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CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

STAFF REPORT

Quarterly Petroleum Supply and Pricing Report

October 2022 through December 2022

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California Energy Commission

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ABSTRACT

California Public Resources Code Section 25358 requires the California Energy Commission (CEC) to prepare a report every quarter that summarizes and analyzes petroleum industry supply, production, transportation, delivery and distribution, demand, and prices. This report looks at information collected by the CEC through its Petroleum Industry Information Reporting Act regulations for analyzing trends in liquid fuel production, storage, and distribution. CEC staff developed new metrics using data collected by this regulation to help better inform the California public on the operations of the liquid transportation fuels supply chain. In addition, staff analyzed several other data sources to provide a more comprehensive discussion of California's liquid transportation fuel issues.

Topics included in this report:

- California, United States, and world crude oil prices
- Inventories of crude oil at refineries
- Quantity of crude oil processed at refineries
- Production of liquid transportation fuels
- Inventories of liquid transportation fuels
- Prices of liquid transportation fuels
- Import and export volumes of liquid transportation fuels for California
- Published analyses from the CEC's Petroleum Watch newsletter

Keywords: California Energy Commission, transportation, gasoline, petroleum, diesel, liquid fuels

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TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

EXECUTIVE SUMMARY

This report describes the trends and relevant issues faced by California's liquid transportation fuel market. Using information from its Petroleum Industry Information Reporting Act data collection regulations, as well as from public and proprietary sources, California Energy Commission (CEC) staff details the flows of the liquid fuels and the volumes of the product that is being moved, and produced, in California. The following report has been organized into four chapters with selected findings listed by chapter.

Chapter 1: Crude Oil — Discusses crude oil prices, inventories of crude oil at California refineries, volume of crude oil stored at refineries, volume of crude oil used at refineries, referred to as "inputs," and the movement of crude oil.

Chapter 2: Gasoline – Discusses the volume of California Reformulated (California Air Resources Board [CARB]) gasoline produced at California refineries, inventories of CARB gasoline and blendstocks, gasoline prices, and movement of gasoline.

Chapter 3: Diesel – Discusses the volume of CARB diesel produced at California refineries, inventories of CARB diesel, diesel prices, and movements of diesel.

Chapter 4: Published Analyses – Provides copies of the CEC's *Petroleum Watch* newsletters that were published during the quarter.

CHAPTER 1:
Crude Oil

This chapter discusses:

- Crude oil prices.
- Volume of crude oil stored at refineries.
- Volume of crude oil used at refineries, referred to as "inputs."
- Volume of crude oil imported to refineries.

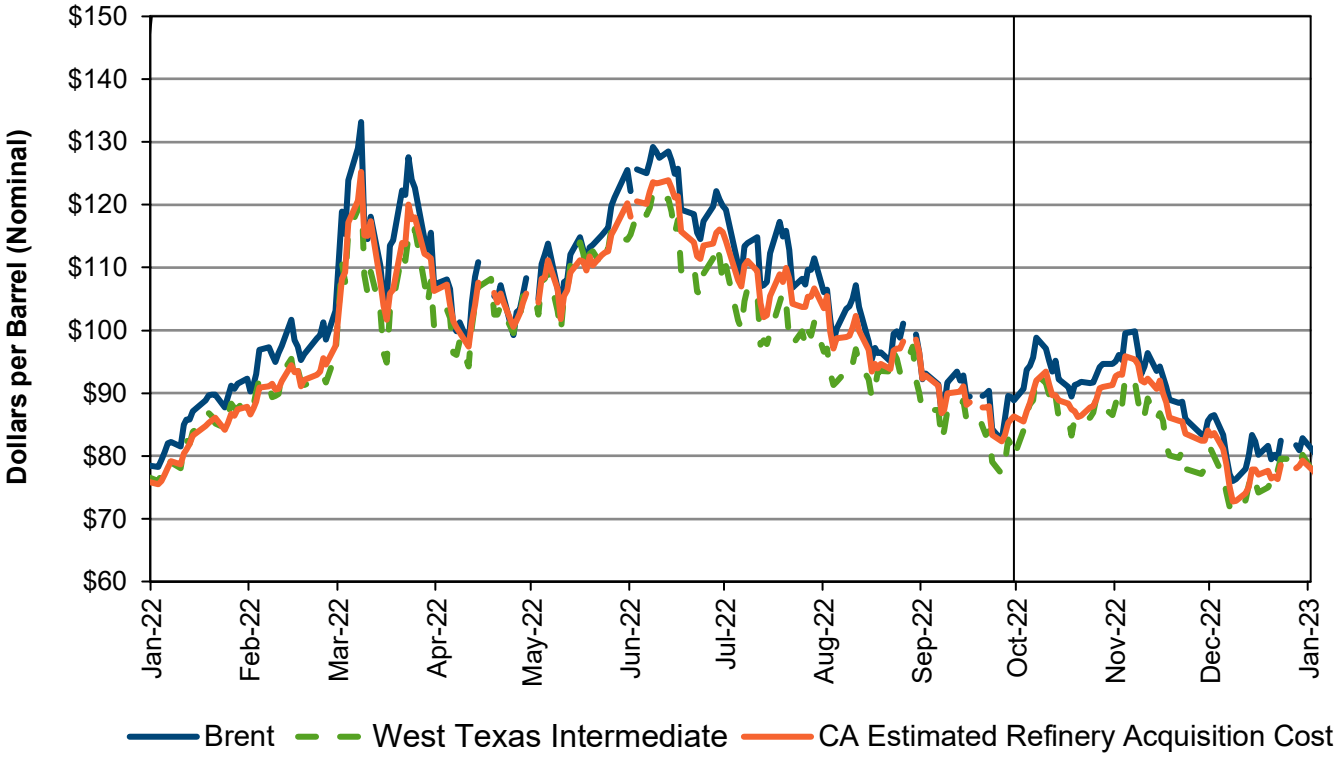
Prices

Figure 1 shows the daily West Coast spot crude oil prices for Brent North Sea (Brent), West Texas Intermediate (WTI), and the California estimated refinery acquisition cost (CA-RAC). Brent crude oil, an international benchmark, is a good surrogate price for foreign sources of crude oil processed at California refineries. WTI is the domestic benchmark; however, this crude oil is not processed at California refineries. The CA-RAC is a weighted average of the prices of California (San Joaquin Valley) crude, Alaskan crude, and foreign crude.

For the fourth quarter of 2022:

- The Brent price peaked on November 7 at $99.87. The monthly average price for December was $80.92, a 10 percent increase compared to December 2021.
- The WTI price peaked on October 7 at $93.07. The monthly average price for December was $76.44, a 7 percent increase compared to December 2021.
- The CA-RAC peaked on November 4 at $95.90. The monthly average price for December was $77.55, a 9 percent increase compared to December 2021.

Figure 1: Daily West Coast Spot Crude Oil Prices



Source: U.S. Energy Information Administration (EIA), Oil Price Information Service (OPIS)
Note: Black vertical line on graphs indicates end of previous quarter's data. Areas to the right indicate new data since last quarter.

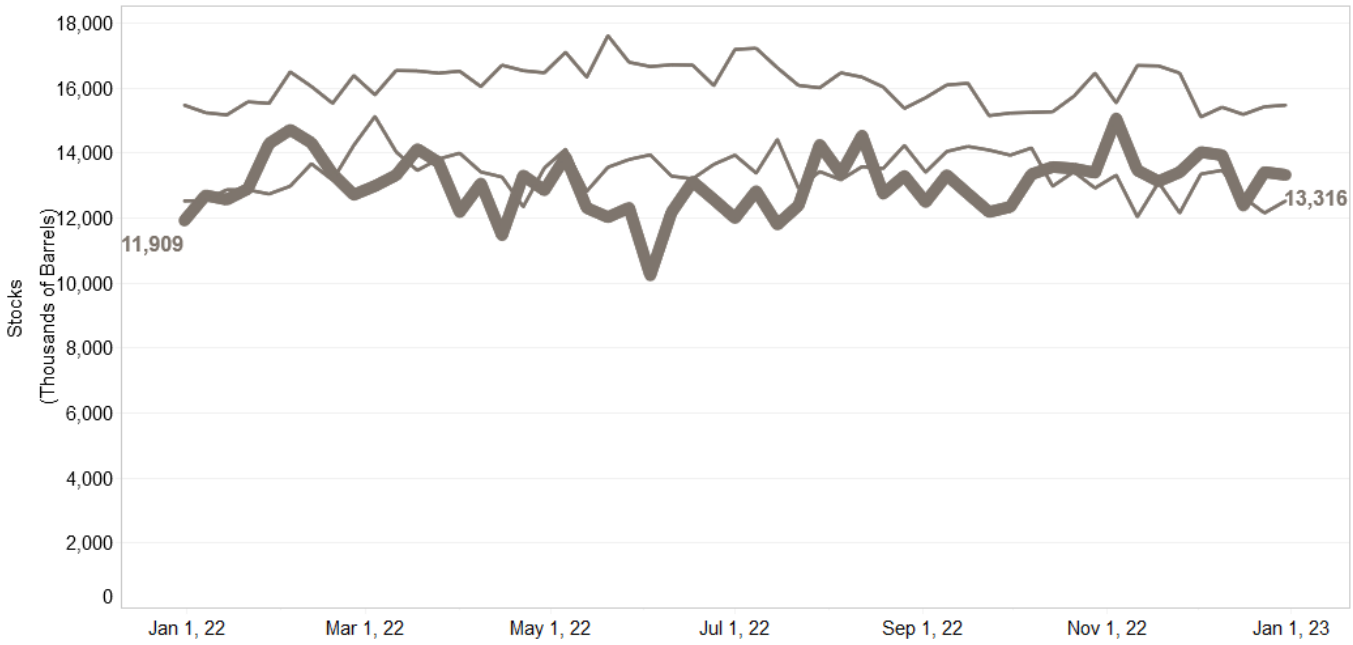
Inventory

Figure 2 shows the volume of crude oil inventories at California refineries. Crude oil inventories spent most of the year below five-year norms. This result is mostly due to the permanent idling of Marathon Martinez in August 2020, with less refining capacity requiring less crude oil to be stored. Inventories grew during October to be within the five-year high-low band and, although dipping below briefly in December, ended the year in that range.

For the fourth quarter of 2022:

- Crude stocks started the quarter at 11.9 million barrels, 20 percent lower than the previous year.
- Crude stocks ended the year at 13.3 million barrels, 12 percent higher than the previous year.

Figure 2: California Refinery Crude Oil Inventories (With Five-Year High-Low Band)



Source: CEC PIIRA data – Weekly Fuels Watch available at: https://www.energy.ca.gov/data-reports/reports/weekly-fuels-watch/refinery-stocks

Note: Inventory, input, and production charts include five-year high-low bands. These bands provide a rolling average of the highs and lows and allows the comparison of the current inventory, input, or production to the highs and lows of the historical trends.

Inputs

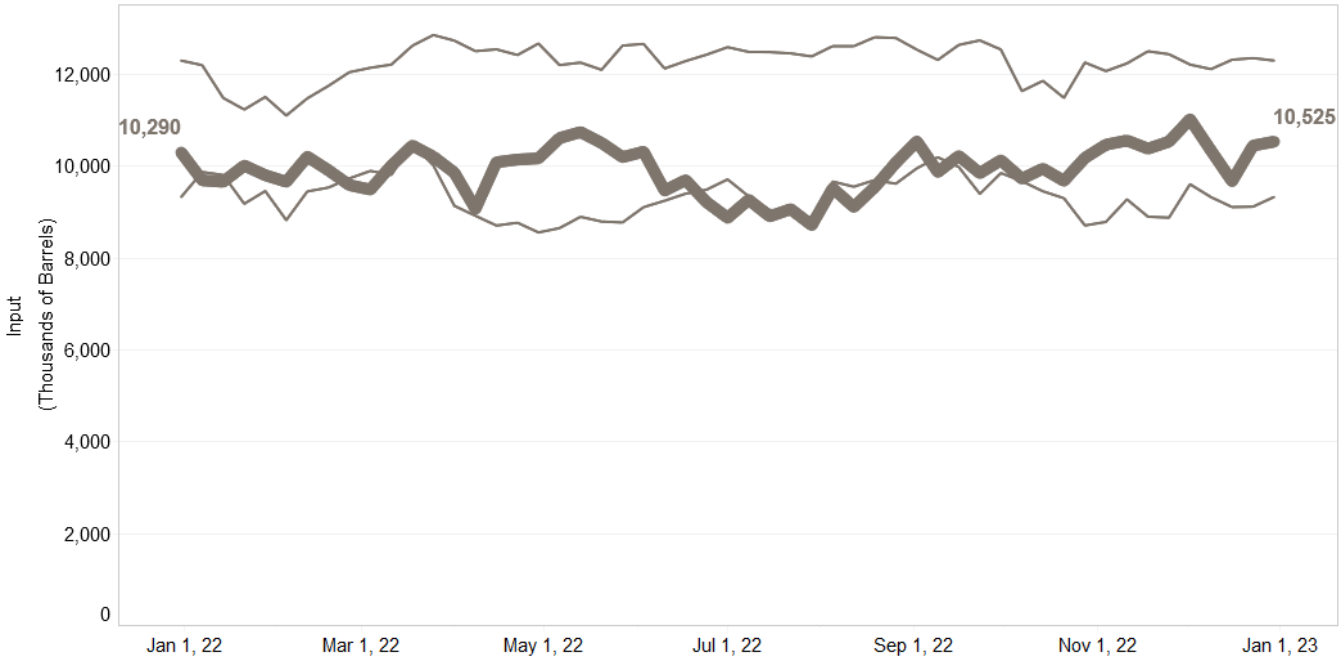
Figure 3 shows the volume of crude oil used at refineries, referred to as "inputs." Crude oil inputs grew starting in October and continued through the quarter. Inputs dipped in December but did not drop below the five-year high-low band and ended the year within the band. Like crude oil inventory, the permanent idling of Marathon Martinez in August 2020 reduced refining capacity and lowered the level of crude oil input.

For the fourth quarter of 2022:

- Inputs started the quarter at 9.7 million barrels, 6 percent lower than the previous year.
- Inputs ended the year at 10.5 million barrels, 2 percent higher than the previous year.

Inputs quarterly average was 10.3 million barrels, 2 percent lower compared to last year's quarterly average of 10.1 million barrels.

Figure 3: California Refinery Crude Oil Inputs (With Five-Year High-Low Band)



Source: CEC PIIRA data – Weekly Fuels Watch available at: https://www.energy.ca.gov/data-reports/reports/weekly-fuels-watch/refinery-inputs-and-production

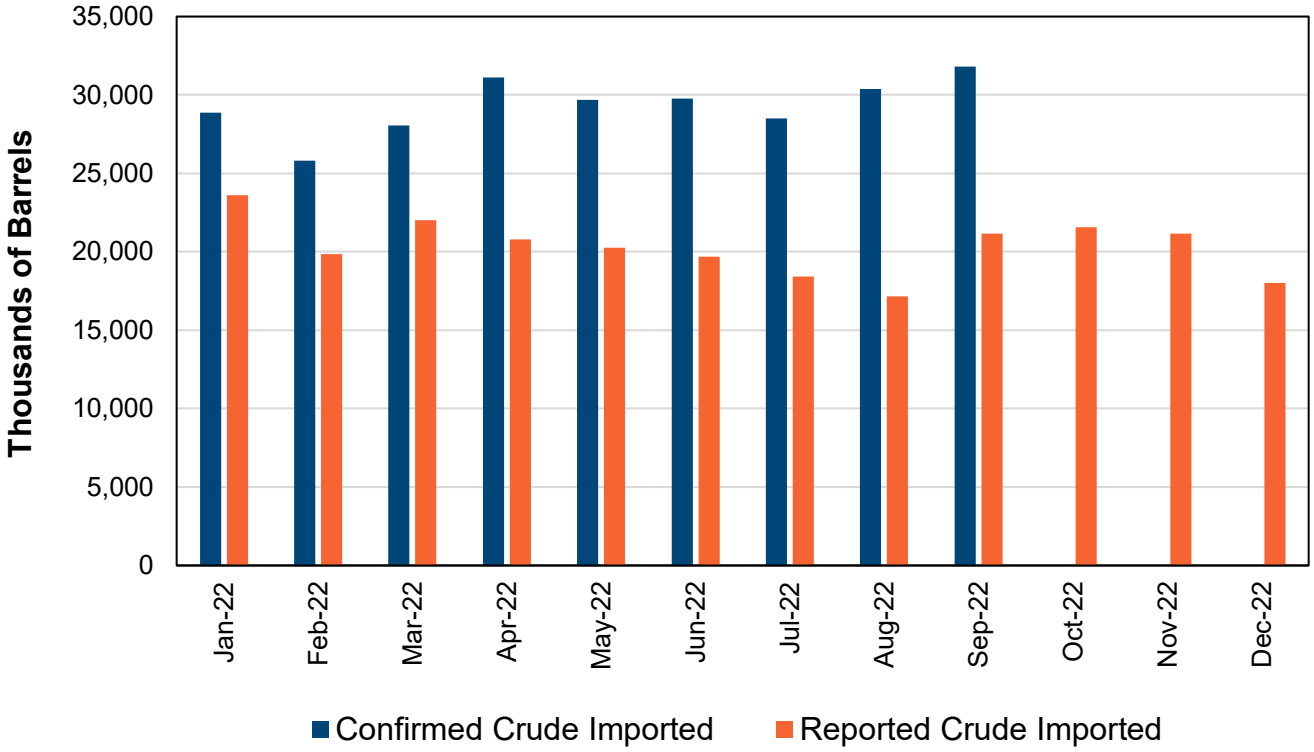
Imports

Figure 4 shows crude oil imports to California refineries. Imports include both domestic and foreign sources received by marine and rail.

For the fourth quarter of 2022:

- Crude oil imports continued the upward trend from September into October and leveled out in November before declining in December.
- October and November maintained import levels at 21 million barrels.
- December saw imports drop to 18 million barrels, a 15 percent drop from the previous month.

Figure 4: Crude Oil Imports



Source: CEC PIIRA data – California Imports, Exports, and Intrastate Movements Weekly Report (Form 700)
Note: "Reported Crude Oil Imported" data is reported directly to the CEC through Form 700. "Confirmed Crude Oil Imported" is Form 700 data that is confirmed with Port Import/Export Reporting Service (PIERS), California State Lands Commission (SLC), and Energy Information Administration (EIA) data through September 30, 2023.

CHAPTER 2:
Gasoline

This chapter discusses:

- Volume of CARB gasoline produced at California refineries.
- Inventories of CARB gasoline and blendstock.
- Gasoline prices.
- Imports and exports of gasoline.

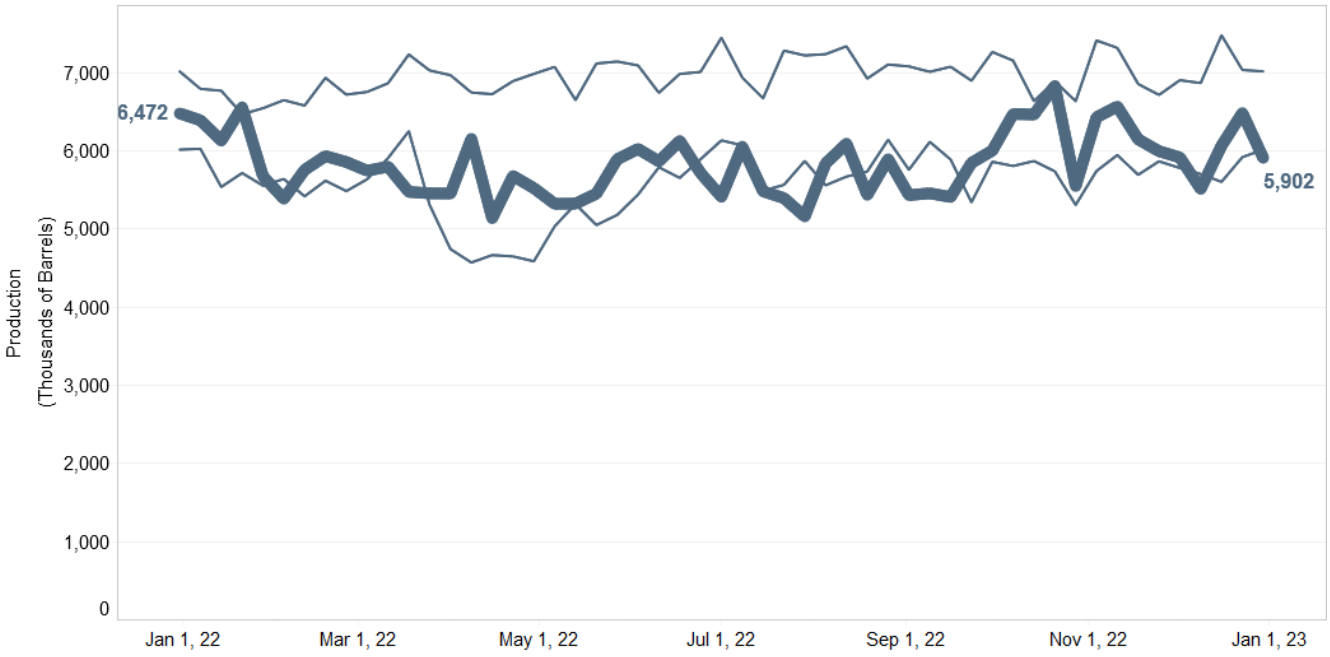
Production

Figure 5 shows California reformulated (CARB) gasoline production for the previous year with the five-year high-low band. CARB gasoline production stayed mostly within the five-year high-low band for the quarter but finished the year just below the band. The permanent idling of Marathon Martinez in August 2020 reduced refining capacity and lowered overall gasoline production.

For the fourth quarter of 2022:

- CARB gasoline production peaked for the quarter at 6.8 million barrels on October 21.
- CARB gasoline production briefly went below the five-year high-low band December 9 (5.5 million barrels) and December 30 (5.9 million barrels).
- CARB gasoline production finished the year at 5.9 million barrels, 9 percent lower than the previous year at 6.5 million barrels.

Figure 5: California CARB Gasoline Production (With Five-Year High-Low Band)



Source: CEC PIIRA data – Weekly Fuels Watch available at https://www.energy.ca.gov/data-reports/reports/weekly-fuels-watch/refinery-inputs-and-production

Inventory

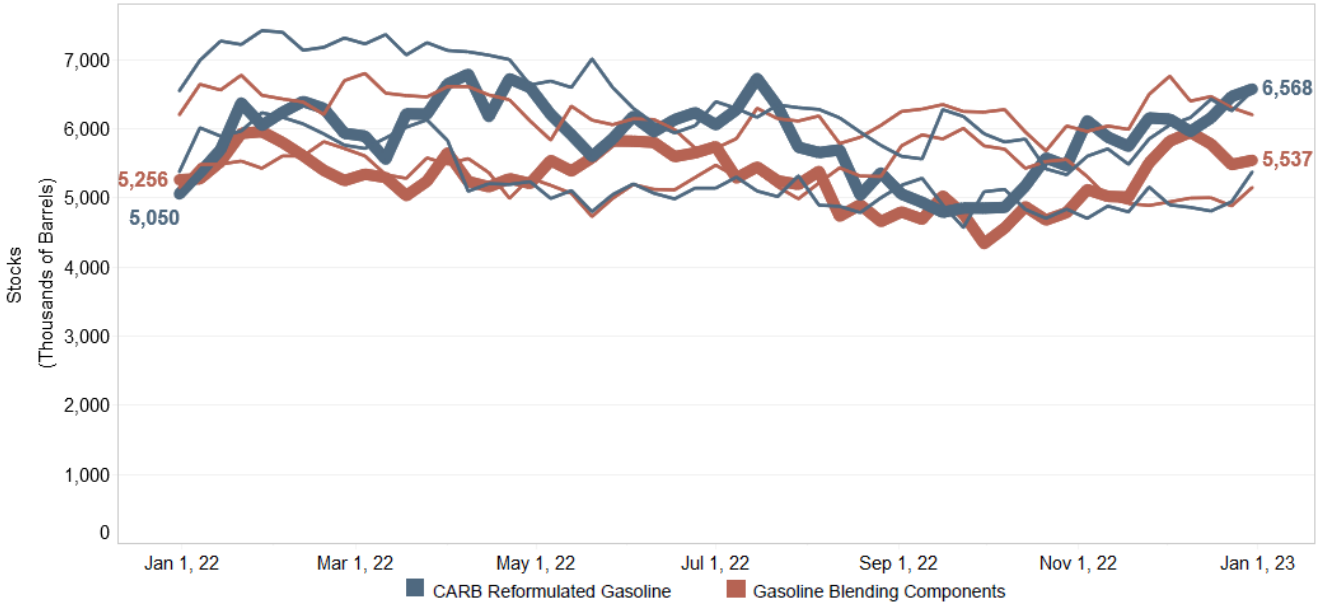
Figure 6 shows the CARB gasoline and blendstock inventories for the previous year with the five-year high-low band. Gasoline inventories grew through the fourth quarter, ending slightly above the five-year high-low band. Blendstock inventories grew during October and November but dipped during December. They ended the year within the five-year high-low band.

For the fourth quarter of 2022:

- California specification gasoline inventories finished the year high, reaching just below 6.6 million barrels.
- Inventories reached 2022 lows in September through October 2022 before climbing through the end of the year.
- CARB gasoline and gasoline blending components ended the year higher than they began. CARB gasoline inventories are roughly 1.5 million barrels higher than they were a year ago.

Figure 6: California CARB Gasoline and Blendstock Inventories

(With Five-Year High-Low Band)



Source: CEC PIIRA data – Weekly Fuels Watch available at https://www.energy.ca.gov/data-reports/reports/weekly-fuels-watch/refinery-stocks.

Prices

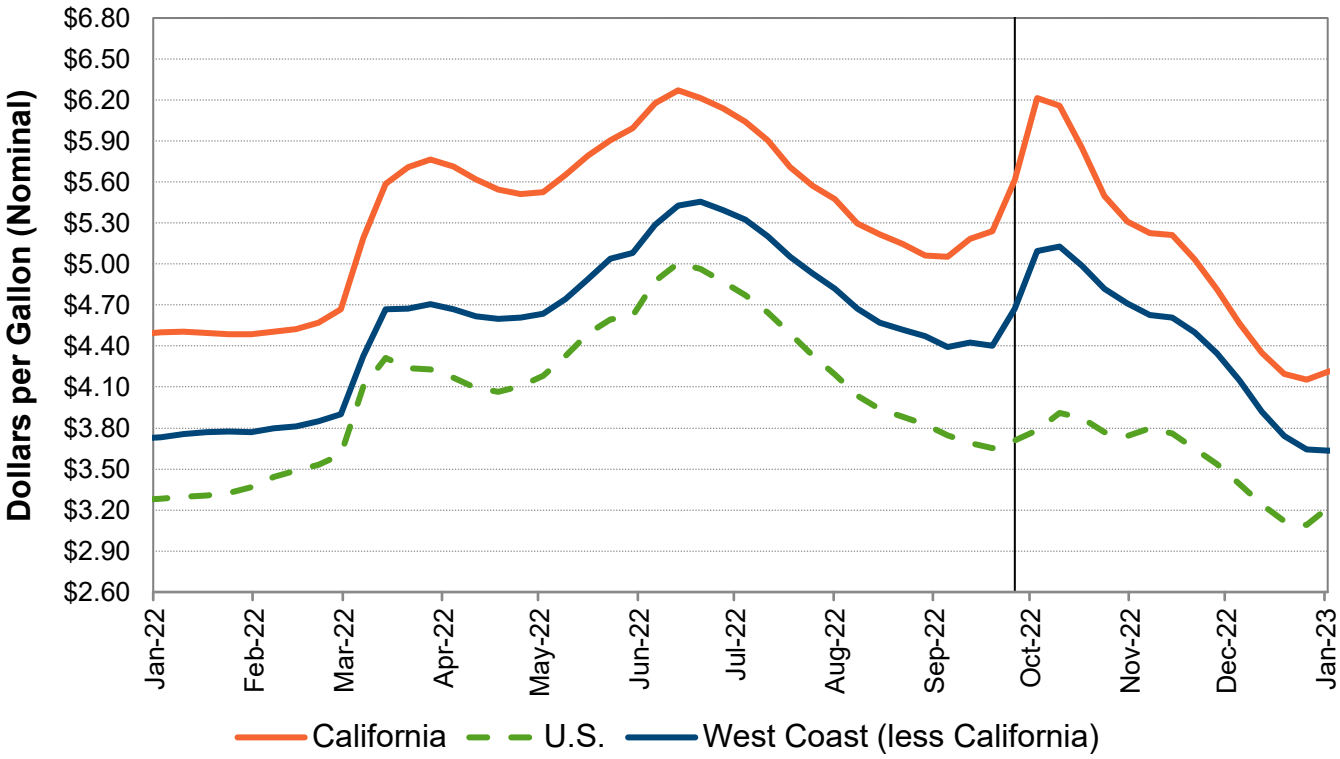
Figure 7 shows regular grade gasoline retail prices for the past year. Gasoline prices spiked in October but continued a downward trend for the rest of the year, ending the year lower than when it began.

For the fourth quarter of 2022:

- California and the West Coast (less California) retail price difference from U.S. retail price surpassed $2.43 and $1.12 as new high price differentials, respectively.
- During early October 2022, California and the West Coast had a noticeably higher price hump, increasing to $6.21 on October 3 for California and $5.13 on October 10 for the West Coast.
- Retail prices decreased at the end of the fourth quarter to the lowest since the beginning of 2022, reaching $4.16 for California, $3.63 for the West Coast, and $3.09 for the United States.

Figure 7: Regular Grade Gasoline Retail Prices,

California vs. West Coast vs. United States



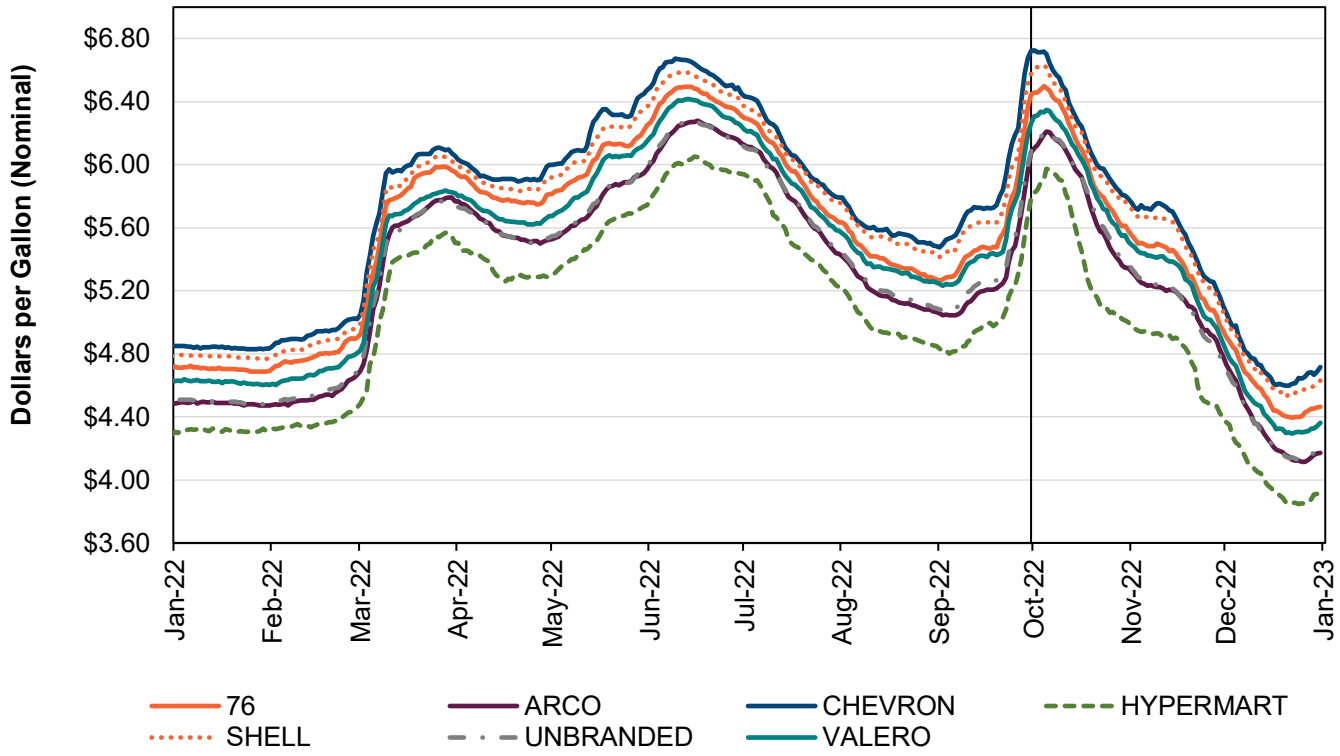
Source: U.S. EIA

Figure 8 shows California gasoline retail prices by brand. Chevron continues to be the highest priced brand and Shell the second highest. Hypermarts continue to offer the lowest prices, followed by ARCO and unbranded stations. A hypermart station (Costco, Safeway, and so forth) is defined as a station that is a company owned or operated supermarket or wholesale chain store that sells its own fuel at the same location.

For the fourth quarter of 2022:

- The highest average price during the fourth quarter was $6.72 at Chevron on October 1, 2022. The lowest average price during the fourth quarter for Chevron was $4.60 on December 21, 2022.
- The lowest average price during the fourth quarter was $3.85 at hypermart on December 24, 2022. The highest average price during the fourth quarter for hypermart was $5.98 on October 6, 2022.
- Price difference among various brands ranged between $0.62 and $0.32 (does not include hypermart and unbranded).
- The difference of monthly average price between Chevron and hypermart started 2022 at $0.53 and ended 2022 at $0.72.

Figure 8: California Gasoline Retail Prices by Brand



Source: CEC analysis of OPIS data

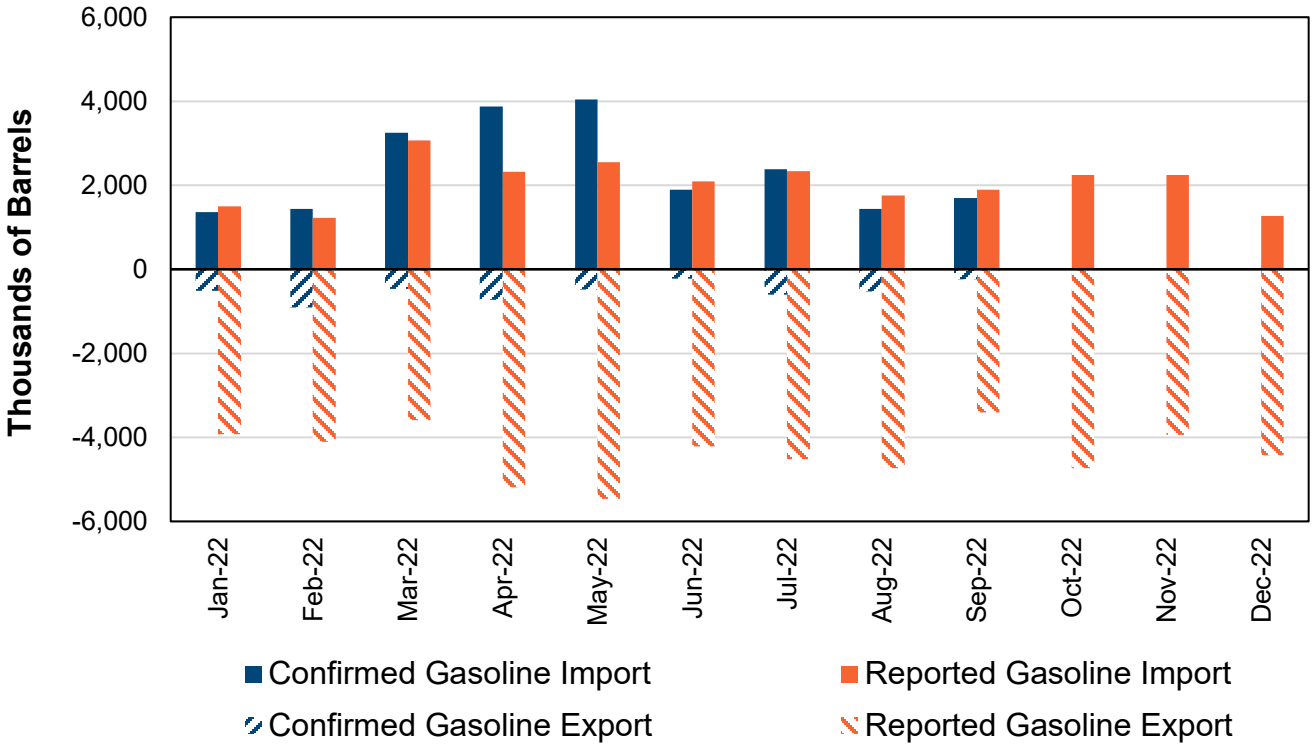
Imports and Exports

Figure 9 shows gasoline imports and exports for 2022. Gasoline imports increased in October and November, then fell in December. Gasoline exports for the fourth quarter were highest in October.

For the fourth quarter of 2022:

- In October and November, 2.2 million barrels of gasoline were imported.
- In December gasoline imports declined by 41 percent to 1.3 million barrels.
- Gasoline exports in October increased to 4.7 million barrels, an increase of 38 percent from September.
- November exports dropped to 3.9 million barrels but picked back up to 4.4 million barrels in December.

Figure 9: California Gasoline Imports and Exports



Source: CEC PIIRA data – California Imports, Exports, and Intrastate Movements Weekly Report (Form 700)
Note: "Reported Gasoline" data is reported directly to the CEC through Form 700. "Confirmed Gasoline" is Form 700 data that is confirmed with Port Import/Export Reporting Service (PIERS), California State Lands Commission (SLC), and Energy Information Administration (EIA) data through September 30, 2023.

CHAPTER 3:
Diesel

This chapter discusses:

- Volume of CARB diesel produced at California refineries.
- Inventories of CARB diesel.
- Diesel prices.
- Imports and exports of CARB diesel.

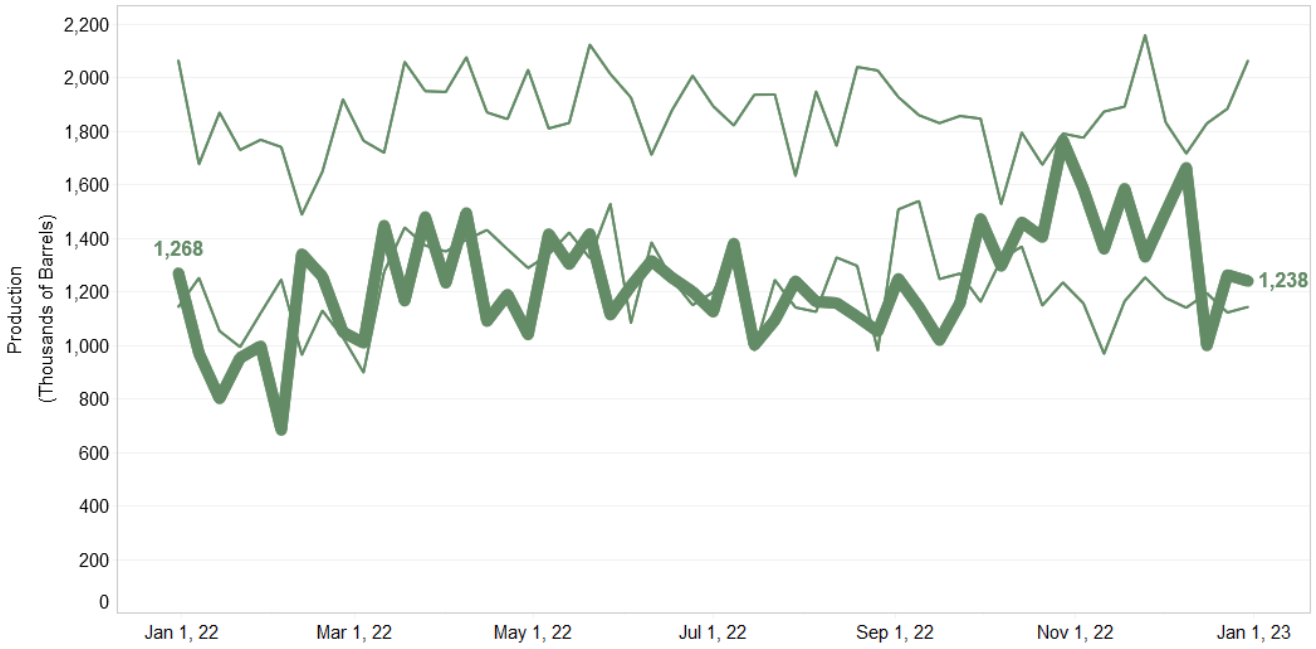
Production

Figure 10 shows California CARB diesel production for the previous year with the five-year high-low band. Diesel production increased in the fourth quarter after fluctuating around the five-year low for most of the year. Production briefly dipped below the five-year high-low band during December but ended the year within the band. The permanent idling of Marathon Martinez in August 2020 reduced refining capacity and lowered overall diesel production.

For the fourth quarter of 2022:

- California specification diesel production reached a high of 1.8 million barrels the week of October 28. Production lows were reached the week of February 4 at 681,000 barrels.
- January 2023 production was roughly 30,000 barrels below January 2022 but still above all-time lows. The January 2023 value exceeds the fourth-quarter time period required of this report to give a year-on-year comparison.

Figure 10: California CARB Diesel Production (With Five-Year High-Low Band)



Source: CEC PIIRA data – Weekly Fuels Watch available at https://www.energy.ca.gov/data-reports/reports/weekly-fuels-watch/refinery-inputs-and-production

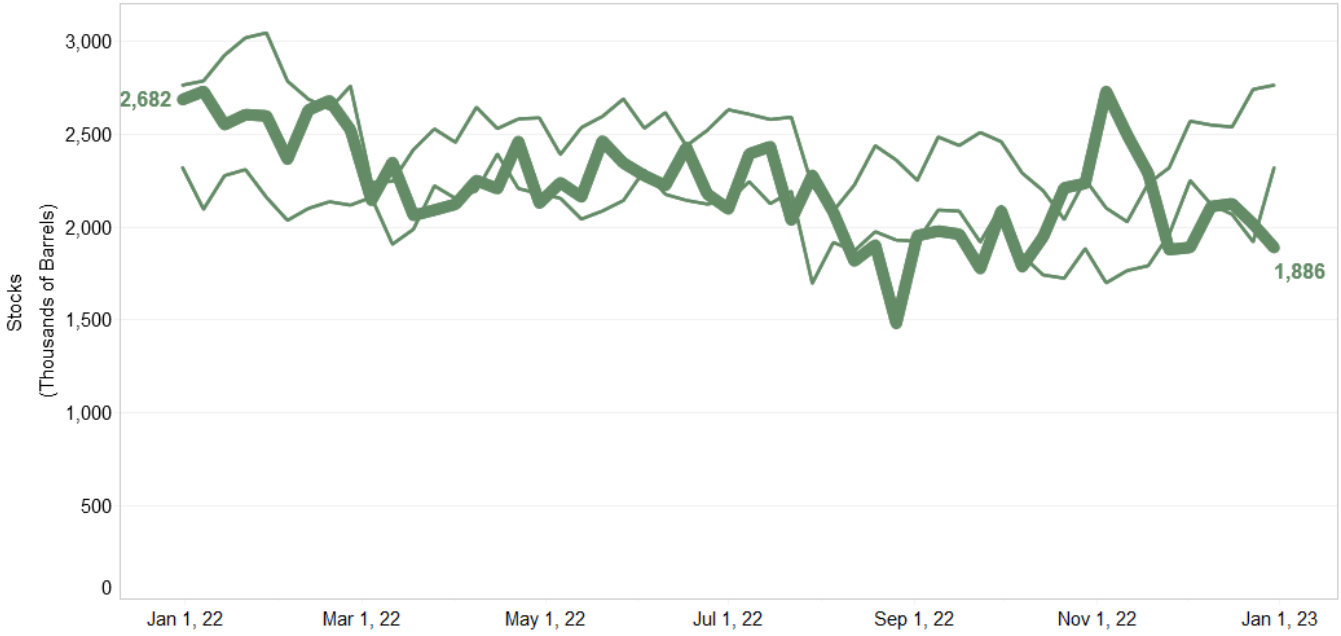
Inventory

Figure 11 shows California diesel inventories for the previous year with the five-year high-low band. Diesel inventories increased in October and peaked November 4, exceeding the five-year high-low band. Inventories then declined and, after fluctuating around the five-year low, ended the year below the band.

For the fourth quarter of 2022:

- Diesel inventories were steady for most of the year, the exceptions being September and October.
- November 2022 marked the 2022 high, reaching 2.7 million barrels.
- Diesel inventories started 2023 at 2.2 million barrels, roughly 500,000 barrels fewer than January 2022 (2.7 million barrels).

Figure 11: California Diesel Inventories (With Five-Year High-Low Band)



Source: CEC PIIRA data – Weekly Fuels Watch available at https://www.energy.ca.gov/data-reports/reports/weekly-fuels-watch/refinery-stocks

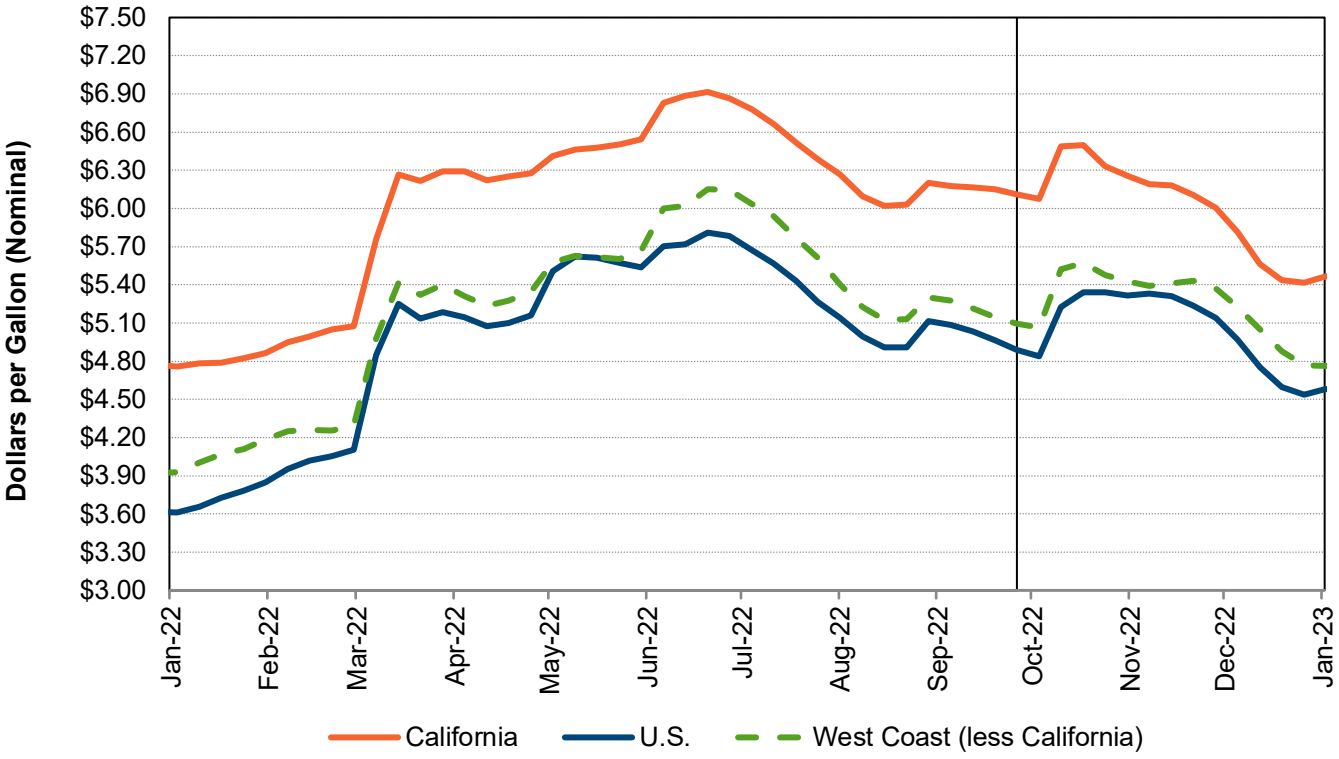
Prices

Figure 12 shows No. 2 diesel ultra-low-sulfur retail prices for the previous year. Early March was the last time diesel prices were low before a sudden increase, and then diesel prices peaked in June. Despite higher prices during October and November, prices declined over the second half of the year and ended at the lowest point since the initial price spike in March. California's premium over the West Coast and United States ended the year less than it started.

For the fourth quarter of 2022:

- California diesel prices average $0.96 more than U.S. prices during the fourth quarter of 2022 although this was the lowest average differential of any quarter of 2022.
- During the fourth quarter, retail diesel prices for California, West Coast (less California), and the United States averaged $6.03, $5.28, and $5.07, respectively.
- Diesel prices ended the year at $5.42 for California, $4.77 for the West Coast, and $4.54 for the United States.

Figure 12: No. 2 Diesel Ultra-Low-Sulfur Retail Prices, California vs. West Coast vs. United States



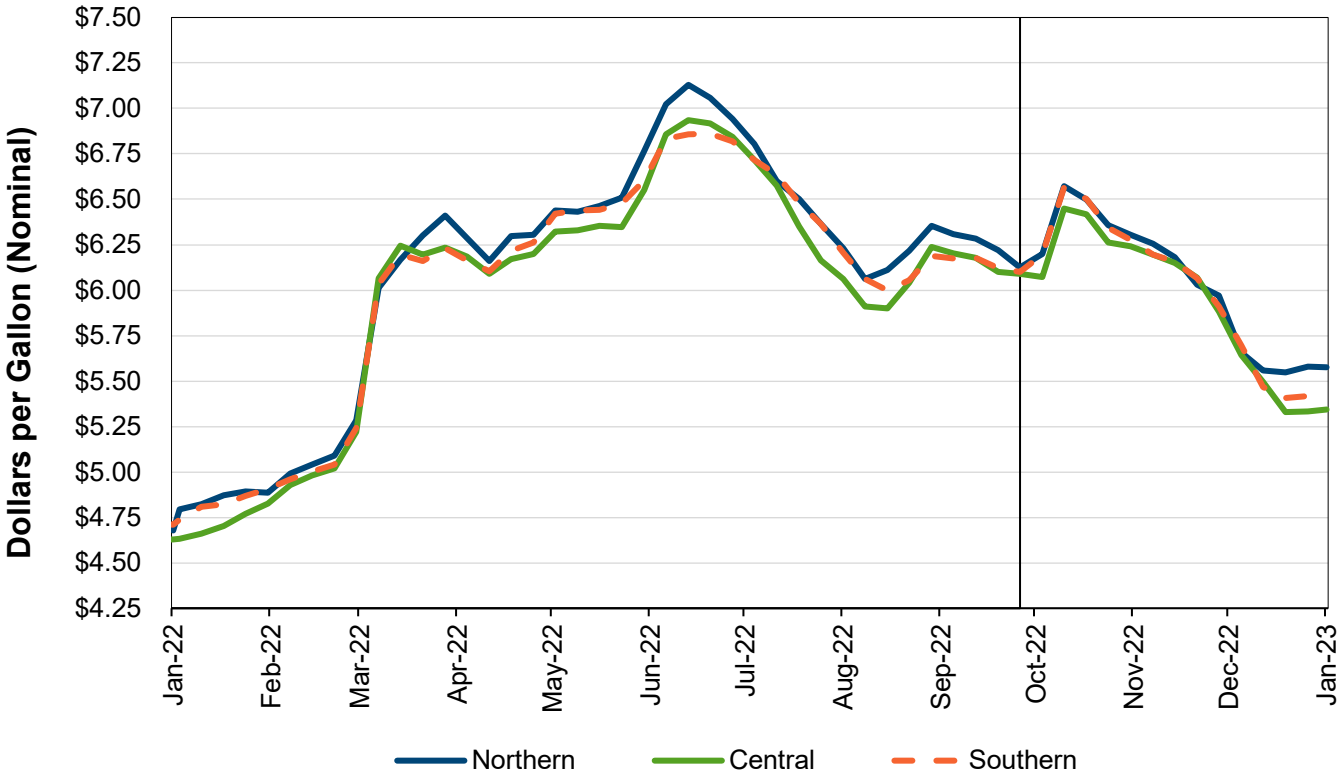
Source: U.S. EIA

Figure 13 shows California diesel retail prices by region. Early March was the last time diesel prices were low before a sudden increase and then peaked in June. Prices declined over the second half of the year and ended at the lowest point since the initial price spike in March. Diesel in Northern California ended the year with a slight premium over the other regions.

For the fourth quarter of 2022:

- Central California had the lowest diesel price of the regions during the fourth quarter of 2022 at $5.79, $0.09 less than Northern California and $0.05 less than Southern California.
- Diesel prices started above $6.09 per gallons on October 1 and ended the quarter under $5.60 per gallon or less.
- Northern California's diesel price was higher than the other regions throughout 2022, peaking June 12 at $7.24.

Figure 13: California Diesel Retail Prices by Region



Source: CEC analysis of OPIS data

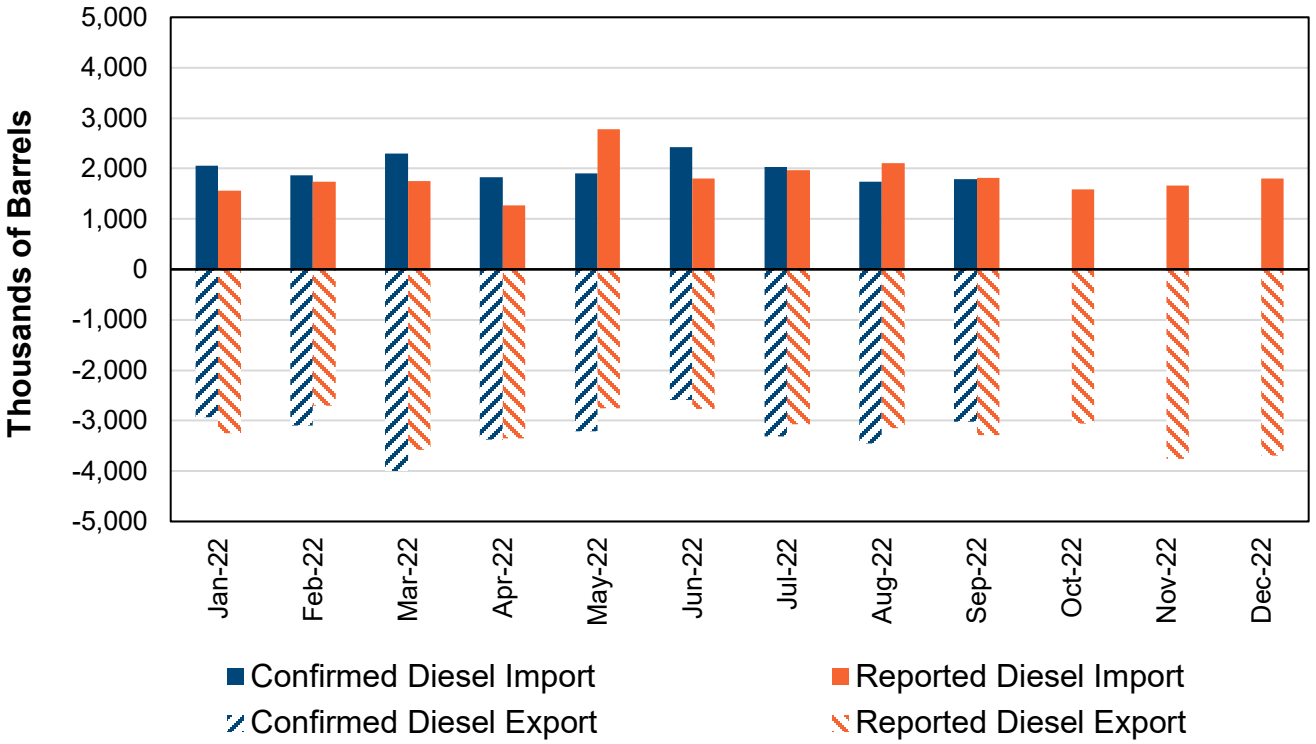
Imports and Exports

Figure 14 shows California diesel imports and exports. Diesel imports increased steadily over the fourth quarter, with December being the largest importing month during the quarter. This increase is expected as diesel is associated with freight movements, which increases during the holiday season. Exports increased and peaked in November but maintained a high level through December.

For the fourth quarter of 2022:

- Diesel imports for October, November, and December were 1.6 million, 1.7 million, and 1.8 million barrels, respectively.
- Diesel exports for October, November, and December were 3.0 million, 3.8 million, and 3.7 million barrels, respectively.

Figure 14: California Diesel Imports and Exports



Source: CEC PIIRA data – California Imports, Exports, and Intrastate Movements Weekly Report (Form 700)
Note: "Reported Diesel" data is reported directly to the CEC through Form 700. "Confirmed Diesel" is Form 700 data that is confirmed with Port Import/Export Reporting Service (PIERS), California State Lands Commission (SLC), and Energy Information Administration (EIA) data through September 30, 2023.

CHAPTER 4:
Published Analyses

Petroleum Watch

During the fourth quarter of 2022, the CEC published three Petroleum Watch newsletters, each featured a different topic for analysis, as listed:

- October 2022 Petroleum Watch – Averaging Gasoline Prices.
- November 2022 Petroleum Watch – Energy Use at Refineries: A Look at Natural Gas.
- December 2022 Petroleum Watch – Highway, Freeway, and Interstate Retail Gasoline Sales and Station Distribution.

Each newsletter is posted on the CEC's website available at https://www.energy.ca.gov/data-reports/reports/petroleum-watch and is included in this chapter, modified into report format.

October 2022 Petroleum Watch – Averaging Gasoline Prices

The average gasoline price for the day (or week or month, and so forth) is often a simple average taking all the posted prices for that period. The posted price is found on retail signs on the street or listed in mobile apps like GasBuddy. The simple average is calculated by summing the prices and dividing the number of prices in the set, but this method may not directly reflect what the average driver pays. Just because a station its price to $9.00 per gallon does not mean that the average driver fills up at that rate.[1] Instead, weighing the costs by the volumes of gasoline sold yields a weighted average, producing a more accurate picture of what Californians spend on gasoline.

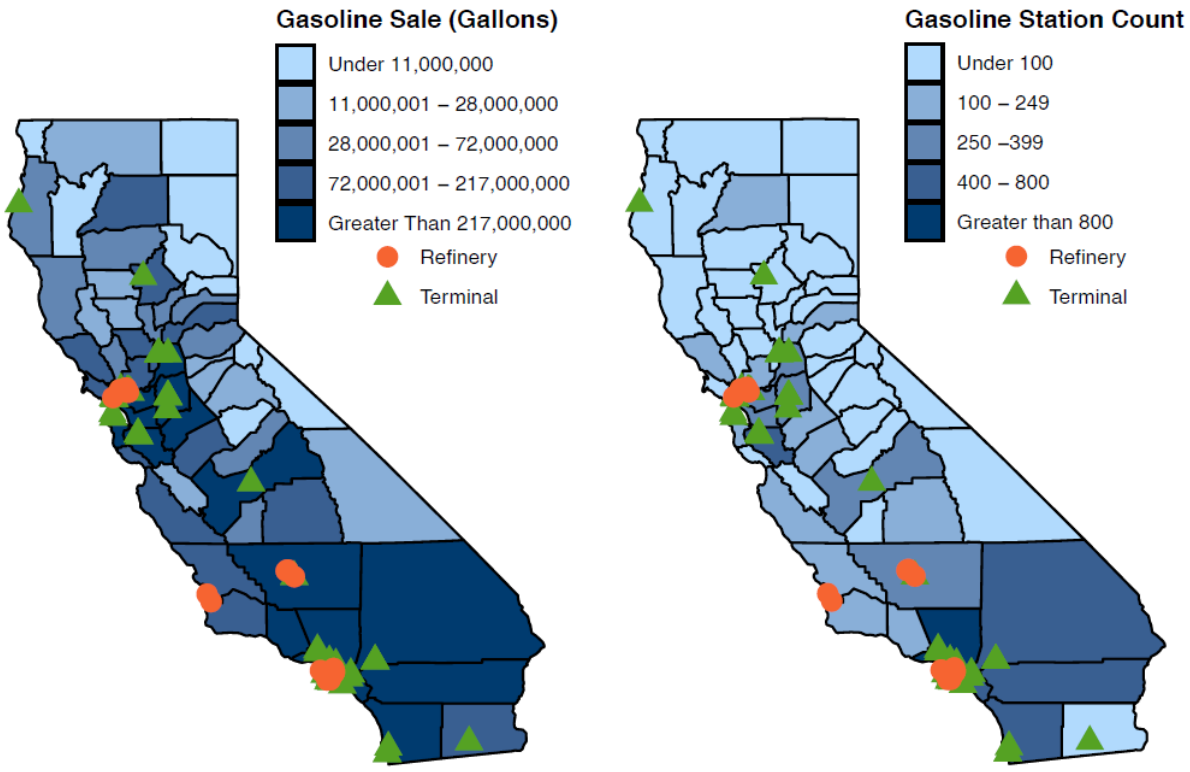
Most people are familiar with a weighted average from school, where exams and projects had more impact on the final grade than homework assignments. For example, a final exam may comprise 60 percent of the grade, midterms 30 percent, and homework the remaining 10 percent. Applying that same logic to the average gasoline price, stations that have a higher percentage of the state's total gasoline sales have a greater effect on the average price. This method helps reduce the effects of price outliers that may appear while accounting for the geographic and demographic qualities such as proximity to distribution infrastructure, population counts, number of retail stations in the area, or even fuel brand presence.

1 "$9.63 A Gallon: She Sells the Country's Most Expensive Gas and Doesn't 'Give a Diddle.'" 2022. Cason City Daily Record. Last accessed February 2, 2023. https://www.canoncitydailyrecord.com/2022/06/19/9-63-a-gallon-she-sells-the-countrys-most-expensive-gas-and-doesnt-give-a-diddle.

California Gasoline Infrastructure

California has 8,435 retail stations (2021) spread out across its 58 counties according to the California Retail Fuel Outlet Annual Report available at https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting. **Figure 15** shows the distribution of sales (in gallons sold) and number of reporting retail stations within each county. Furthermore, the map includes the locations of refineries and terminals that supply gasoline throughout the state.

Figure 15: California Gasoline Sales and Stations by County (2021)



Source: CEC analysis of PIIRA data and California Office of Emergency Services (Cal OES)

The production (refineries) and storage facilities (terminals) require a system of pipelines and delivery trucks to distribute fuel across the state. (See the March 2020 newsletter available at https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf and August 2021 available at https://www.energy.ca.gov/sites/default/files/2021-08/August_Petroleum_Watch_ADA.pdf Petroleum Watch for more information on delivery infrastructure.) Distribution costs are another factor to consider when weighing gasoline prices.

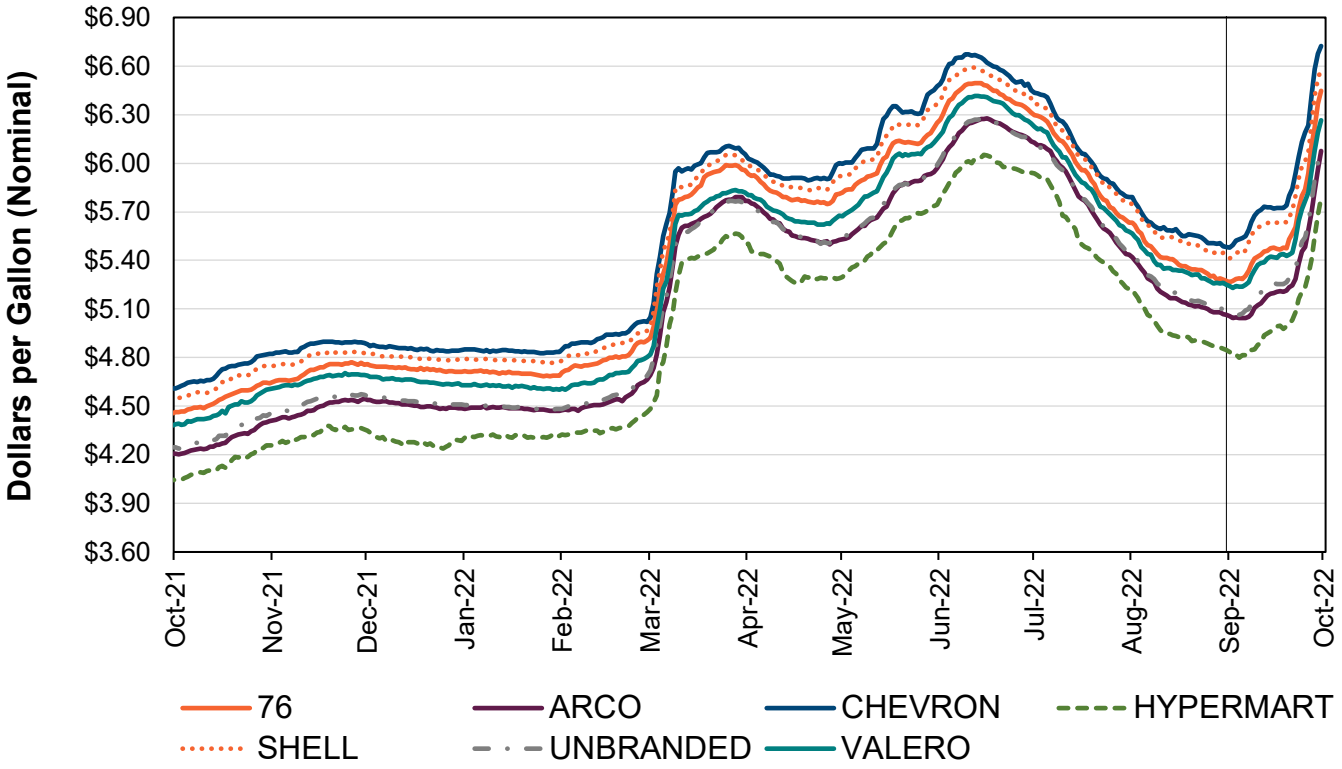
As a result of the setup of the distribution network, the average price of gasoline will generally rise on the regional level first, then statewide. California essentially has two regional markets because of pipeline infrastructure: Northern California and Southern California. The farther a station is from a refinery or fuel terminal, the more the retail station pays for its wholesale fuel since it costs more to deliver. Most stations (and sales) are near the refineries and terminals.

Stations in rural areas that are farther from terminals have higher prices since it costs more to receive the fuel. They also have less sales volume, so their prices have less weight toward the average.

Fuel Brand Effect on Price Average

In addition to the geographic differences, not all fuel brands have the same pricing strategies according to **Figure 16**. Certain fuel brands tend to price higher than unbranded or hypermart stations. A hypermart station (Costco, Safeway, etc.) is defined as a station that is a company owned or operated supermarket or wholesale chain store that sells their own fuel at the same location. The October 2020 Petroleum Watch available at https://www.energy.ca.gov/sites/default/files/2020-10/2020-10_Petroleum_Watch_ADA.pdf explored how more station locations for a specific brand did not equate to more sales of gasoline. Hypermarts have the least amount of presence by station count, less than 3 percent, but have more than 16 percent of total gasoline sales.

Figure 16: California Gasoline Retail Prices by Brand



Source: CEC analysis of OPIS data

On the other end of the spectrum, 76 has four times as many stations as hypermarts but represents only about 8 percent of the sales volume. As a higher-priced brand with many more posted prices going into the average, 76 has a larger impact on the standard average than hypermarts despite selling half the fuel volume. Chevron also brings up the standard average as the brand with the most stations (excluding unbranded) and usually has the highest prices as shown in **Figure 16**.

Gasoline Price Sources

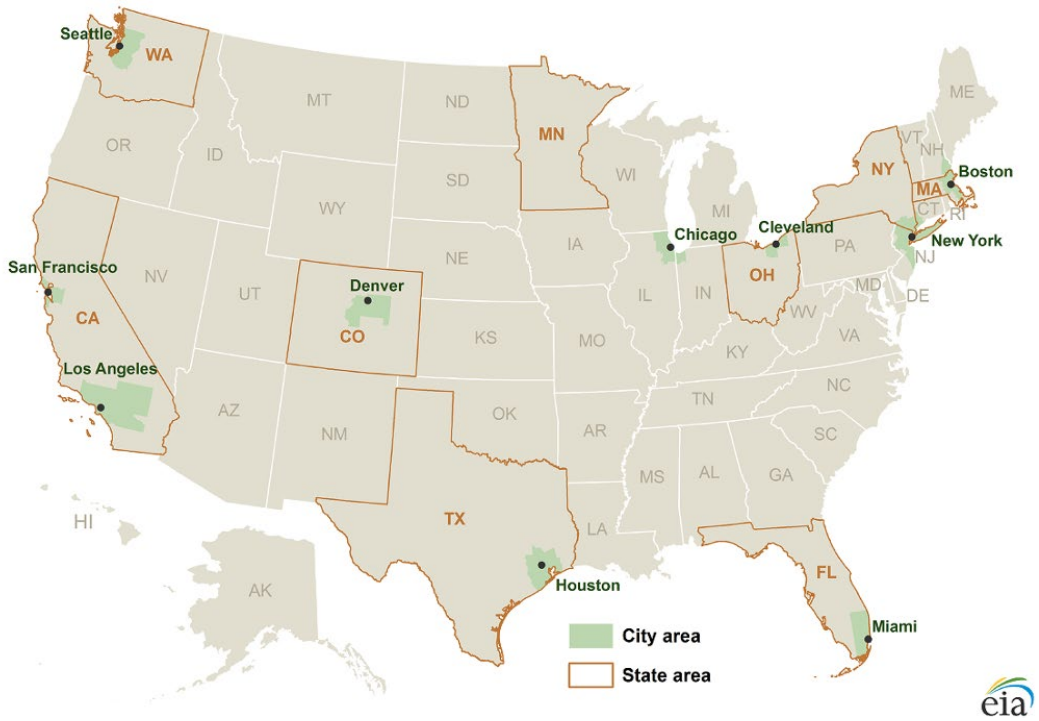
The CEC uses two sources for gasoline prices and other transportation fuel prices: the Energy Information Administration (EIA) and Oil Price Information Services (OPIS). Both use different methods for collecting and averaging prices. Both price sources include taxes.

EIA

EIA provides averages for retail gasoline prices on [weekly, monthly, and annual periods](https://www.eia.gov/dnav/pet/PET_PRI_GND_DCUS_SCA_W.htm) available at https://www.eia.gov/dnav/pet/PET_PRI_GND_DCUS_SCA_W.htm. It collects the prices every Monday by surveying stations over telephone, email, text, or fax and maintains its own process for error checking. Its survey also includes volumes sold to weigh the weekly average for that state. Furthermore, only certain cities and metropolitan areas are included in its survey sample. Rural counties seen in the sales and station map mentioned above are not included in its average.

Figure 17 shows the specified metropolitan areas they sample prices from for each state. California is mainly composed of the San Francisco and Los Angeles areas, where refineries and terminals have the most presence. This arrangement for choosing stations extends to the other states. The [June 2021 Petroleum Watch](https://www.energy.ca.gov/sites/default/files/2021-07/2021-06_Petroleum_Watch_ADA.pdf) available at https://www.energy.ca.gov/sites/default/files/2021-07/2021-06_Petroleum_Watch_ADA.pdf explored this issue and found that California has a wider distribution of price ranges. Sampling from a single metropolitan area is likely closer to entire state averages for Texas or New York.

Figure 17: EIA Map of Surveyed Regions for Average Price Estimate



Source: EIA

It is important to note that EIA changed its method in May 2018, which noticeably lowered its weekly average. This method change modified the sampling frame, estimation methods, and ways that they defined the city areas. More information on their sampling method can be found on its website at https://www.eia.gov/petroleum/gasdiesel/gas_proc-methods.php.

OPIS

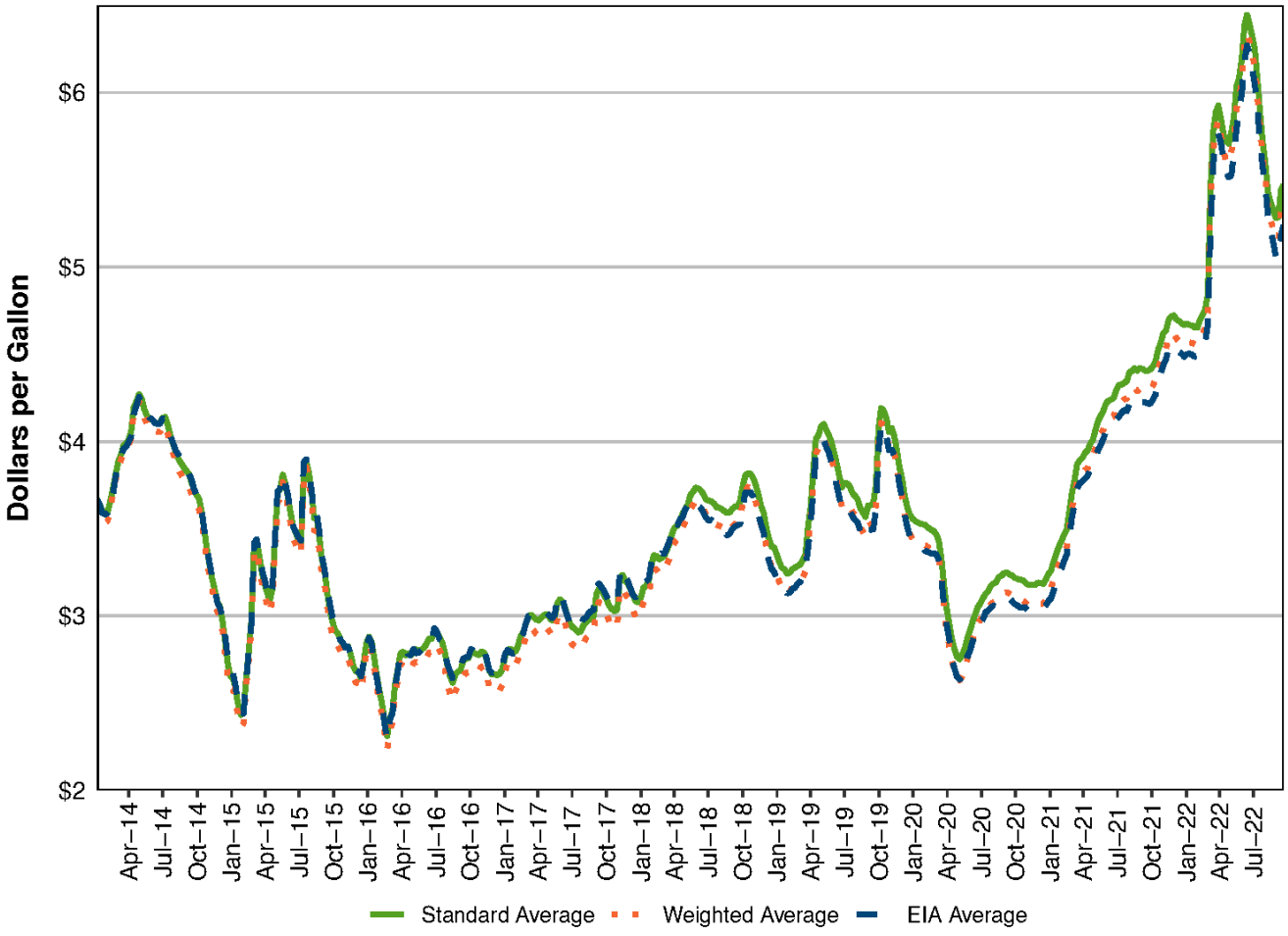
OPIS provides daily price reports that include prices from all stations in the nation. Included with the daily posted price is the fuel brand of the station and address. OPIS primarily sources its prices through credit card swipe data and does not limit its collection to specific cities or metropolitan areas, providing a wider pool of station prices compared to the EIA source. However, OPIS does not factor in the volume of sales. OPIS information is available only through a subscription, but a public source for its pricing data is available through AAA website available at https://gasprices.aaa.com/. Visit the OPIS website available at https://www.opisnet.com/commodities/gasoline-products/ for more information on the OPIS retail reports.

Weighted Average Method

This Petroleum Watch calculates a weighted average based on each station's price and sales data by combining OPIS daily price information and the CEC's annual retail outlet data. This method uses only regular gasoline sales volumes since that is the price received through OPIS. Furthermore, only the OPIS addresses that exist in the CEC's A15 database are used, which is about 84 percent of the OPIS addresses.

The weights (or coefficients) for the weighted average formula takes the reported total sales per year for each station and divides by the total sales per year of all stations. These weights allow a station's sales performance to adjust the daily average so that stations with higher volume (like the hypermarts and unbranded) have more impact on the daily average. **Figure 18** lists three different daily price averages since 2014. The standard price is consistently higher than the weighted average (orange dotted) since 2014 by at least $0.05 and increases to $0.10 after 2019. The EIA average (blue dashed line) begins to match the weighted average after the method switch in May 2018. This suggests that EIA's sample area of just the San Francisco and Los Angeles regions is an accurate reflection of the state average as a whole.

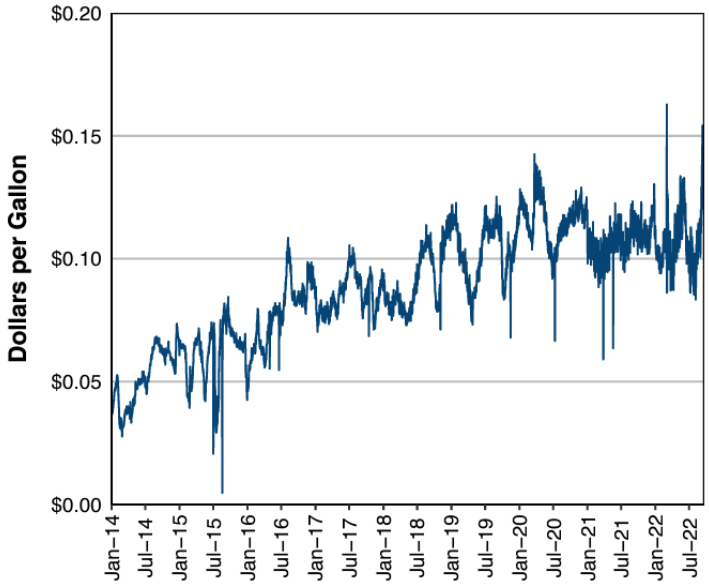
Figure 18: Average Price Methods Compared



Source: CEC analysis of PIIRA, OPIS, and EIA data

Figure 19 plots the difference between the two average methods (excluding the EIA average). In 2014, the difference stayed within $0.05 but increased after 2015, around the time of the Torrance Refinery explosion. This is also around the time when the "Mystery Surcharge," available at https://haas.berkeley.edu/energy-institute/research/in-the-media/mystery-gasoline-surcharge/, surfaced, an unexplained $0.20–$0.30 price gap in California's retail gasoline price. The station weighted average solves a portion of that mystery.

Figure 19: Standard Average Less Station Weighted Average



Source: CEC analysis of PIIRA and OPIS data

Takeaways

The standard average of gasoline prices is still useful for gauging the overall trend in the gasoline market. It captures the effect of crude oil prices, any changes in the supply market, and consumer demand. It is also easily available to most of the public since it does not require proprietary or confidential information to calculate. There are other shortfalls with using the standard average as well, such as ignoring the seasonal variations in pricing along with the local branding and locational nuances that get lost when averaging across the entire state. Averaging on the county, city, or zip code levels could alleviate some of these issues without the need for volume sales data.

Fortunately, the EIA has a weekly average that does involve volume weighing and a reliable pool of stations to sample from. This is a good resource for a more accurate average price. However, in a time where gasoline prices are steadily more than $5–$6 per gallon and refiner margins (available at https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/estimated-gasoline-price-breakdown-and-margins are nearly half of that, the $0.10–$0.15 difference between averaging methods may not seem as significant.

Visit our website for more information about California's Petroleum Market available at https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market.

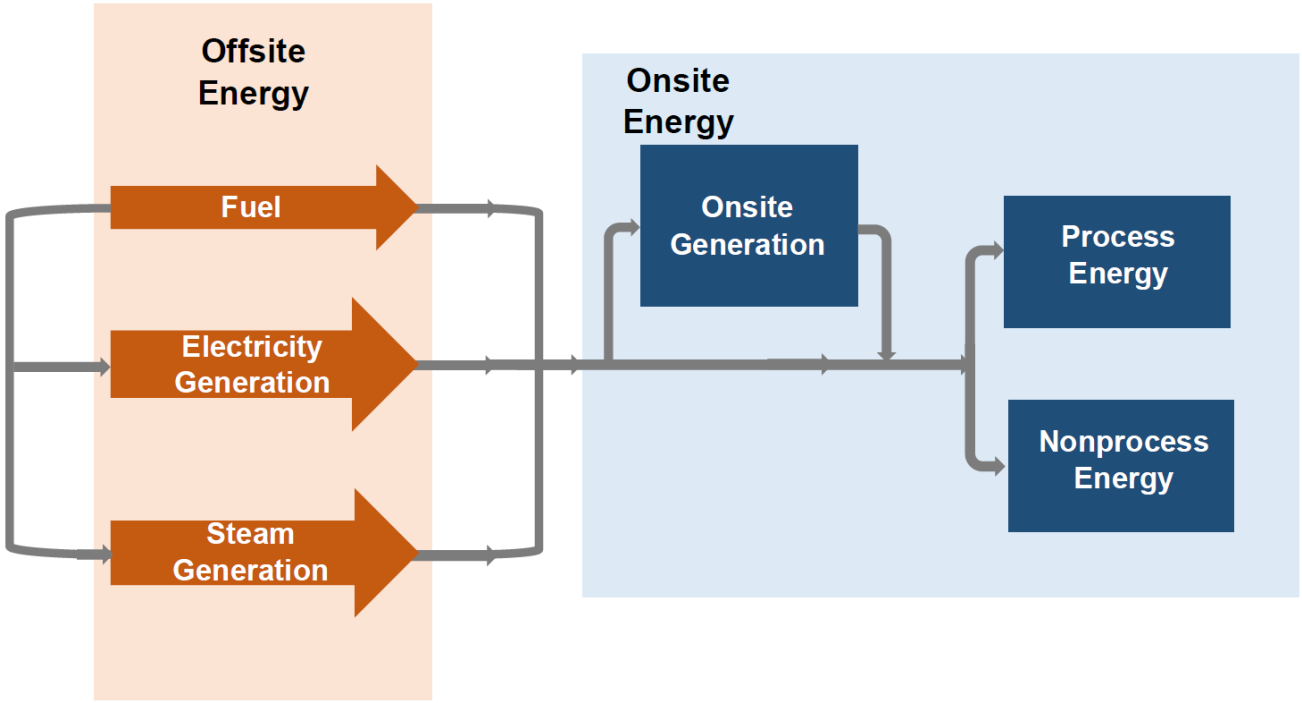
November 2022 Petroleum Watch — Energy Use at Refineries: A Look at Natural Gas

The petroleum refining sector has the greatest demand for process heating energy of all manufacturing sectors, according to the U.S. Department of Energy (DOE available at https://www.energy.gov/eere/amo/downloads/us-manufacturing-energy-use-and-greenhouse-gas-emissions-analysis). This demand is because refining crude oil into marketable products, like gasoline, diesel, and jet fuel, requires an abundance of heat and steam energy. Natural gas plays a large role in meeting those energy demands and has meaningful weight over refinery operating costs.

Energy Flow at Refineries

Energy use at refineries can be grouped into two categories: offsite energy use and onsite energy use. **Figure 20** depicts the offsite and onsite energy flows at refineries. The primary offsite energy sources are, in descending order, direct fuel use, steam generation, and electricity generation, with the majority being direct fuel use (DOE available at https://www.energy.gov/eere/amo/downloads/us-manufacturing-energy-use-and-greenhouse-gas-emissions-analysis). Direct fuel use is any process that is not steam or electricity generation. Sources of fuel include natural gas, fuel oils, by-product fuels, and other petroleum-based fuels.

Figure 20: Energy Flow at Refineries



Source: U.S. DOE. "U.S. Manufacturing Energy Use and Greenhouse Gas Emissions Analysis," available at https://www.energy.gov/eere/amo/downloads/us-manufacturing-energy-use-and-greenhouse-gas-emissions-analysis

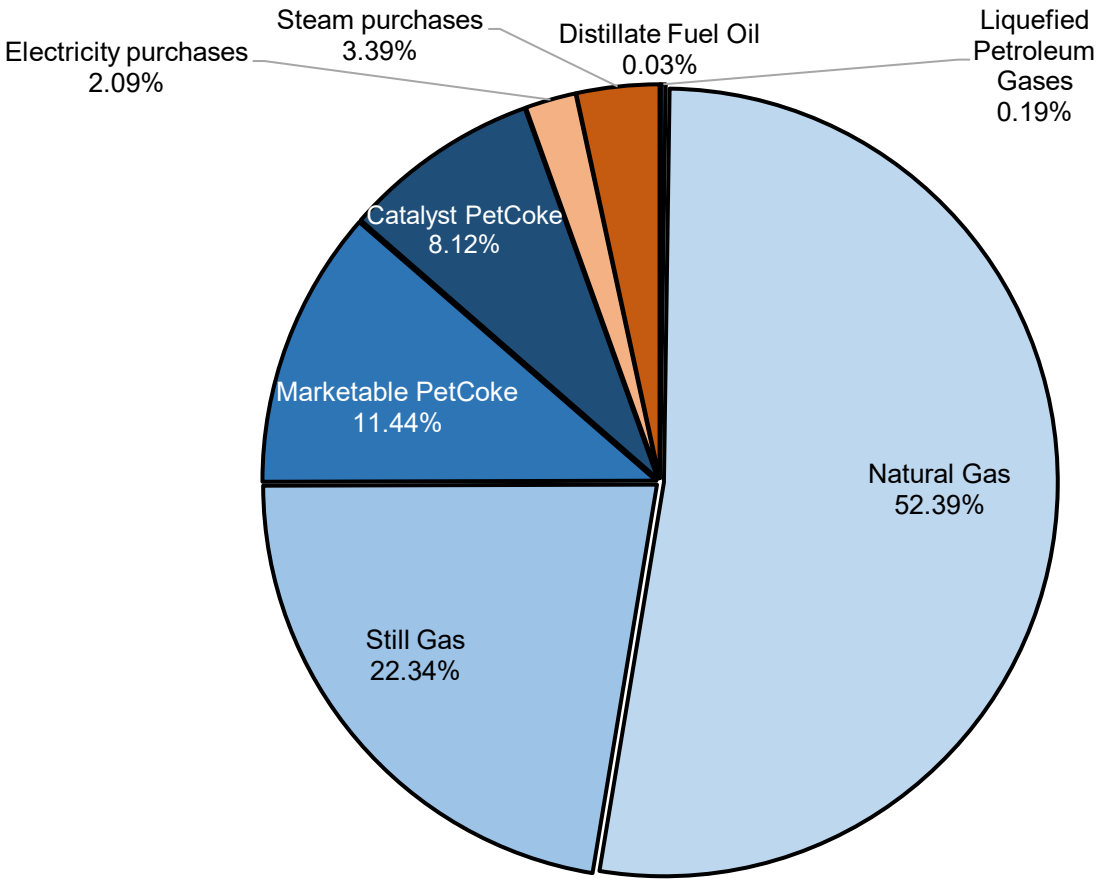
Onsite energy generation is used for process energy and nonprocess energy. Process energy involves the energy-intensive processes required to refine crude oil such as distillation, cracking, reforming, and treating. Read the May 2020 Petroleum Watch available at https://www.energy.ca.gov/sites/default/files/2020-05/2020-05_Petroleum_Watch.pdf for more on refinery operations. About 90 percent of onsite energy is used for processing, and the remainder is used for nonprocess energy. Nonprocess energy is used for facility support such as heating, ventilation, and air conditioning, lighting, and onsite transportation.

Energy Sources at California Refineries

Energy consumption data at California refineries are collected through the California Refinery Monthly Fuel Use Report and are required by all refineries to report to the CEC. Refinery reporting requirements include monthly fuel use by fuel type, electricity purchases, and steam purchases.

Figure 21 shows a pie chart of energy consumption for California refineries in 2021. Consistent with the energy flow chart, offsite energy is shown in orange shades, and onsite energy is shown in blue shades. To compare the energy content of fuels, all values were converted to British thermal units (Btu). A Btu is a measure of the heat content of fuels or energy sources. One Btu is roughly equal to the energy released by burning a match (EIA available at https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php). Heat content is useful for comparing fuels on an equal basis. In 2021, about 95 percent of energy use at California refineries was generated onsite, leaving just more than 5 percent of energy generated offsite in the form of steam and electricity purchases. Of the onsite energy consumed, natural gas is the largest share at 52.4 percent, or 222.4 trillion Btu. This is followed by still gas at 22.3 percent, marketable petroleum coke at 11.4 percent, catalyst petroleum coke at 8.1 percent, liquified petroleum gases at 0.2 percent, and distillate fuel oil at 0.03 percent. Of the offsite energy consumed, steam purchases comprised 3.4 percent, and electricity purchases comprised 2.1 percent of total energy consumption.

Figure 21: Energy Consumption at California Refineries (2021)



Source: CEC analysis of CEC M13 data
Notes: CEC M13 data for all refineries with fuel types converted to MMBtu

This analysis does not include natural gas consumed onsite for combined heat and power, also known as "cogeneration." Cogeneration is when combustion turbine generators and steam turbine generators produce electricity and thermal energy for useful purposes. Cogeneration produces most of the electricity consumed at refineries, but refineries still purchase small amounts of electricity from California's electric grid, find more information on this topic in the January 2021 Petroleum Watch available at https://www.energy.ca.gov/sites/default/files/2021-01/2021-01_Petroleum_Watch.pdf

Natural Gas Use at California Refineries

Natural gas use at refineries is categorized into four applications: cogeneration, hydrogen production, heater, and boiler. **Table 1** lists the end-use shares of natural gas at California refineries using data from 2014 and 2015, collected through an ad hoc survey conducted in 2016. These data are not collected regularly; however, refinery fuel use does not vary significantly due to infrastructure architecture limitations. While energy flows may vary a little from year to year, they will stay within a small range as they are determined by the refineries' physical infrastructure. That has not changed since then, so these figures should still be accurate. Therefore, it is assumed that these ratios can still be applied to present-day fuel use consumption at refineries.

Table 1: Natural Gas End Use at Refineries

Natural Gas End Use	2014 Percent Share	2015 Percent Share
Cogeneration	45.9%	45.2%
Hydrogen Production	34.6%	34.0%
Heaters	17.7%	16.8%
Boilers	1.8%	3.9%

Source: CEC analysis of CEC survey data

Cogeneration makes up just under half of natural gas use, around 45 percent. Hydrogen production from natural gas makes up about 35 percent. Hydrogen is produced from natural gas through a process called steam-methane reforming. The hydrogen is then used to lower the sulfur content of diesel fuel to make it compliant with air quality standards (EIA available at https://www.eia.gov/todayinenergy/detail.php?id=24612). The remaining share, about 20 percent, is used by heaters and boilers. Heaters and boilers are used in process heating systems to break down crude oil. Most process heaters and boilers are fueled by a combination of natural gas and fuel gas (hydrogen, methane, and other light-end gases produced in the refining of crude oil, read more in April 2021 Petroleum Watch available at https://www.energy.ca.gov/sites/default/files/2021-04/2021-04_Petroleum_Watch.pdf).

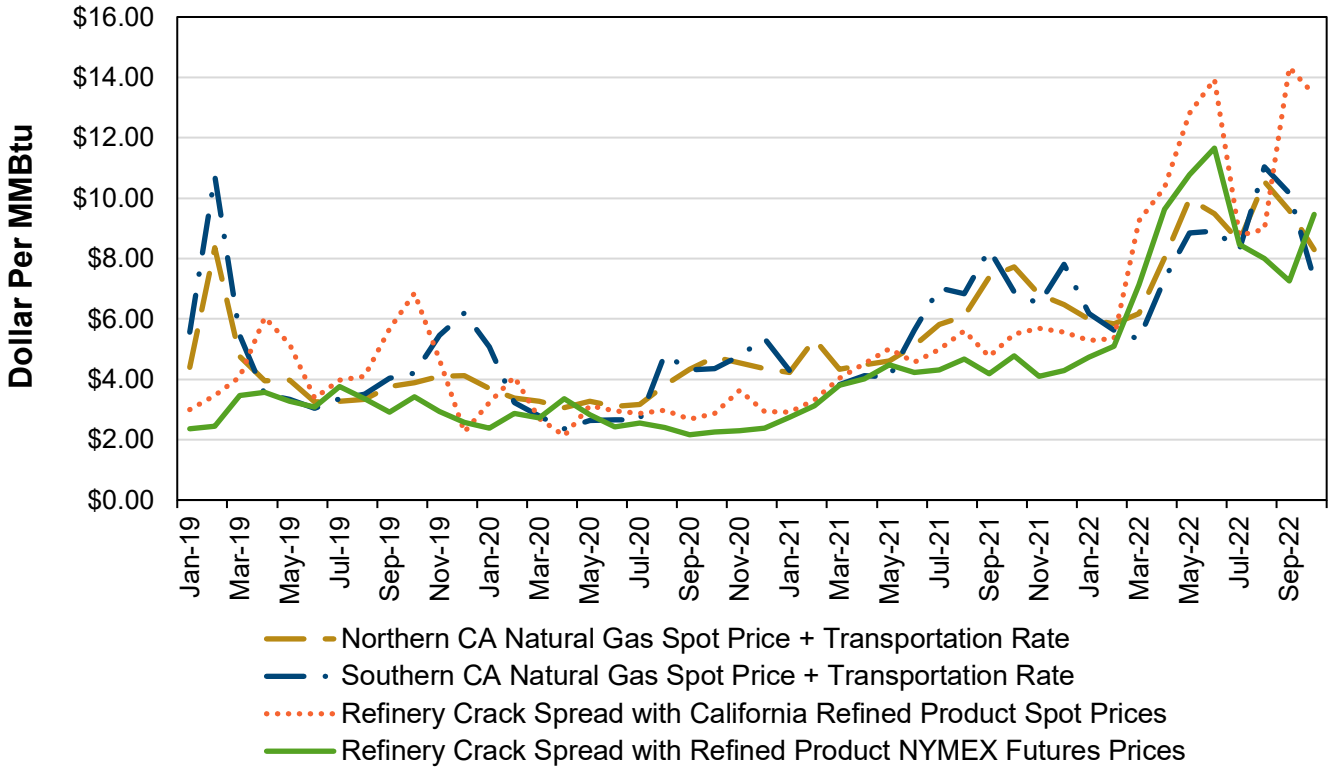
How Does Natural Gas Affect Refinery Operating Costs and Margins?

Worldwide natural gas prices increased significantly in the second quarter of 2022. This increase largely has to do with the invasion of Ukraine by Russia on February 24, 2022, which had wide repercussions for global commodities, including natural gas. For the period between July 2021 to June 2022, the monthly average Henry Hub natural gas spot price, the U.S. benchmark, doubled from $3.84 per MMBtu to $7.70 per MMBTU in June 2022. The average inflation-adjusted monthly Henry Hub spot price reached a 12-month high of $8.17 per MMBtu in May 2022, the highest price since November 2008 (EIA available at https://www.eia.gov/todayinenergy/detail.php?id=53039). Since natural gas makes up more than half of fuel use for refineries, it brings into question the influence of natural gas prices over refinery operating costs and margins.

To determine if natural gas costs influence California refinery margins, crack spreads can be used to estimate the margin of a refinery per barrel of crude oil. **Figure 22** plots the California

natural gas spot prices against two refinery crack spread calculations in units of million Btu (MMBtu). The natural gas prices consist of monthly average spot prices for PG&E Citygate, representing Northern California, and SoCal Citygate, representing Southern California. There is a regional transportation rate added to the spot prices to account for transportation costs; however, these are price estimates and do not consider the additional fees and tariffs associated with industrial natural gas use at refineries. To note, the gap in the Southern California natural gas prices trend line is due to the removal of an outlier that occurred in February 2021 when the average spot price for that month reached $29.85 per MMBtu (daily high of $146.42/MMBtu), which was due to a winter storm.[2]

Figure 22: Refinery Crack Spreads



Source: CEC analysis of PointLogic Energy, PIIRA, OPIS, and EIA data

Notes: Crack Spread calculation uses a 6:3:2:1 ratio: 6 barrels of crude oil produces 3 barrels of gasoline, 2 barrels of diesel, and 1 barrel of jet fuel. Text provides more information on the specific products and prices used.

2 "February Spot Gas Values in Parts of US Grew By 900% Month Over Month." 2021. S&P Global, Market Intelligence. Last accessed February 3, 2023. https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/february-spot-gas-values-in-parts-of-us-grew-by-900-month-over-month-62948924.

Refinery crack spreads are the estimated refiner margins of refining a barrel of crude oil. Specifically, it is the difference between the price of crude oil refiners pay and the spot price of the petroleum products they sell. The 6:3:2:1 crack spread ratio represents six barrels of crude oil becomes three barrels of gasoline, two barrels of diesel, and one barrel of jet fuel. These formulas do not account for refining costs, other fees, and the production of other petroleum products and should be taken as an estimation of the margin of a refinery per crude oil barrel. The formula to represent California refinery crack spreads uses product spot prices for products sold within Petroleum Administration Defense District 5 (PADD 5) and a California Crude Basket (weighted average of local San Joaquin Valley, Alaskan North Slope, and Brent International crude oil prices). More information on crack spreads can be found in the April 2021 Petroleum Watch available at https://www.energy.ca.gov/sites/default/files/2021-04/2021-04_Petroleum_Watch.pdf.

The NYMEX futures crack spread is using the same ratio (6:3:2:1), but the prices are different. It still uses California Crude Basket, but it replaces the California Refined Product Prices with NYMEX future prices. This gives a comparison between California refineries and the others in the nation. The NYMEX future prices (EIA available at https://www.eia.gov/dnav/pet/pet_pri_fut_s1_d.htm) replace California Air Resources Board oxygenated blend (CARBOB) spot price, and the No. 2 Heating Oil (New York Harbor) price replaces the price for CARB diesel and jet fuel spot prices.

In **Figure 22**, the California Crack Spread and the NYMEX Futures Crack Spread somewhat follow the natural gas price trends, with natural gas being more expensive or equal to refined products on a Btu basis until February 2022. Beginning February 2022, natural gas prices and crack spreads increased, surpassing $8.00 per MMBtu by May 2022. In July 2022, refinery crack spreads and natural gas prices were relatively equal on a Btu basis until September 2022, when natural gas prices started to decline to the $10.00 per MMBtu range. During that same month, the NYMEX Futures Crack Spread was at an average of $7.26 per MMBtu, while the California Crack Spread increased to an average of $14.33 per MMBtu, almost double the NYMEX Futures Crack Spread. The California Crack Spread peak in September 2022 is an almost 60 percent increase from the August 2022 average of $8.97 per MMBtu. This volatility in the California Crack Spread is absent in the NYMEX Futures Crack Spread as well as the natural gas prices and suggests the driver behind the price movements during September 2022 in California were not related to natural gas prices and were isolated to California (as opposed to the nation).

California's Petroleum Products Market

While this analysis does not find a conclusive correlation between natural gas prices and refinery margins, there are other factors influencing California's petroleum product supply that make the region more vulnerable to price swings. Not only does California lack the infrastructure to import products from the greater United States, but the state has stricter fuel specifications, both of which contribute to an isolated fuels market (more on California's infrastructure available at https://www.energy.ca.gov/sites/default/files/2021-08/August_Petroleum_Watch_ADA.pdf and fuel specifications available at https://www.energy.ca.gov/sites/default/files/2020-09/2020-09_Petroleum_Watch_ADA.pdf). This isolated fuels market means that most of the fuel supply is produced in state, and any

disruptions, like refinery outages, have a large effect. California refining capacity has decreased since the idling of Marathon Martinez refinery in August 2020, available at https://www.energy.ca.gov/sites/default/files/2020-08/Petroleum_Watch-August_2020_ADA.pdf, which resulted in a loss of 166,000 barrels per day or 9 percent of California's refining capacity (August 2020 Petroleum Watch available at https://www.energy.ca.gov/sites/default/files/2020-08/Petroleum_Watch-August_2020_ADA.pdf). Moreover, the EIA reports available at https://www.eia.gov/petroleum/weekly/archive/2022/221026/includes/analysis_print.php that lower refinery runs in September 2022 contributed to withdrawals from West Coast product inventories, tightening supply. The combination of these factors plays a role in the volatility of California's petroleum products market.

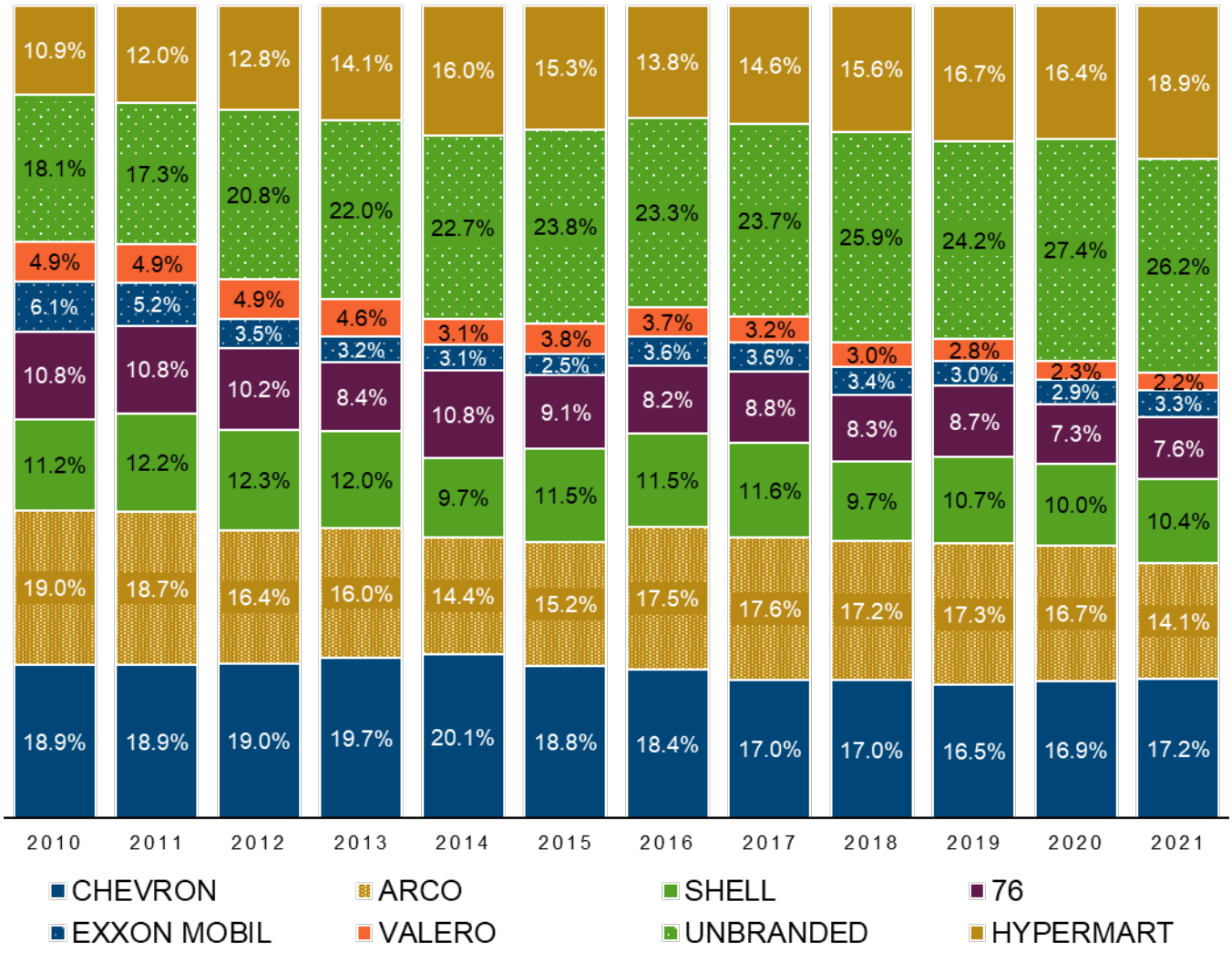
December 2022 Petroleum Watch — Highway, Freeway, and Interstate Retail Gasoline Sales and Station Distribution

The CEC has been collecting gasoline sales from retail fuel outlet since 2006 as part of the California Retail Fuel Outlet Annual Reporting Requirement, available at https://www.energy.ca.gov/rules-and-regulations/energy-suppliers-reporting/petroleum-industry-information-reporting-act-0. Previous Petroleum Watch editions have used the survey response data to analyze gasoline stations. A 2020 edition shows that 93 percent of new gasoline stations include a convenience store as an amenity. In the January 2020 Petroleum Watch (available at https://www.energy.ca.gov/sites/default/files/2020-02/2020-01_Petroleum_Watch.pdf), 80 percent of gasoline sales in 2018 were within one mile of a highway or freeway per California Department of Transportation (Caltrans) (GIS data available at https://gisdata-caltrans.opendata.arcgis.com/datasets/1f71fa512e824ff09d4b9c3f48b6d602_0/about). This issue of Petroleum Watch is an update of gasoline sales by fuel brand, which was last updated in the October 2020 (available at https://www.energy.ca.gov/sites/default/files/2020-10/2020-10_Petroleum_Watch_ADA.pdf) and July 2021 (available at https://www.energy.ca.gov/sites/default/files/2021-07/2021-07_Petroleum_Watch.pdf) issues. This edition also provides updates on gasoline sales and station counts from the nearest highway or freeway using Tele Atlas mapping.

Market Share Update

Figure 23 shows that from 2010 to 2021, market share has shifted more to hypermarts and unbranded gasoline sales, while branded fuels are heading in the opposite direction. These branded fuels are Chevron, ARCO, Shell, 76, ExxonMobil, and Valero. The total share of branded gasoline sales decreased from 70.7 percent in 2010 to 63.4 percent in 2021. During the same period, unbranded and hypermart sales increased from 29 percent to 45.1 percent. One of the most noticeable changes is ARCO branded decreasing from 16.7 percent in 2020 to 14.1 percent in 2021. The main reason was because Marathon Petroleum Corporation sold 3,800 of its Speedway stations to 7-Eleven in early 2021, as reported in Supermarket News (available at https://www.supermarketnews.com/retail-financial/7-eleven-completes-speedway-acquisition-3800-convenience-stores). A total of 161 California ARCO stations were likely part of that deal, resulting in lower reporting and change of ownership for some ARCO-branded stations.

Figure 23: California Retail Gasoline Market Share



Source: California Retail Fuel Outlet Annual Reporting (CEC-A15)

Despite the higher gasoline prices, consumers continue to fill up at branded stations. Branded fuel retailers have marketed their products in various ways to get consumers to their pump, as discussed in the July 2021 Petroleum Watch (available at https://www.energy.ca.gov/sites/default/files/2021-07/2021-07_Petroleum_Watch.pdf). One of these marketing strategies is the use of TOP TIER® licensing that states its fuel quality standard is recommended by automobile brands such as Audi, BMW, GM, Ford, Honda, Toyota, Mercedes-Benz, and Volkswagen. Many retailers, branded and unbranded, offer rewards programs to purchase fuel at a discount or bundle services like car washes to discount their gasoline prices.

Where Consumers Are Fueling

U.S. Department of Transportation (U.S. DOT, available at https://www.transportation.gov/transition/dot-overview) reported that there are 3.9 million miles of public roads in the United States. In California, there are more than 15,347 miles of combined highways and freeways (available at https://gisdata-caltrans.opendata.arcgis.com/datasets/1f71fa512e824ff09d4b9c3f48b6d602_0/about),

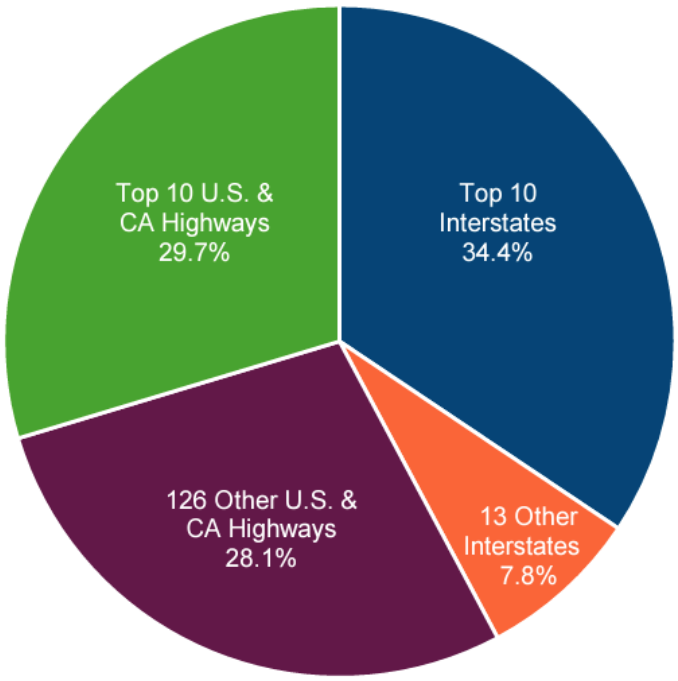
including two corridors with more than 800 miles of roadway. Those two are Interstate 5 and U.S. Highway 101. Interstate 5 (available at https://gisdata-caltrans.opendata.arcgis.com/datasets/1f71fa512e824ff09d4b9c3f48b6d602_0/about) starts south of the United States-Mexico border and runs along the Central Valley to north of the Oregon-California border, stretching 801 miles with 421 on- and off-ramps. Other highways, like Highway 101 and State Highway 1, are popular routes that run through cities along some of the most scenic coastal counties. The chance of an established gasoline station under a mile of these ramps is very likely and is discussed in detail in the January 2020 Petroleum Watch (available at https://www.energy.ca.gov/sites/default/files/2020-02/2020-01_Petroleum_Watch.pdf). While highways, freeways, and interstates are similar, they have unique definitions:

- Highway — A highway typically has two lanes but may have more and may take drivers into a city as a "main" street. To access a highway, driver can enter using ramps or intersecting streets. Speed limits are slower compared to a freeway. An example of a highway is CA-101 that runs north and south, including going through the city streets of San Francisco and over the Golden Gate Bridge. Highways may have pedestrian pathways and allow nonmotorized vehicle such as bicycles and farming vehicles on the roadway.
- Freeway — A freeway typically has four or more lanes. The only way drivers can access a freeway are by controlled-access on- and off-ramps. The California Transportation Commission (CTC) and Caltrans will refer to a freeway as a "controlled access highway." Speed limits are faster than highways and can post speeds of 70 miles per hour on some stretches of roadway. Interstates are examples of a freeway.
- Interstate — An interstate connects two or more states. The characteristics of an interstate are the same as freeways, but roadway boundaries are regulated and maintained by the federal government. Some interstate routes with three-digit numbers (available at https://dot.ca.gov/-/media/dot-media/programs/design/documents/chp0020-a11y.pdf) are spur routes that connect one- or two-digit interstates or navigate around cities. For example, I-805 is a spur route of I-5.

2021 California Total Gasoline Sales

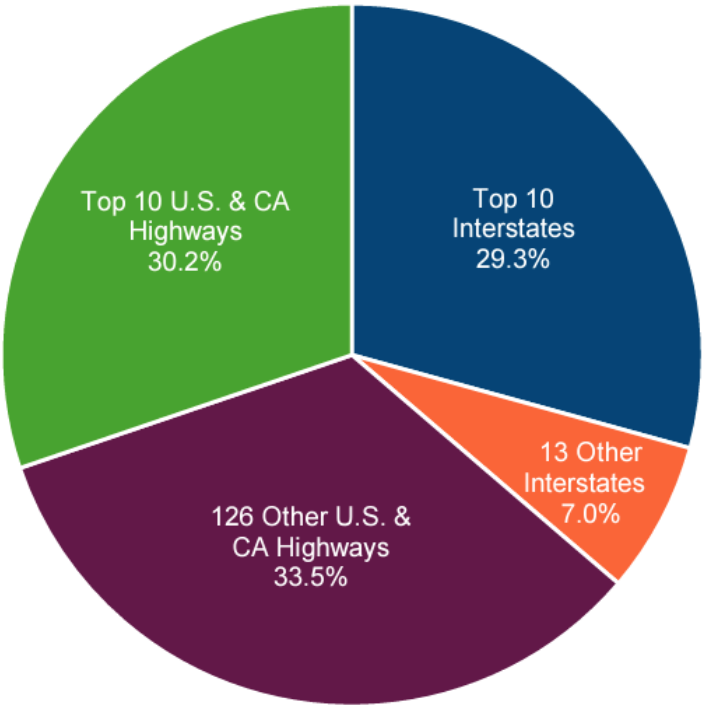
The 2021 California Retail Fuel Outlet Annual Reporting (CEC-A15, available at https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting) received 84 percent of total California gasoline sales from 8,435 stations. In 2018, most gasoline sales and station counts were within one mile of a highway or freeway, as reported in the January 2020 Petroleum Watch (available at https://www.energy.ca.gov/sites/default/files/2020-02/2020-01_Petroleum_Watch.pdf). **Figure 24** breaks down the 2021 gasoline sales by location and **Figure 25** breaks down active CEC-A15 retail fuel outlet station counts by location. Four slices of the pie are top-ten interstates, top-ten highways, 126 other U.S. and California highways, and 13 other interstates. A total of 34.4 percent, or 4.0 billion gallons, were sold near the top-ten interstates. A total of 29.7 percent, or 3.4 billion gallons were sold by the top-ten highways. The remaining slices of California gasoline sales totals 35.9 percent, split between 126 other highways and 13 other interstates. Like gasoline sales, the percentage of stations located near the top-ten highway and top-ten interstate are 30.2 percent and 29.3 percent, respectively. The other highways and interstates share 40.5 percent of total stations.

Figure 24: Top Locations by Sales



Source: CEC-A15

Figure 25: Top Locations by Station Counts

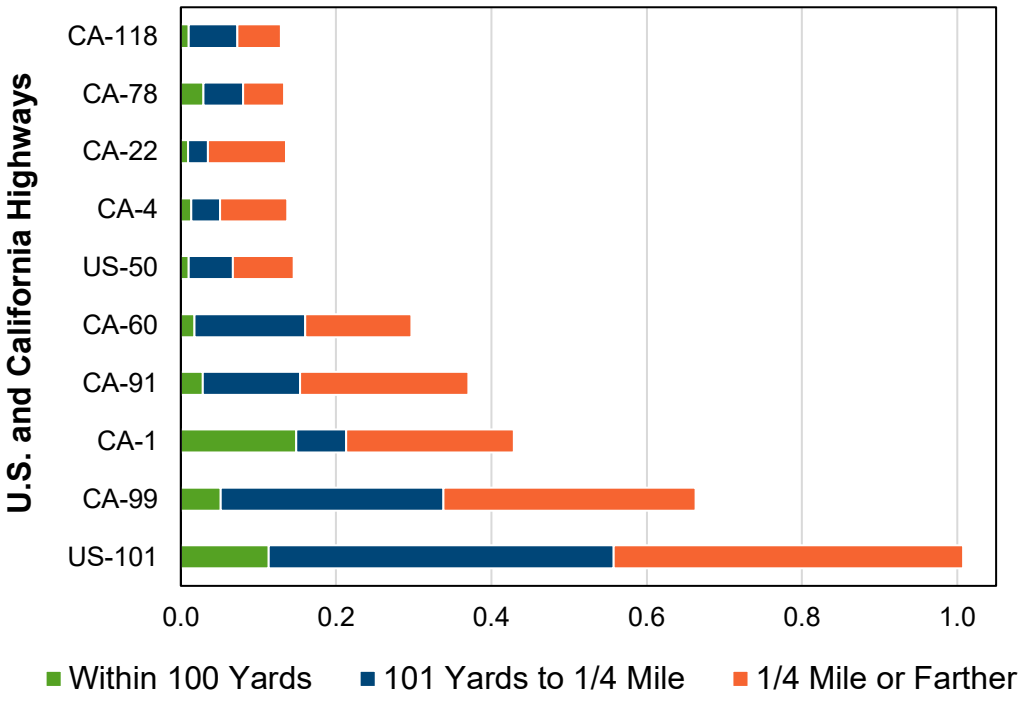


Source: CEC-A15

Highway and Interstate Sales and Station Counts

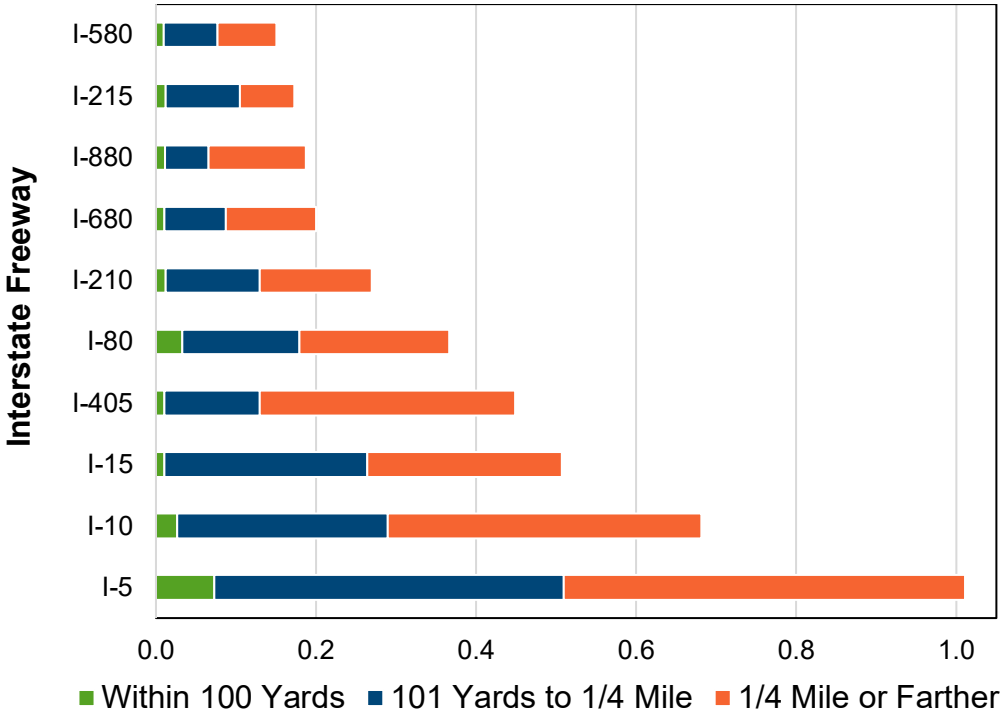
Figure 26 and **Figure 27** show where volume of gasoline is sold when breaking down each of the top-ten highways and interstates by distance of within 100 yards, between 100 yards to a quarter mile, and farther than a quarter mile. Those stations located within 100 yards are more convenient for drivers to refuel and get back onto the road. Comparing the top-ranked highway and interstates by total sales within 100 yards, Highway US-101 had 40 million more gallons at 113 million gallons than Interstate 5 at 73 million gallons. Most interstates have fewer sales within 100 yards compared to highways because of the ease of exiting highways without controlled ramps. U.S. and CA highways tend to have low-volume traffic because of the limited number of lanes. Most stretches of highway, like US-101 and CA-1, are in rural areas, where fuel services are likely on the side of roadway. Five of those top-ten highways and six of the top-ten interstates are located on roadways running through Los Angeles, San Diego, and Orange Counties. These counties are top-three counties (available at https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting) by gasoline sales since 2010.

Figure 26: U.S. and California Highway Sales by Distance



Source: CEC-A15

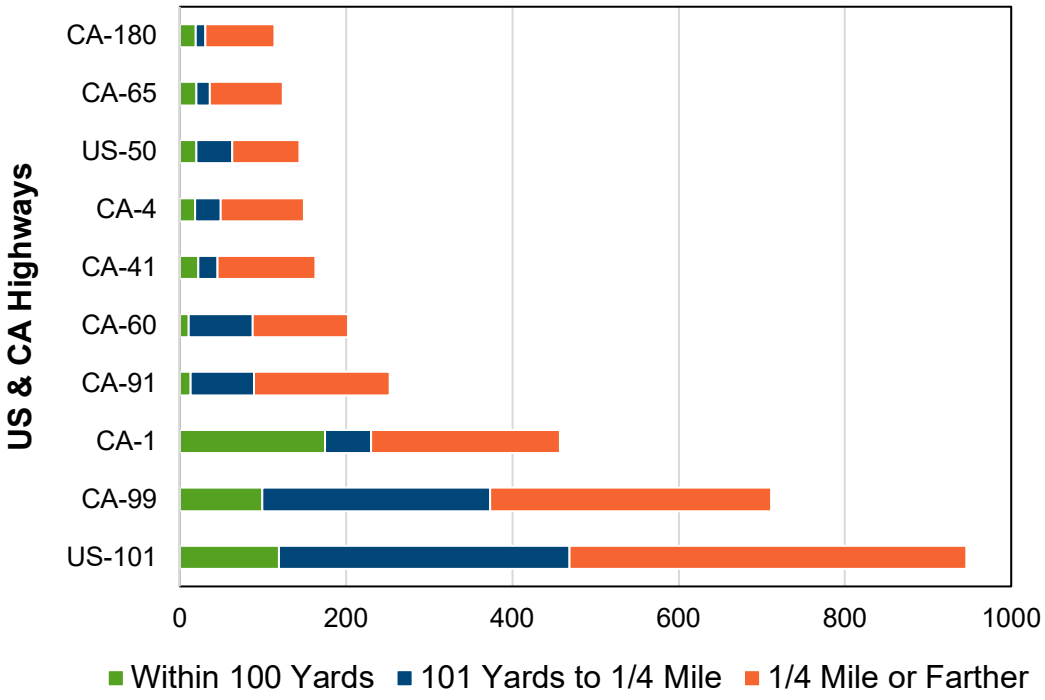
Figure 27: Interstate Freeway Sales by Distance



Source: CEC-A15

The top-ten highways by volume sales in California in descending order are US-101, CA-99, CA-1, CA-91, CA-60, US-50, CA-4, CA-22, CA-78, and CA-118. These highways together total 2,568 miles of roads within California. The shortest highway is CA-22 at 15 miles, and the longest highway is US-101 at 813 miles. Highway CA-22 (available at https://gisdata-caltrans.opendata.arcgis.com/datasets/1f71fa512e824ff09d4b9c3f48b6d602_0/about) is ranked eighth in the gasoline sales at 135 million gallons and has 17 controlled ramps. CA-22 is in the heart of Orange County, running from (West) Long Beach to (East) Santa Ana. The highway is 2.6 miles away from one of the world's most popular theme parks, Disneyland, where people travel around the globe to visit year-round. US-101 is the number-one-ranked highway by total stations of 946 and sales of 1.0 billion gallons, as shown in **Figure 28**. Highway 99 had the second most sales volume, running from south near Wheeler Ridge to north of Red Bluff. Also known as the Golden State Highway, CA-99 has as many as 711 stations nearby that sold 663 million gallons of gasoline. Highway 1 is one of the most scenic routes because most of this highway is by the coast. It is different from other highways and interstates because 35 percent of its sales and 38 percent of stations are within 100 yards. Under 100 yards, Highway CA-1 has a total of 175 stations that sold 149 million gallons; this is the most of any highway in the state.

Figure 28: U.S. and California Highway Station Counts by Distance

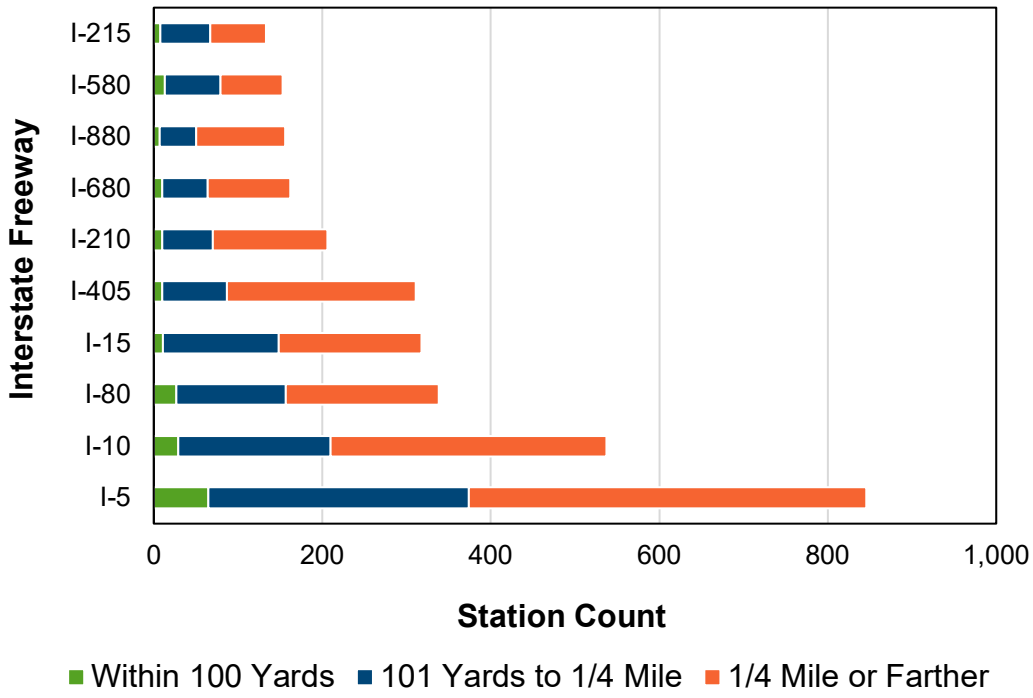


Source: CEC-A15

Interstates 5, 10, 15, 405, 80, 310, 680, 880, 215, and 580 are the top-ten ranked interstates by sales in California. Interstate 5 is the second-longest stretch of roadway, running through 16 counties, including 4 of the top ten (available at https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting) by highest gasoline sales by volume. It runs through cities like Sacramento, Fresno, Los Angeles, Anaheim, and San Diego. Those cities are all in the top nine of the 2021 survey responses for

gasoline sales. Combined sales for those cities in 2021 was 1.5 billion gallons. There are 846 stations servicing I-5 with total sales exceeding 1.0 billion gallons, as shown in **Figure 29**. Interstate 10 is ranked second with 681 million gallons in total sales. Running 244 miles, it intersects I-5 in Los Angeles as it goes from Santa Monica Pier to the California-Arizona border. In Northern California, Interstate 80 starts in San Francisco, runs through the capital city of Sacramento and to California-Nevada border. It is ranked five in sales but third rank in total stations. With 162 total on- and off-ramps and 338 stations, I-80 has more than twice as many stations as on and off ramps. The total sales for I-80 under 100 yards are as much as Interstates 15, 405, and 210 combined, totaling 33 million gallons.

Figure 29: Interstate Freeway Station Counts by Distance

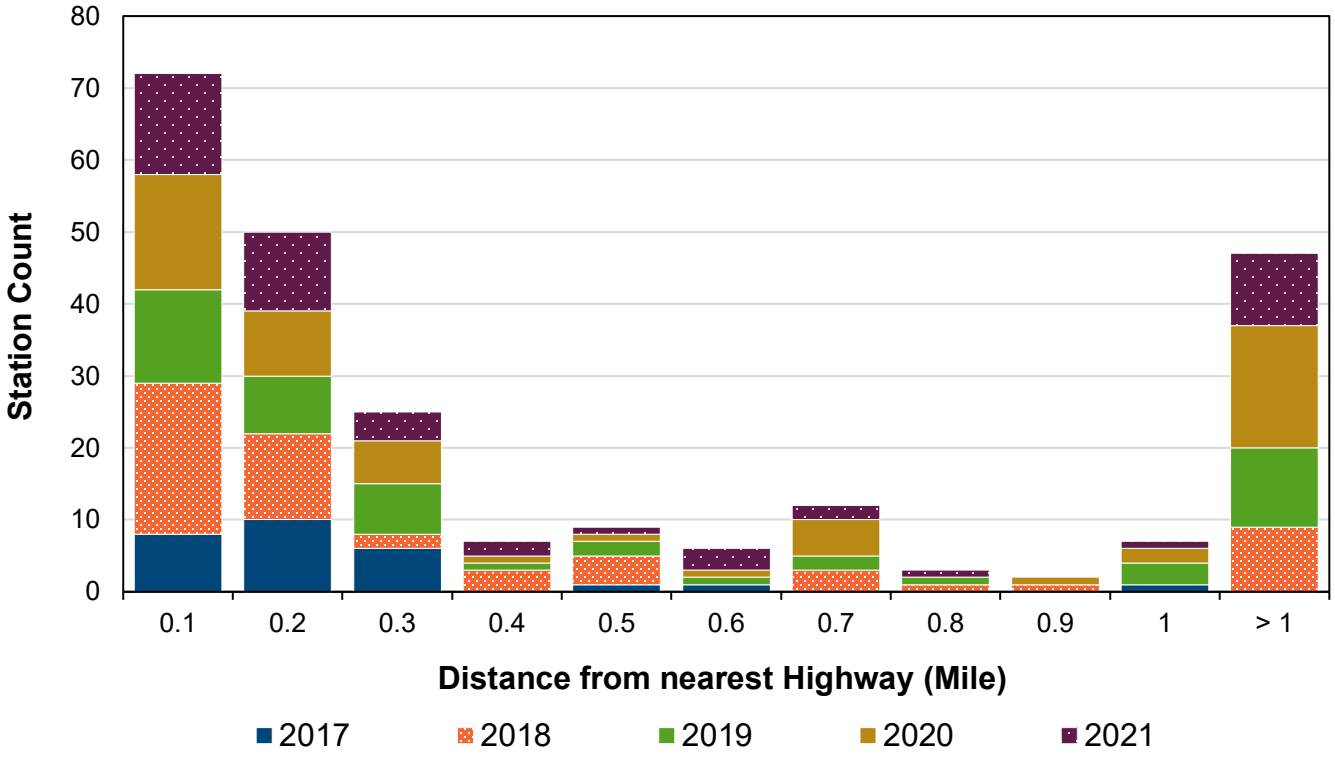


Source: CEC A-15

New Stations From Nearest Highway or Freeway

In the last five years, newly constructed stations have been built closer to highways and freeways, as shown in **Figure 30**. Seventy-eight percent of the 248 new stations reported between 2017 and 2021 were within one mile. The highest count of new stations was within 0.1 mile at 72 total stations compared to all outside one mile at 55 total stations. An overwhelming 60 percent of new stations were within 0.3 miles, about one of every two stations being built are 0.3 miles or closer. In addition to branded companies focusing on gasoline additives, credit cards, or car washes for a discount on fuel, most new branded stations, both company and independently own, are settling in front of highways and freeways to draw first choice for customers to refuel. Fifty percent of gasoline sales are within a quarter of a mile, and that may increase in the future.

Figure 30: New Stations From Nearest Highway or Freeway



Source: CEC-A15

Finding Stations

Every year, the CEC works to ensure that it has located all retail fuel stations in California. This work usually involves purchasing a list of stations from OPIS. This year, the CEC found additional sources to identify fuel stations in the state. These sources include:

- Air districts (available at https://ww2.arb.ca.gov/california-air-districts), which permit gasoline dispensing facilities.
- California State Parks, Division of Boating and Waterways (available at http://dbw.ca.gov/BoatingFacilities), which maintains a database of boating facilities and the services offered such as fuel sales.
- AirNav (available at https://www.airnav.com/airports/us/CA), which lists airports and the fuel providers at each airport.
- Weights and measures departments (available at https://www.cdfa.ca.gov/exec/county/documents/countycommissionersealercontactinfo.pdf), which enforce quality standards of petroleum products.

The CEC sends each newly identified station a copy of the CEC-A15 report to complete.

Visit our website for more information about CEC-A15 Results available at https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting.

APPENDIX A:
Glossary

Term	Definition
Brent North Sea (Brent)	A blended crude stream produced in the North Sea region which serves as a reference or "marker" for pricing a number of other crude streams.
California Air Resources Board (CARB)	The "clean air agency" in the government of California, whose main goals include attaining and maintaining healthy air quality; protecting the public from exposure to toxic air contaminants; and providing innovative approaches for complying with air pollution rules and regulations.
California Energy Commission (CEC)	The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's seven major areas of responsibilities are: • Forecasting future statewide energy needs • Licensing power plants sufficient to meet those needs • Promoting energy conservation and efficiency measures • Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels • Planning for and directing state response to energy emergencies Funding for the Commission's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account, and other sources.

Term	Definition
California Estimated Refinery Acquisition Cost (CA-RAC)	A weighted average of the prices of California (San Joaquin Valley) crude, Alaskan crude, and foreign crude.
California State Lands Commission (SLC)	The state agency that provides the people of California with stewardship of the lands, waterways, and resources entrusted to its care based on the principles of equity, sustainability, and resiliency, through preservation, restoration, enhancement, responsible economic development, and the promotion of public access.
Hypermart	A station that is a company owned or operated supermarket or wholesale chain store that sells its own fuel at the same location
Oil Price Information Service (OPIS)	A company that provides crude oil and petroleum pricing data.
Petroleum Industry Information Reporting Act (PIIRA)	Legislature enacted in 1980, enables a complete response to possible shortages of fuel or other disruptions. The information also helps develop and administer energy policies in the interest of the state's economy and the public's well-being.
Port Import/Export Reporting Service (PIERS)	A company that provides import and export data at the bill-of-lading level.
United States Energy Information Administration (EIA)	An independent agency within the U.S. Department of Energy that develops surveys, collects energy data, and analyzes and models energy issues. The agency must meet the requests of Congress, other elements within the Department of Energy, Federal Energy Regulatory Commission, the Executive Branch, its own independent needs, and assist the general public, or other interest groups, without taking a policy position. See more information about EIA at http://www.eia.gov/about/
Steam-Methane Reforming	In steam-methane reforming, methane reacts with steam under 3–25 bar pressure (1 bar = 14.5 psi) in the presence of a catalyst to produce hydrogen, carbon monoxide, and a small amount of carbon dioxide. Steam reforming is endothermic—that is, heat must be supplied to the process for the reaction to proceed.

Term	Definition
West Texas Intermediate (WTI)	A crude stream produced in Texas and southern Oklahoma that serves as a reference or "marker" for pricing several other crude streams and which is traded in the domestic spot market at Cushing, Oklahoma.