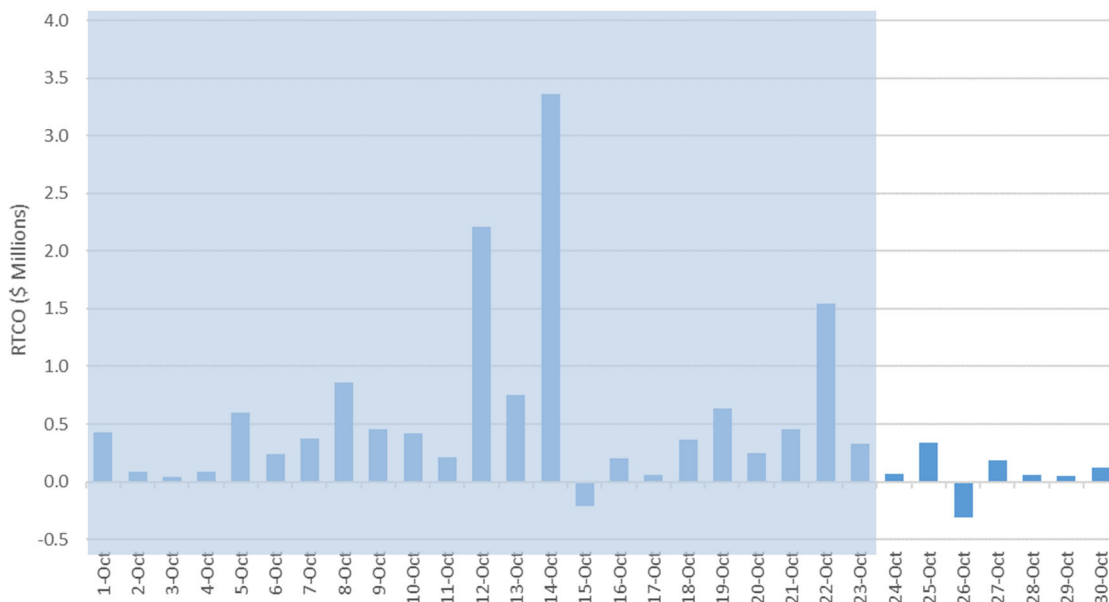


Figure 11 shows the RTCO trend for the month of October and highlights the periods in which the gas constraint was used in the CAISO’s markets.

The constraint does not seem to have any meaningful impact on RTCO from October 2 to October 4. However, there may have been some impact on the high RTCO for June 12 and 14 when the constraint was binding with maximum shadow prices of \$1000/MWh and about \$140/MWh, respectively, from HE 16 to HE21. The congestion offset for October 12 and 14 in particular were about \$2.2 million and \$3.3 million, respectively. The constraint had minimal impact on RTCO for October 14 as the constraint was binding in hours with very low RTCO. However the congestion offset accrued about \$1 million in HE 19 for October 12. There are other factors contributing to such high congestion offsets. There was local area congestion on certain 500kV transmission constraints as well as outages contributing to the congestion offsets.

Enhancements to the use of gas constraints

Over the years, CAISO has enhanced the market functionality to improve the use of the gas nomogram constraints. Under the original functionality, when the limitation provided by the gas company relied on a daily limit, the CAISO distributed the daily limitation on an hourly basis using a gross load shaping profile.

The CAISO enhanced the gas constraint shaping logic and implemented in the market applications in May 2021. This enhanced logic distributes the daily maximum gas

volume, specified by SoCal Gas, to hourly maximum gas volumes based on an assigned forecast zone. The enhancement offers operators the option to use net load shaping. The net load assessment considers the total system load net of generation by solar and wind resources, which resembles the actual gas burn requirement. This approach more accurately accounts for changes that may happen from day to day because it is based on forecasted production of wind and solar resources.

Another option available to operators through this enhancement is the use of the last available day ahead historical gas burn to shape the limitation profile. In addition, the CAISO enhanced the gas constraint capabilities by applying an hourly fixed maximum burn constraint throughout the operating day. Thus, when the need arises, the CAISO may assess what shape can fit better to the current system conditions.

A second enhancement implemented on May 25, 2021 is the expanded functionality to the dynamic competitive path assessment (DCPA). This logic does not impact the shaping of the constraint. This functionality determines the competitiveness of market constraints to assess the need for local market power mitigation. Currently, the DCPA methodology is in the Locational Market Power Mitigation (LMPPM) mechanism in the DAM and RTM. The DCPA determines whether a binding transmission constraint is competitive or not. Supply resources that provide counter flow to uncompetitive binding transmission constraints may be subject to market power mitigation. This enhancement includes the effects of gas-burn nomogram that limit the supply counter flow in the calculation of the Residual supply Index within the DCPA methodology.

As the CAISO continues to use the gas nomogram and evaluates the market outcomes as part of its ongoing performance analysis, the CAISO may implement further improvements to the existing logic as necessary.

CERTIFICATE OF SERVICE

I certify that I have served the foregoing document upon the parties listed on the official service list in 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 on this 30th day of June, 2021.

/s/ Jacqueline Meredith
Jacqueline Meredith