California Gasoline Supply Issues Analysis

November 28, 2022

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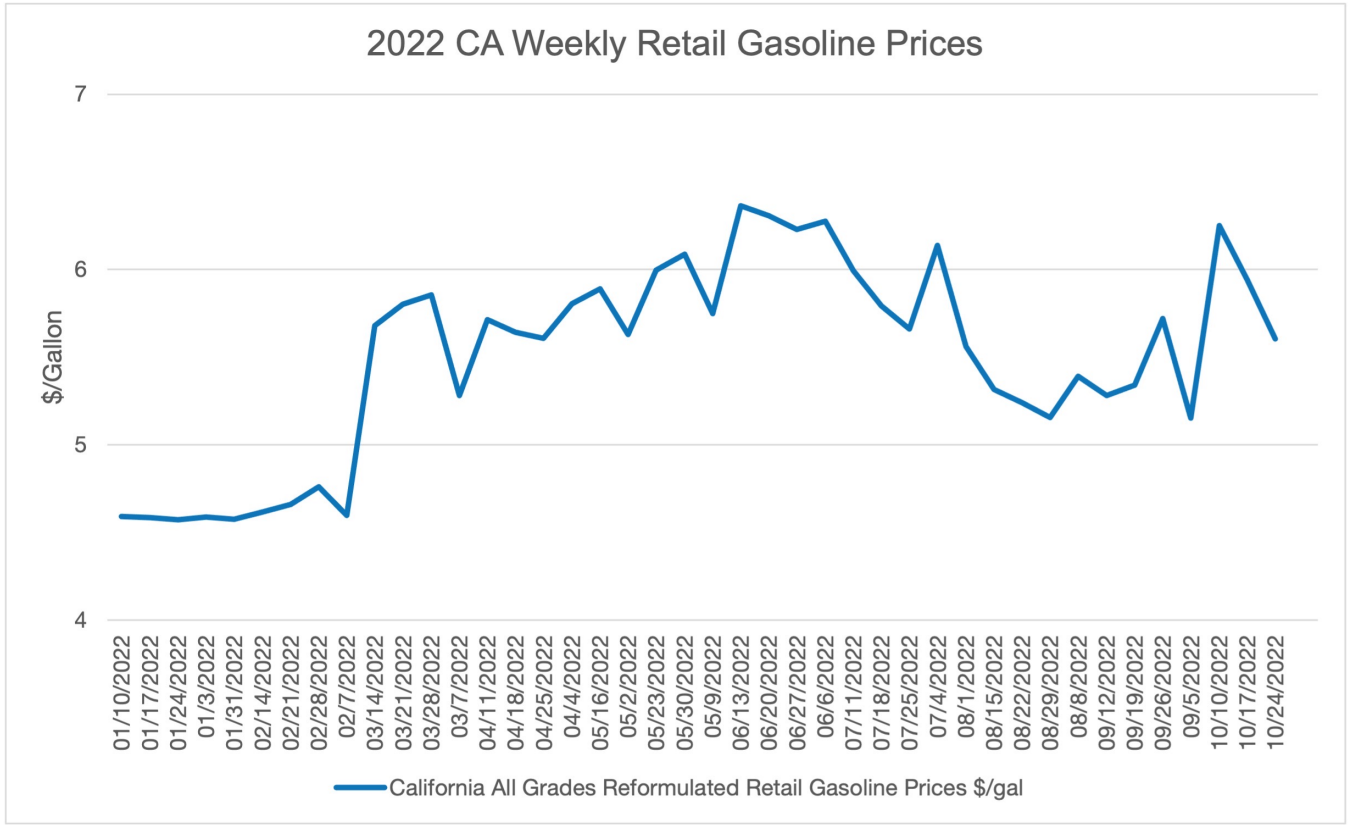
3. Leading experts on West Coast petroleum and renewable fuel markets and the supply and demand issues that drive them.

Agenda

1. 2022 California Retail Gasoline Price Spike
2. History California Refining Industry
3. Analysis of earlier fall price spikes

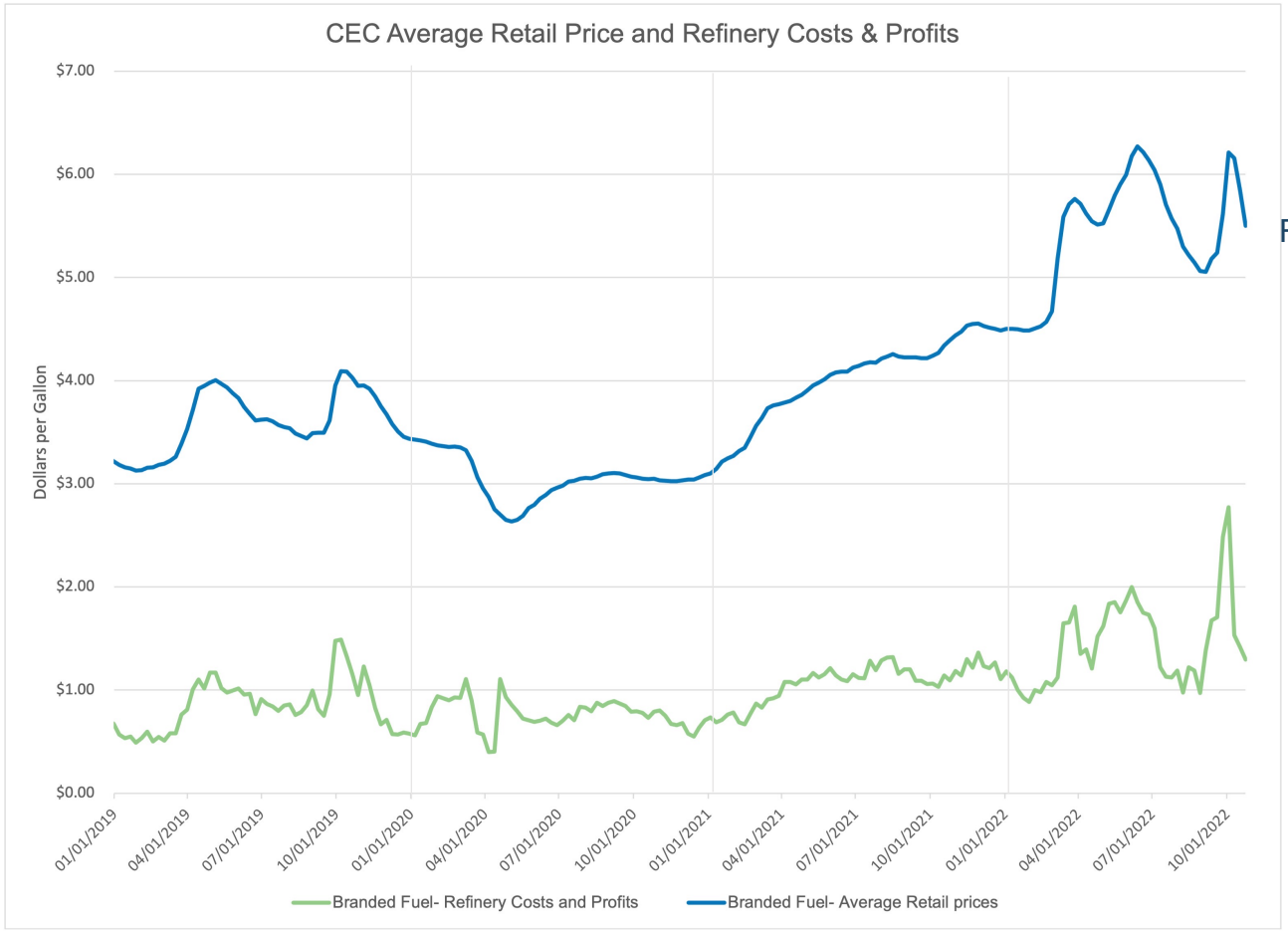
2022 CA Retail Gasoline Price Spike



Source: EIA

The pandemic created a new factor in gasoline supply.

1. With shrinking refining capacity, operating refining costs & profits have increased.
2. COVID hit in March 2020 and Marathon Martinez idled production in April. Marathon announced they would idle the refinery permanently in August 2020, and approved plans to convert the refinery to renewable fuel production in March 2021.[1, 2, 3]
3. Globally, excluding China, about 3 million barrels per day of refining capacity closed since January 1, 2020.[4]
4. As the economy improved into 2021 refining cost & profit rose above $1/gallon as petroleum demand grew faster than supply.
5. The Ukraine war caused a further shortfall in global refined capacity starting in March 2022.
6. Unscheduled refinery maintenance created a spike in Sept/Oct 2022 that was short lived.

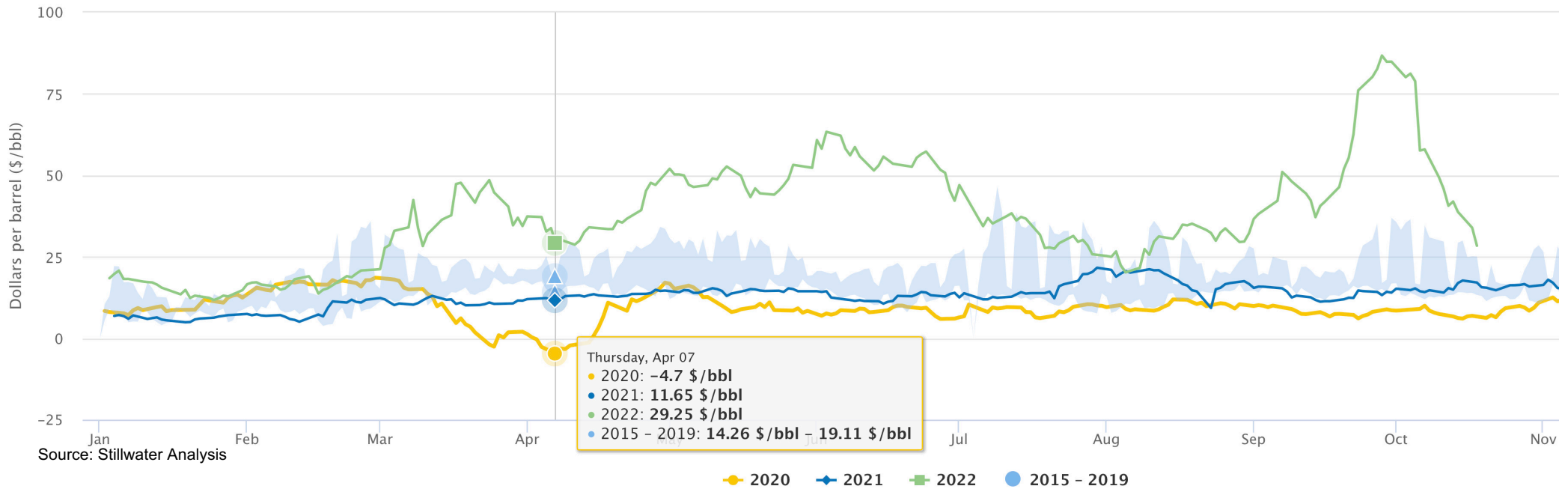


Source: CEC

Sources:
1. East Bay Times, Marathon Martinez refinery set to idle production
2. CBS Bay Area, Marathon Martinez Refinery 'Indefinitely Idled' due to Pandemic-Driven drop in Auto Travel
3. Marathon, Marathon Petroleum to Proceed with Conversion of Martinez Refinery to Renewable Fuels Facility
4. RBN, Already Gone Part 2: Refinery Shutdowns Around the World

The current price spike starts with the pandemic.

Historic and Recent Refining Margin Index After RVO (RMIR)
Source: Stillwater Analysis



Source: Stillwater Analysis

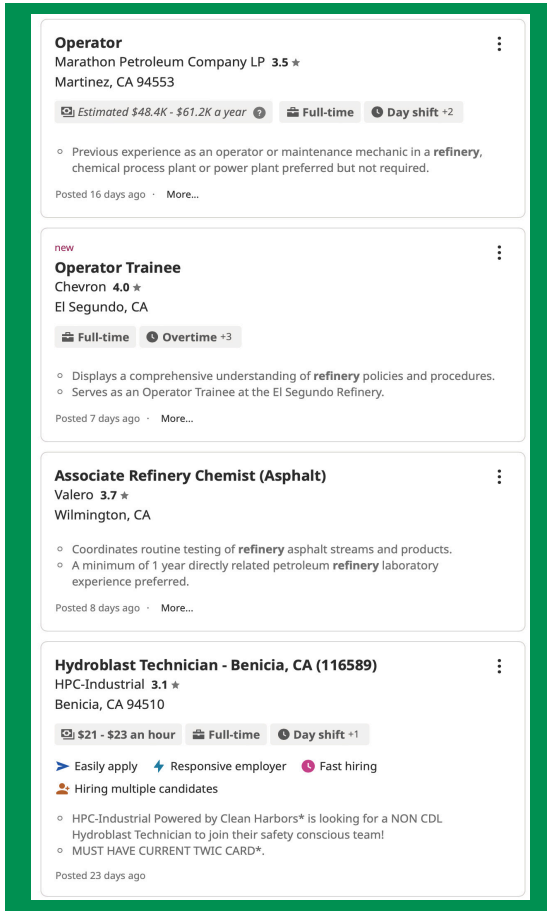
1. At the height of the pandemic lockdowns in 2020, petroleum demand cratered, and refiner margins followed.
2. At operating refineries, maintenance budgets were slashed, and maintenance crews were unable to assemble due to COVID.
3. Marathon's 161 kbd Martinez refinery was idled in April 2020. In August 2020, Marathon announced they would convert the refinery to renewable fuel production. This represents about 8% of in-state capacity.
4. In August 2020, P66 announced it would close the Santa Maria crude processing facility, idle processing at their 114 kbd Rodeo facility, and convert the Rodeo site to renewable fuel production expected in 2023. This represents another 7% of petroleum product production capacity.

Shuttered petroleum refinery capacity is gone for good.

As the effects of the pandemic ease, just like other industries, refiners are facing a labor shortage.

1. At the height of the pandemic, many experienced personnel retired and will not return to the refinery work force.
2. Refinery maintenance firms report continued problems with labor availability and productivity.
3. “It’s a struggle to find the right people to do the work.”

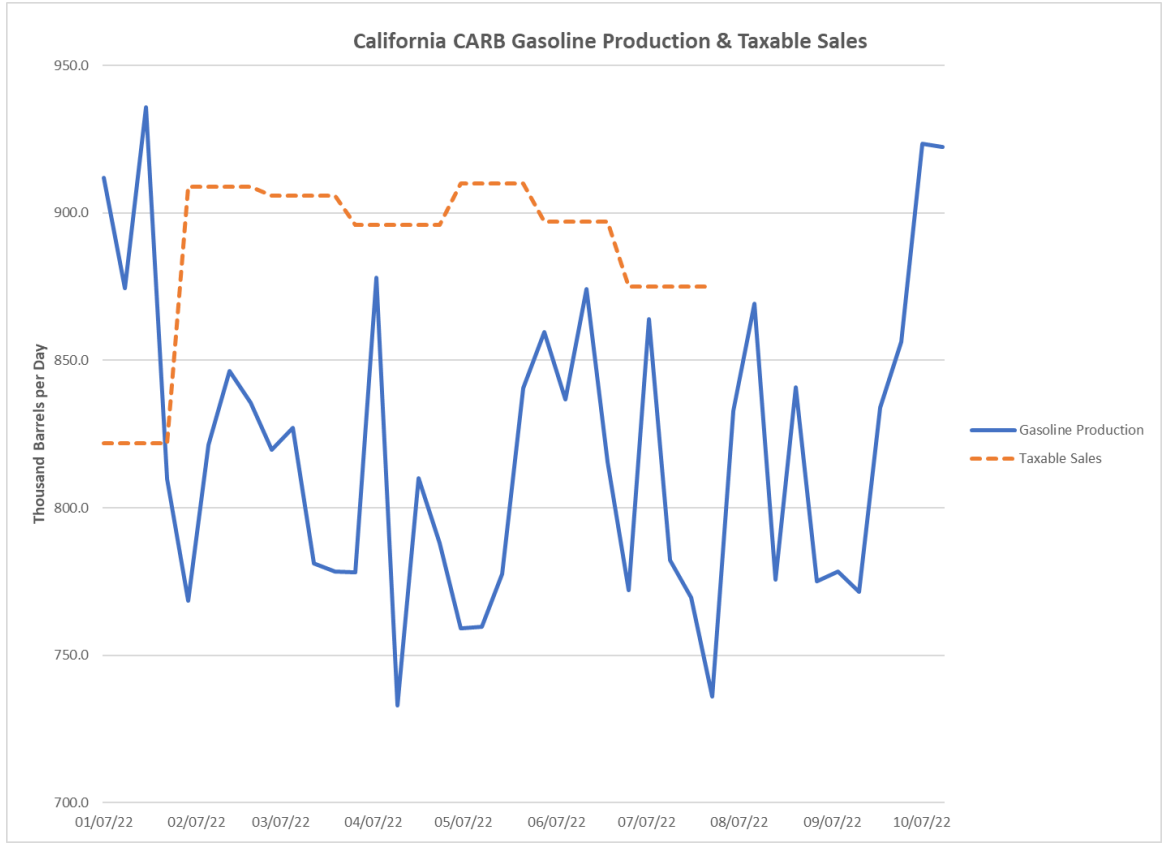
Indeed.com currently lists 236
CA Refinery Employment opportunities



Sources: Indeed
Stillwater conversations with industry contacts

With refinery closures, a short West Coast gasoline market is the new normal.

1. CA gasoline demand is made up of in-state refinery gasoline production, movements from the PNW, and imports from abroad.
2. 2022 CA gasoline production volumes peaked in late January at 936 kbd.
3. Gasoline production saw a decline through August and a sustained low in September, just below 779 kbd for two weeks.
4. Gasoline production averaged 820 kbd through early October.
5. Taxable gasoline sales through July were 887 kbd. Assuming sales remained at that level into August and September, inventories would have to be drawn to maintain consumer supply if imports failed to materialize.



Source: CEC & CDTFA

Pre-pandemic, PNW and Bay Area enclaves that were long product could cover the LA market when it was short. That flexibility was lost with the Martinez closure.

In the face of an already short supply cycle and a tight labor market, refiners pushed routine maintenance schedules until pandemic conditions eased… Then Russia invaded Ukraine.

1. Spring 2022 planned turnarounds were deferred after Russia invaded Ukraine.
2. To keep up with demand, refiners deferred maintenance through the summer.
3. This led to a pileup of planned and unplanned outages in the fall.

Refinery	Location	Start Date	Planned/ Unplanned	Notes
Chevron	Richmond	9/11	Unplanned	Equipment failure
P66	Carson	9/16	Unplanned	Reformer overhaul after reformer fire on 9/4/22
Marathon	Carson	9/3	Planned	Unit shutdown for planned flaring
Valero	Benicia	9/20	Planned	Work on units
P66	Anacortes	9/30	Planned	Scheduled turnaround maintenance

Sources: WSJ, California Gov. Gavin Newsom to Propose 'Windfall' Oil Profit Tax
Reuters, Los Angeles Wholesale Gasoline Hits New High on Refinery Outages

September saw five West Coast refineries down for maintenance.

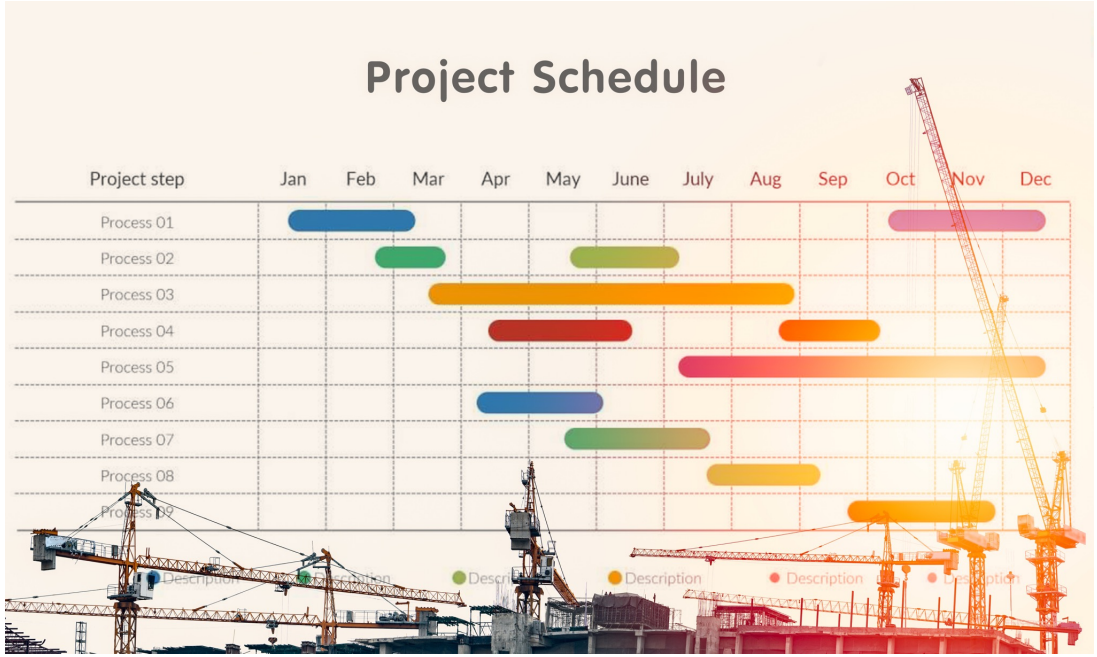
A note about refinery maintenance: Planned or unplanned maintenance is time, resource, and capital intensive. Routine maintenance is planned well in advance to meet these needs.

All refinery processing units require routine maintenance.

1. A process unit in planned maintenance is said to be in turnaround.
2. Maintenance of interdependent process units is typically performed at the same time for efficiency, including limiting shutdowns.
3. The turnaround cycle can vary from a few months to 5+ years, depending on permitting, operating severity, unit performance, etc.
4. Normally the maintenance of separate units is grouped together.
5. Major turnarounds routinely take 5-7 weeks to complete.
6. Planning for turnarounds start 24-36 months in advance.

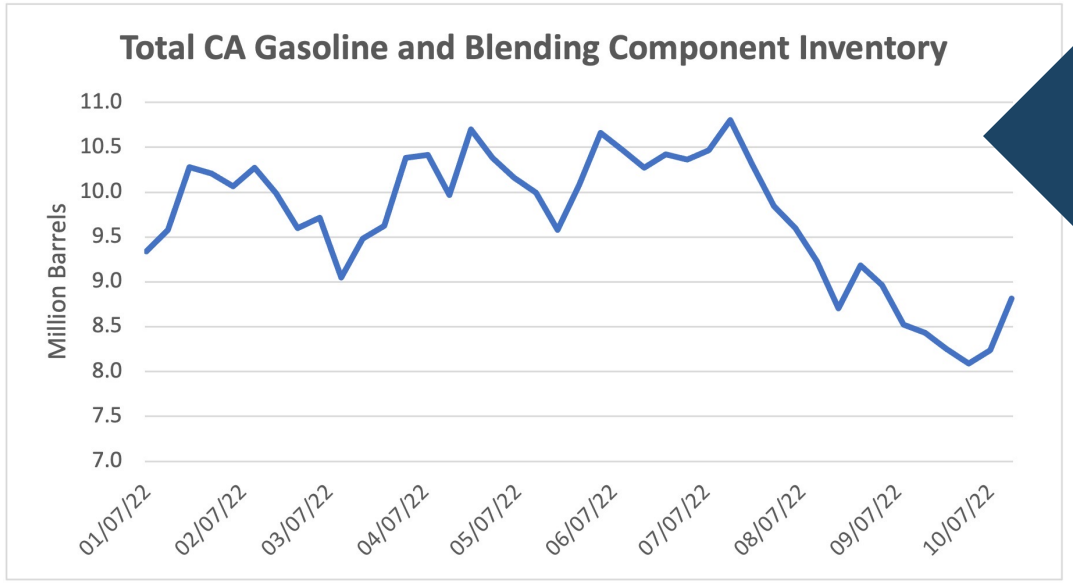
Source: Aegion Energy Services

Schedules for turnaround timing & duration are also established well in advance.



1. Refiners schedule turnarounds during slack demand periods.
    a. In California, slack demand season is January to March and October/November.
2. Coordinating turnaround schedules with competitors raises anti-trust concerns.
3. Maintenance contractors frequently coordinate the timing because their people and equipment will be working at several refineries at the same time.
4. To replace production lost during a turnaround, refiners can plan to build inventory in advance, and/or purchase product from other suppliers, including importers.
5. Inventory levels are critical to commodity markets because they are linked to supply and demand, and ultimately, prices.

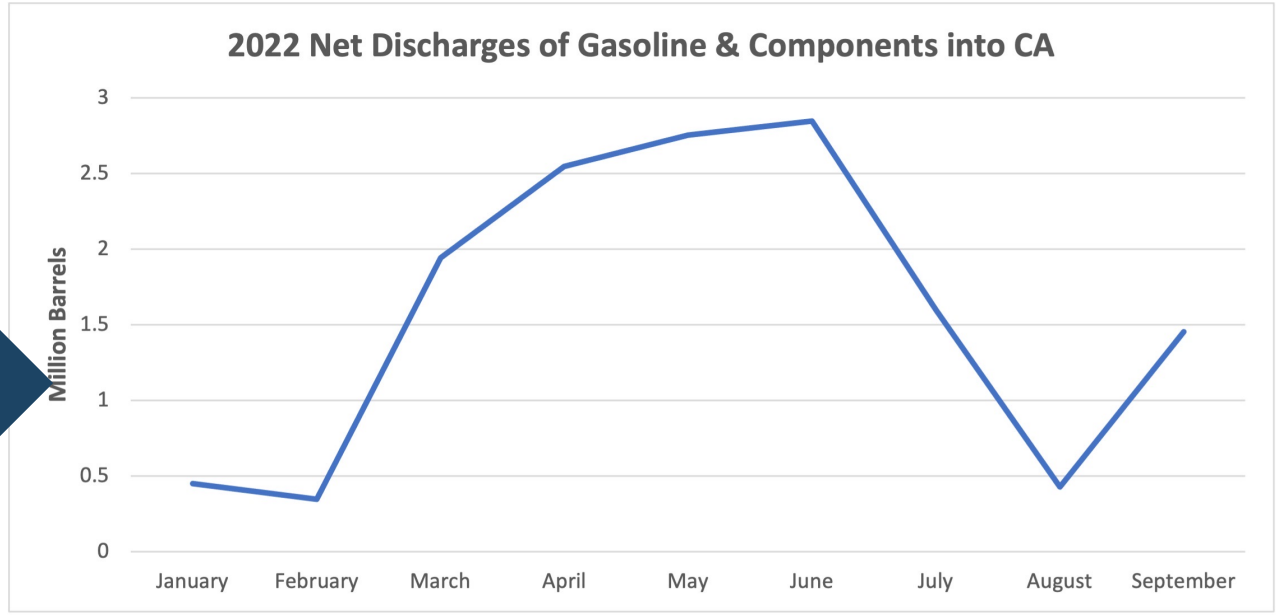
Low inventory & lack of imports contributed to scarcity in the market.



Source: CEC

CA gasoline inventory saw a steady draw down from a height of 10.8 million barrels in July to a low of 8 million barrels at the end of September.

With production offline and inventory at the bottom of the barrel, imports are needed to make up the difference.

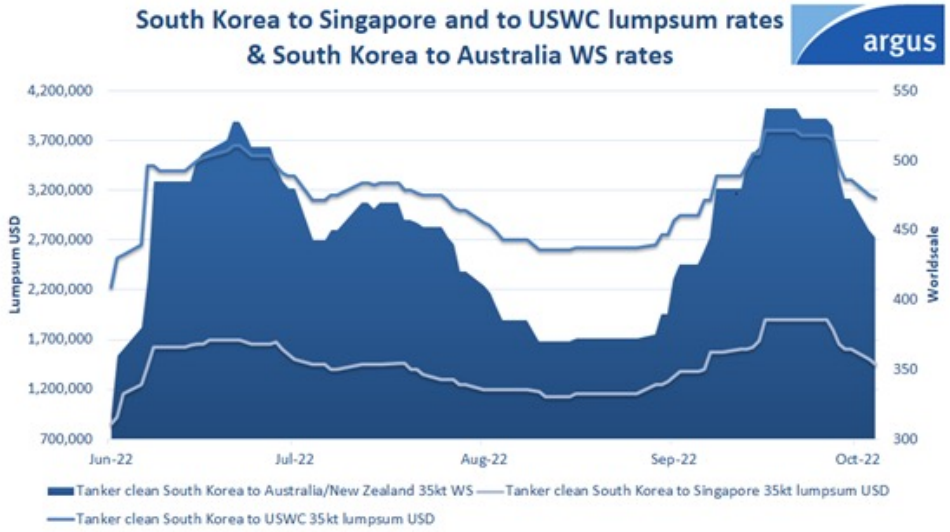


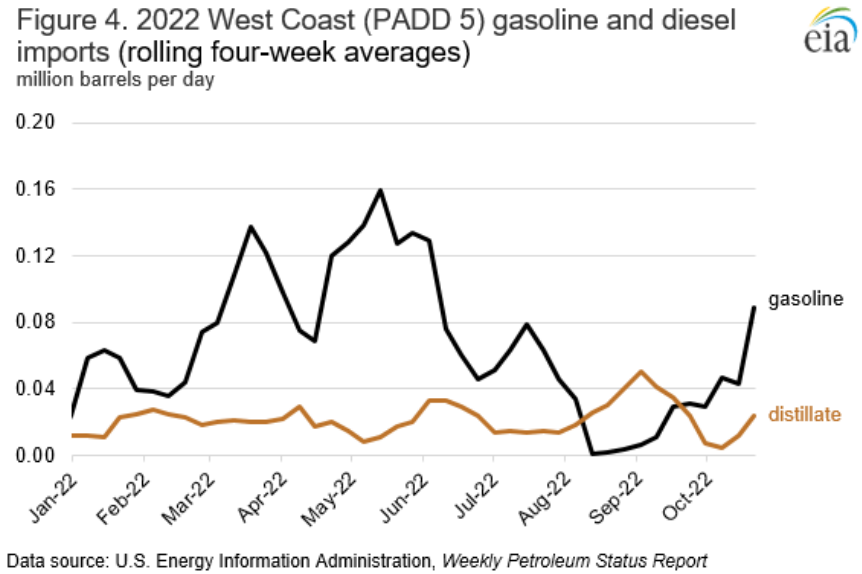
But import volumes were low during the summer, dropping from a high of 2.8 million barrels reported in May to a low of 0.4 million barrels in August.

Source: California State Lands Commission (SLC)

The cost of freight has skyrocketed, creating a barrier for imports.

1. According to industry sources, imports in the summer were low because freight rates are “astronomical” and gasoline blending components in Asian refineries were hard to find.
2. Asian region production may have been interrupted by COVID outbreaks.
3. Freight rates spiked in June and again in September, probably as the result of high prices on the West Coast.



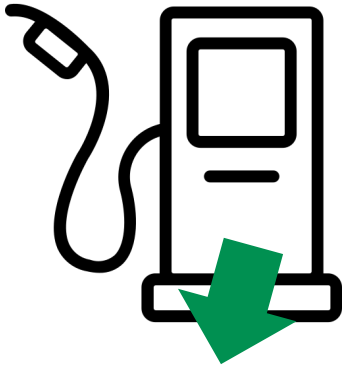


Data source: U.S. Energy Information Administration, *Weekly Petroleum Status Report*

Sources: Argus, Weight of Freight: crouching tanker, hidden dragon
EIA, This Week In Petroleum
Stillwater discussions with industry sources

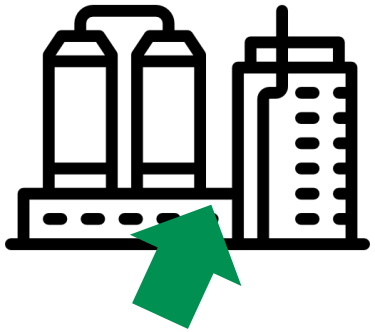
The price spike has receded since the early switch to winter grade gasoline

Since CARB issued the September 30 regulatory advisory for an early transition to winter-blend gasoline:



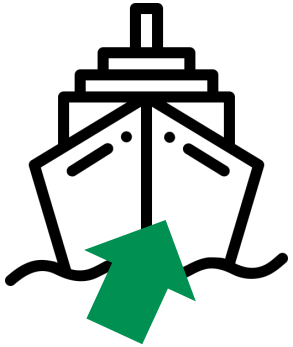
Gas Prices are Down
Average retail gasoline prices are down $1.18 per gallon since the week of 10/3.

Source: EIA

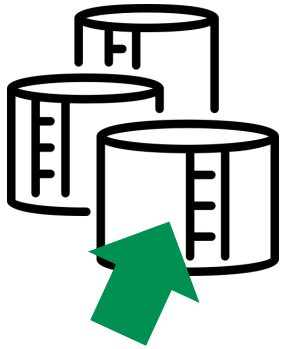


Gasoline Production is Increasing
Production rose from a low of 772 kbd on 9/16 to 877 kbd on 11/18.

Source: CEC



Imports are Arriving
According to OPIS, the week of 10/7 saw imports at their highest levels in the previous 12 weeks at 92 kbd. The week of 11/14 saw West Coast imports increase to 96 kbd.



Inventories are Climbing
Total gasoline and blending component inventory rose from 9 million barrels on 9/30 to 10.7 million barrels on 11/18.

Source: CEC

Supply and demand fundamentals are working.

A note about the winter/summer switchover: CA winter gasoline blend is cheaper for refiners to produce resulting in lower retail costs.

1. **Winter gasoline blend:** contains light blending components like low-cost butane which creates a higher Reid Vapor Pressure (RVP).
   a. This allows the gasoline to ignite more easily so cars can start better in cold temperatures.
   b. These lighter blends are cheaper to produce, resulting in lower gas prices.
   c. This coupled with lower demand for winter driving generally leads to the lower refining margins traditionally seen in the winter.
2. **Summer gasoline blend:** to reduce the effects of hot weather gasoline evaporation, smog, and emissions, refiners are required to reduce the RVP in gasoline.
   a. This lower volatility fuel is more expensive to produce and adds to the retail price per gallon.
   b. Increased summer driving demand coupled with the increased cost of the finished product leads to higher refining margins typically seen in the spring and summer.

History of Refining

Source: Chevron Global History

Chevron Richmond ca. 1914

The U.S. refining industry has been shaped by government regulations for the last 40 years.

Refining Capacity in California compared to the U.S.

	1982 – 1992	1993 - 2022
California	Decreased 18%	Decreased 16%
U.S. less California	Decreased 11%	Increased 19%

Source: EIA

1. Refineries retooled to meet federal, state, and local requirements. Some shut down early on rather than make the investment.
3. Since 1993 the refining industry has gown nationwide.
4. California's refining industry has shrunk.

California's refining industry is unique in the U.S. because of state regulations.

1. California has a waiver from the Clean Air Act to write its own regulations.
   a. CARB regulates mobile emissions.
   b. The Air Districts handle stationary emissions.
2. CARB has set more restrictive standards for gasoline & diesel than national standards
   a. Surviving refiners retooled to produce the CARB specification
   b. These boutique fuels create barriers to entry for outside suppliers
3. Less visible to the public is the impact of the regional Air Districts which mandate significant capital expenditures in the refineries and distribution systems.

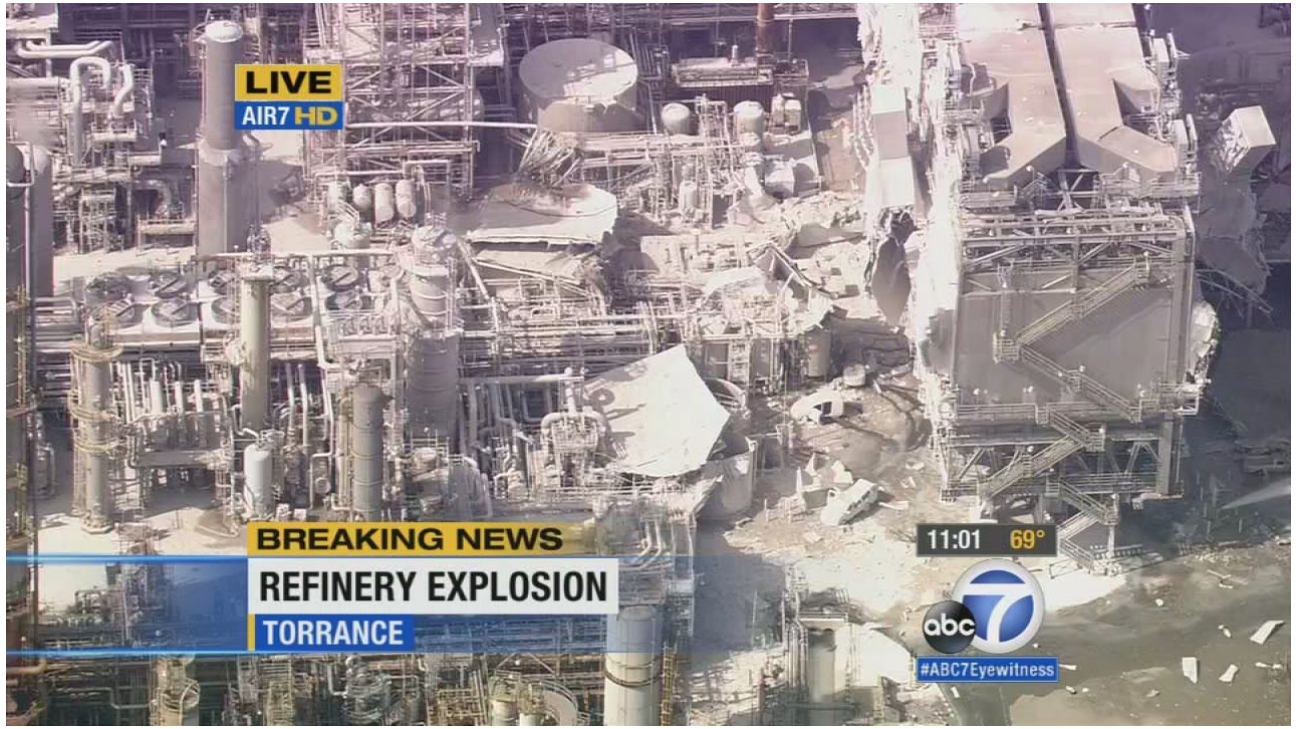
Refiners are reluctant to make long-term upgrade investments because state climate and air quality initiatives disincentivize petroleum production.

California Climate & Air Quality Initiative	Impact on Refiners	Result
Low Carbon Fuels Standard (LCFS)	Incentivizes renewable fuel production and disincentivizes petroleum product production.	Some refiners convert from petroleum to renewable fuel production leading to a short petroleum products market. LCFS compliance is an added cost to consumers.
Cap & Trade (C&T)	Incentivizes reduced emissions by requiring refiners to buy allowances to offset emissions above the declining cap.	The application of C&T to gasoline and diesel is called Cap at the Rack (CAR). CAR is the calculated cost of C&T added to gasoline and diesel sold at the terminal. C&T compliance is an added cost to consumers.
South Coast Air Quality Management District (SCAQMD) NOx Rule	Requires refiners and other fuels and chemicals facilities decrease NOx and CO emissions.	Affected LA-area refineries will have to install pollution control equipment to reduce NOx with a cost estimated by AQMD of $2.3 to $2.9 billion. Cost of compliance may be passed on to consumers.
Bay Area Air Quality Management District (BAAQMD) Particulate Emissions Rule	Requires decreased allowed PM_{10} emissions from refinery Fluid Catalytic Cracking Units (FCCUs).	Affected Northern CA refineries, Chevron Richmond and PBF Martinez will have to install wet gas scrubbers to reduce FCCU PM_{10} with estimated costs between $240M -$1.48B. Both companies are currently suing BAAQMD over the rule. Cost of compliance may be passed on to consumers.

Sources: OPIS West Coast Spot Market Report
CARB, Information for Entities That Take Delivery of Fuel for Fuels Phased into the Cap-and-Trade Program
SCAQMD Board Meeting Minutes, November 5, 2021
BAAQMD, Proposed Amendments to Regulation 6, Rule 5: Particulate Emissions from Petroleum Refinery Fluidized Catalytic Cracking Units, Final Staff Report

California regulations have increased the cost of petroleum fuels and contributed to the decline in the refining industry in the state.

Unplanned maintenance has caused the biggest price spikes

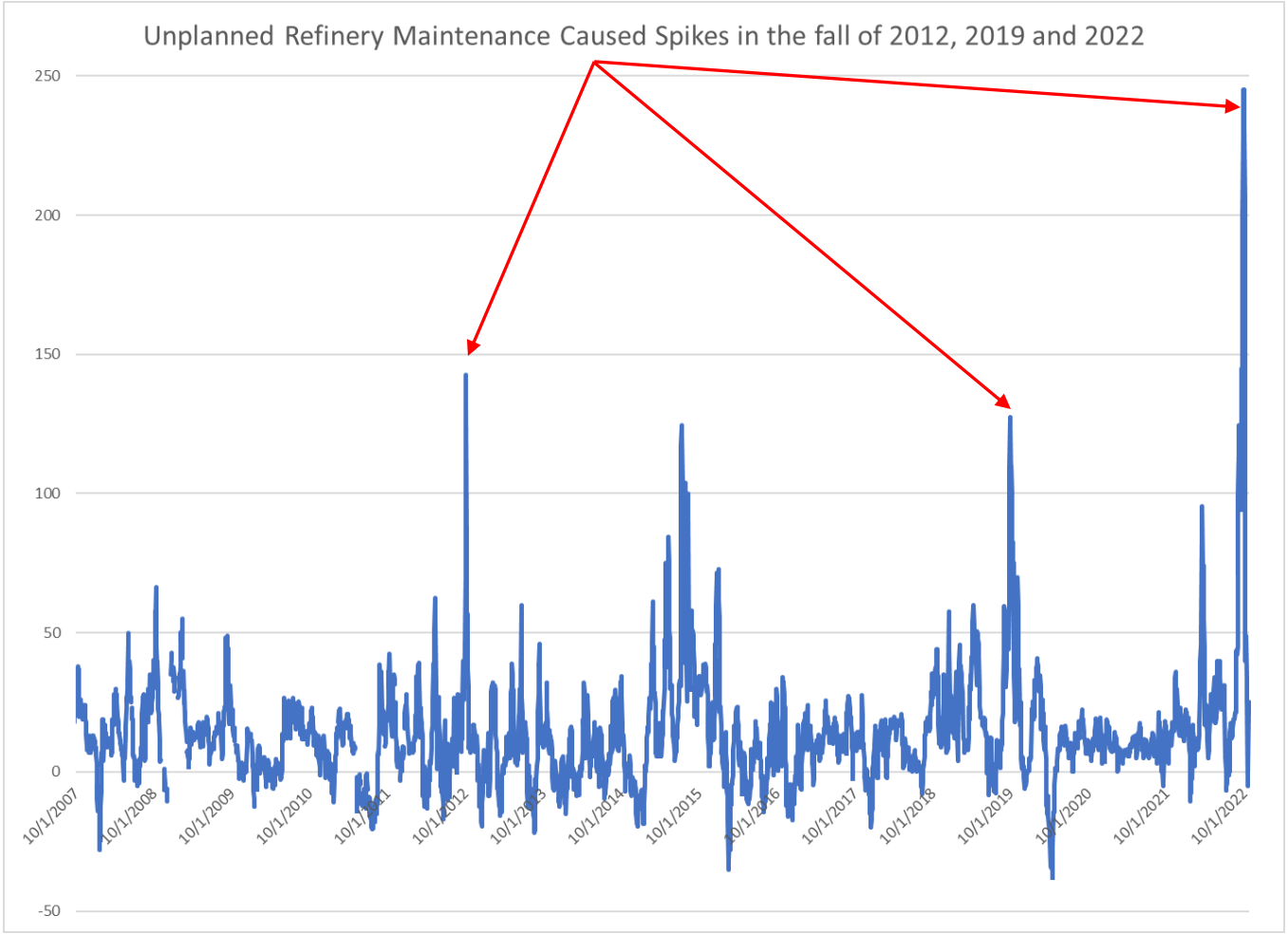


Source: ABC7

ExxonMobil Torrance Refinery ca. 2015

Fall price spikes are not uncommon.

1. This chart shows LA spot gasoline price, relative to the NYMEX.
2. Spikes occurred in the fall of 2012, 2019, and 2022 due to unplanned refinery maintenance.
3. Refiners plan fall maintenance as a matter of course, but occasionally unplanned maintenance occurs in the season.
4. The 2015 high prices were related to the Torrance outage.



Source: OPIS

Conclusion

1. COVID was a big contributor to the wave of unplanned maintenance.
2. Import availability proved to be unreliable.
3. There wasn’t enough inventory to cover the shortfall.
4. The California refining industry is shrinking due to government regulation.
5. The governor’s action, switching to winter blend early, increased gasoline supply which led gasoline retail costs to go down.
6. Short gasoline market conditions will be the new normal until either demand decreases or increased supply becomes available.

Thank you.

Questions?