August 2022

PETROLEUM WATCH

CALIFORNIA ENERGY COMMISSION

INSIDE

REFINERY NEWS

- No refinery news

CALIFORNIA GASOLINE RETAIL PRICES BY BRAND

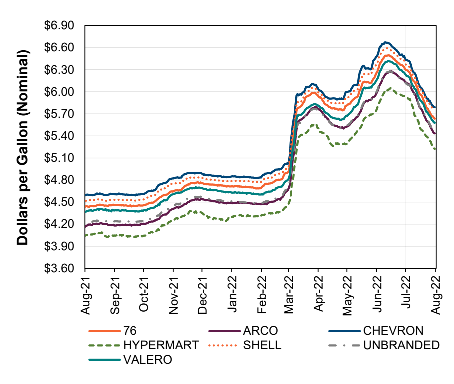
July 2022 vs. 2021

(Percentage Change)

76	36% higher
ARCO	40% higher
Chevron	35% higher
Hypermart	39% higher
Shell	36% higher
Unbranded	39% higher
Valero	37% higher

July 2022 Averages

76	$5.97
ARCO	$5.79
Chevron	$6.10
Hypermart	$5.56
Shell	$6.05
Unbranded	$5.80
Valero	$5.90



Source: California Energy Commission (CEC) analysis of Oil Price Information Service (OPIS) data

CALIFORNIA DIESEL RETAIL PRICES BY REGION

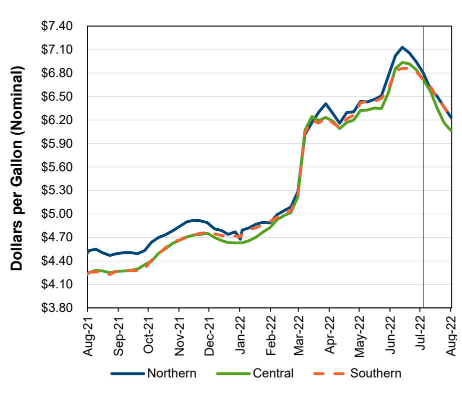
July 2022 vs. 2021

(Percentage Change)

Northern CA	52% higher
Central CA	58% higher
Southern CA	56% higher

July 2022 Averages

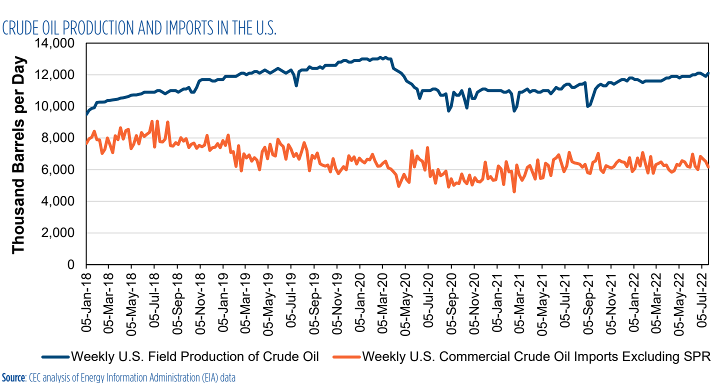
Northern CA	$6.58
Central CA	$6.46
Southern CA	$6.55



Source: CEC analysis of OPIS data

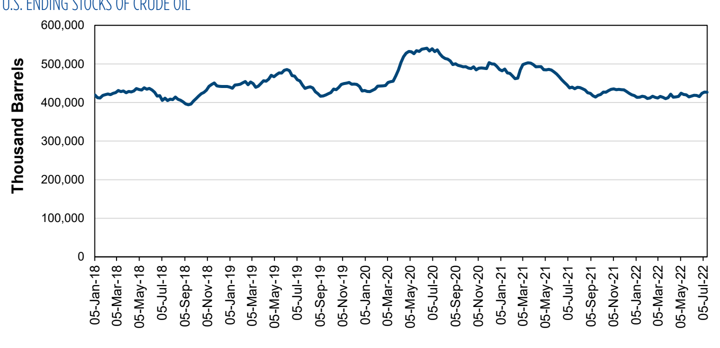
CRUDE OIL

CRUDE OIL PRODUCTION AND IMPORTS IN THE U.S.



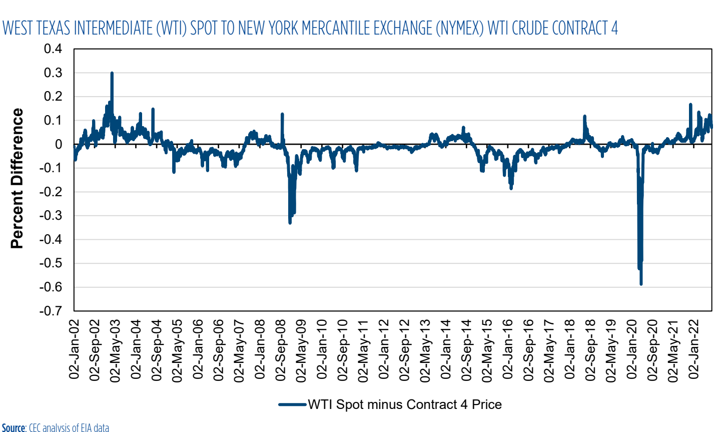
Source: CEC analysis of Energy Information Administration (EIA) data
Notes: Strategic Petroleum Reserve (SPR)

U.S. ENDING STOCKS OF CRUDE OIL



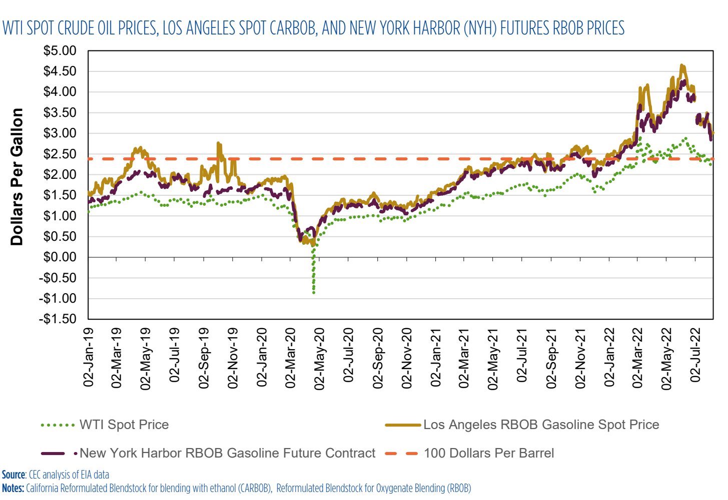
Source: CEC analysis of EIA data

WEST TEXAS INTERMEDIATE (WTI) SPOT TO NEW YORK MERCANTILE EXCHANGE (NYMEX) WTI CRUDE CONTRACT 4



Source: CEC analysis of EIA data
Notes: Values are percents of Contract 4 prices

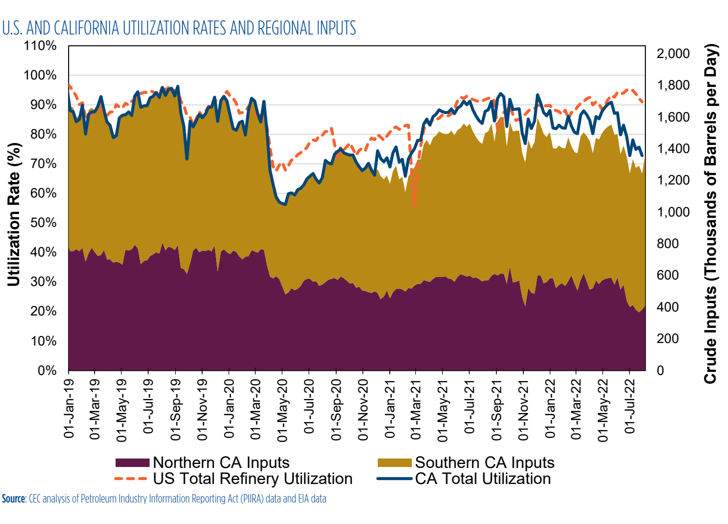
WTI SPOT CRUDE OIL PRICES, LOS ANGELES SPOT CARBOB, AND NEW YORK HARBOR (NYH) FUTURES RBOB PRICES



Source: CEC analysis of EIA data
Notes: California Reformulated Blendstock for blending with ethanol (CARBOB), Reformulated Blendstock for Oxygenate Blending (RBOB)

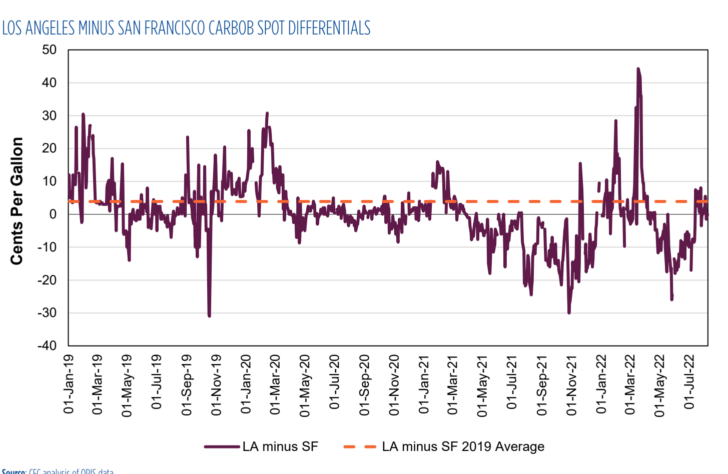
REFINING

U.S. AND CALIFORNIA UTILIZATION RATES AND REGIONAL INPUTS



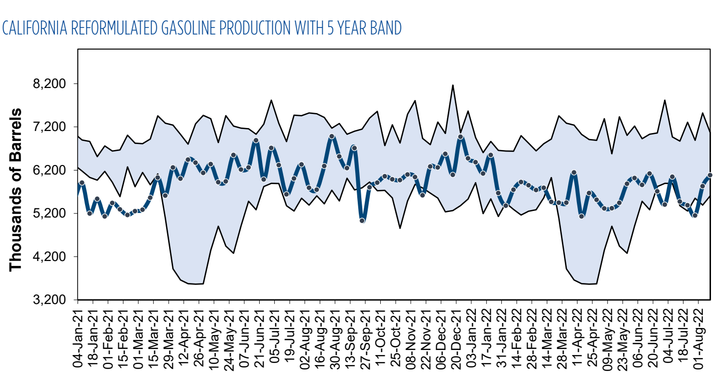
Source: CEC analysis of Petroleum Industry Information Reporting Act (PIIRA) data and EIA data

LOS ANGELES MINUS SAN FRANCISCO CARBOB SPOT DIFFERENTIALS



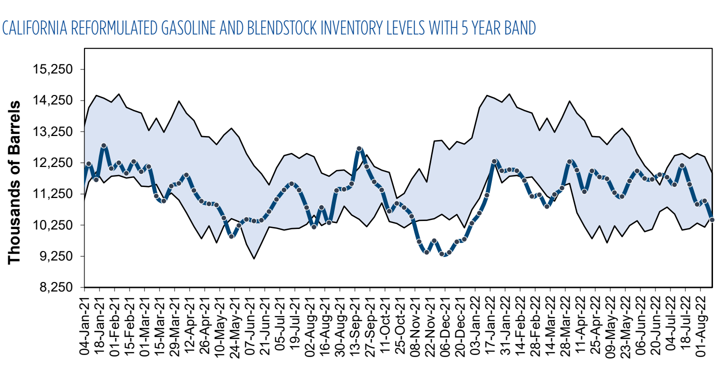
Source: CEC analysis of OPIS data

CALIFORNIA REFORMULATED GASOLINE PRODUCTION WITH 5 YEAR BAND



Source: CEC analysis of PIIRA data

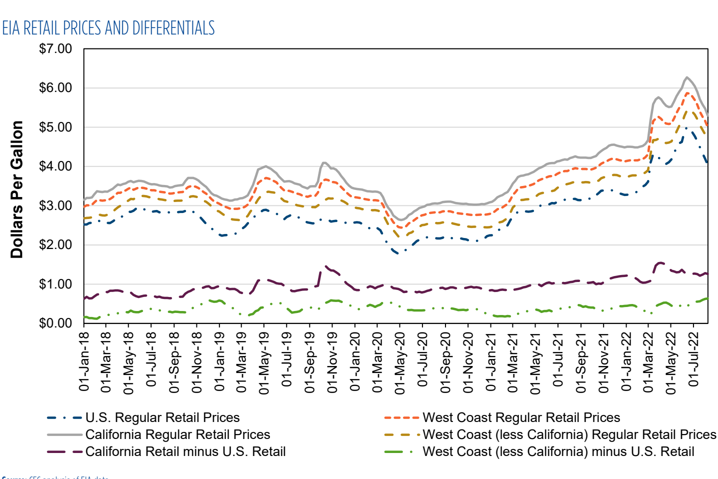
CALIFORNIA REFORMULATED GASOLINE AND BLENDSTOCK INVENTORY LEVELS WITH 5 YEAR BAND



Source: CEC analysis of PIIRA data

PRICES

EIA RETAIL PRICES AND DIFFERENTIALS



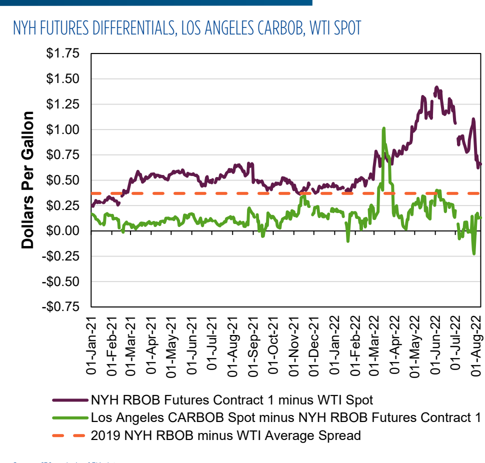
Source: CEC analysis of EIA data

FEATURED TOPIC

GASOLINE SUPPLY AND PRICES

Most drivers expect high gasoline prices during the summer and accompanying driving season, but this year, Americans paid the highest prices for gasoline in over 10 years. This Petroleum Watch examines crude oil prices, gasoline prices, and California's current supply to describe what the markets have done since January 2022 and compared to 2019 (pre-COVID) levels. Crude oil costs are still a large part of these price rises but other factors, such as futures contract prices, are now significant drivers in gasoline prices.

NYH FUTURES DIFFERENTIALS, LOS ANGELES CARBOB, WTI SPOT



Source: CEC analysis of EIA data

CRUDE OIL

Crude oil production in the United States (U.S.) is still recovering from the effects of the pandemic. Crude Oil Production and Imports in the U.S. shows crude oil production reached 12.1 million barrels per day (bpd), while the past four-weeks of production averaged over 12 million bpd. These rates are equal to rates observed in February 2019, however this is still one million bpd lower than peak 2019 production of 13 million bpd. Imports of crude oil averaged 6.5 million bpd over the past four weeks (ending 8/5/2021), 200,000 bpd higher than July 2021, but 450,000 bpd below July 2019 rates. Both production and imports have room to increase to the maximum rates observed in 2019.

Inventory levels of crude oil have slowly increased throughout July to 432 million barrels, which is equal to August 2019 levels. Higher levels of inventory indicate lower petroleum demand, shown in U.S. Ending Stocks of Crude Oil, where stocks peaked at 540 million barrels three months into the pandemic on June 19, 2020. A stock decrease signals increasing demand, and inventories drew down below pre-pandemic levels in September 2021 (413 million barrels compared to 417 million barrels in September 2019). The inventory decreases continued, reaching a five-year low at 409 million barrels on March 25, 2022. The small crude oil stock build of the past five weeks indicates that demand decreased nationally in July.

The lack of any inventory build up during winter 2021-2022 and strong spring demand in the United States led to decreasing inventories of crude oil. Crude oil prices surged higher after the Russian invasion of Ukraine in late February. Oil refineries in Europe and North America anticipated switching to non-Russian crude oil sources and crude oil spot prices rose in response (see April 2022 Petroleum Watch).

This combination of high demand and low supply pushed crude markets into a condition called backwardation as indicated by WTI Spot to NYMEX WTI Crude Contract 4 (percent of Contract 4 price). Backwardation occurs when spot prices and early futures contracts are priced higher than later expiring futures contracts, indicating that the short-term market is undersupplied. In contrast, contango is the opposite, with early contracts at lower prices indicating short term markets are oversupplied. Contract 4 is the futures contract for crude four months ahead and is the latest expiring contract price published by the EIA. Taking the spot price, subtracting out the Contract 4 price, and then dividing by the Contract 4 price gives a simple measure of backwardation or contango relative to Contract 4 prices (instead of measuring based on absolute spread of prices). The graph shows this when the line rises above zero, signaling the market is in backwardation. This graph shows backwardation beginning since January 15, 2021, and building slowly then staying below five percent of Contract 4 prices until October 2021. The level of backwardation has continued to steepen throughout 2022, reaching as high as 13 percent on March 2 and averaging 7 percent since then. This period appears lengthier than the periods of backwardation in 2017, 2013, and 2007. Current crude spot and futures markets are similar to the period between 2002 and 2005, when the United States was a net importer of petroleum and the beginning of the invasion of Iraq in 2003.

WTI Spot Crude Oil Prices, Los Angeles Spot CARBOB and New York Harbor Futures RBOB Prices shows the spot prices of WTI, and LA CARBOB and the NYMEX futures one-month ahead contract price of New York Harbor RBOB all in dollars per gallon. This chart shows how gasoline spot prices and futures prices respond quickly to changes in crude oil spot prices. The LA CARBOB spot market quotes NYMEX Futures 1 contract prices as a part of its own price called a differential (see February 2022 Petroleum Watch for details on California's spot market prices). Shortly after the invasion of Ukraine (after February 24, 2022), WTI spot prices (green dotted line) rise past the $100 per barrel mark ($2.38 per gallon orange dashed line) and gasoline futures and spot prices follow. Crude oil prices, LA CARBOB spot and NYMEX futures had an early peak of $2.94 per gallon ($123.48 per barrel), $4.10 and $3.68 per gallon respectively on March 8. Crude oil prices fell below $100 in April 2022, but built to a second peak on June 8, 2022, at $2.90 per gallon ($121.94 per barrel). Yet, at this lower crude price LA CARBOB and NYMEX futures logged $4.61 and $4.22 per gallon respectively, $0.51 and $0.54 per gallon higher than on March 8, 2022.

New York Harbor Futures Differentials, Los Angeles CARBOB, WTI Spot shows the differences between the lines from the previous graph, that is WTI Spot is subtracted from NYMEX Futures 1 RBOB, and in turn NYMEX Futures 1 is subtracted from LA CARBOB Spot. Before March 2022, the NYMEX Future prices stayed in a range between $0.10 to $0.60 higher than WTI Spot on a per gallon basis. The only large spike in difference between NYMEX Futures prices and WTI Spot occurred when WTI Spot prices went negative on April 20, 2020 (see April 2020 Petroleum Watch for analysis on that event). There appear to be some seasonal rises in NYMEX-WTI difference during summer 2019 as the difference moves above $0.50 per gallon, and even during the pandemic the difference remained steady.

After the invasion of Ukraine, NYMEX Futures prices rose to $0.62 above WTI on March 1, 2022, peaking on June 2, 2022, at $1.40 per gallon above WTI Spot. This difference fell below $1.00 after July 29, 2022, but has continued to stay above $0.62 per gallon. This rise has cost American drivers an extra $0.02 to $0.80 per gallon since March 1, 2022. These rises in the cost of gasoline were unavoidable to nearly all marketers and consumers and were not directly tied to costs of crude oil. Only the U.S. Gulf Coast posted spot prices consistently below NYMEX RBOB Futures throughout this time.

REFINING

U.S. and California Utilization Rates and California Regional Inputs shows utilization rates for the United States and California as lines. Refinery utilization rates measure how much crude oil refineries process as a percentage of their total capacity. To calculate the rate, divide crude oil inputs by total operable capacity. The shaded areas below the lines show California refinery inputs in thousands of bpd by Northern and Southern California regions. On August 5, 2022, U.S. utilization rates reached 94.3 percent, while California refinery utilization rates reported 79.5 percent. Northern California refineries have been the largest drag on California utilization rates. Northern California refineries reported 368,000 bpd of inputs on July 22, 2022, this is the lowest input rate recorded for Northern California in a decade. The next lowest rate (excluding July 2022 reports) is 480,000 bpd reported on May 8, 2020. Southern California inputs averaged 910,000 bpd since July 8, 2022, effectively propping up the California refinery utilization rate. Utilization rates in California are alarmingly low to meet summer demand.

Los Angeles (LA) minus San Francisco (SF) CARBOB Spot Differentials shows the difference between LA CARBOB spot prices minus SF CARBOB spot prices in cents per gallon. When the graph rises above zero, Los Angeles is more expensive; values below zero indicate San Francisco is more expensive. This difference can reveal if supply issues are regional rather than statewide. LA CARBOB spot is usually the higher price, shown by the dashed line representing 2019 average difference (+3.9 cents per gallon), but since 2021 SF CARBOB spot prices are higher with LA CARBOB spiking higher occasionally. The most recent data shows SF CARBOB becoming higher than LA CARBOB (line below zero) in April before coming equal to LA (line rises to zero) by July 14, 2022. This adds to the evidence of Northern California refineries struggling to meet demand since spring 2022.

California Reformulated Gasoline (CARB RFG) Production with 5-year band (2021- Present) and California Reformulated Gasoline (CARB RFG) and Blendstock Inventory Levels with 5-year band (2021- Present) show how gasoline production at California refineries has performed. Refineries have reported five-year lows in three of the six weeks since June 24, 2022, including two weeks in July. This means gasoline production in 2022 was lower than summer 2020 rates, during the pandemic, half the time. Inventory levels of gasoline are within five-year ranges, but since July 15 are falling. These indications suggest that despite the production issues, most refineries were able to keep supply flowing, but low production in mid-July forced refineries to use reserves.

The supply struggles in Northern California are the aftershocks from a labor strike that began March 22, 2022, at Chevron's Richmond refinery. The refinery accounts for just under half of Northern California's crude refining capacity. The strike did not fully shutdown production as rates for Northern California were within the five-year range during this time. However, statewide production never rose to the rates observed in late-April to May 2021. While the labor strike ended May 26, 2022, Chevron reported the labor strike delayed planned maintenance on the refinery's crude distillation unit that would begin in June. This delay shifted a supply squeeze into the highest gasoline demand season of the year. As of publication, Northern California inputs have not yet recovered.

PRICES

EIA Retail Prices and Differentials shows the result of all this activity in crude oil and gasoline markets. Average retail prices for the United States, West Coast (PADD V), West Coast (less California), and California are shown along with the differences of California and West Coast (less California) to the United States average for comparison. The EIA reported peak gasoline prices on June 13, 2022, with California at $6.27 dollars per gallon, West Coast at $5.86, West Coast (less California) at $5.45, and the United States at $5.00. California's retail differential to the United States averaged $0.99 in 2019. In 2022, the difference reached a peak of $1.54 per gallon on April 4, 2022, 13 days after the beginning of Chevron Richmond's strike on March 22, 2022, and 11 days after the LA CARBOB spot peak difference to NYMEX futures on March 24, 2022. This retail price difference sits at $1.26 per gallon as of August 8, 2022.

FINAL NOTES

Crude oil remains constrained internationally due to Russia's invasion of Ukraine on February 24, 2022. Crude oil production in the U.S. is increasing slowly but still under the 2019 peak by one million barrels per day. Low inventory levels and steep market backwardation indicate short-term demand outstripping supply. Most periods of backwardation last months to years.

California refinery utilization rates are lower than normal for summertime, this has been a major factor in higher retail prices in California. Recently reported low LA CARBOB spot prices suggest CA gasoline supply is improving. The March price spike was possibly due to the start of a labor strike at Chevron Richmond but subsided quickly. LA to SF spot differential suggests stable supply between the two regions since July 14, 2022. Expect supply improvement as Chevron Richmond finishes work.

Retail prices will continue to fall as crude oil prices are now well below $100 per barrel but NYMEX gasoline futures prices are still above historical prices (vs WTI Spot). This is a national trend and higher gasoline prices will stay if this continues.

Gasoline markets usually do not absorb increasing crude oil costs, these increases should be reflected in the crude oil price itself. Previous crude supply shocks usually stay within the crude oil market, in this case refineries in Russia or Ukraine are not major exporters of gasoline to the world. Therefore, the markets of other inputs for refinery operations besides crude oil must also be affected by the invasion of Ukraine. Future analysis by CEC staff will look further for factors behind these changes.

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