

Summer 2019 SoCalGas Conditions and Operations Report

BY STAFF OF THE CALIFORNIA PUBLIC UTILITIES COMMISSION

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Executive Summary

This report presents a summary and analyses of natural gas operations in Southern California from April 1, 2019, to October 31, 2019 (the summer), by the California Public Utilities Commission's (CPUC) Energy Division staff (staff). This summer 2019 report is meant to provide decisionmakers and stakeholders with information to plan for continued energy reliability and customer affordability. This is the first of a series that focuses on summer conditions and operations in the SoCalGas territory. The CPUC has published two similar reports that focus on winter 2017-19 and 2018-19.¹

The purpose of the report is to provide a summary of weather patterns, operational decisions, and price trends within the natural gas and electric markets. The report also provides an analysis of the impacts of regulatory changes made by the CPUC to address energy reliability challenges and price volatility in the last few years.

In summer 2018, Southern Californians experienced gas and electric price volatility due to a combination of several heat waves, high electric demand, and limited gas supply. In comparison, natural gas and electricity prices remained relatively stable during summer 2019 due to mostly mild weather conditions, high production from out-of-state gas fields, above-normal hydrological conditions, and mid-summer changes to the Aliso Canyon Withdrawal Protocol (Withdrawal Protocol) by the CPUC.²

Southern California Gas Company's (SoCalGas) storage inventory levels at the start of summer 2019 were markedly low due to a string of cold weather events that drew down inventory levels during the winter of 2018-19. The mostly mild summer created the potential for customers to inject gas into the storage fields. However, injection capacity on the system declined when Aliso Canyon reached its maximum authorized inventory of 34 billion cubic feet (Bcf) on June 20, 2019, which resulted in the loss of its 545 million cubic feet a day (MMcfd) of nominal injection capacity.³ Staff analysis shows a decline in the amount of gas customers were able to inject into storage after June 20.

The CPUC revised the Withdrawal Protocol on July 23, 2019, in response to concerns that the price spikes of summer 2018 and the energy reliability problems of winter 2018-19 could reoccur. The revised Withdrawal Protocol allows Aliso Canyon to be used if any of four conditions are met in order to reduce system stress, preserve the inventory levels of the Honor Rancho, Playa del Rey, and La Goleta gas storage fields (non-Aliso fields), and tame the price spikes that can occur as a result of limited gas supply and high customer demand.

In summer 2019, Condition 1 of the Withdrawal Protocol was met on three gas days—August 20, August 28, and September 6. Condition 1 states that Aliso Canyon may be used if *preliminary* low

¹ The reports can be found here: <https://www.cpuc.ca.gov/Aliso/>.

² July 23, 2019, Aliso Canyon Withdrawal Protocol:

https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/UpdatedWithdrawalProtocol_2019-07-23%20-%20v2.pdf.

³ Aliso Canyon fills more quickly than the other fields because it has much more injection capacity. For example, on June 10, 2019, Aliso Canyon had 500 MMcfd of injection capacity, Honor Rancho had 200 MMcfd, La Goleta had 40 MMcfd, and Playa del Rey had zero because it was already full. It would be difficult for SoCalGas to fill the non-Aliso fields first without rationing Aliso Canyon's injection capacity early in the injection season.

Operational Flow Order (OFO) calculations for any cycle result in a Stage 2 low OFO or higher for the gas day. If Condition 1 is met in the preliminary OFO calculations, SoCalGas can then add Aliso Canyon’s withdrawal capacity to the OFO formula, which often eliminates the need for an OFO altogether.⁴ That is what happened on the dates above. On two of these days—August 28 and September 6—SoCalGas withdrew gas from Aliso Canyon, totaling 115 MMcfd and 108 MMcfd, respectively. Staff reviewed the confidential market data that SoCalGas provided to support its determination that a Stage 2 or higher OFO would have been warranted without the use of Aliso Canyon, along with the OFO calculation data, and concurred with the utility’s calculations.

In addition to revising the Withdraw Protocol, the CPUC approved a modified OFO penalty structure on May 30, 2019, in response to the financial impacts felt by customers as a result of the Stage 3 and Stage 4 low OFOs of summer 2018. However, the revised OFO penalty structure had no impact during summer 2019 because the system never exceeded a Stage 1 low OFO. In total, SoCalGas declared 37 low OFOs during summer 2019, all of which were Stage 1. In contrast, during summer 2018, there were 32 Stage 1, 19 Stage 2, nine Stage 3, and two Stage 4 low OFO days. The reduction in high-stage low OFOs reduced gas price volatility in summer 2019 compared to 2018, which in turn resulted in more price stability in the electric market.

As summer progressed, staff analysis showed that SoCalGas was not on track to fill the non-Aliso fields prior to winter. This was due in part to the fact that Line 235-2 remained out of service for most of the season, and Line 4000 was operating at reduced capacity and was out intermittently for inspections, reducing SoCalGas pipeline capacity. However, lack of injection capacity and the rules for allocating the injection capacity that was available also played a role. Under the rules in place last summer—which the CPUC has since changed—when total system injection capacity was low, its use for system balancing had higher priority than customer use of injection capacity to fill storage.⁵ In response to low storage levels, the CPUC’s Executive Director issued a letter to SoCalGas on September 19, 2019, directing SoCalGas to temporarily reallocate some injection capacity from balancing to customer use. This directive expired on December 31, 2019.

Finally, summer 2019 culminated with the return of Lines 235-2 and 4000 on October 15 and October 25, respectively. The return of these transmission lines increased system receipt capacity in the Northern Zone by 290 MMcfd to 990 MMcfd.⁶

⁴ The change in withdrawal capacity can be seen in the OFO entry posted to Envoy on August 20, 2019. The Storage Withdrawal Limit for Balancing increases from 224,400 dekatherms (Dth) in Cycle 2 (Evening) to 491,166 Dth in Cycle 3 (Intraday 1) once Aliso Canyon’s withdrawal capacity is added to the formula: <https://scgenvoy.sempra.com/#nav=/Public/ViewExternalLowOFO.getLowOFO%3FfileName%3D%26Class%3D%26page%3Dletter%26pageOrientation%3Dportrait%26HiddenGasFlowDateField%3D02%252F26%252F2020%26HiddenCycleField%3D4%26gasFlowDate%3D08%252F20%252F2019%26cycle%3D4%26and%3D128>.

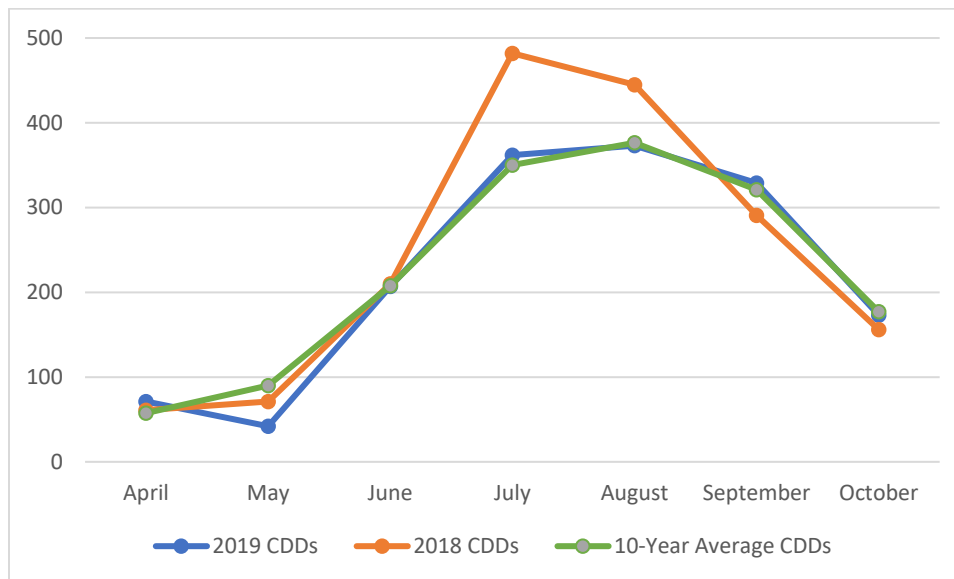
⁵ In 2019, SoCalGas Rule No. 41, Sheet 2 stated that, “The storage injection capacity allocated to the balancing function shall be the lesser of 345MMcf/day or the full amount of available storage injection capacity of the Utility’s system.” Rule No. 41 can be found here: <https://www2.socalgas.com/regulatory/tariffs/tm2/pdf/41.pdf>.

⁶ While Lines 235-2 and 4000 were out of service, the Northern Zone capacity was 700 MMcfd, which included 150 MMcfd of interruptible capacity being offered at the Kramer Junction receipt point. The return of both lines brought the Northern Zone to 990 MMcfd of firm capacity, and interruptible capacity was no longer consistently possible at Kramer Junction and in the Wheeler Ridge Zone due to competition from the other pipelines.

Weather

Weather is a prime driver of gas demand, and summer 2019 was relatively mild. This is important to keep in mind, because a significant portion of electric generation in California is gas-fired, and warmer weathers increase air conditioning usage, which in turn increases electricity usage. As shown in Figure 1 below, in summer 2019, Cooling Degree Days (CDDs)⁷ generally followed the 10-year average. In contrast, summer 2018 was considerably warmer than average, particularly in July and August.

Figure 1: Comparison of Cooling Degree Days: 2018, 2019, and 10-Year Average



Data Source: SoCalGas Data Request

July 2019 was mostly uneventful compared to the heat waves and gas price spikes of July 2018. Composite weighted average temperatures in July 2019 were lower than the previous year about 78 percent of the time, and there were 362 CDDs in July 2019 compared to 482 CDDs in July 2018. The milder weather contributed to more stable prices in 2019.

September 2019 was warmer than 2018. A heat wave during the last week of August and first week of September combined with maintenance on the system caused storage inventory to dip. On September 6, the non-Aliso fields dropped from 72 percent full to 70 percent full, as shown in Figure 2 below. The rest of September was warm, but without heat waves. In SoCalGas' territory, there were 329 CDDs in September 2019, compared to 291 CDDs in September 2018.

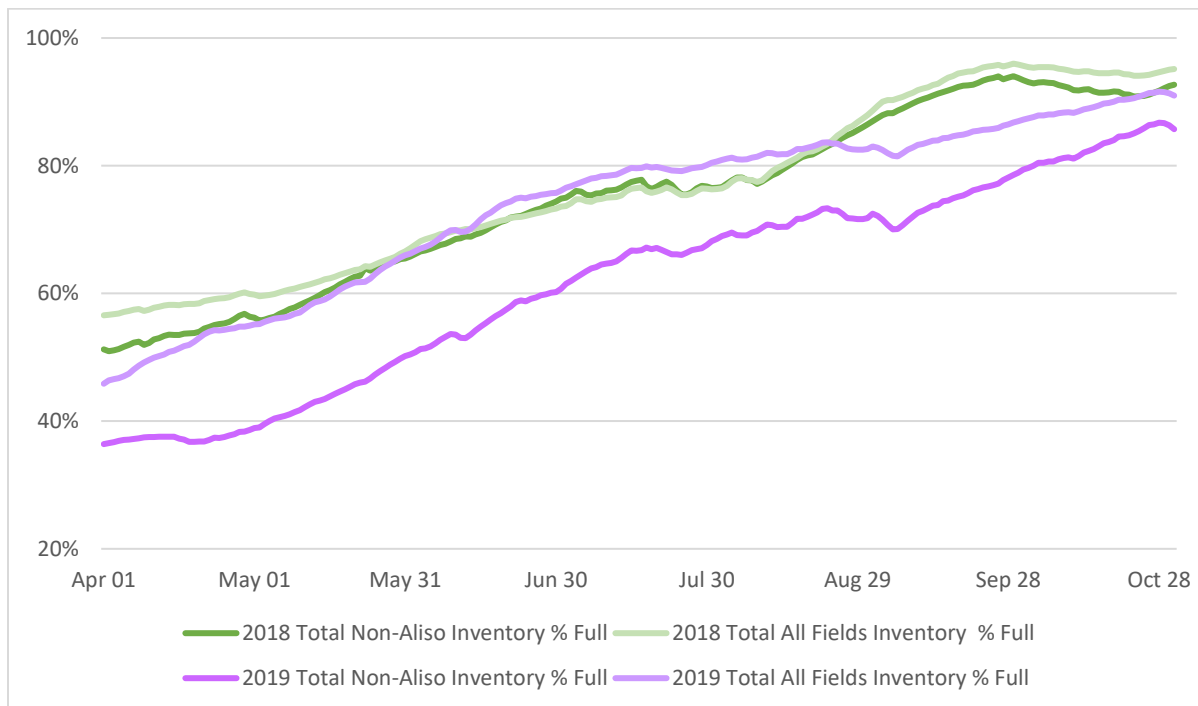
October 2019 was slightly warmer than the previous year, with 173 CDDs compared to 156 CDDs in 2018. The warm fall weather helped facilitate late-season storage injections.

⁷Cooling Degree Days are a widely used unit of measurement to compare the average temperature for a location. CDDs measure how hot the temperature was on a given day or during a period of days. One CDD is when the average temperature for the day raises one degree above 65° Fahrenheit. Note: CDDs listed in this section reflect SoCalGas' territory, excluding the San Diego Gas & Electric (SDG&E) service area.

Storage Inventory

Summer 2019 began with gas storage inventory critically low due to a stretch of cold weather that drew down inventory during the preceding winter season.⁸ On April 1, 2019, the combined inventory of the non-Aliso fields was approximately 37 percent of maximum capacity, and the total combined storage inventory of all four fields was approximately 46 percent of maximum capacity. By contrast, on April 1, 2018, the non-Aliso fields were at 51 percent of capacity and the combined inventory was at 57 percent of total capacity.

Figure 2: April-October 2018 and 2019 Storage Inventory



Data source: SoCalGas Envoy

SoCalGas began injecting gas into all available storage fields at the beginning of the spring injection season while also completing the low inventory shut-ins required by the California Geologic Energy Management Division (CalGEM).⁹ When a storage field is shut in, it is completely offline, meaning SoCalGas cannot inject or withdraw gas. SoCalGas shut in one field at a time and thus was able to inject gas into the three operational storage fields.

Staff analyzed confidential injection data to determine how SoCalGas prioritized injections into its storage fields and whether injection patterns changed after Aliso Canyon reached its maximum authorized capacity of 34 Bcf on June 20. Staff compared available injection capacity and actual injections from April through October, which showed that average injections into Honor Rancho

⁸ For more details on winter 2018-19, refer to the Winter 2018-19 SoCalGas Conditions and Operations Report: https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/Winter2018-19LookbackReport_PublicDraft.pdf

⁹ CalGEM was formerly known as the Division of Oil, Gas, and Geothermal Resources, or DOGGR.

were high in April, May, and June (88 percent, 108 percent,¹⁰ and 80 percent,¹¹ respectively) but dropped substantially in July, August, September, and October (62 percent, 43 percent, 57 percent, and 48 percent respectively).¹² Staff did not observe as noticeable of a difference in average injections into La Goleta throughout the summer months. Playa del Rey, the smallest storage field on the SoCalGas system, was nearly full throughout the spring and most of summer. SoCalGas made injections into the field when there was available injection capacity. SoCalGas utilized an average of 57 percent, 30 percent, and 32 percent of available injection capacity at Aliso Canyon in April, May, and June, respectively, until the storage field reached its maximum allowed capacity on June 20.

Table 1: Injection into Honor Rancho and La Goleta Before and After Aliso Canyon Reached Its Maximum

Average Injection from 4/1/19 - 6/20/19	
Honor Rancho	La Goleta
99%	100%

Average Injection from 6/21/19 - 10/31/19	
Honor Rancho	La Goleta
53%	93%

As shown in Table 1 above, injections into Honor Rancho averaged 99 percent before Aliso Canyon reached capacity on June 20 and 53 percent from June 21 to October 31. Injections into La Goleta averaged 100 percent before Aliso Canyon reached capacity and 93 percent from June 21 to October 31.

The contrast between average injections at Honor Rancho before and after June 20 can be explained by two important factors. First, since injection capacity is largely concentrated at Aliso Canyon, once that field reached its 34 Bcf maximum, there was very little injection capacity left on the system. Under the rules in place at that time,¹³ when injection capacity fell below 345 MMcfd—as it does when Aliso Canyon is full¹⁴—all the injection capacity was allocated to the balancing function during the prime trading cycle, increasing customers’ difficulty injecting gas into storage as shown in Figure 3 below.¹⁵ Second, storage withdrawals later in summer inhibited injection and decreased non-Aliso storage inventory. Withdrawals were low at the beginning of the summer as the weather

¹⁰ SoCalGas stated to staff on June 15, 2020, that injection capacity made available to customers on Envoy is based on available *firm* capacity. Actual injection capacity may vary on a daily basis depending on different factors, including system demand. SoCalGas may inject excess gas if there is interruptible injection capacity available.

¹¹ Injections into Honor Rancho averaged 91 percent from June 1 through June 20 and 54 percent from June 21 through June 30.

¹² To compute average injections, staff compared actual injections with available firm injection capacity, excluding days when a field was shut in or offline for other maintenance.

¹³ SoCalGas Rule 41: <https://www.socalgas.com/regulatory/tariffs/tm2/pdf/41.pdf>

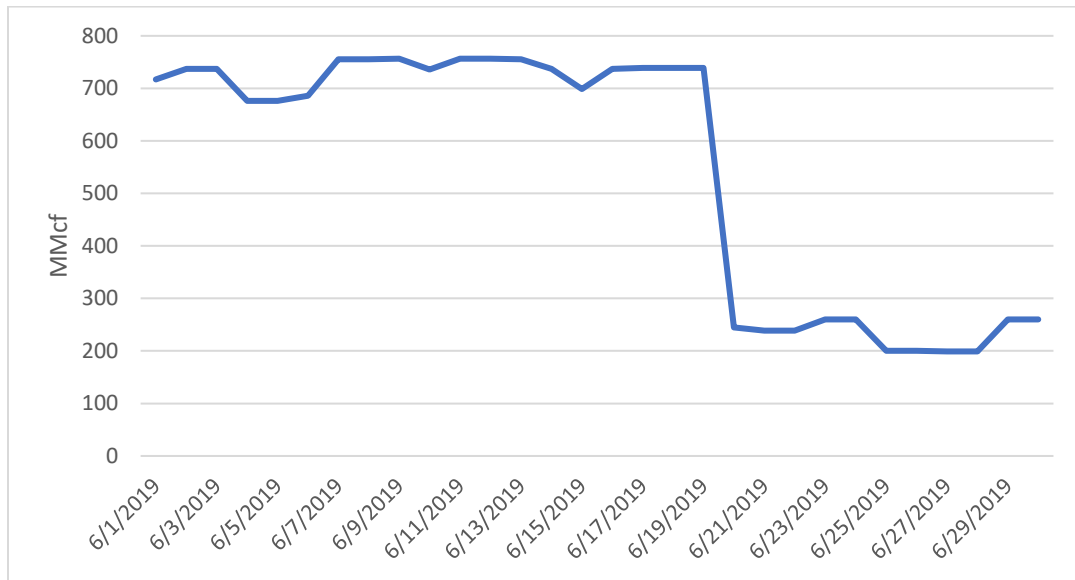
¹⁴ The combined average injection capacity of the non-Aliso fields was less than 345 MMcfd all summer.

¹⁵ A new TCAP decision, D.20-02-045, was approved on February 28, 2020, which changed this rule. Under the new rules, went into effect May 1, 2020, the injection allocated to core reliability and the balancing function is prorated daily based on available capacity. The decision can be found here:

<http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=328289863>

was relatively mild, which helped gas customers build and maintain their storage inventories. However, weather-driven demand steadily increased during the last two weeks of July and throughout August. During this time, SoCalGas frequently had Honor Rancho on withdrawal to fill the gap between receipts and demand.¹⁶

Figure 3: Injection Capacity on Cycle 1: June 2019



Data source: SoCalGas Envoy

Receipt Point Utilization

Analyzing receipt point utilization provides additional perspective to storage facility usage, since demand is fulfilled either by pipeline or storage gas, or a combination of both. The staff analysis below shows that receipt point utilization in the summer often mirrors the weather, with more flowing gas supply on hotter, higher demand days. Another factor, however, is the availability of storage injection capacity. When ample injection capacity is available, customers with storage rights frequently bring in more gas than they burn in order to fill storage, increasing receipt point utilization. When injection capacity isn't available, customers must balance their deliveries more closely to their burn, and receipt point utilization drops.

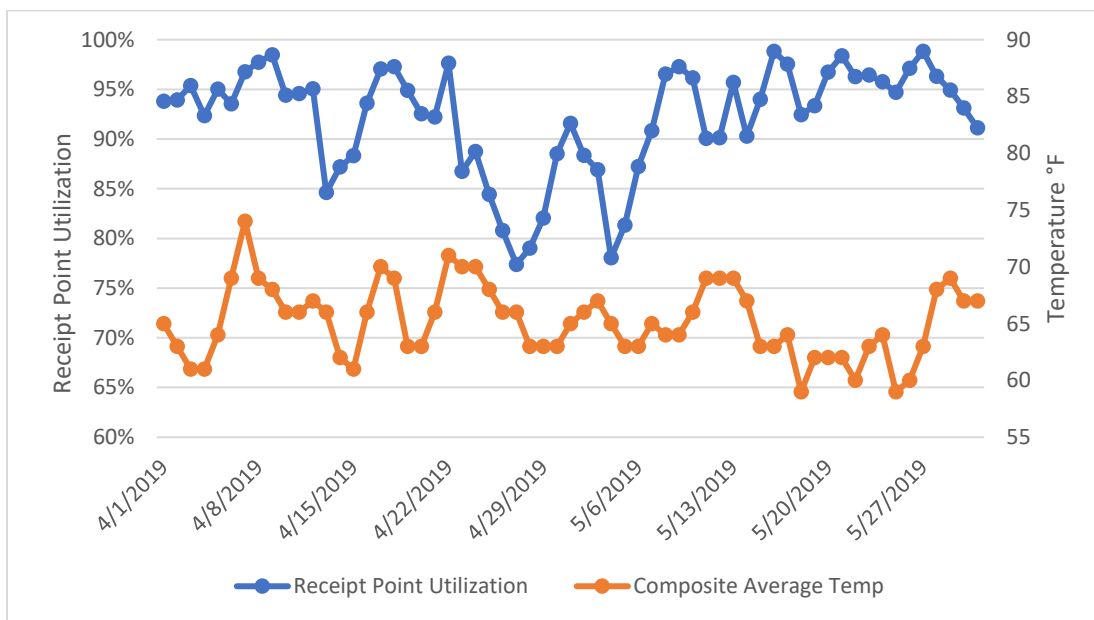
The figures in this section combine daily receipt point utilization from Ehrenberg, Otay Mesa, Blythe, Transwestern/North Needles, Kramer Junction, Kern/Mojave, Kern River, and Occidental Elk Hills for total system capacity utilization and the corresponding composite weighted average temperature. They are computed using actual daily receipt point capacity, which includes the impacts of maintenance and reduced pressure, as opposed to nominal receipt point capacity. In Figure 4, the high receipt point utilization seen during the first two-thirds of April is primarily the result of storage injection into Aliso Canyon (Honor Rancho was under a low inventory shut-in

¹⁶ Since Aliso Canyon can only be used when one of the four conditions of the Withdrawal Protocol are met, the vast majority of summer storage withdrawals come from the non-Aliso fields. This makes maintaining storage in the non-Aliso fields more difficult.

from April 1 to April 22). From April 1 to April 22, the average receipt point utilization was 94%. On April 23, 2019, a low inventory shut-in began at Aliso Canyon, which reduced nominal injection capacity by 545 MMcfd. As a result, the remaining 120 MMcfd of injection capacity on the system was allocated to balancing. The lack of injection capacity decreased receipt point utilization because customers could only schedule as much gas as they were forecasted to burn. Average receipt point utilization from April 23 to April 30 was 83 percent.

On May 7, 2019, SoCalGas completed the low inventory shut-in at Aliso Canyon, restoring its injection capacity. From May 6 to May 8, receipt point utilization increased from 87 percent to 97 percent (see Figure 4 below). Although the La Goleta storage field was shut in from May 8 to May 24, receipt point utilization remained above 90 percent due to that field’s relatively low injection capacity. As seen in the next section, customers with firm injection rights (primarily SoCalGas’ Gas Acquisition Department) were building storage inventory by scheduling more gas than their anticipated burn. This in turn led to increased receipt point utilization. Average receipt point utilization in May was 93 percent.

Figure 4: Receipt Point Utilization in April and May 2019



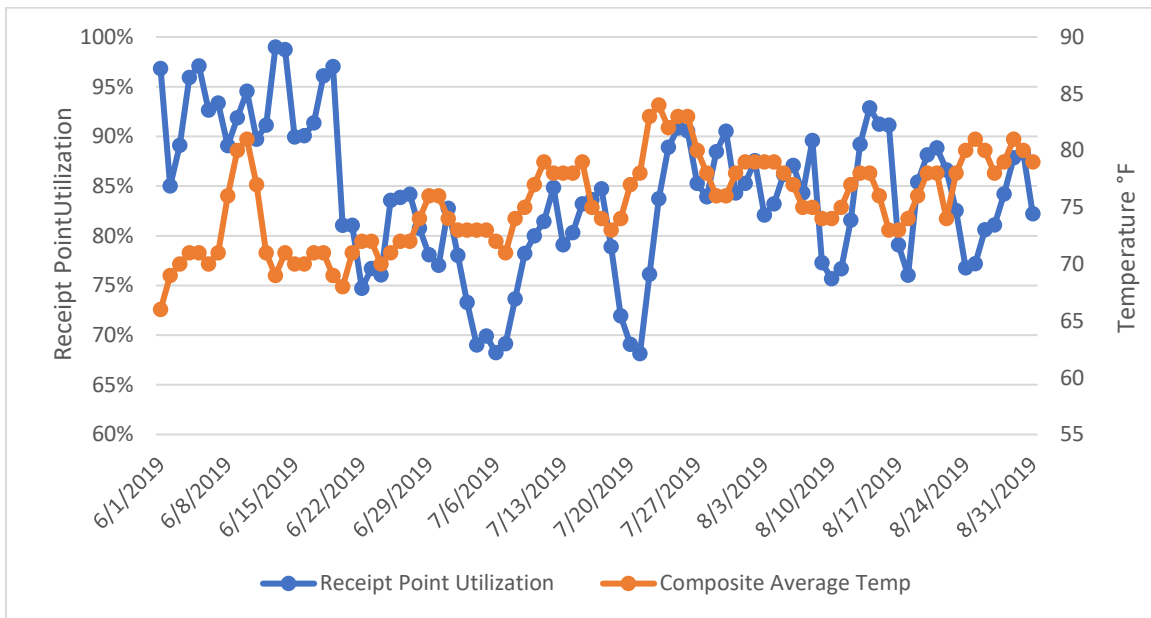
Data source: SoCalGas Envoy

June came with mild temperatures and low sendout. System sendout did not exceed 2 billion cubic feet per day (Bcfd) until June 10. Receipt point utilization remained steadily between 90 and 99 percent until Aliso Canyon was filled on June 20. On June 21, receipt point utilization dropped to 81 percent, then 75 percent on June 22. Average receipt point utilization in June was 87 percent, below the average receipt point utilization in both April and May.

Southern Californians mostly experienced moderate summer temperatures until July 22, as shown in Figure 5. The decline in receipt point utilization from July 18 to 21 can be attributed to a combination of an increase in receipt point capacity due to the completion of maintenance work and a decrease in total system sendout, which did not exceed 2 Bcfd during these four days. As

temperatures increased during the week of July 22, receipt point utilization increased, due largely to increased gas demand from gas-fired electric generators. Peak-hour gas-fired electric generation nearly doubled from July 20 to July 22. Average receipt point utilization in July was 80 percent.

Figure 5: Receipt Point Utilization in June, July, and August 2019



Data source: SoCalGas Envoy

The trend of higher receipt point utilization carried into August, until it dropped on the weekend of August 9. Available capacity remained unchanged from August 8 to August 9, but the amount of gas scheduled by customers dropped from 2.4 Bcf on August 8 to 2.0 Bcf on August 9. Receipt point utilization continued to trend with the weather over the next two weeks. Staff analysis of hourly receipt information prior to the August 28 Aliso Canyon withdrawals shows a trend of consistent gas receipts in the hours prior to the Aliso Canyon withdrawal and increased receipts during and after the Aliso Canyon withdrawal hours. Average receipt point utilization in August was 84 percent.

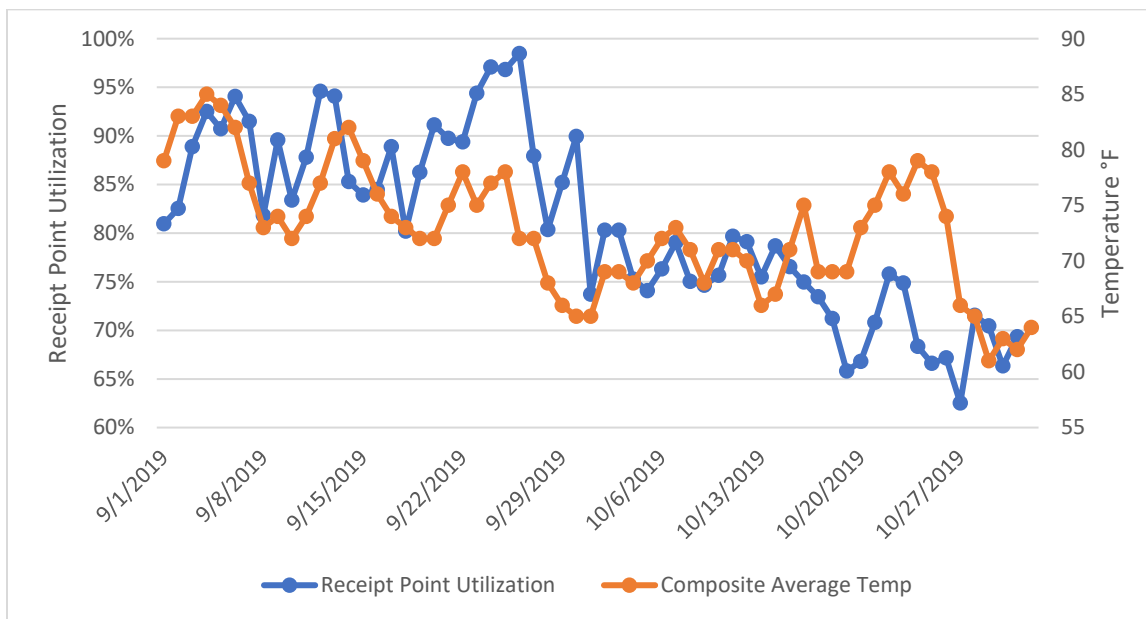
Receipt point utilization throughout September continued to follow weather patterns. SoCalGas’ in-line inspection work on Line 4000 reduced system capacity by 70 MMcfd from September 3 to 7; however, gas receipts increased due to the summer heat. The increase in natural gas burn was also due to less hydroelectric generation in California since the close of August, which necessitated more natural gas-fired generators to fill baseload capacity need.¹⁷ High demand, pipeline capacity constraints, and lack of storage injection capacity led to several Stage 3 high OFOs between September 11 to September 29. Average receipt point utilization in September was 88 percent.

From October 1 to 21, temperatures continued to be mild and system sendout remained moderate, not exceeding 2.2 Bcfd during those three weeks. This period was followed by warmer-than-average seasonal temperatures throughout the Southwest. During this time, gas was injected daily. Unlike

¹⁷ “Gas Daily.” Platts. Page 14. (August 27, 2019)

the months of May and June, the mild temperatures and consistent injection did not translate into extremely high receipt point utilization because the amount of injection capacity on the system remained low. On October 15, Line 235-2 returned to service at reduced pressure and increased total system receipt capacity by 170 MMcfd. Subsequently, Line 4000 returned to service on October 25 at reduced pressure and increased total system receipt capacity by another 120 MMcfd. During that same week, the increase in capacity combined with moderate temperatures led to a decline in receipt point utilization. Average receipt point utilization in October was 73 percent.

Figure 6: Receipt Point Utilization in September and October 2019



Data source: SoCalGas Envoy

CPUC Actions and Regulatory Changes

On July 23, 2019, the CPUC issued a revised Aliso Canyon Withdrawal Protocol with a focus on improving energy reliability and price stability in the Southern California region. The revised Withdrawal Protocol includes four independent conditions that can trigger gas withdrawals from Aliso Canyon. Under the revised Withdrawal Protocol, Aliso Canyon is no longer treated as an “asset of last resort.” If any of the four conditions are triggered, then Aliso Canyon’s withdrawal capacity becomes available for balancing and customer scheduling (under the prior Withdrawal Protocol, Aliso Canyon’s capacity was only available for emergency balancing; it was not incorporated into the OFO calculation or available for customer scheduling).

Condition 1 of the revised Withdrawal Protocol allows withdrawals from Aliso Canyon if preliminary low OFO calculations for any cycle result in a Stage 2 low OFO or higher for the applicable gas day. In total, SoCalGas declared 37 low OFOs in summer 2019, all of which were Stage 1. There were three gas days—August 20, August 28, and September 6—when preliminary low OFO calculations resulted in a Stage 2 low OFO or higher. During each of these events, Aliso

Canyon's withdrawal capacity became available for balancing and scheduling, which eliminated the need for a low OFO. Customers thus avoided facing OFO penalties for noncompliance.¹⁸

On May 30, 2019, the CPUC issued Decision (D.)19-05-030 modifying the OFO penalty structure between June 1 and September 30.¹⁹ The decision changed the Stage 4 OFO penalty from \$25/dekatherm (Dth) to \$5/Dth. It also changed the Stage 5 OFO penalty from \$25/Dth plus the G-IMB daily balancing standby rate to \$5/Dth plus the G-IMB daily balancing standby rate. The decision's aim was to provide cost relief to end-use electric customers who experienced significant price spikes in summer 2018 that were linked to high gas prices and OFO penalties. The decision also called for a study of data from summer 2019 to determine the effectiveness of the revised OFO penalties. However, in summer 2019, there were no instances when a Stage 4 or 5 low OFO was called. Therefore, it is difficult to assess the impact of the new OFO penalty structure.

As discussed earlier in the report, in September 2019 storage inventory levels were lower than the same time the previous year. Staff analysis showed that SoCalGas was not on track to fill the non-Aliso fields prior to the winter in part because, under the rules existing at the time, the lesser of 345 MMcf/d or all available system injection capacity was reserved for system balancing on the primary gas trading cycle. With Aliso full, the remaining fields consistently provided less than 345 MMcf/d of injection capacity. In response, the CPUC Executive Director issued a letter to SoCalGas on September 19, 2019, directing SoCalGas to release some injection capacity from balancing to customers with storage rights. The goal was to provide storage-owning customers with more opportunity to inject gas into storage prior to the winter season.²⁰ Specifically, the letter directed SoCalGas to release up to 100 MMcf/d of Cycle 1 injection capacity prior to Bidweek. The letter further directed SoCalGas to release additional injection capacity to customers on Cycle 1 on the day before the gas flow day if conditions allowed. The temporary measures expired on December 31, 2019.

SoCalGas filed an advice letter on January 30, 2020, to report on the effectiveness of these temporary modifications in increasing storage inventory.²¹ After reviewing the advice letter, Energy Division staff conclude that the directive contributed to a slight increase in injection during the six

¹⁸ See Appendix for analysis of the preliminary low OFO determination and the impact of Aliso's withdrawal capacity on the resultant OFO status.

¹⁹ D.14-06-021 can be found here:

<http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M298/K555/298555621.PDF>

²⁰ CPUC Executive Director Letter to SoCalGas dated September 19, 2019:

https://www.cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/News_Room/NewsUpdates/2019/Signed%20Letter%20to%20Bret%20Lane%20So%20Cal%20Gas%20Company%20re%20Injection%20Required%20for%20SCG%20Winter%20Reliability%20and%20Storage%20Inventory_v2.pdf. This directive occurred for a second time this year.

This directive was similar to temporary policies adopted by advice letter in the two previous years. The resolutions for SoCalGas Advice Letters 5275 (2018) and 5139 (2017) can be found here:

<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M214/K267/214267695.PDF>

[https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/G-3529%20Final%20Resolution%20\(SoCalGas%20AL%205139\).docx.pdf](https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/News_and_Updates/G-3529%20Final%20Resolution%20(SoCalGas%20AL%205139).docx.pdf).

²¹ CPUC Resolution G-3560 Ordering Paragraph 6 required SoCalGas to file an advice letter "containing a status report of storage inventory and an analysis of the effectiveness of these temporary modifications in increasing storage inventory." SoCalGas submitted Advice Letter 5577 on January 30, 2020.

weeks following its implementation, but injection into storage became more difficult to achieve as the non-Aliso fields underwent their required high inventory shut-ins and gas sendout increased due to colder temperatures. The shut-ins began with La Goleta from October 30 through November 14, followed by Honor Rancho from November 15 through November 27, then Playa del Rey from November 15 through November 18.

Aliso Canyon Usage

There were two instances of Aliso Canyon withdrawal over the summer—gas days August 28 and September 6. For August 28, the preliminary low Operational Flow Order calculation for Cycle 3, resulted in a Stage 2 or higher low OFO, thus triggering Condition 1 of the Withdrawal Protocol. With the inclusion of Aliso Canyon’s withdrawal capacity, the low OFO was eliminated. The SoCalGas System Operator withdrew roughly 115 MMcf of gas from Aliso Canyon between approximately 7:40 AM and 7:11 PM. Within the first three hours of Aliso Canyon withdrawals, Honor Rancho withdrawals declined to zero, then remained at zero throughout the withdrawal period. Hourly receipts at the various points either increased or remained steady during this time. System sendout rose from 77.5 MMcf per hour (MMcfh) between 7:00 and 8:00 AM to a peak of 157 MMcfh at 7:00 PM. After this peak time, Aliso Canyon withdrawals ceased. Staff analysis shows that system reliability could have been maintained without Aliso Canyon withdrawals during these hours. However, it appears that after Condition 1 was met, the System Operator withdrew gas from Aliso Canyon to preserve inventory in the non-Aliso fields. 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.

For September 6, the preliminary low OFO calculation for Cycle 3 indicated a Stage 2 or higher low OFO. Again, the inclusion of Aliso Canyon’s withdrawal capacity during Cycles 3 and 4 eliminated the low OFO. The System Operator withdrew roughly 108 MMcf of gas from Aliso Canyon between approximately 12:14 PM and 10:39 PM. Honor Rancho withdrawals declined at the start of Aliso Canyon withdrawals and remained at zero throughout this withdrawal period as well. Hourly receipts at the various points remained steadily high. Receipts rose from approximately 105 MMcfh between 9:00 and 10:00 AM to a peak of 153 MMcfh at 6:00 PM. Again, staff conclude that system sendout could have been met without Aliso Canyon. However, the System Operator likely shifted withdrawals from Honor Rancho to Aliso Canyon to preserve inventory at Honor Rancho, as there had been significant withdrawals from that field over the previous four days. Staff review indicates that the Aliso Canyon Withdrawal Protocol was followed on September 6 as well.

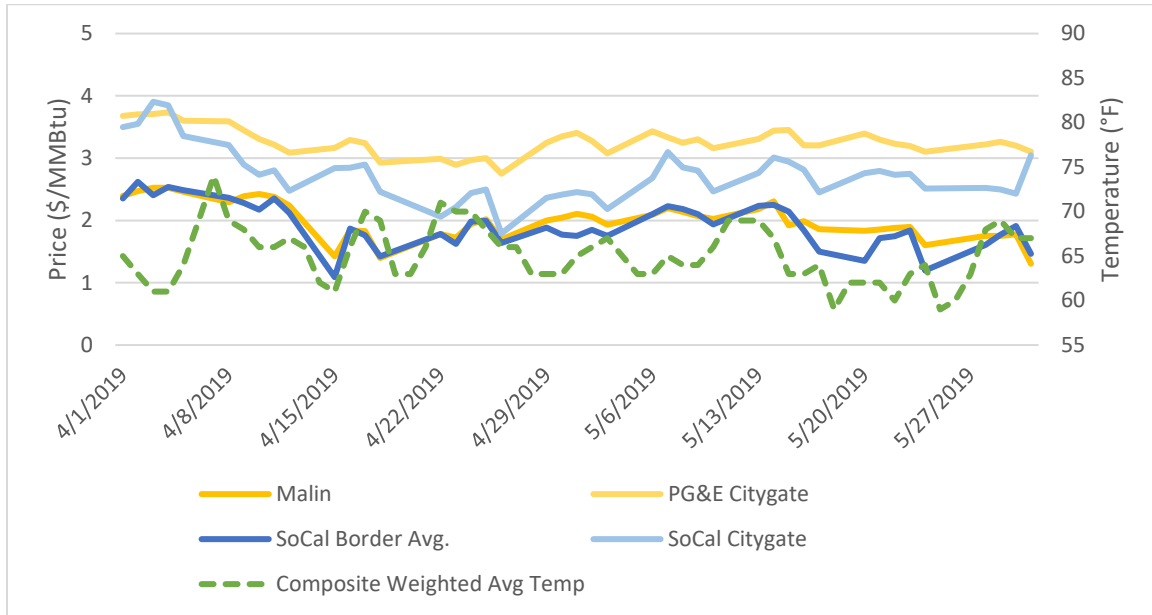
Natural Gas Prices

Summer 2019 was the first season without abnormal gas price volatility since October 2017, when the region began experiencing the combined impacts of the Line 235-2 rupture and the Aliso Canyon storage field restrictions. Generally, moderate weather, high production from out-of-state gas and oil wells, ample hydroelectric energy, and revisions to the Aliso Canyon Withdrawal Protocol contributed to a stabilizing of average gas prices. Figures 7-11 below show gas prices at PG&E Malin,²² PG&E Citygate, SoCal Border, and SoCal Citygate, then overlay the composite

²² Malin is a PG&E receipt point on the California border.

temperature in Southern California. From April 1 through October 31, the maximum spread between PG&E Citygate and SoCal Citygate was under \$1.50 per million British thermal units (MMBtu). This contrasts with summer 2018, when the maximum spread between PG&E Citygate and SoCal Citygate was about \$36.00/MMBtu. On June 21, 2019, trading saw the lowest prices of the season with SoCal Border trading at less than \$1.00/MMBtu and SoCal Citygate just under \$1.15/MMBtu.

Figure 7: Gas Prices April and May 2019



Data source: Prices from Natural Gas Intelligence and temperature data from SoCalGas Envoy

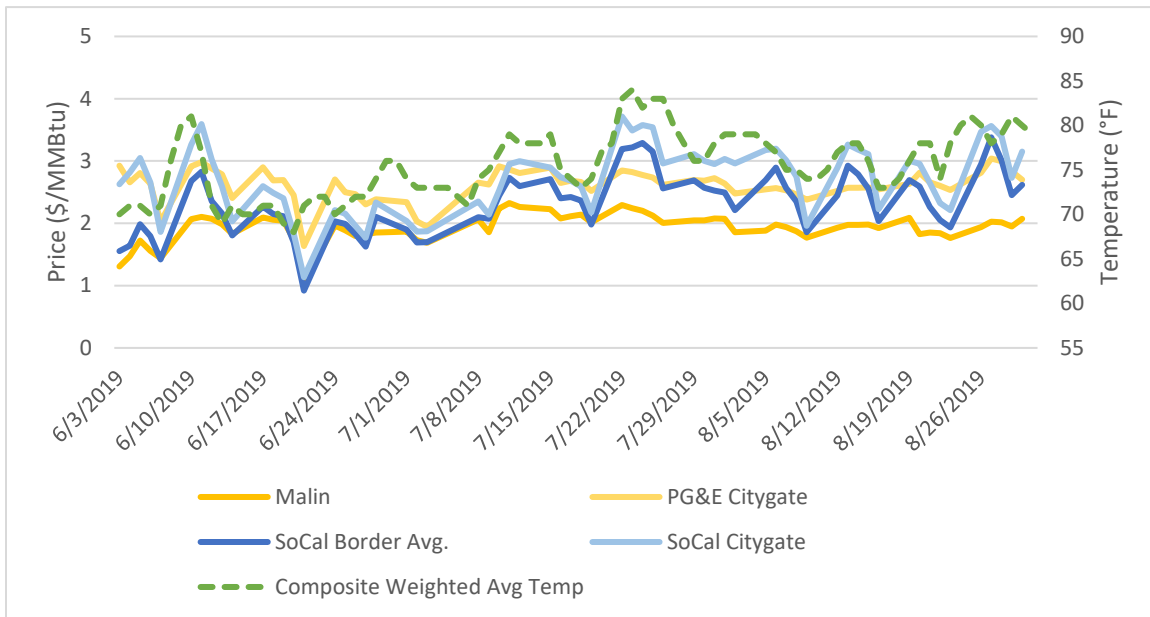
On June 19, SoCalGas announced another delay in the return of Line 235-2 from July 6 to July 30. Markets had previously responded strongly to delays in the return-to-service date for Line 235-2. As NGI's Forward Look noted on June 21, "Other postponements have corresponded with upward movements in SoCal Citygate forward prices due to their implications for continued uncertainty in SoCalGas' supply for its summer demand season and for refilling storage before winter." However, SoCal Citygate futures prices slightly dipped in the days following news of the delay, as there were no heat waves in the weather forecasts. On June 21, S&P Global Platts reported, "Looking ahead, the most recent eight- to 14-day weather outlook from the National Weather Service calls for a likelihood of cooler-than average temperatures for much of the West, which could put downward pressure on power demand in the region going forward."²³ Overall, natural gas prices throughout most of the summer were relatively tame, especially in comparison to summer 2018.

One factor in the moderation of gas prices in summer 2019 was the CPUC's changes to the Withdrawal Protocol, which were publicly shared as a draft on July 1 and adopted on July 23. The initial proposal on July 1 sparked a drop in forward prices, which continued to decline during the

²³ "Gas Daily." Platts. Page 15. (June 21, 2019)

next three weeks, showing market confidence in the proposed revisions and supply conditions.²⁴ Furthermore, the spread between SoCal Citygate and SoCal Border prices, which had been more pronounced since the Aliso Canyon well leak and the problems on Lines 235-2 and 4000, narrowed and largely remained under \$1.00/MMBtu after the draft was shared. On July 9, the spread between SoCal Citygate and SoCal Border was \$0.07/MMBtu. The maximum spread during summer 2019 was approximately \$1.75/MMBtu; this contrasts with summer 2018, when the maximum spread between SoCal Citygate and SoCal Border was about \$39.00/MMBtu.

Figure 8: Gas Prices June, July, and August 2019



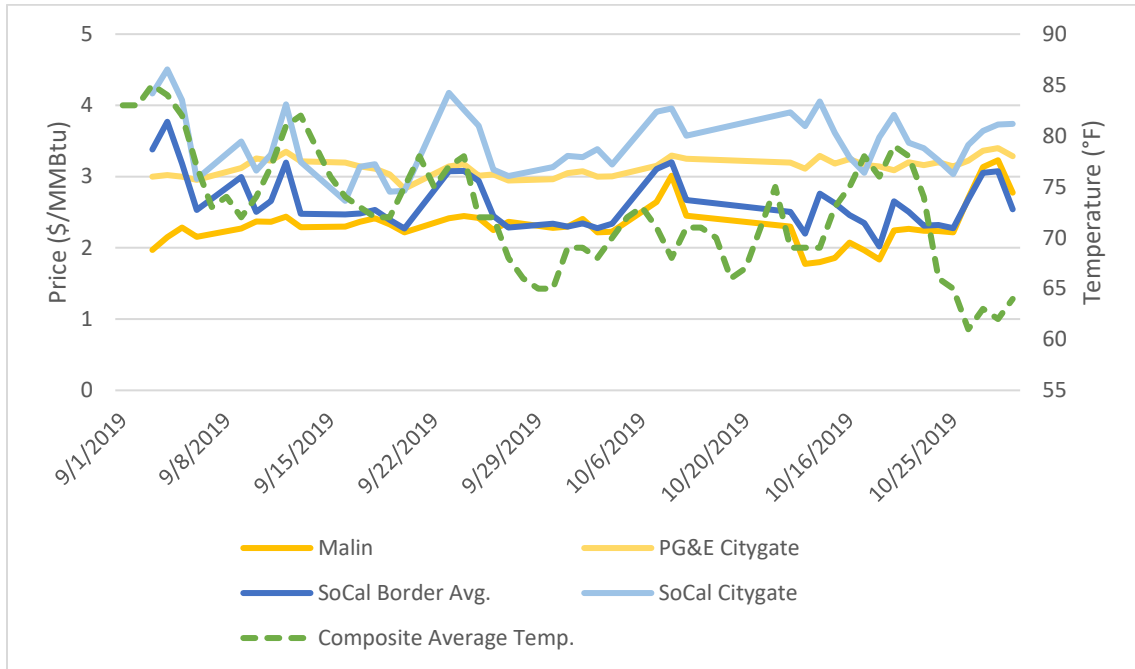
Data source: Prices from Natural Gas Intelligence and temperature from SoCalGas Envoy

Southern California experienced hot weather from July 21 to 24, which led to more gas-fired electric generation due to more air conditioning usage. Staff does not consider the market reaction to SoCal Citygate and SoCal Border during this time to be excessive; the slight increases fall in line with expected market outcomes.

The highest price spike of the summer—which occurred on September 4, with SoCal Citygate trading at about \$4.50/MMBtu—was the result of several events. First, warmer temperatures were expected across the SoCalGas territory. Second, SoCalGas had scheduled an in-line inspection on Line 4000, reducing capacity in the Northern Zone. Third, El Paso Natural Gas experienced an equipment failure at its Lincoln compressor station (located in New Mexico) on September 3-24, which constrained the amount of gas supply that could be brought to the California border. Lastly, a low OFO was called for September 3, and the market expected another low OFO on September 4. Despite these events, the spread between SoCal Citygate and SoCal Border was only \$0.75/MMBtu.

²⁴ Evans, B. (2019, July 24). Aliso Canyon Withdrawal Protocol Revisions Seek to Minimize Price Volatility. Retrieved from: <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/072419-aliso-canyon-withdrawal-protocol-revisions-seek-to-minimize-price-volatility>

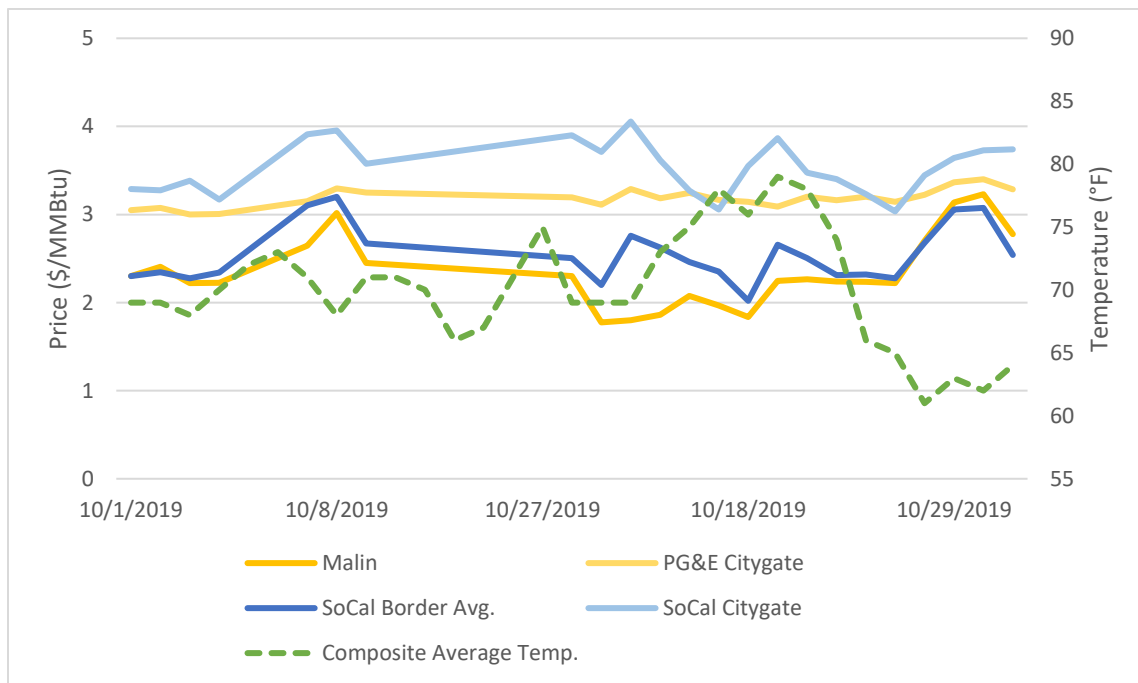
Figure 9: Gas Prices September and October 2019



Data source: Prices from Natural Gas Intelligence and temperature data from SoCalGas Envoy

A notable price increase occurred again on Monday, September 23 for several reasons: a weekend of high temperatures, Line 4000 validation digs that took the line out of service, high wildfire risks, and increased gas-fired electric generation due to maintenance at the Diablo Canyon nuclear facility.

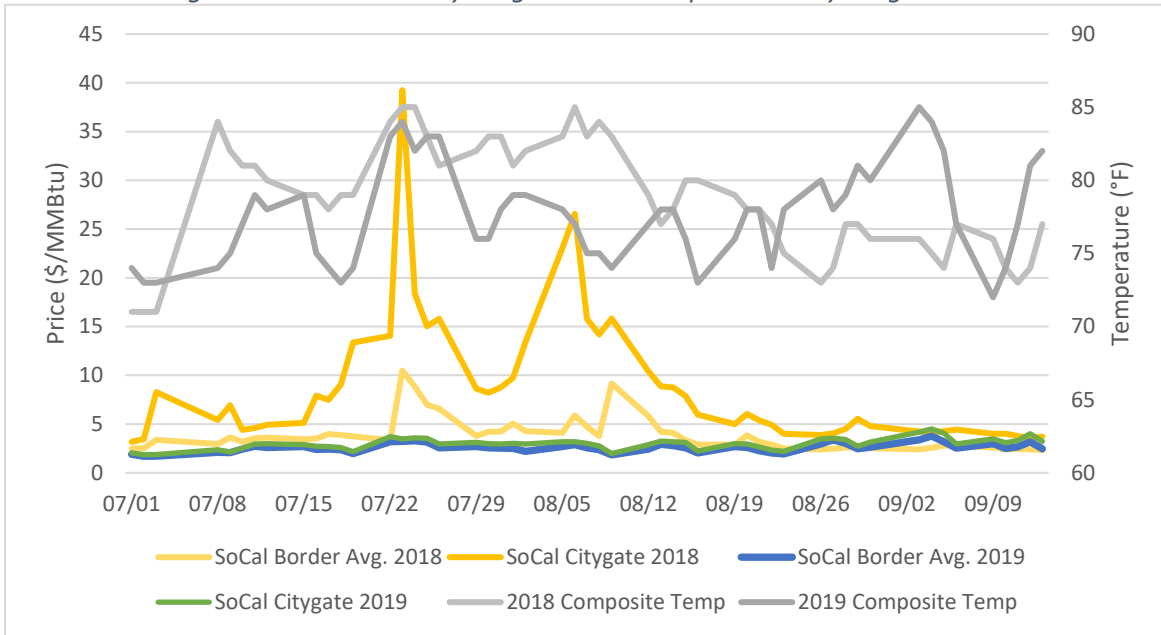
Figure 10: Gas Prices October 2019



Data source: Prices from Natural Gas Intelligence and temperature data from SoCalGas Envoy

Gas prices during summer 2019 were particularly un-newsworthy when compared to summer 2018, as shown in Figure 11, which is a graph of SoCal Border and SoCal Citygate prices from July to September in 2018 and 2019. The blue and light blue lines showing 2019 prices in Figure 11 indicate a return to normalcy, as temperature increases resulted in minor, predictable price movements.

Figure 11: Gas Prices July–August 2018 Compared to July–August 2019



Data source: Prices from Natural Gas Intelligence and temperature data from SoCalGas Envoy

To discern why this was so, staff compared the peak gas price day of summer 2018—Monday, July 23—with similar days in 2019, but no clear picture emerged. Staff looked at July 22, 2019, which was also a Monday with a similar temperature profile but had much lower sendout. The other days reviewed were September 4, 2019, which had relatively high sendout and the highest prices of the summer, and September 9, 2019, which saw high sendout and high customer imbalances as well as withdrawals from Aliso Canyon. While the data in Table 2 does not present a clear-cut story for why prices were so much more moderate in 2019, a few possibilities emerge. Cooler weather, lower sendout, and lower customer imbalances all seem to have played a role. SoCalGas’ elimination of a 6 percent error factor in the calculated forecasted sendout number used in its summer low OFO calculations also reduced the customer imbalances in the formula, which likely reduced market pressure. Another possible factor is that the regulatory changes the CPUC put in place—reducing the Stage 4 and 5 OFO penalties and revising the Withdrawal Protocol to make Aliso Canyon available to avoid price spikes—decreased market uncertainty, thereby tamping down price volatility.

Table 2: Comparison of High Sendout and Gas Price Days in Summer 2018 and 2019

	7/23/2018	7/22/2019	9/4/2019*	9/6/2019*
OFO	Stage 4	Stage 1	No	No
Aliso Withdrawals	0	0	0	108

Day of the week	Monday	Monday	Wednesday	Friday
Forecasted Receipts (MMcf) ²⁵	2,671	2,047	2,468	2,477
Calculated Forecasted Sendout (MMcf) ²⁶	-3,077	-2,204	-2,585	-2,666
Withdrawals (MMcf)	39	40	191	176
Injections (MMcf)	-104	-218	-43	-336
Customer Imbalance (MMcf)	-471	-336	31	-349
Composite Weighted Avg. Temp	85	83	84	77
SoCal Citygate price	\$39.04	\$3.72	\$4.50	\$2.97

Source: Prices: Natural Gas Intelligence; all other data from Envoy.
 *Line 4000 in-line inspection caused reduced capacity from Sept. 3 to 7

Electricity Prices

This report includes a discussion of electricity prices because a significant portion of electric generation in California is gas-fired, and electricity prices tend to reflect natural gas trends. Electricity prices from April through October remained relatively stable due to moderate weather conditions and above-normal hydrological conditions, which fuels hydroelectric generation. The figures in this section report daily average electricity prices, which are derived by taking an average of hourly electricity prices each day. In summer 2019, the maximum daily average price was \$65.09 per megawatt hour (MWh) in SP15 on September 5, and the minimum average daily price was \$10.05/MWh in NP15 on May 28.²⁷ Low electricity prices on May 28 can be attributed to moderate temperatures, strong renewable generation supply, and increased energy efficiency. The California Independent System Operator’s (CAISO) Department of Market Monitoring reported an instantaneous peak load of 44,301 MW summer 2019, which is the lowest peak load for a summer since 2003 and approximately 5 percent lower than the 2018 instantaneous peak load.²⁸

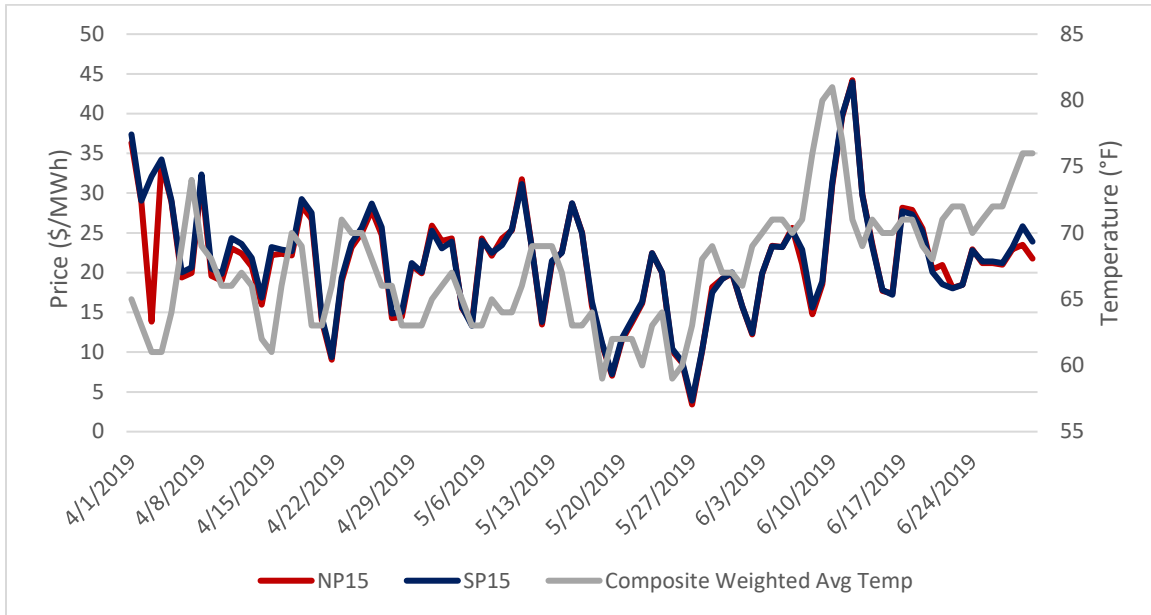
²⁵ All figures in MMcf are taken from the low OFO calculations on Envoy, using the cycle with the highest customer imbalance of the day. The numbers on Envoy are reported in dekatherms and are converted to MMcf here by dividing by 1,035, i.e. 347,426 Dth * 1 MMcf/1,035 Dth = 336 MMcf. Some calculations in Table 2 may not add up precisely because of rounding in the conversion.

²⁶ In 2018, SoCalGas’ low OFO calculation multiplied the forecasted sendout by 1.06 to account for possible error. In 2019, SoCalGas determined that this additional error factor wasn’t necessary in the summer. However, the utility still uses it in its winter low OFO calculations. On July 23, 2018, this resulted in a customer imbalance that was 174 MMcfd higher than it would have been if the simple forecasted sendout of 2,903 MMcfd had been used.

²⁷ 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>

²⁸ Department of Market Monitoring – California ISO. (2019, December 5). Q3 Report on Market Issues and Performance. Page 8. Retrieved from www.caiso.com/Documents/2019ThirdQuarterReportonMarketIssuesandPerformance.pdf.

Figure 12: Average Daily Electricity Prices April, May, and June 2019²⁹



Data source: Prices from CAISO OASIS and temperature data from SoCalGas Envoy

Electricity prices spiked during the first week of September following high natural gas prices. Hourly prices shot up on September 3, with the real-time market reaching above \$260 in Southern California during hours 18-19. This spike can be attributed to unanticipated demand due to high temperatures, low electricity imports, and high natural gas prices. CAISO system demand was 42.5 GW around 6:00 PM on September 3.³⁰ Almost 50 percent of the electric generation supply came from natural gas generators during this time.³¹ Average daily electricity prices were highest in SP15 on September 4-5, with hourly prices spiking above \$100/MWh, which parallels the natural gas price spikes on these same dates. Staff believes warmer temperatures on these dates as well as congestion on transmission lines contributed to the elevated prices.

Average daily prices spiked again on September 24-25, with the average daily price increasing to \$47.27 in NP15 and \$46.36 in SP15 on September 24. On September 25, the average daily price was \$50.80 in NP15 and \$49.84 in SP15. Prices reached above \$100/MWh for five hours in both NP15 and SP15 on these days as well. In response to the high prices during this time, CAISO issued a special report in which it pointed to the lack of competition in the market from 7:00 PM to 9:00 PM as one possible reason for the price spikes.³² Despite these spikes, “the average cost per megawatt-

²⁹ The graph may visually suggest that electricity prices lag temperature increases; however, electricity prices were more influenced by natural gas price increases, which is not shown here. This relationship can be seen in Figure 14.

³⁰ One gigawatt is 1,000 megawatts.

³¹ Electric demand and supply figures are taken from CAISO’s OASIS database:

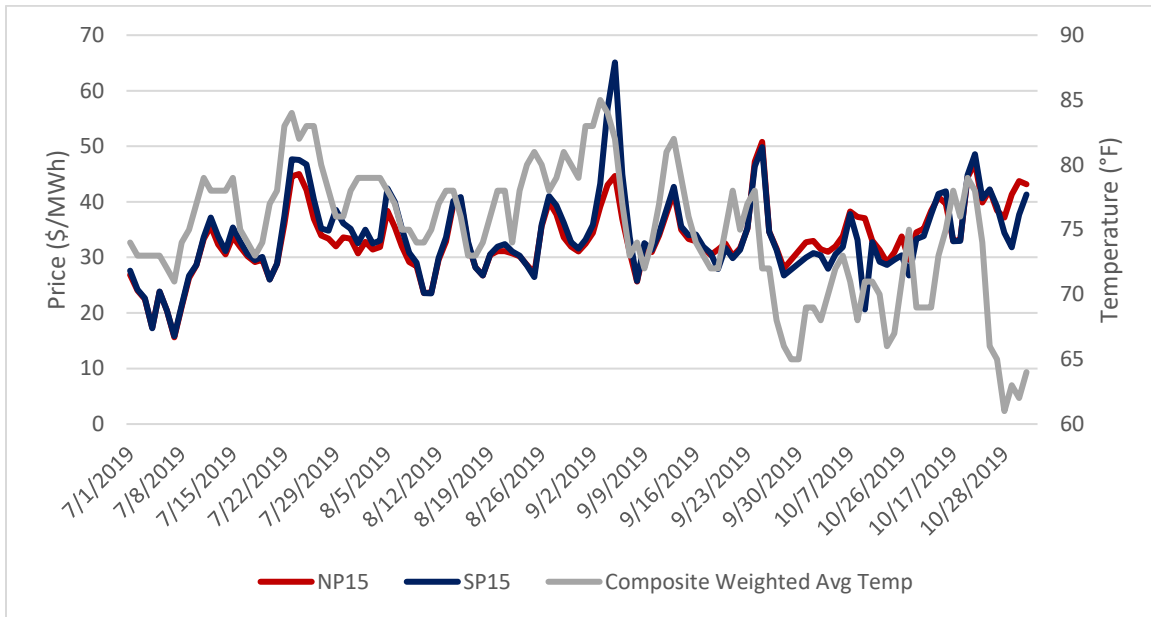
<http://oasis.caiso.com/mrioasis/logon.do>

³² The “Report on Day-Ahead Market Competitiveness: For September 25, 2019” can be found here:

<http://www.caiso.com/Documents/Reportonday-aheadmarketcompetitivenessforSeptember252019-Oct302019.pdf>

hour of load decreased 44 percent to about \$39/MWh for the third quarter from \$69/MWh in the same quarter of 2018.³³

Figure 13: Average Daily Electricity Prices July, August, September, and October 2019



Data source: Prices from CAISO OASIS and temperature data from SoCalGas Envoy

Another notable event of summer 2019 was the number of extreme wildfires throughout California fueled by record seasonal winds. Force majeure events, such as seasonal wildfires, can severely impact the electricity grid. During such events, in-basin generation, including natural gas-fired electric generation, serves a critical role in replacing electricity imports.

On October 10, 2019, the Saddle Ridge wildfire broke out near the San Fernando Valley and burned approximately 8,800 acres of land and 16 power poles. There was a resultant loss of imported power into the Los Angeles area due to transmission power lines being taken offline, which required greater reliance on in-basin power generation.³⁴ Two weeks later, the Tick Fire broke out on October 24, 2019, burning several thousand acres near Santa Clarita. In-basin generation was brought online to prepare for the possible loss of transmission lines. On October 28, 2019, a tree branch fell on a distribution line, sparking the Getty fire and burning more than 700 acres of land

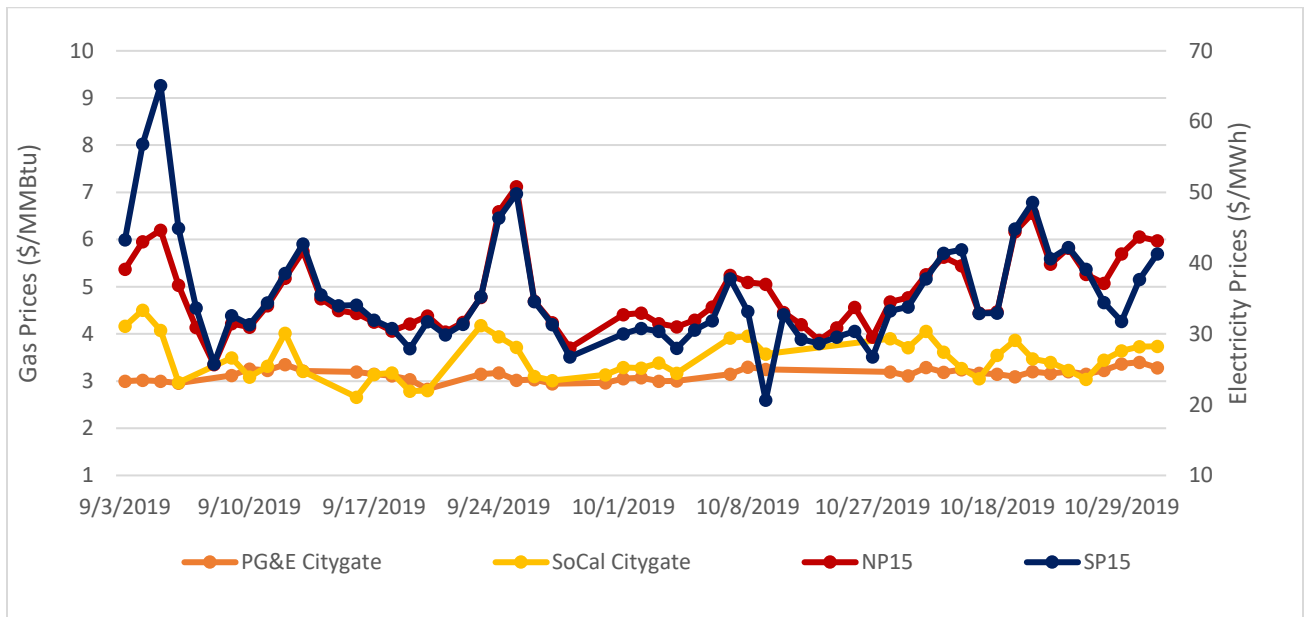
³³ Department of Market Monitoring – California ISO. (2019, December 5). Q3 Report on Market Issues and Performance. Page 17. Retrieved from www.caiso.com/Documents/2019ThirdQuarterReportonMarketIssuesandPerformance.pdf.

³⁴ For additional information on the Saddle Ridge fire, refer to the management report given during LADWP's November 5, 2019 Board of Commissioners meeting: https://www.ladwp.com/cs/idcplg?IdcService=GET_FILE&dDocName=OPLADWPCCB693522&RevisionSelectionMethod=LatestReleased

within the Los Angeles Department of Water and Power's (LADWP) service territory in west Los Angeles.³⁵

The last several days of October saw electric price movement primarily due to wildfires, weather, and natural gas price upticks. The highest hourly electric price spike occurred on October 22, at approximately 7:00 PM, with SP15 trading at \$190/MWh. Prices were also above \$100/MWh during five additional hours on October 22 due to above-average temperatures. By and large, electricity and natural gas prices trended together throughout the summer season, but wildfires introduced additional volatility in October, as seen in Figure 14.

Figure 14: Average Daily Electricity and Gas Prices September-October 2019



Data source: Prices from CAISO OASIS and gas prices from Natural Gas Intelligence

Closing Summary

Overall, summer 2019 weather, system, and regulatory conditions were considerably different from those of summer 2018. Especially notable was the difference in the low OFO stages that were called. SoCalGas declared several Stage 3 and Stage 4 low OFOs during summer 2018 but called nothing higher than a Stage 1 during summer 2019. Natural gas and electric prices remained comparatively stable throughout the summer and generally trended together. Furthermore, the spread between SoCal Citygate and SoCal Border prices began a return to normalcy and even reached a low of \$0.07/MMBtu.

Another notable issue in summer 2019 was the impact of low storage inventory at the end of winter 2018-19 and low injection capacity on overall storage inventory. The total non-Aliso storage

³⁵ Wilson, S. (2019, October 30). Reagan Library spared from flames as powerful wind gusts drive new wildfire near Los Angeles. Retrieved from <https://www.washingtonpost.com/nation/2019/10/30/california-fires-map-getty-fire-kincade-fire/>.

inventory on September 1, 2019, was approximately 72 percent full compared to 87 percent full on the same date in 2018—a 15-point difference. In response, the CPUC’s Executive Director issued a directive to SoCalGas to take steps to enhance injection. The utility’s advice letter about the results of the temporary modifications showed a slight increase in injections until the non-Aliso fields underwent their required shut-ins and gas sendout increased due to colder weather.

Lastly, Lines 235-2 and 4000 returned to service in October and increased overall receipt point capacity. The return of these transmission pipelines, in combination with the revised Withdrawal Protocol, mitigated some of the system risks that customers faced in winter 2018-19.

Appendix A

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

Composite Weighted Average Temperature: Composite weighted average temperature data can be found on SoCalGas' Envoy. The calculation first takes the average daily temperature of several locations in the territory, applies a weight to each location, then averages those into one number.

Cooling Degree-Days (CDDs): A widely used unit of measurement to compare the average temperature for a location. CDDs measure how hot the temperature was on a given day or during a period of days. One CDD is when the average temperature for the day raises one degree above 65° Fahrenheit.

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.

Shut-In: Regulations enacted by the California Geologic Energy Management Division (CalGEM is formerly known as 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 building gas inventory.

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 FERC firewall between Gas Acquisition and the System Operator; Gas Acquisition only has access to public information about the SoCalGas system.

SoCalGas System Operator (System Operator): The System Operator is charged with keeping the gas system in balance but does not have primary responsibility for procuring gas or scheduling gas deliveries.³⁶ 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

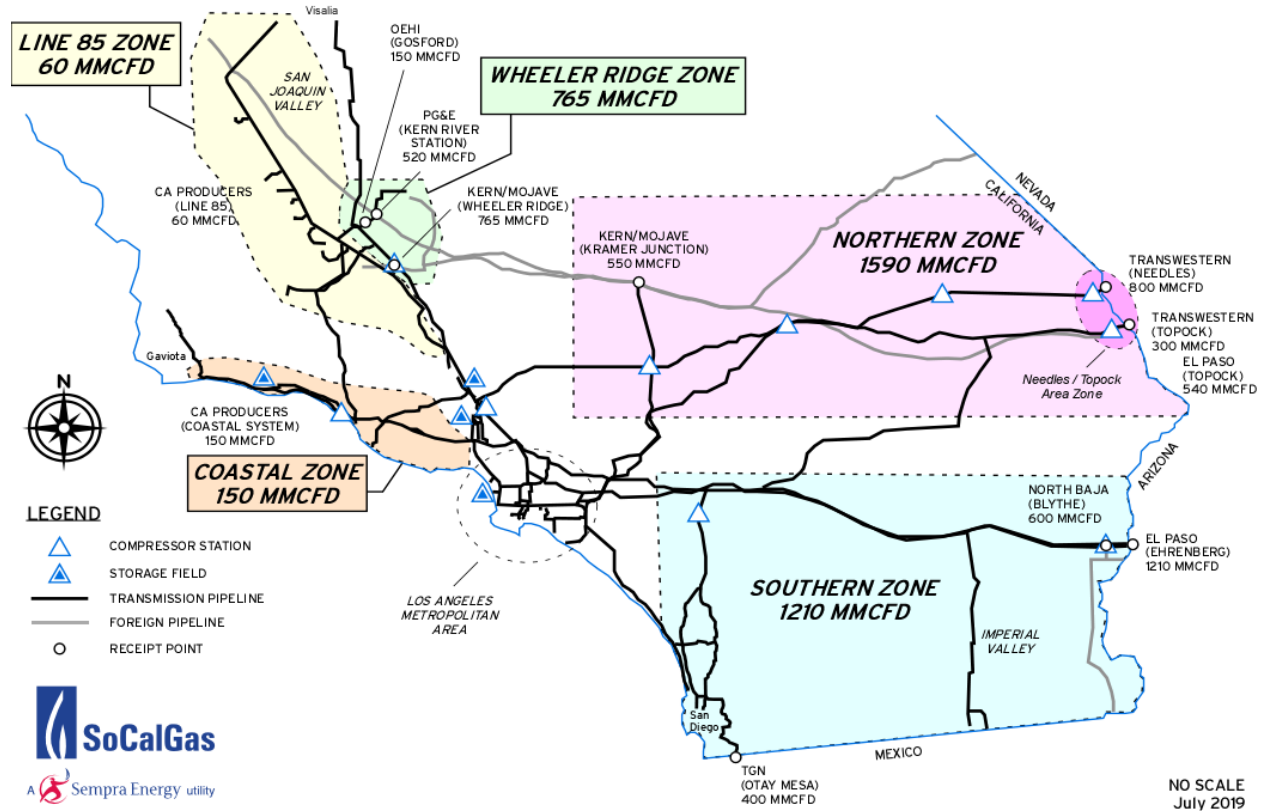
³⁶ Under certain circumstances, the System Operator can purchase gas to support demand on the Southern System, which includes San Diego. See SoCalGas Rule 41: <https://www.socalgas.com/regulatory/tariffs/tm2/pdf/41.pdf>

procure and schedule gas deliveries onto the system. In order to balance the gas system and maintain reliability, the System Operator calls Operational Flow Orders and decides when to inject or withdraw from storage. As a last resort, the System Operator can also curtail customers' gas usage.

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.

RECEIPT POINT & TRANSMISSION ZONE FIRM CAPACITIES



Appendix C

The preliminary and final OFO calculations for three dates are shown here. The yellow rows display the amount of gas determined to be needed from storage beyond the 224,400 Dth 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 and determinations.

Flow Date	Cycle	Preliminary Low OFO Determination	Stage	Tolerance Percentage	Forecasted Total Daily Customer Imbalance	Storage Withdrawal Limit For Balancing	Excess Storage Withdrawal For Balancing	Storage Withdrawal Limit For Balancing <i>With</i> Aliso	Excess Storage Withdrawal For Balancing <i>with</i> Aliso	OFO Declared	Stage
8/20/2019	3	Yes	2	-5%	311,277	224,400	86,877	491,166	0	No	N/A
8/28/2019	3	Yes	2	-5%	363,042	224,400	138,642	491,000	0	No	N/A
9/6/2019	3	Yes	2	-5%	361,181	224,400	136,781	468,496	0	No	N/A