# Winter 2019-20 SoCalGas Conditions and Operations Report

BY STAFF OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION

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# CALIFORNIA PUBLIC UTILITIES COMMISSION STAFF CONTRIBUTORS

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## Executive Summary

This report presents a summary and analyses of natural gas operations in Southern California from November 1, 2019, through March 31, 2020, (the winter) by the California Public Utilities Commission's (CPUC) Energy Division staff (staff). The purpose of the report is to provide a summary of weather and system occurrences, operational actions taken, and lessons learned for future system operations and policymaking, with a focus on usage of Southern California Gas Company's (SoCalGas) Aliso Canyon natural gas storage facility (Aliso Canyon).

Operating conditions improved in comparison to winter 2018-19 due to Line 235-2 returning to service at reduced pressure prior to the winter season and the CPUC's issuance of a revised Aliso Canyon Withdrawal Protocol (Withdrawal Protocol).[1] Under the revised Withdrawal Protocol, Aliso Canyon is no longer designated an "asset of last resort." Rather, SoCalGas is able to use Aliso Canyon if any of four conditions in the revised Withdrawal Protocol are met in order to reduce system stress, preserve the inventory levels of the non-Aliso fields,[2] and reduce the price spikes that can occur as a result of limited gas supply and high customer demand. Aliso Canyon withdrawals occurred on 48 gas days this winter, resulting in approximately 18.6 billion cubic feet (Bcf) of gas withdrawn from the storage field. Of these withdrawals, 47 were under Condition 1 of the Withdrawal Protocol, which is designed to prevent price spikes, and one was under Condition 4, which allows withdrawals to prevent gas curtailments.

The winter was generally mild and without a sustained cold snap. However, there were several cold weather events that resulted in sendouts of 3.2-3.9 Bcf. Average gas receipts into the system were high and ranged from a low of 88 percent receipt point utilization in March 2020 to a high of 99 percent in December 2019.

Storage was not full by November 1, but SoCalGas maintained healthy inventory levels throughout the winter, especially compared to the previous year. In winter 2018-19, the non-Aliso fields declined from approximately 93 to 36 percent full. In 2019-20, the non-Aliso fields declined from approximately 86 percent full to 68 percent full. Thus, even though SoCalGas began winter 2019-20 with less inventory than the previous year, it was in a better position at the end of winter.

Gas and electricity prices saw less volatility this winter compared to the previous year. In winter 2018-19, electric generators experienced 43 days of voluntary curtailments and five days of mandatory curtailments due to gas shortages. Gas prices peaked at $26 per million British thermal units (MMBtu), and average hourly electric prices spiked to $135 per megawatt hour (MWh) in Southern California and $150/MWh in the north.[3] In contrast, gas and electric prices did not exhibit volatile behavior during cold weather or tight system conditions in winter 2019-20. Gas prices peaked at $6.74/MMBtu, and electric prices at $51.25/MWh.

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[1] Aliso Canyon Withdrawal Protocol: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2020/WithdrawalProtocol-Revised-April12020clean.pdf.

[2] SoCalGas operates three storage fields in addition to Aliso Canyon, which are referred to as the non-Aliso fields: Honor Rancho, Playa del Rey, and La Goleta.

[3] Electricity price data comes from CAISO OASIS, located at http://oasis.caiso.com/mrioasis/logon.do.

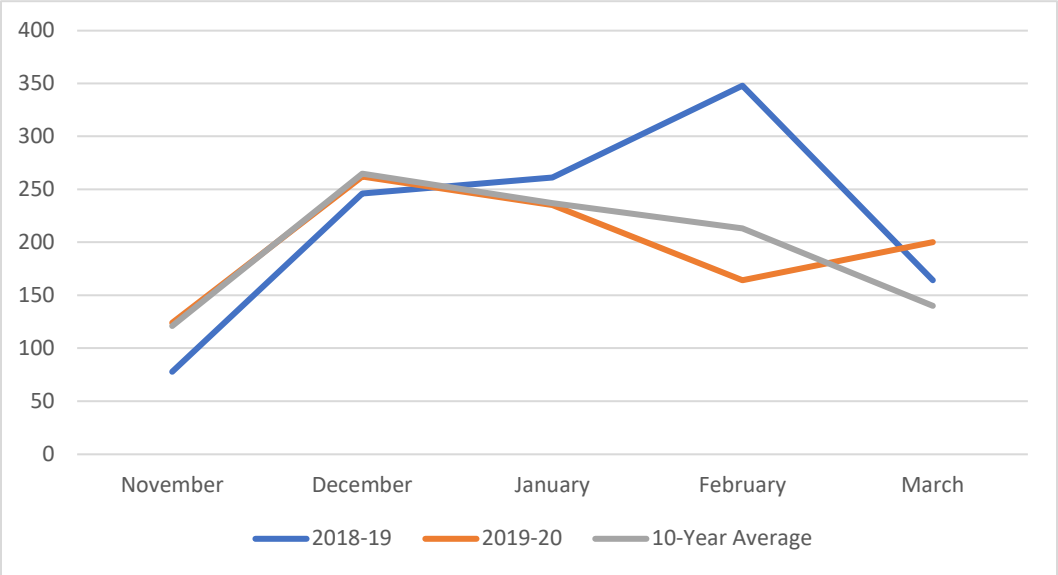
Staff also reviewed the SoCalGas Gas Acquisition Department's (Gas Acquisition) gas purchases for core customers and examined the impact of Operational Flow Orders (OFOs). Gas Acquisition's estimated actual burn was within +/- 5 percent of the forecast on 15 OFO days during winter and between +/- 5-10 percent on nine days. While there were several OFO days when the forecast could have been more accurate, receipt point capacity utilization was already near maximum on those dates. As such, only withdrawals from storage could have fulfilled the remaining gas demand on the system.

In this report, staff concludes that the higher inventory levels and stable gas and electricity prices can be attributed to the lack of a sustained winter cold snap, the return of Line 235-2, and the revised Withdrawal Protocol, which allowed for more balanced withdrawals from the gas storage fields.

## Weather

There was no sustained cold snap like the one that marked winter 2018-19. However, there were several cold weather events that resulted in sendouts of 3.2-3.9 Bcf. November and December saw temperatures in line with 10-year averages. In SoCalGas's service territory, there were 124 Heating Degree Days (HDDs) in November and 262 in December compared to historical average HDDs of 121 and 265, respectively. January, with 235 HDDs, was comparable to the 10-year average of 237 HDDs and warmer than January 2019 which had 261 HDDs. By contrast February, with 164 HDDs, was significantly warmer than the 10-year average of 213 HDDs. It was also much warmer than February 2019, which saw 348 HDDs. The winter ended on a cold note, as seen in Figure 1, when a cold front moved into SoCalGas' territory on March 12. In SoCalGas' service territory, there were 200 HDDs in March compared to a historical average of 140 HDDs and 164 HDDs in March 2019.

*Figure 1: Comparison of Heating Degree Days: 2018-19, 2019-20, and 10-Year Average*




*Data source: SoCalGas Data Request Response*

Cold weather combined with the beginning of the COVID-19 pandemic caused a shift in energy usage patterns in the latter half of March. California residents began sheltering at home in the middle of March just as a cold snap rolled into Southern California. On March 12, which was before California's official March 19 shelter-in-place order was issued but after individuals had already begun staying home, cold and rainy weather took hold across the region. As a result, sendout did not decline after the morning peak as it typically would on a weekday. Rather, energy usage remained high into the evening, resulting in emergency withdrawals from Aliso Canyon. From March 12 through March 31, residential energy demand for SoCalGas' customers increased by an average of 38 percent, core non-residential gas usage decreased by an average of 7 percent, and noncore gas usage increased by an average of 13 percent in comparison to the same time in 2019.[4] These figures do not account for the continued changes to gas demand profiles in April and May. However, analysis of noncore gas usage in April and May showed a steady drop in usage in comparison to the same time in 2019.[5]

## Receipt Point Utilization

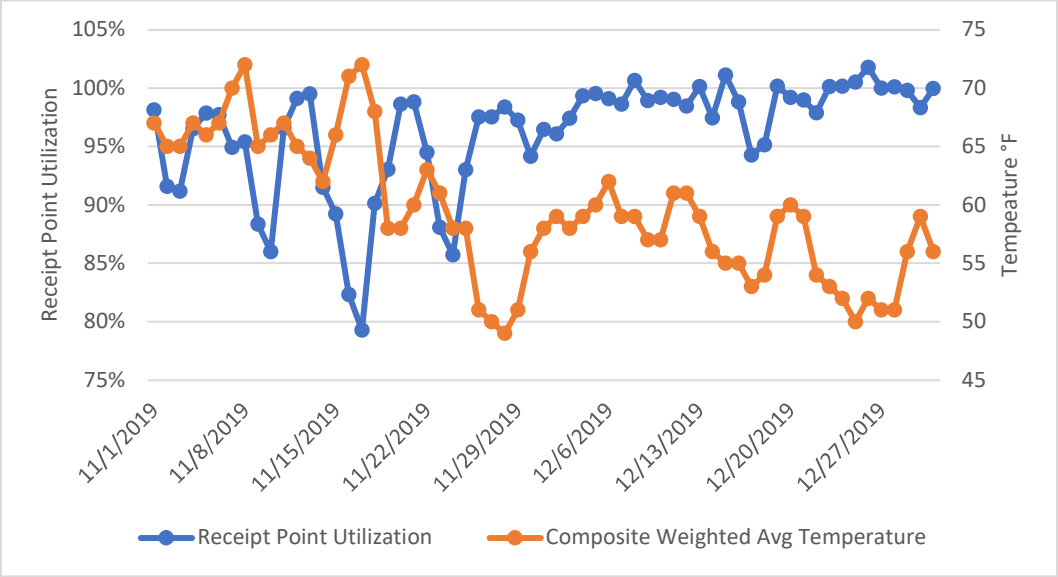
The figures in this section combine daily receipt point utilization from Ehrenberg, Otay Mesa, Blythe, Transwestern/North Needles, Kramer Junction, Kern/Mojave, Kern River, and Occidental Elk Hills for total receipt point utilization and the corresponding composite weighted average temperature. With a few relatively minor exceptions, it is the customers of SoCalGas—including electric generators, industrial customers, and the SoCalGas Gas Acquisition Department—who must procure and schedule gas deliveries onto the system. As demonstrated in Figures 2-4, generally there is a negative relationship between receipt point utilization and temperatures. As temperatures dropped, receipt point utilization tended to increase. Conversely, as temperatures increased, utilization tended to decrease.

Figure 2 shows receipt point utilization during the first half of the winter. Receipt point utilization averaged 93 percent in November but trended lower during the first half of the month as the SoCalGas storage fields underwent their annual shut-ins, reducing injection capacity. Lack of injection capacity tends to reduce receipt point utilization when demand is moderate because there is nowhere for extra gas to go. The lowest receipt point utilization of the winter—79 percent—occurred on November 17. It is not a coincidence that on that same day, Honor Rancho was undergoing its high inventory shut-in, and the composite weighted average temperature was among the highest of the season. Receipt point utilization sharply increased in the latter half of November as temperatures dropped to record lows. The high receipt point utilization later in the month led to high OFOs on November 24 and 25. It continued to remain high throughout December, with an average utilization of 99 percent and a mean composite weighted average temperature of 57°F. The average total receipt point capacity was approximately 2,703 million cubic feet (MMcf), and customers scheduled an average of 2,674 MMcf in receipts.

[4] June 8, 2020, SoCalGas Response to Energy Division data request.

[5] April and May 2020 demand profiles will be examined more closely in a future summer lookback report.

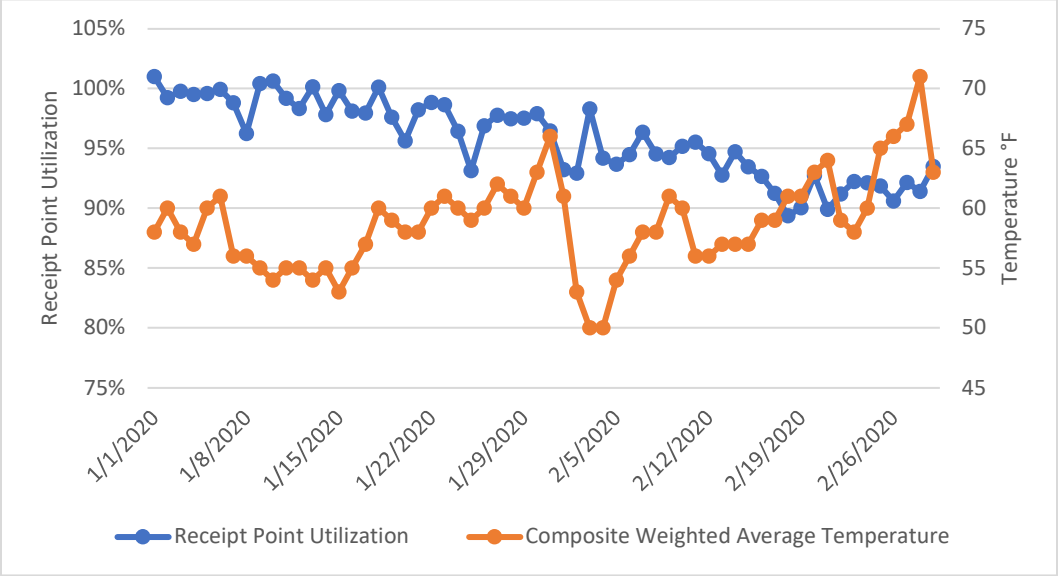
*Figure 2: Receipt Point Utilization in November-December*




*Data source: SoCalGas Envoy*

In January 2020, receipt point utilization averaged 98 percent and the mean composite weighted average temperature was 58°F. The average total receipt point capacity was approximately 2,722 MMcf, and customers scheduled an average of 2,678 MMcf in receipts.[6] In February, the average receipt point utilization was approximately 93 percent and the mean composite weighted average temperature was 59°F. The highest utilization of the month was 98 percent and occurred on February 3; it can be attributed to the sharp drop in temperatures from February 2 to 3.

*Figure 3: Receipt Point Utilization in January-February*



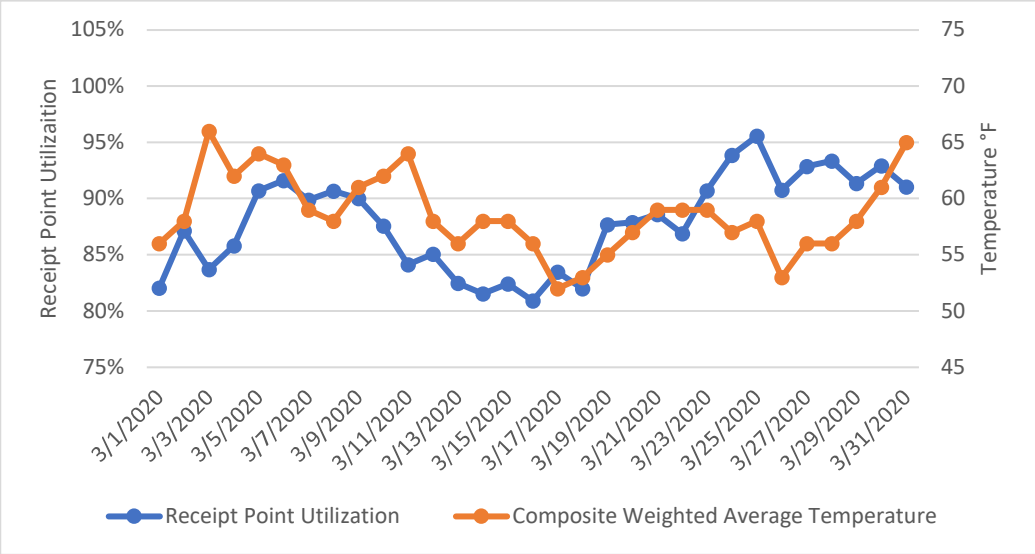

*Data source: SoCalGas Envoy*

Receipt point utilization in March was not as high as in the previous winter months. Average utilization was 88 percent, and the mean composite weighted average temperature was 59°F. The

[6] SoCalGas' Envoy Available vs Scheduled Archives and Daily Operations Archives: https://scgenvoy.sempra.com/

average receipt capacity for the month was approximately 2,688 MMcf, but receipts averaged 2,363 MMcf, leaving an average of 325 MMcf of capacity unscheduled. Playa del Rey was shut in from March 9 through March 12, which may partly explain the overall lower receipt point utilization. Receipt point utilization was notably low from March 16 to 18 despite the wet weather and increase of people staying home due to the pandemic. Average receipt capacity was approximately 2,764 MMcf, and receipts averaged 2,270 MMcf on those days, leaving an average of 494 MMcf of unscheduled capacity. Sendout exceeded 3,300 MMcf on all three days—a 30 percent difference between receipts and demand.

*Figure 4: Receipt Point Utilization in March*




*Data source: SoCalGas Envoy*

While much of the gas burned by customers flows through interstate pipelines, storage inventory is critical and enables SoCalGas to meet its winter demand. The following section discusses storage usage and compares winter 2019-20 inventory levels to that of winter 2018-19.

## Storage Usage

The SoCalGas system entered November with 76.7 Bcf of gas inventory in storage, which is approximately 91 percent full (see Table 1). In comparison, the SoCalGas system entered November 2018 with its storage fields slightly closer to the maximum allowed inventory level of 84.4 Bcf.

*Table 1: Storage Inventory on 11/1/18 and 11/1/19*

| **Storage Field** | | 11/1/2018 | 11/1/2019 |
|---|---|---|---|
| | Maximum Inventory (Bcf) | Actual Inventory (Bcf) | |
| Combined non-Aliso | 50.4 | 46.9 | 43.1 |
| Aliso | 34 | 33.6 | 33.6 |
| **Total Inventory** | **84.4** | **80.5** | **76.7** |

Storage usage was more balanced during winter 2019-20 than in winter 2018-19. During winter 2018-19, Aliso Canyon was considered an "asset of last resort" so SoCalGas relied heavily on the non-Aliso fields to meet customer demand, which significantly drew down their inventory, reducing their withdrawal capacity.[7] During winter 2019-20, SoCalGas used Aliso Canyon more frequently, mostly under Condition 1 of the Withdrawal Protocol, which allows the field to be used if the preliminary OFO calculation results in a Stage 2 or high low OFO.[8] In addition to avoiding the gas and electric price spikes associated with gas supply shortages and higher stage OFOs, these withdrawals from Aliso Canyon helped preserve inventory in the other three fields. Maintaining higher inventories in the non-Aliso fields results in a higher level of combined withdrawal capacity than is possible if some fields are severely depleted while others are nearly full. It is particularly important to preserve the inventory level and withdrawal capacity of Honor Rancho and Playa del Rey, which are geographically closer to the Los Angeles basin than La Goleta.

In its Winter 2018-19 Technical Assessment, SoCalGas set month-end minimum storage inventory targets needed to sustain the withdrawal capacity required for core customer reliability.[9] In winter 2018-19, Honor Rancho and Playa del Rey were frequently close to their monthly and weekly minimum inventories.[10] In contrast, in winter 2019-20 Honor Rancho and Playa del Rey did not get close to reaching the thresholds shown in Table 2.

*Table 2: Month-End Minimum Inventory by Field (in Bcf)*

| Storage Field | Nov. | Dec. | Jan. | Feb. | March |
|---|---|---|---|---|---|
| **Honor Rancho** | 13.9 | 13.2 | 12.6 | 7.5 | 5 |
| **La Goleta** | 8 | 7.9 | 7.7 | 7.6 | 7.5 |
| **Playa del Rey** | 1.9 | 1.9 | 1.5 | 1.1 | 0.7 |
| **Total Non-Aliso** | 23.8 | 23 | 21.8 | 16.2 | 13.2 |
| **Aliso Canyon** | 5.7 | 5.1 | 4.4 | 3.8 | 2.1 |
| **Total** | 29.5 | 28.1 | 26.2 | 20 | 15.3 |

As seen in Figure 5, underground gas storage played a crucial role in meeting customer demand throughout the winter. The gap between the blue line and orange area illustrates demand that must be met with gas from linepack or storage facilities. The green and orange areas above the blue sendout line indicate gas that remained in linepack or gas that was injected into storage. There were

[7] Unbalanced drawdowns have the most significant impact on the Honor Rancho storage field because it is the only large, non-Aliso field close to Los Angeles. Staff cannot release the storage levels at individual non-Aliso fields due to confidentiality concerns. However, Honor Rancho was significantly more depleted than the other two fields at the end of winter 2018-19. Using a combined inventory number for the three fields masks the severity of the drawdown at Honor Rancho, which exited winter 2018-19 considerably less than 36 percent full.

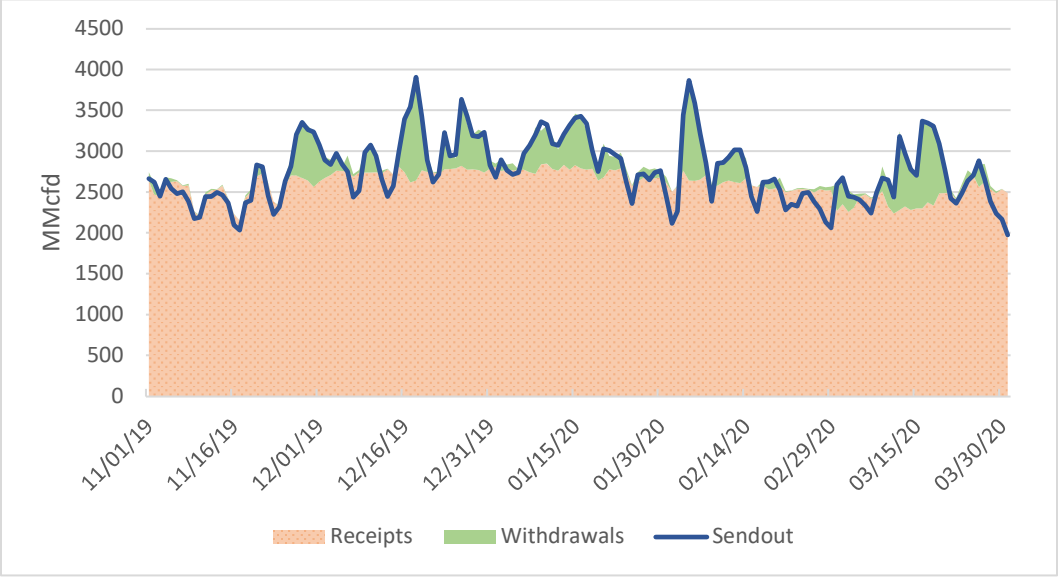
[8] See Footnote 1 above for a link to the revised Withdrawal Protocol.

[9] SoCalGas Winter 2018-19 Technical Assessment, October 16, 2018, p. 7: http://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2018/2018%2011%2002%20SoCalGas%20(R.%20Schwecke)%20letter%20to%20CEC%20enclosing%20WINTER%202018-19%20TECHNICAL%20ASSESSMENT.PDF.

[10] SoCalGas 2018-19 Winter Conditions and Operations Report, p. 11: https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/Winter2018-19LookbackReport-Final-January2020.pdf

eight gas days when storage withdrawals exceeded 900 MMcf. On three of those days—December 17, February 4, and March 16—withdrawals exceeded 1,000 MMcf. Colder-than-average weather was a notable factor on all three gas days. However, a factor unique to the high withdrawals on March 16 was the COVID-19 pandemic, which changed the demand curve. With so many people at home, demand never dropped after the morning peak, and SoCalGas was unable to repack the pipelines before the evening peak hit.

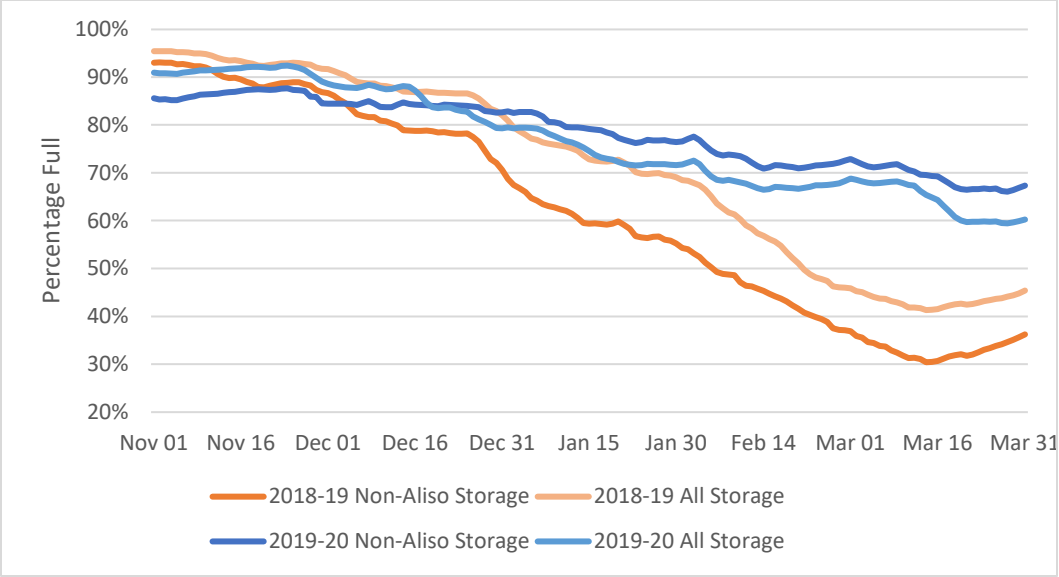
*Figure 5: Daily Receipts, Sendout, and Withdrawals*




*Data source: January 6, 2016, Data Request to SoCalGas to provide daily logs*

Figure 6 shows that although winter 2018-19 began with total storage inventory approximately 95 percent full, prolonged use of storage during the latter half of winter caused storage inventory to drop to approximately 45 percent full by March 31, 2019. In contrast, storage inventory was 61 percent full by the end of March 2020. Furthermore, the non-Aliso fields experienced significant decline in winter 2018-19 (the dark orange line) compared to winter 2019-20 (the dark blue line). From November 1, 2018, to March 31, 2019, the non-Aliso fields declined from approximately 93 percent full to 36 percent full. During the same period in 2019-20, the non-Aliso fields declined from approximately 86 percent full to 68 percent full. Thus, it is important to point out that even though the 2018-19 winter starting inventory was higher than the 2019-20 winter starting inventory, the latter was in a better position at the end of the winter. The March 31, 2020, inventory levels shown in Figure 6 can be attributed to the lack of a sustained winter cold snap, the return of Line 235-2, and the revised Withdrawal Protocol, which allowed for more balanced withdrawals.

*Figure 6: November 2018–March 2019 and November 2019–March 2020 Storage Inventory Comparison*




*Data source: January 6, 2016, Data Request to SoCalGas to provide daily logs*

## Aliso Canyon Usage

Aliso Canyon withdrawals were made under Conditions 1 and 4 of the revised Withdrawal Protocol during winter 2019-20. Aliso Canyon withdrawals occurred on 48 days this winter, resulting in the withdrawal of approximately 18.6 Bcf of gas. SoCalGas withdrew gas from Aliso Canyon 47 times under Condition 1 of the Withdrawal Protocol, which is intended to improve short-term reliability and reduce price volatility. SoCalGas made one Condition 4 emergency withdrawal. Under Condition 1 of the Withdrawal Protocol, Aliso Canyon's withdrawal capacity can be used if preliminary calculations indicate a Stage 2 or higher low OFO for the gas day. Once that threshold has been reached, the Withdrawal Protocol allows SoCalGas to include Aliso Canyon's withdrawal capacity in the OFO calculation, which often eliminates the OFO. As shown in Table 3 below, SoCalGas' preliminary calculations indicated a Stage 2 or higher low OFO 53 times. The subsequent inclusion of Aliso Canyon's withdrawal capacity in the calculations eliminated the OFO 75 percent of the time. Staff reviewed the confidential workpapers submitted by SoCalGas documenting the preliminary low OFO calculation, and it appears that SoCalGas followed the Aliso Canyon Withdrawal Protocol.

*Table 3: Preliminary and Final Low OFO Determinations*

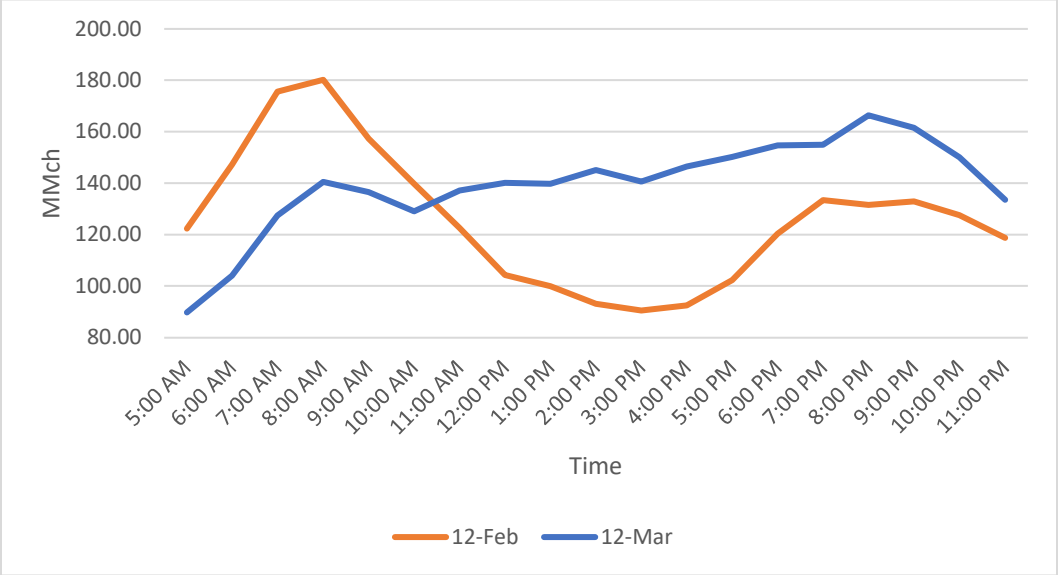
| Preliminary Stage 2+ Low OFO Determination | OFOs Declared | Stage 1 | Stage 2 | Stage 3 | No OFO |
|---|---|---|---|---|---|
| 53 | 13 | 2 | 4 | 7 | 40 |

Condition 4 of the Withdrawal Protocol was met on Thursday, March 12. Energy usage on March 12 was unique because more people were staying home due to the COVID-19 pandemic. As a

result, sendout did not decline after the morning peak as it typically would on a weekday. Rather, energy usage remained high into the evening. According to SoCalGas' Envoy bulletin board, March 12 Cycle 1 forecasted sendout was approximately 2,426 MMcf and forecast receipts were approximately 2,293 MMcf. However, actual sendout unexpectedly totaled 3,181 MMcf. One reason for this unexpected increase in sendout was cold, stormy weather conditions and heavy cloud coverage, which led to less renewable generation. In turn, more gas-fired electric generation was required on the grid, and in combination with more people at home, gas sendout increased.

Staff analyzed hourly system sendout on March 12 to determine hourly margins. In the winter, SoCalGas typically experiences two peak periods per day that are driven by customer behavior: one in the morning (usually around 6:00-9:00 AM) and a second in the evening (usually around 6:00-9:00 PM). The unique load shape of March 12 can be seen in Figure 7, which compares hourly sendout from 5:00 a.m. to 11:00 p.m. on February 12 and March 12. The February 12 time-of-day variation shown in Figure 7 is an example of a typical winter load shape for SoCalGas, with a morning peak, followed by a drop in gas demand as customers left their homes and then an evening peak as customers returned to their homes after the workday. This consumption trend did not manifest on March 12. Hourly sendout hit 127 MMcfh at 7:00 a.m., and the peak carried continuously throughout the day and into the evening, with hourly sendout averaging 144 MMcfh.

*Figure 7: Hourly Sendout on February 12 and March 12*

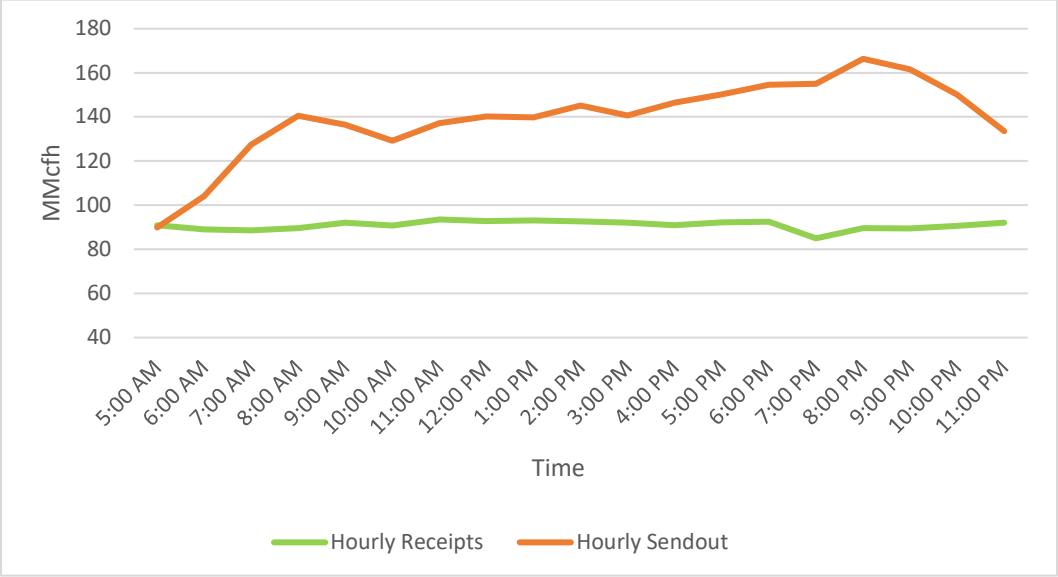



*Data source: SoCalGas Data Request January 6, 2016, to provide daily logs*

Thus, the persistently high hourly sendout, coupled with increased natural gas-fired electric generation and cold, stormy weather conditions led to demand that exceeded the available supply, triggering emergency withdrawals from Aliso Canyon under Condition 4. SoCalGas began withdrawals from Aliso Canyon at 1:05 p.m., which is another notable feature because most of the other Aliso Canyon withdrawal events began during the morning peak. However, as shown in Figure 8, hourly receipts remained stagnant for much of the day relative to hourly demand. The average receipt point utilization for the day was also markedly low at 85 percent. Playa del Rey was on its low inventory shut-in, and its withdrawal capacity was therefore unavailable. Lastly, Honor

Rancho and La Goleta were near their maximum withdrawal rates when SoCalGas began withdrawing from Aliso Canyon.

*Figure 8: Hourly Receipts and Sendout on March 12*




*Data source: SoCalGas Data Request Response*

## Gas Acquisition

SoCalGas' Gas Acquisition Department was required to balance to a forecast rather than to actual burn on high or low OFO days during winter 2019-20.[11] Therefore, there are three data sets relevant to this section: daily core forecast, confirmed gas deliveries, and estimated actual burn. Staff analyzed Gas Acquisition's role in the winter supply and demand by comparing daily core forecasts to estimated actual burns (see Figure 9).

In winter 2019-20, Gas Acquisition's estimated actual burn was within +/- 5 percent of the forecast on about 51 percent of the days and within +/- 10 percent on 80 percent of the days. However, there is no penalty for being out of balance on non-OFO days, so Table 4 focuses on Gas Acquisition's deliveries on days when an OFO was called. Negative percentages indicate a forecast lower than estimated actual burn. On low OFO days, not enough gas is delivered onto the system, so having a positive imbalance is a benefit to the system. Conversely, on high OFO days, too much gas is delivered to the system, so a negative balance is a benefit to the system.

[11] However, as of April 1, 2020, Gas Acquisition is required to balance gas deliveries to their estimated actual gas use.

*Table 4: Number of OFO Days and Forecast Compared to Estimated Actual Burn*[12]

| | Number of Low OFO Days When % Difference Between Forecast and Estimated Actual Is: | | | | | |
|---|---|---|---|---|---|---|
| | Under -10% | Between -5-10% | Within -5% | Within 5% | Between +5-10% | Over +10% |
| Low OFO | 2 | 7 | 9 | 6 | 2 | 4 |

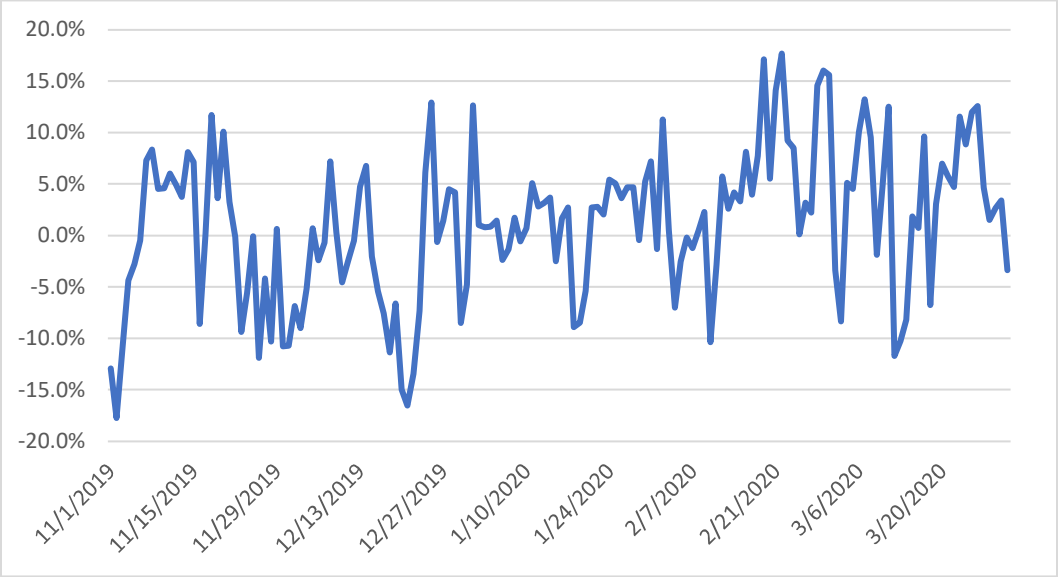
| | Number of High OFO Days When % Difference Between Forecast and Estimated Actual Is: | | | | | |
|---|---|---|---|---|---|---|
| | Under -10% | Between -5-10% | Within -5% | Within 5% | Between +5-10% | Over +10% |
| High OFO | 2 | 2 | 2 | 5 | 3 | 2 |

During the 18 low OFO days (summation of 2+7+9) when Gas Acquisition's forecasts were lower than the estimated actual burn, confirmed gas deliveries were almost always lower than estimated actual burn as well. For example, Stage 3 low OFOs were called from December 17 to 19, and Gas Acquisition delivered within 5 percent of their *forecast* each day. However, confirmed gas deliveries were more than five percent below *estimated actual* burn on all three days. While the forecast could have been more accurate, capacity utilization was already near maximum on these dates, as illustrated earlier in Figure 2. As such, only withdrawals from storage could have fulfilled the remaining gas demand on the system.

Analyzing the ratio of confirmed gas deliveries to estimated actual burn provides insight into Gas Acquisition's contributions to the system being in balance or out of balance. Confirmed gas deliveries exceeded estimated actual burn 64 percent of the time. During the last week of November, confirmed gas deliveries were consistently below estimated actual burn, at times almost 20 percent below. However, there was insufficient pipeline capacity available to schedule enough gas on these days (receipt point utilization during this time was approximately 98 percent on several days), and Honor Rancho was shut in.

[12] Positive imbalances on a low OFO day and negative imbalances on a high OFO day help the system.

*Figure 9: Core Forecast vs. Estimated Actual Burn—November 2019-March 2020*




*Data source: SoCalGas Data Request Response*

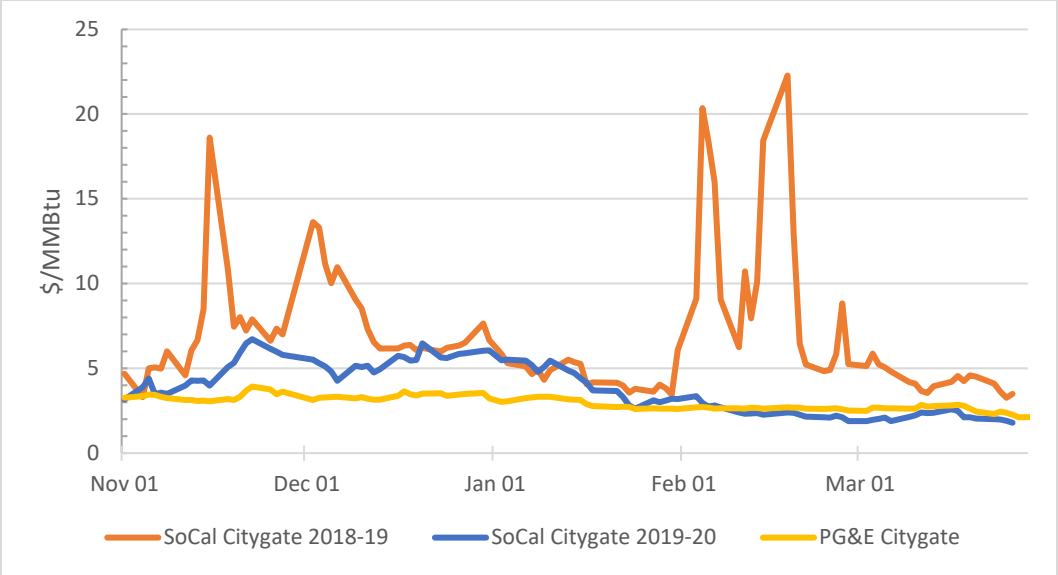
ED staff analyzed Gas Acquisition's forecasts and compared them to estimated actual burn to determine forecast accuracy. The most severe discrepancy took place on November 2, when estimated actual burn was approximately 18 percent more than the forecast. However, as this was a high OFO day, it was not in Gas Acquisition's best interest to nominate more gas onto the system. The next most severe occurrence was on December 21, when the forecast was lower than estimated actual burn by almost 17 percent. On this day, receipt point utilization was 99 percent, receipt and sendout were nearly equal, and there were no OFOs called. Staff believes overdeliveries created by other customers may have contributed to a balanced system. All instances of estimated actual burn exceeding the forecast by more than 10 percent occurred on days when receipt point utilization was higher than 90 percent.

Unlike the previous three winters, Gas Acquisition was able to periodically schedule gas from Aliso Canyon, if certain conditions were met under the revised Withdrawal Protocol.

## Natural Gas Prices

SoCal Citygate gas prices did not exhibit volatile behavior during extreme weather or tight system conditions, as was seen in winter 2018-19 (see Figure 10). The last 11 days of November saw the highest prices of the season, with gas topping out at approximately $6.74/MMBtu on November 22 (see Figure 11). The winter 2019-20 peak price pales in comparison to the winter 2018-19 peak price of $26/MMBtu seen on February 18, 2019. The lowest prices of winter 2019-20 were seen in March, when COVID-19 abruptly changed the national calculus for gas demand. Staff examines the winter's highs and lows in more detail below.

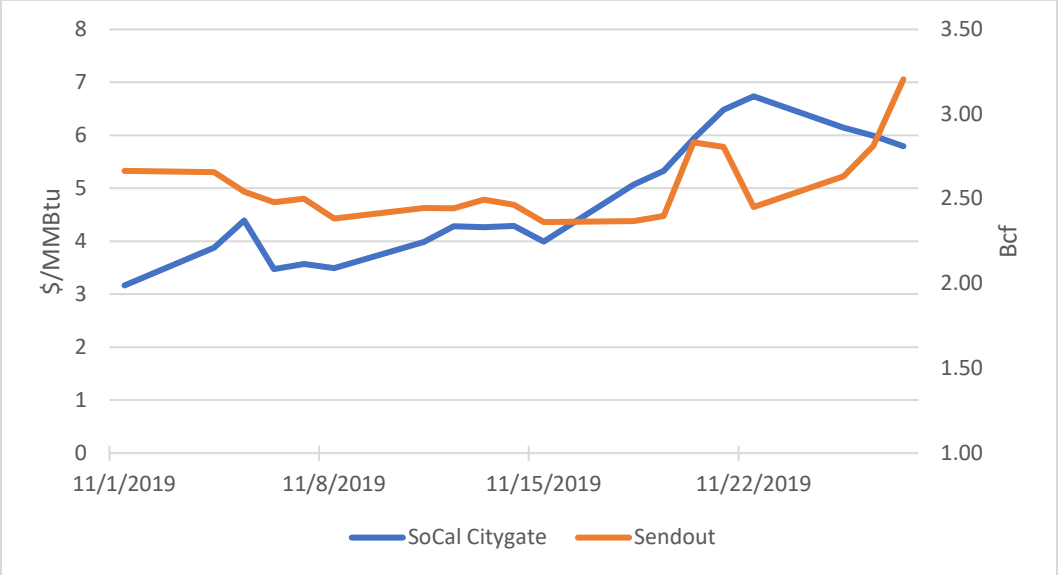
*Figure 10: SoCal Citygate Prices Winter 2018-19 Compared to Winter 2019-20*




*Data source: Natural Gas Intelligence*

Two key factors impacted gas prices in late November 2019. First, Honor Rancho was under a mandatory high inventory shut-in from November 15 to November 27, which resulted in a loss of 675 MMcf of withdrawal capacity. Second, November 2019 was the wettest November in Downtown Los Angeles since 2011, and there were two storms during the second half of the month. Over Thanksgiving weekend, Downtown Los Angeles dipped to 43°F, and several spots dipped even lower. Burbank experienced a low of 37°F from November 27 through 30.[13]

*Figure 11: SoCal Citygate Prices and System Sendout November 2019*




*Data source: Natural Gas Intelligence and January 6, 2016, data request to SoCalGas to provide daily logs*

Total system sendout remained above 2.8 Bcf and gas prices remained above $5/MMBtu through December 4, as the third storm of the season moved through Southern California. Gas prices

[13] Temperature source: National Centers for Environmental Information. http://www.noaa.gov/

dipped below $5/MMBtu from December 5 to 6 and December 12 to 13. Other than those dates, gas prices shifted between the mid-$5/MMBtu and mid-$6/MMBtu range. In December, the average price was $5.43/MMBtu, compared to an average price of $7.92/MMBtu in December 2018. On December 13, S&P Global's *Gas Daily* stated:

> New withdrawal protocols for Aliso Canyon have helped to soften single-day price blowouts at Southern California Gas city-gate despite total inventories entering this winter at a deficit… The SoCal footprint has experienced strong heating demand since the official start to winter, but prices did not see huge spikes, likely due to accessibility to Aliso Canyon… Additional accessibility to supply through the combination of increased receipt capacity at Topock/Needles and greater withdrawal flexibility at Aliso has dampened prices this winter.[14]

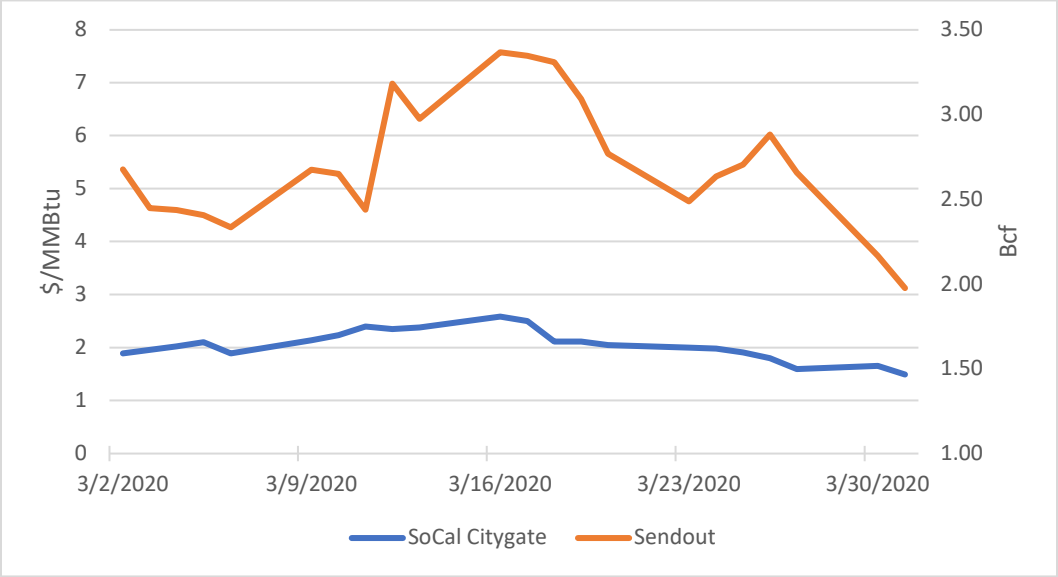
In other words, the revised Withdrawal Protocol, along with other factors, such as the return of Line 235-2, assuaged concerns of tight gas supply on the system and led to lower price volatility.[15]

As seen in Figure 10, on February 10, the SoCal Citygate price fell below PG&E Citygate—a return to historical norms prior to the Aliso Canyon well leak and the maintenance on Lines 235-2 and 4000. By February 28, 2020, SoCal Citygate was approximately $1.90/MMBtu.

Figure 12 presents SoCal Citygate gas prices and total gas sendout during March 2020. The average price of gas in March was low at $2.05/MMBtu, despite several high sendout days. On March 12, the composite weighted average temperature was 58°F, and Downtown Los Angeles received 1.3 inches of rain. Sendout rose from 2.44 Bcf on March 11 to 3.18 Bcf on March 12. Despite increased sendout, SoCal Citygate prices only increased by several cents. From March 16 through 19, sendout exceeded 3 Bcf each day; however, SoCal Citygate dropped by approximately $0.48/MMBtu during the combined four days. On March 23, the price dipped below $2.00/MMBtu, then "continued to slide [on March 27] amid coronavirus-related concerns and dissipating demand ahead of the shoulder season."[16] March ended with SoCal Citygate and PG&E Citygate at approximately $1.49/MMBtu and $2.21/MMBtu, respectively.

[14] "Gas Daily." S&P Global Platts. (December 13, 2020)
[15] Refer to footnote no. 1.
[16] "Gas Daily." S&P Global Platts. (March 30, 2020)

*Figure 12: SoCal Citygate Prices and System Sendout March 2020*




*Data source: Natural Gas Intelligence and January 6, 2016, data request to SoCalGas to provide daily logs*

There were several other factors that helped put downward pressure on prices, in addition to the return of Line 235-2 at reduced capacity and the revised Withdrawal Protocol. There were fewer unplanned outages occurred during the winter, which previous analysis had shown to be a key contributor to price spikes. Furthermore, the U.S. produced a record high amount of natural gas in 2019, resulting in ample supply to keep prices from increasing at the national level.[17] Lastly, the COVID-19 pandemic reduced the chance of price increases from the demand side, largely due to the closure of non-essential businesses throughout SoCalGas' service territory. In fact, by the end of the winter season, S&P Global Platts Analytics head of gas and power stated, "We are beyond the bend; the price-to-demand elasticity relationship is fully broken due to the virus."[18]

## Electric Prices

This report includes a discussion of electricity prices because a significant portion of electric generation in California is gas-fired. Figure 13 shows PG&E Citygate, SoCal Border, and SoCal Citygate gas prices against CAISO NP15 and SP15 prices during the winter.[19] Electricity prices tend to reflect natural gas price trends since natural gas generators are often the marginal resource in the CAISO market. Furthermore, "SoCal Citygate prices often impact overall system prices because 1) there are large numbers of natural gas resources in the south, and 2) these resources can set system prices in the absence of congestion."[20] With a correlation coefficient of 0.83, the relationship

[17] *Natural Gas Gross Withdrawals and Production*. U.S. Energy Information Administration. Release date: March 31, 2020. Access date: April 22, 2020. https://www.eia.gov/dnav/ng/ng_prod_sum_dc_NUS_mmcf_a.htm

[18] "Gas Daily." S&P Global Platts. (April 2, 2020)

[19] South of Path 15 (SP15) and North of Path 15 (NP15) are two regions within California Independent System Operator (CAISO)'s balancing area. Generally, SP15 covers Southern California and NP15 covers Northern California. Prices can be accessed by visiting: http://oasis.caiso.com/mrioasis/logon.do

[20] *Q4 2019 Report on Market Issues and Performance*, Department of Market Monitoring — California ISO, Page 7: http://www.caiso.com/Documents/2019FourthQuarterReportonMarketIssuesandPerformance.pdf

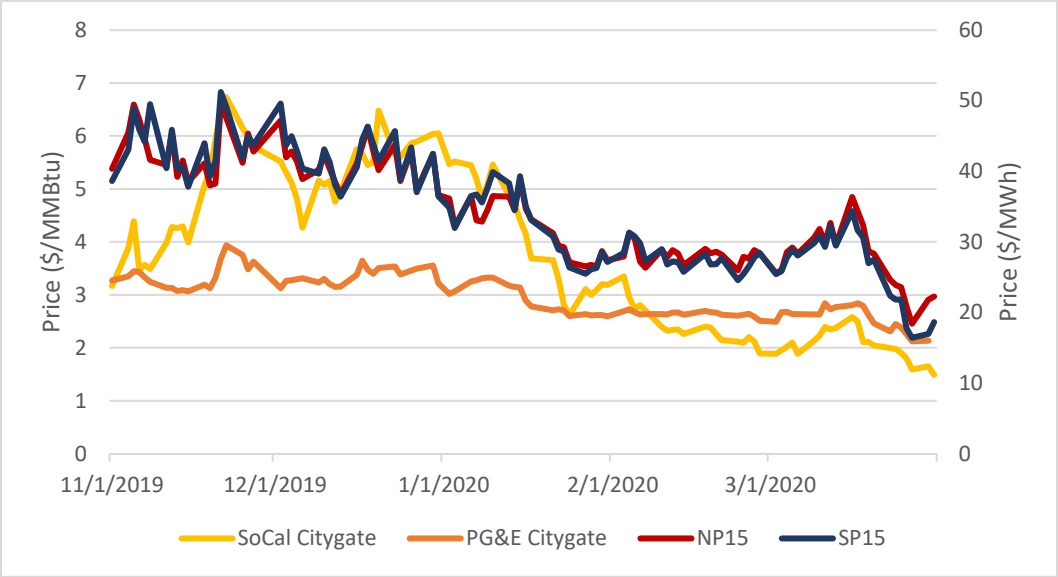
between SoCal Citygate and SP15 prices during this time exhibited strong correlation in a continuation of historical norms.

Daily electricity prices largely saw small movements and lacked volatility, although the average price in November 2019 of approximately $43/MWh was the highest monthly average since February 2019. This follows the trend set by gas prices and weather. CAISO reported,

> During the fourth quarter of 2019, natural gas prices increased across major gas trading hubs in the west. This increase in natural gas prices increased system marginal energy prices across the [CAISO] footprint during the fourth quarter.[21]

The highest daily average electricity price of $51.25/MWh in SP15 on November 22 was coincident with the higher gas price of $6.48/MMBtu on November 21 (which is for delivery on the November 22 gas day). In contrast, the highest daily average electricity price seen in the winter 2018-19 season was almost $146/MWh in SP15 on February 22, 2019, during a sustained cold snap, Stage 4 OFO, and a mandatory curtailment of electric generation.[22]

*Figure 13: Gas and Electricity Prices Winter 2019-2020*




*Data source: Natural Gas Intelligence and CAISO OASIS*

The new year ushered in lower gas prices to the benefit of electricity prices. As CAISO reported,

> During the first quarter of 2020, natural gas prices declined significantly across major gas trading hubs in the west, when compared to the same quarter in 2019. This decrease in natural gas prices led to lower system marginal energy prices across the ISO footprint during the first quarter.[23]

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[21] Ibid. Page 6.

[22] A mandatory curtailment, also known as a Rule 23 curtailment, is a mandatory reduction in gas use pursuant to SoCalGas' Rule No. 23 tariff (https://www.socalgas.com/regulatory/tariffs/tm2/pdf/23.pdf).

[23] *Q1 2020 Report on Market Issues and Performance*, Department of Market Monitoring — California ISO, Page 6: http://www.caiso.com/Documents/2020FirstQuarterReportonMarketIssuesandPerformance-Sep112020.pdf

Under the revised Withdrawal Protocol, SoCalGas did not declare any voluntary or mandatory curtailments of electric generation customers during the winter, in contrast to the 43 days of voluntary curtailments, six days of systemwide curtailment watch, and five days of mandatory Rule 23 curtailments during winter 2018-2019. The absence of these events helped avoid volatility in electricity prices.

## Closing Summary

SoCalGas' winter 2019-20 system capacity and operating conditions improved compared to winter 2018-19 due to several factors. First, the CPUC issued a revised Aliso Canyon Withdrawal Protocol on July 23, 2019, that removed Aliso Canyon's designation as an "asset of last resort" and allowed the field to be used under specified conditions of system stress in an effort to reduce price volatility. Next, Line 235-2 returned to service at reduced pressure after having been out of service for nearly two years. Lastly, the weather was largely mild and did not bring a sustained cold snap despite several cold weather events.

The COVID-19 pandemic resulted in more people staying at home, even before the statewide stay-at-home order was issued. This change combined with wet and cold weather, resulted in more unpredictable hourly demand trends in the latter half of March. Analysis of customer gas usage from March 12 through March 31 showed a significant increase in residential demand, a minor drop in core non-residential demand, and a moderate increase in noncore gas demand in comparison to the same time the previous year.

Gas and electric prices were lacked the volatile swings seen in winter 2019-20. The peak gas price of $6.74/MMBtu occurred on November 22, 2019, and is significantly lower than the peak price of $26/MMBtu seen last winter on February 18, 2019. During winter 2018-19, the highest daily average electricity price was almost $146/MWh on February 22, 2019, during a sustained cold snap, Stage 4 OFO, and a mandatory curtailment of electric generation. On the other hand, this winter's highest daily average electricity price of $51.25/MWh occurred on November 22, 2019. Furthermore, SoCalGas did not declare any voluntary or mandatory curtailments of electric generation this winter.

Aliso Canyon withdrawals occurred on 48 days this winter, resulting in the withdrawal of approximately 18.6 Bcf of gas. Staff found that, under the revised Withdrawal Protocol, the inclusion of Aliso Canyon's withdrawal capacity in the OFO calculations eliminated the need for an OFO 75 percent of the time. Staff reviewed the confidential workpapers submitted by SoCalGas documenting the preliminary low OFO calculation, and it appears that SoCalGas followed the Aliso Canyon Withdrawal Protocol throughout winter 2019-20.

Staff's analysis of Gas Acquisition's demand forecasts and resultant gas deliveries did not yield any material forecasting errors or harm to system balancing.

The CPUC's Energy Division and Safety and Enforcement Division teams continued weekly oversight calls and meetings with SoCalGas to monitor system conditions and potential reliability concerns. The CPUC will continue to exercise oversight to safeguard safety, reliability, and just and reasonable rates.

# Appendix A

This appendix contains additional information on terms used in the report.

**Composite Weighted Average Temperature**: A calculation that approximates the temperature in a gas utility's entire service territory by first taking the average daily temperature of several locations in the service territory, applying a weight to each location, and then averaging those into one number.

**Estimated Actual Burn:** Core's estimated burn is derived by subtracting the noncore and Core Transport Agent sendout from System Sendout.

**Heating Degree Day (HDD):** An indicator of space heating demand. The heating degree days for a single day equal 65 degrees Fahrenheit minus the average of the highest hourly temperature and the lowest hourly temperature for the day, if greater than or equal to zero.

**Linepack:** Gas stored in the pipelines. Linepack is created by the difference between a pipeline's maximum and minimum allowable operating pressures.

**Operational Flow Order (OFO):** For natural gas pipeline systems to remain physically "in balance," they must operate within a set range of pressures. If there is not enough gas in the system, the pressure falls, and gas does not flow properly. If there is too much gas, the pressure rises, posing a risk to the structural integrity of the pipelines.

The SoCalGas System Operator is responsible for maintaining the system's balance, but it does not control most gas procurement. To maintain balance, the system operator calls low OFOs when gas deliveries are too low and high OFOs when deliveries are too high. When an OFO is called, customers are required to balance supply and demand within a specified tolerance band; otherwise, they face specified financial penalties for noncompliance.

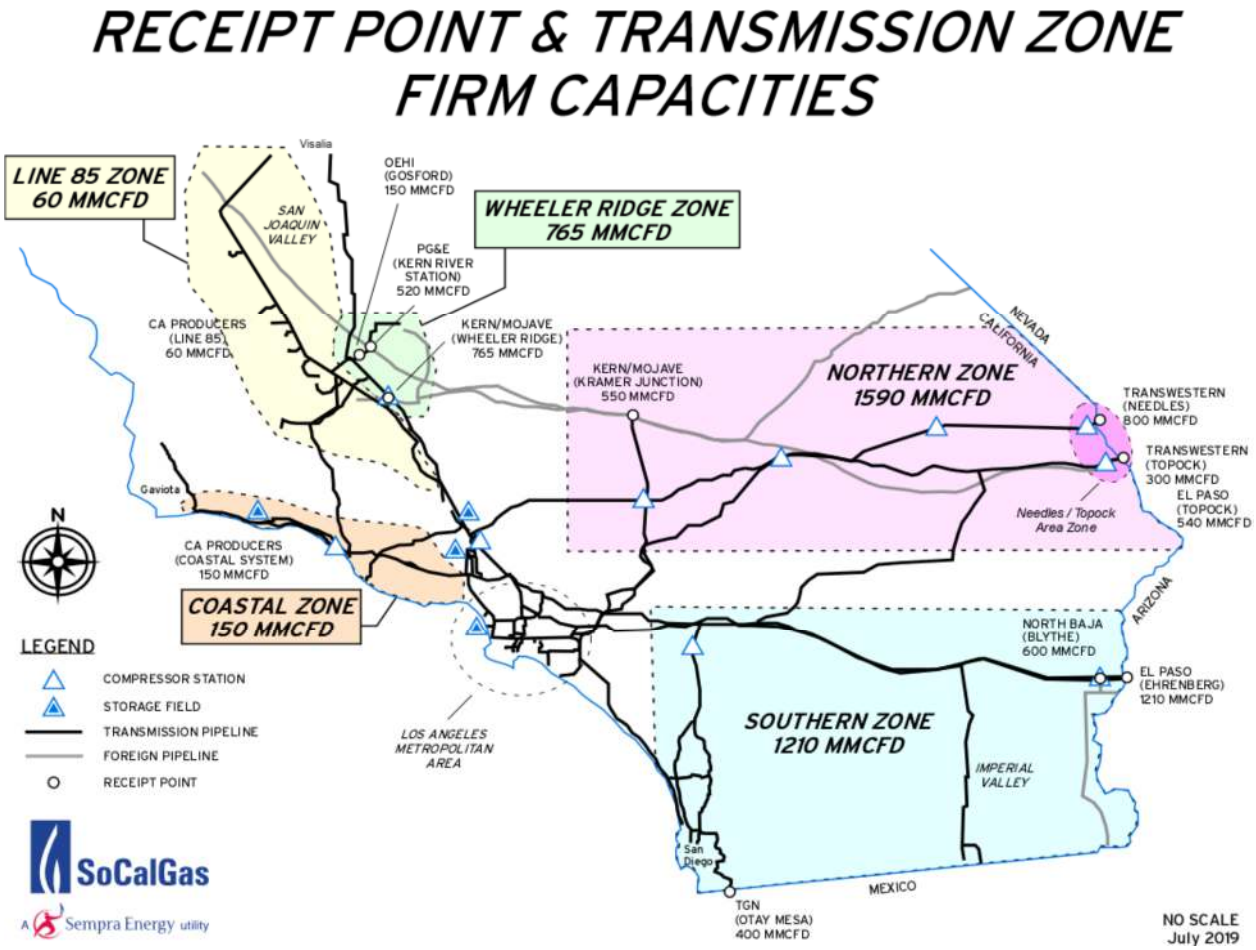
**Receipt Point Utilization:** The ratio between the actual amount of gas flowing through a gas pipeline receipt point on a given day and the maximum operating capacity of that receipt point.

**SoCalGas' Gas Acquisition Department:** Responsible for procuring gas for SoCalGas and SDG&E core customers, which are made up of residential and small business customers. There is a firewall between Gas Acquisition and the System Operator; Gas Acquisition only has access to public information about the SoCalGas system.

**Shut-In:** Regulations enacted by the California Geologic Energy Management Division (CalGEM formerly the Division of Oil, Gas, and Geothermal Resources or DOGGR) in 2018 require semiannual storage field shut-ins for testing and inventory verification. SoCalGas schedules each storage field to be shut-in for compliance procedures and maintenance during the shoulder, or off-peak, seasons of spring and fall. Low inventory shut-ins are typically scheduled in April or May, and high inventory shut-ins are typically scheduled in September, October, or November. These shut-ins may result in reduced opportunities for storage field injection.

# Appendix B

This map created by SoCalGas depicts receipt points with black and white circles and the maximum amount of gas that could be transported through the receipt points assuming no maintenance and no pipelines operating at reduced pressure.



## Appendix C

The preliminary and final OFO calculations for the days when SoCalGas used Aliso Canyon in winter 2019-20 are shown on the following page. The yellow rows display the amount of gas determined to be needed from storage beyond the amount set aside for balancing. As Condition 1 of the Withdrawal Protocol was met in each preliminary OFO calculation, Aliso Canyon's withdrawal capacity became allowable in the OFO calculation. The green rows display the final OFO calculations, the stage of the low OFO, if any, and the amount withdrawn from Aliso, if any. Note: All figures are in dekatherms unless otherwise indicated.

| Flow Date | Cycle | Preliminary Low OFO Stage | Forecasted Total Daily Customer Imbalance | Storage Withdrawal Limit For Balancing | Excess Storage Withdrawal For Balancing | Storage Withdrawal Limit For Balancing *With* Aliso | Excess Storage Withdrawal For Balancing with Aliso | OFO Declared | Stage | Aliso Withdrawal in MMcf |
|---|---|---|---|---|---|---|---|---|---|---|
| 11/20/2019 | 3 | 2+ | 123,792 | 97,400 | 26,392 | 367,000 | 0 | Yes | 1 | 90 |
| 11/21/2019 | 1 | 2+ | 286,277 | 97,200 | 189,077 | 369,000 | 0 | No | n/a | 47 |
| 11/22/2019 | 1 | 2+ | 225,553 | 99,200 | 126,353 | 368,800 | 0 | No | n/a | 0 |
| 11/23/2019 | 2 | 2+ | 139,494 | 99,400 | 40,094 | 368,800 | 0 | No | n/a | 0 |
| 11/26/2019 | 2 | 2+ | 232,173 | 99,200 | 132,973 | 368,300 | 0 | No | n/a | 178 |
| 11/27/2019 | 2 | 2+ | 496,000 | 99,200 | 397,183 | 368,400 | 77,066 | Yes | 2 | 374 |
| 11/29/2019 | 1 | 2+ | 262,305 | 239,000 | 23,305 | 507,600 | 0 | No | n/a | 644 |
| 12/1/2019 | 2 | 2+ | 383,029 | 228,400 | 154,629 | 497,500 | 0 | No | n/a | 418 |
| 12/2/2019 | 1 | 2+ | 816,544 | 228,000 | 588,544 | 497,200 | 327,722 | Yes | 3 | 249 |
| 12/3/2019 | 1 | 2+ | 713,145 | 228,200 | 484,945 | 496,800 | 0 | No | n/a | 184 |
| 12/4/2019 | 1 | 2+ | 449,769 | 229,200 | 220,569 | 487,000 | 0 | No | n/a | 153 |
| 12/5/2019 | 2 | 2+ | 273,901 | 211,800 | 62,101 | 480,800 | 0 | No | n/a | 38 |
| 12/11/2019 | 2 | 2+ | 384,079 | 221,200 | 162,879 | 497,421 | 0 | No | n/a | 166 |
| 12/16/2019 | 1 | 2+ | 489,032 | 220,600 | 268,432 | 490,400 | 0 | Yes | 2 | 567 |
| 12/17/2019 | 1 | 2+ | 653,170 | 220,600 | 432,570 | 490,000 | 60,708 | Yes | 3 | 951 |
| 12/18/2019 | 1 | 2+ | 432,272 | 211,600 | 220,672 | 492,000 | 380,400 | Yes | 3 | 1140 |
| 12/19/2019 | 2 | 2+ | 805,885 | 221,800 | 584,885 | 480,000 | 319,700 | Yes | 3 | 712 |
| 12/20/2019 | 2 | 2+ | 472,239 | 221,800 | 250,439 | 480,000 | 0 | No | n/a | 185 |
| 12/21/2019 | 2 | 2+ | 240,397 | 218,800 | 21,597 | 477,000 | 0 | No | n/a | 0 |
| 12/22/2019 | 1 | 2+ | 314,047 | 218,800 | 95,247 | 477,000 | 0 | No | n/a | 0 |
| 12/23/2019 | 1 | 2+ | 485,154 | 218,800 | 266,354 | 477,000 | 0 | No | n/a | 351 |
| 12/24/2019 | 1 | 2+ | 229,896 | 218,400 | 11,496 | 467,600 | 0 | No | n/a | 171 |
| 12/25/2019 | 1 | 2+ | 262,954 | 225,000 | 37,954 | 467,600 | 0 | No | n/a | 76 |
| 12/26/2019 | 1 | 2+ | 504,615 | 224,800 | 279,815 | 467,200 | 2,231 | Yes | 2 | 765 |
| 12/27/2019 | 1 | 2+ | 338,726 | 224,800 | 113,926 | 467,600 | 0 | No | n/a | 499 |
| 12/29/2019 | 1 | 2+ | 249,118 | 225,000 | 24,118 | 467,800 | 0 | No | n/a | 449 |
| 12/30/2019 | 1 | 2+ | 736,164 | 225,000 | 511,164 | 467,800 | 144,108 | Yes | 3 | 449 |
| 12/31/2019 | 1 | 2+ | 646,376 | 225,000 | 421,376 | 464,000 | 113,884 | Yes | 3 | 59 |
| 1/1/2020 | 2 | 2+ | 263,851 | 219,600 | 44,251 | 462,502 | 0 | No | n/a | 0 |
| 1/9/2020 | 2 | 2+ | 386,946 | 221,800 | 165,146 | 450,800 | 0 | No | n/a | 371 |
| 1/10/2020 | 1 | 2+ | 287,449 | 221,800 | 65,649 | 439,200 | 0 | No | n/a | 351 |
| 1/12/2020 | 1 | 2+ | 295,909 | 218,000 | 77,909 | 442,000 | 0 | No | n/a | 237 |
| 1/13/2020 | 1 | 2+ | 423,331 | 217,800 | 205,531 | 442,000 | 0 | No | n/a | 380 |
| 1/14/2020 | 1 | 2+ | 378,535 | 217,600 | 160,935 | 442,000 | 0 | No | n/a | 477 |
| 1/15/2020 | 2 | 2+ | 405,571 | 217,800 | 187,871 | 441,600 | 0 | No | n/a | 508 |
| 1/16/2020 | 1 | 2+ | 369,764 | 214,800 | 154,964 | 437,800 | 0 | No | n/a | 568 |
| 1/17/2020 | 1 | 2+ | 330,190 | 211,600 | 118,590 | 433,800 | 0 | No | n/a | 402 |
| 1/21/2020 | 1 | 2+ | 431,745 | 203,000 | 228,745 | 427,800 | 0 | No | n/a | 37 |
| 2/2/2020 | 1 | 2+ | 583,040 | 219,600 | 363,440 | 433,048 | 0 | No | n/a | 0 |
| 2/3/2020 | 1 | 2+ | 1,134,978 | 219,600 | 915,378 | 433,000 | 79,919 | Yes | 3 | 260 |
| 2/4/2020 | 1 | 2+ | 820,207 | 219,600 | 600,607 | 441,200 | 0 | No | n/a | 618 |
| 2/5/2020 | 1 | 2+ | 276,831 | 227,800 | 49,031 | 441,600 | 0 | No | n/a | 477 |
| 2/6/2020 | 2 | 2+ | 434,172 | 227,800 | 206,372 | 436,000 | 0 | No | n/a | 231 |
| 2/9/2020 | 1 | 2+ | 281,766 | 224,600 | 57,166 | 432,600 | 0 | No | n/a | 141 |
| 2/10/2020 | 1 | 2+ | 337,198 | 224,200 | 112,998 | 431,600 | 0 | No | n/a | 97 |
| 3/13/2020 | 2 | 2+ | 240,997 | 155,800 | 85,197 | 344,600 | 0 | No | n/a | 601 |
| 3/14/2020 | 2 | 2+ | 323,488 | 149,000 | 174,488 | 338,000 | 0 | No | n/a | 421 |
| 3/15/2020 | 1 | 2+ | 428,759 | 148,600 | 280,159 | 394,800 | 0 | No | n/a | 358 |
| 3/16/2020 | 1 | 2+ | 631,814 | 205,400 | 426,414 | 394,200 | 0 | No | n/a | 679 |
| 3/17/2020 | 1 | 2+ | 691,315 | 205,600 | 485,715 | 377,740 | 0 | No | n/a | 587 |
| 3/18/2020 | 1 | 2+ | 238,296 | 206,200 | 32,096 | 377,400 | 0 | No | n/a | 589 |
| 3/19/2020 | 3 | 2+ | 413,678 | 199,000 | 214,678 | 369,600 | 44,078 | Yes | 2 | 444 |
| 3/20/2020 | 1 | 2+ | 239,951 | 198,600 | 41,351 | 367,400 | 154791 | Yes | 1 | 200 |