Katherine Douglas Public Comment # 3 LATE DIST

From:	Amjad, Robia <Robia.Amjad@alston.com>
Sent:	Monday, October 20, 2025 3:54 PM
To:	sbcob
Cc:	Wickersham, Matt; Zhang, Kim
Subject:	Sentinel Peak Comment Letter re Agenda Item 3 (No. 25-00921)
Attachments:	Oct 2025 - SPR - Santa Barbara BOS - Comment Ltr re Drilling Ban.pdf
Importance:	High

Good afternoon,

Please see the attached comments submitted on behalf of Sentinel Peak Resources California LLC regarding Agenda Item 3 for the October 21, 2025 Meeting (No. 25-00921). Please confirm receipt.

Best,

Robia Amjad
Associate
ALSTON & BIRD
350 South Grand Avenue
Suite 5100
Los Angeles, CA 90071
+1 213 576 2533 (Direct)
robia.amjad@alston.com

ALSTON & BIRD

350 South Grand Avenue, 51st Floor
Los Angeles, CA 90071
213-576-1000 | Fax: 213-576-1100

Matthew C. Wickersham Direct Dial: **+1 213 576 1185** Email: **matt.wickersham@alston.com**

VIA EMAIL (sbcob@countyofsb.org)

October 20, 2025

Santa Barbara County Board of Supervisors
105 E Anapamu Street
Santa Barbara, CA 93101

Re: Comment Letter regarding Agenda Item 3 for the October 21, 2025 Meeting (No. 25-00921)

Dear Members of the Santa Barbara Board of Supervisors,

On behalf of Sentinel Peak Resources California LLC ("Sentinel Peak"), this letter provides comments regarding the Board's consideration of recommendations regarding the framework, approach and budget to phaseout oil and gas operations. Sentinel Peak objects to the recommendations and strongly urges the Board to refrain from moving forward with this item. The recommended actions are not appropriate given California's energy demands, the potential constitutional violations, and the attempt to circumvent environmental review mandated by California Environmental Quality Act ("CEQA").

THE STAFF REPORT'S RECOMMENDATIONS ARE ECONOMICALLY DISRUPTIVE AND ENVIRONMENTALLY COUNTERPRODUCTIVE.

Sentinel Peak incorporates herein our prior letter submitted on May 12, 2025, in connection with the Board's prior consideration of this item at its May 13, 2025 hearing (Item No. 8; No. 25-00399). As discussed in detail in our May 12 letter, the County's actions in reducing local oil production will have no impact on the State's voracious appetite for energy and will only increase the amount of hydrocarbon fuels that must be imported from foreign countries. To meet demand, every barrel of oil that is not produced within the County must necessarily be produced elsewhere, requiring further expenses and negative environmental impacts due to the importation of oil. A reduction in oil production within the County will necessarily result in an immediate, significant, and foreseeable increase in the importation of foreign oil. As discussed in the May 12 letter, the California Geologic Energy Management Division has recognized that imported foreign oil is necessarily more carbon intensive than oil produced in California, resulting in higher GHG emissions as a result of the ships and other vessels needed to import the oil to California and the County. These emissions can be significantly reduced by the continuation of oil and gas production within the County. Yet the Board Letter fails to analyze the potentially significant environmental impacts from its recommendation.

Reliance on foreign oil in the midst of the current geopolitical turmoil will create threats to the stability of the state's economy. The reduction in local production, driven by regulatory headwinds, has caused California crude oil pipelines to near critical minimum throughput levels. The loss of these internal pipelines would have devastating consequences to the State's refineries. (See Attachment 1 [Nechodom slides] at pp. 5-10; see also Attachment 2 [Mische study].) Several recent articles show that turmoil to the State's energy infrastructure has been caused by declining local production. (Attachment 3 [Bloomberg article] [discussing risk of closure by California's largest inland crude oil pipeline due to "a 'sudden and unexpected shift' of regional oil production to rival pipelines serving Los Angeles-area fuel makers"].) Beyond the environmental impacts from greater reliance on imported oil (see Attachment 4 [EDC article], it also creates greater economic risk. (Attachment 5 [Stillwater article] ["Importing waterborne crudes increases supply risk, lowers fuel production, and increases costs"].)

For these reasons, the California Energy Commission released a report recently recommending that the State take actions to "[s]tabilize in-state crude oil production and distribution to bolster supply for California refineries and support the petroleum fuels system." (See Attachment 6 [6/27/25 CEC Report at p. 4].) The County's proposed actions run directly contrary to this State policy.

A DRILLING PROHIBITION AND AN AMORTIZATION STUDY OF EXISTING OIL AND GAS PRODUCTION IS LEGALLY INAPPROPRIATE.

The County ignores the fundamental legal doctrine that prohibits this course of action—the diminishing asset doctrine as applied to legally nonconforming uses. (*See Hansen Bros. Enters. v. Board of Supervisors* (1996) 12 Cal.4th 533.) In *Hansen*, the California Supreme Court recognized the "diminishing asset" doctrine and defined the scope of vested rights for mining, quarrying and other extractive uses, recognizing the unique qualities of extractive uses, holding that it includes an expansion of those uses. "The very nature and use of an extractive business contemplates the continuance of such use of the entire parcel of land as a whole, without limitation or restriction to the immediate area excavated at the time the ordinance was passed." (*Hansen*, *supra*, 12 Cal.4th at pp. 553-54 [and cases cited therein].)

Similarly, Sentinel Peak's vested oil and gas rights are uniquely situated within Santa Barbara County. A prohibition on drilling new wells within the County's proposed Ordinance violates Sentinel Peak's rights to use the entire parcel to which it has mineral rights. Under the diminishing asset doctrine, Sentinel Peak is entitled to produce oil and gas resources from its mineral rights until the resource is exhausted or otherwise uneconomical to produce. The continued production of oil and gas resources is the expanded use that is protected under the diminishing asset doctrine. The County's proposed prohibition on oil and gas uses in the entire County makes it impossible to extract those resources from any other location in the County. This fact distinguishes this situation from cases that have approved of the use of amortization to discontinue existing businesses. (See *Los Angeles v. Gage* (1954) 127 Cal.App.2d 442, 461 [allowing amortization of an existing business where "[t]he ordinance does not prevent the operation of defendants' business; it merely restricts its location"].) No case has held that a drilling prohibition and amortization applies to eliminate a diminishing asset use.

The Staff Report's reliance on AB 3233 is misguided. First, AB 3233 contravenes Article XI, Sections 5 and 7, of the California Constitution by treating matters of statewide concern as if they were simply local matters. (See *County of Riverside v Superior Court* (2003) 30 Cal.4th 278, 288.) Even if AB 3233 is ultimately determined to be constitutional, it only purports to protect local restrictions from arguments that they are preempted by state law. It would not immunize the County from claims for damages for interfering with the vested rights of oil and gas operators within the County or for the taking of property rights without the payment of just compensation.

COUNTY CANNOT AVOID CEQA REVIEW BY CHOPPING ITS PROJECT INTO TWO HALVES

The Staff Report's recommendations inappropriately try to avoid environmental review of these impacts. "Agencies cannot allow environmental considerations to become submerged by chopping a large project into many little ones." (*Banning Ranch Conservancy v. City of Newport Beach* (2012) 211 Cal.App.4th 1209, 1222.) The Staff Report acknowledges that the two "phases" were proposed in order to reduce the complexity of implementing the Board's initial directive to staff: "In recognition of the difference in effort and complexity in implementing the Board's direction, staff is recommending that this be divided into two phases: 1) prohibit new oil and gas wells, and 2) phaseout existing oil and gas facilities/operations." (Staff Report at p. 2.)

However, CEQA applies whenever a government agency approves a discretionary project, defined as "an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment." (Pub. Res. Code § 21065.) CEQA defines "project" as the "whole of an action" and prohibits segmentation of project activities in an effort to minimize the evaluation of environmental effects. (Cal. Code Regs., tit. 14, § 15378.) "Accordingly, CEQA forbids piecemeal review of the significant environmental impacts of a project." (*Banning Ranch*, *supra*, 211 Cal.App.4th at p. 1222 (internal citations omitted).)

CEQA requires that "environmental considerations do not become submerged by chopping a large project into many little ones—each with a minimal potential impact on the environment—which cumulatively may have disastrous consequences." (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 396 [holding that CEQA review must consider the reasonably foreseeable future expansion of the project].)

Here, the Staff Report shows that Planning Staff propose to split up the Board's direction into separate phases, so that it can avoid preparing an environmental impact report on the first phase. This is simply not allowed under CEQA. Assuming the County moves forward with adopting an ordinance prohibiting the drilling of new wells, it must consider the environmental impacts of any reasonably foreseeable future ordinances that will be adopted as a consequence of this action. Here, the adoption of a phase-out ordinance is not foreseeable—it is intended.

The County must consider the potential environmental impacts of both the drilling prohibition and the phase-out ordinances when the first ordinance is adopted, as the two ordinances comprise the "whole of the project." The adoption of the drilling prohibition is a necessary precursor to the County's adoption of a phase-out ordinance. "Under CEQA, the agency must consider the cumulative environmental effects of its action before a project gains irreversible momentum." (*City of Antioch v. City Council* (1986) 187 Cal.App.3d 1325, 1333; see also *City of Carmel-by-the-Sea v. Board of Supervisors* (1986) 183 Cal.App.3d 229, 249-25 ["the difficulty of assessing future impacts of a zoning ordinance does not excuse preparation of an EIR; such difficulty only reduces the level of specificity required and shifts the focus to the secondary effects"].)

There is a long history of courts finding that the "division of the project into two parts with 'mutually exclusive' environmental documents [was] 'inconsistent with the mandate of CEQA' and constituted an abuse of discretion." *City of Antioch*, *supra*, 187 Cal.App.3d at pp. 1333-1336, citing cases.) As in these cases, the County's drilling prohibition is simply "the first domino to fall in a causally related series of events to follow." (*Paulek v. Dep't of Water Res*. (2014) 231 Cal.App.4th 35, 46.)

County staff has set forth no reason for the decision to prohibit wells other than as part of implementing a plan to "phase out existing oil and gas facilities/operations." (Staff Report at p. 2.) The County cannot phase out oil and gas operations within the County without prohibiting the drilling of new wells. This scenario is effectively identical to the facts at issue in *City of Antioch* where the court rejected the use of a negative declaration for the construction of a roadway and accompanying utilities because "the sole reason to construct the road and sewer project is to provide a catalyst for further development in the immediate area." (*City of Antioch*, *supra*, 187 Cal.App.3d at p. 1338.) In such circumstances, environmental review of the full project is required during "Phase I." As the Staff Report concedes that Phase II of its proposed project will require an Environmental Impact Report, the County must recognize that it cannot delay preparation of this EIR by splitting this project into two parts.

For all of these reasons, we urge the Board of Supervisors to postpone consideration of the proposed recommendations in the Board Letter unless and until it cures the numerous legal defects discussed herein.

Sincerely,

Matt Wickersham

Attachment 1

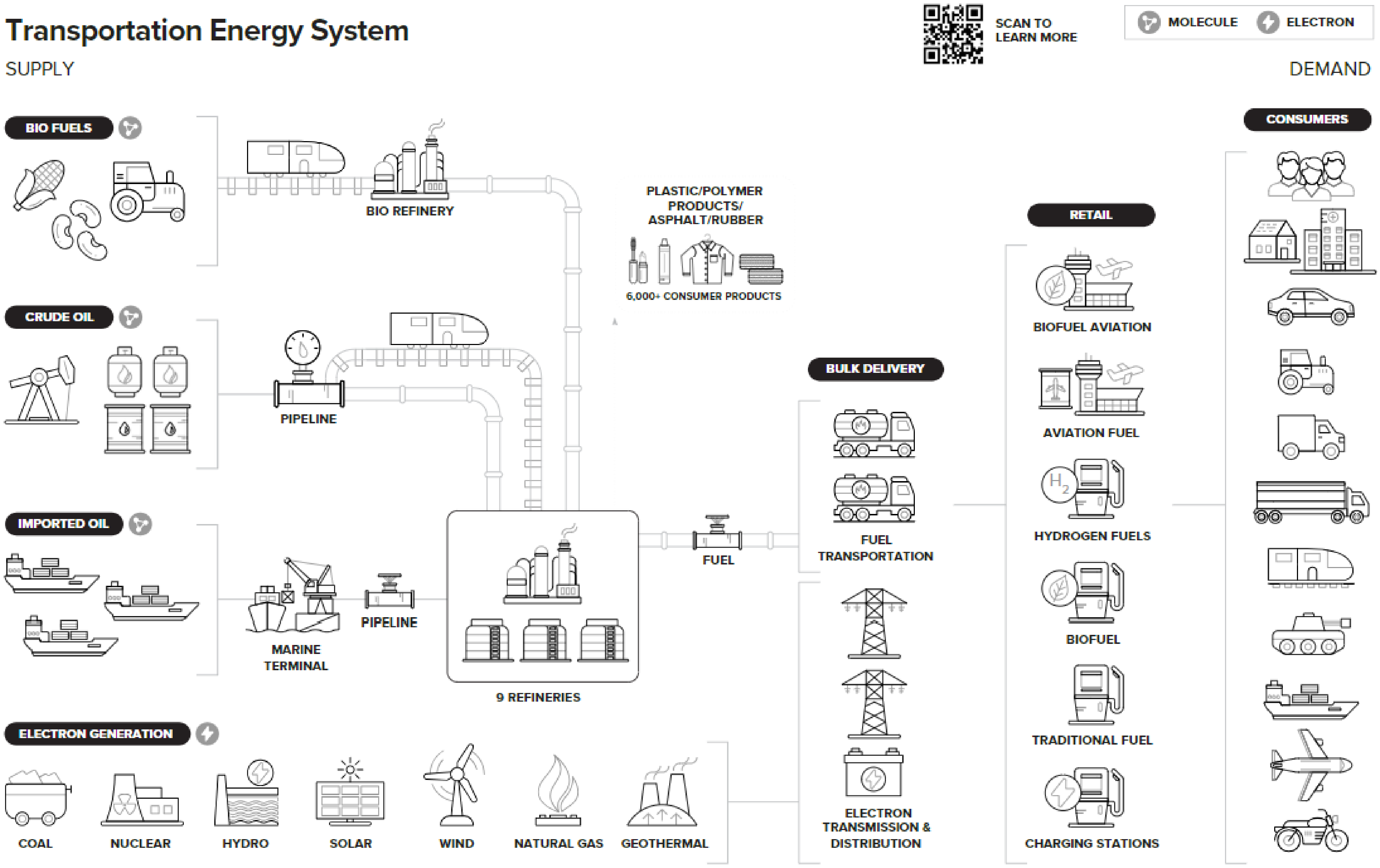
Urgent Vulnerabilities and Risks in California's Fuel Supply Chain

Transportation Energy Supply Chain Infrastructure & Investment (TESCII) Study Summary

For: Petroleum and Gasoline Supply Committee –September 19, 2024

By: Dr. Mark Nechodom, Senior Director for Science & Technology, WSPA

Transportation Energy System



WSPA

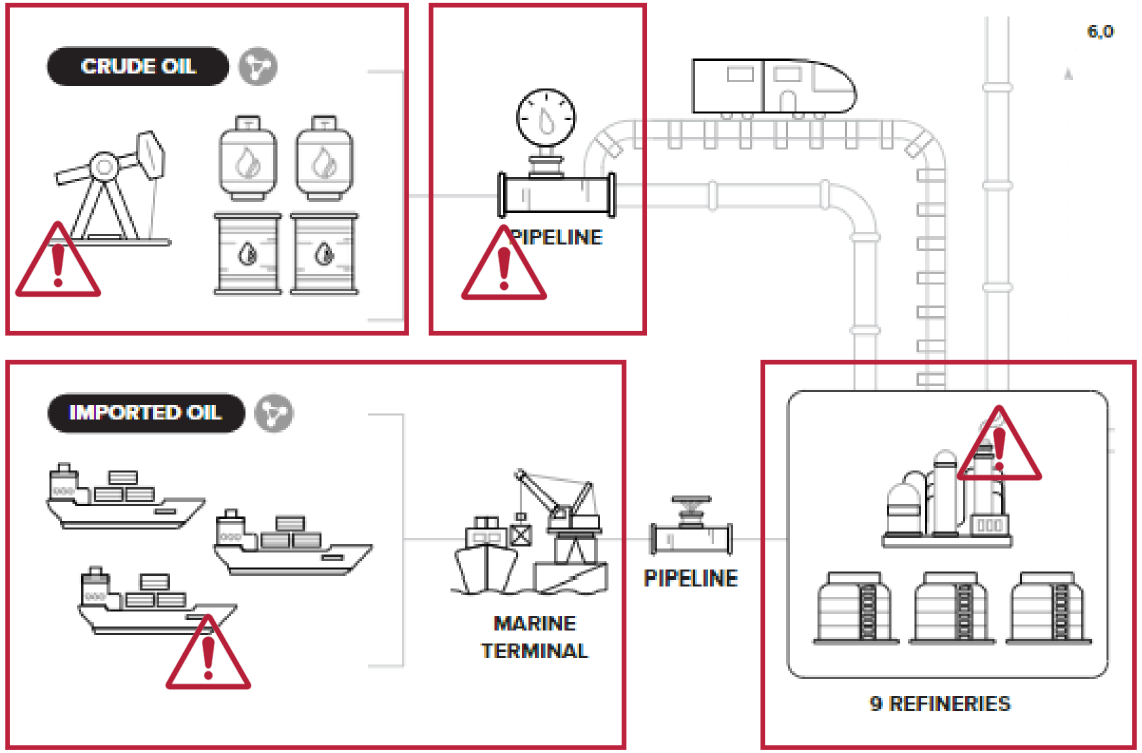
Background & Approach

- California's transportation fuel supply chain is at risk of unprecedented disruption, primarily due to the culmination of tightening state policies and regulations. To better understand the complete impact, WSPA enlisted Turner, Mason & Company (TM&C) to carry out the Transportation Energy Supply Chain Infrastructure and Investment (TESCII) study.

- TM&C conducted a study of the California transportation fuel system (upstream, downstream, logistics, refining, regulatory) with a focus on identifying potential "pinch-points" that could significantly impact the ability of the system to meet the state's future transportation fuel demands.

Concerns & Urgent Takeaways

- California crude oil production is in terminal decline, despite ample reserves.
- Pipelines are increasingly at risk of shutdown.
- Marine facilities face increased congestion and dramatic vessel limits.
- It's not a matter of "if" but "when" refiners and oil producers will face tough decisions.
- Without major investments, refiners' ability to adapt to shifts in supply or demand will be constrained.



Production of Crude Oil is in Terminal Decline

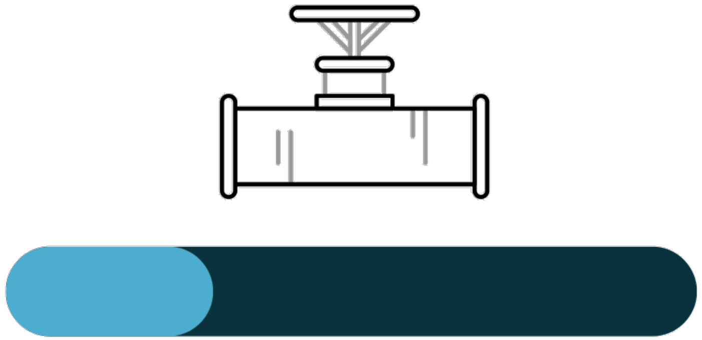
- California's crude oil production is experiencing a sharp annual decline rate of ~15%, which is about 50% faster than gasoline demand declines in the state's Transportation Fuels Assessment "Rapid" case.

- This rapid decline is driven by the lack of drilling permits, NOT lack of resources.

- Setback law (SB 1137) could result in a ~20% decrease of production per year.

Pipelines Are Approaching Minimum Volume

- California crude oil pipelines are nearing critical minimum throughput levels, requiring at least 30% capacity to maintain safe flow.
- In all scenarios, it’s assumed that once a pipeline shuts down, it will not return to service.
- Pipelines serving Northern California are at the greatest risk.
- If pipelines close, refineries become more dependent on waterborne crude oil imports but in some cases lack sufficient marine capacity to fully compensate.



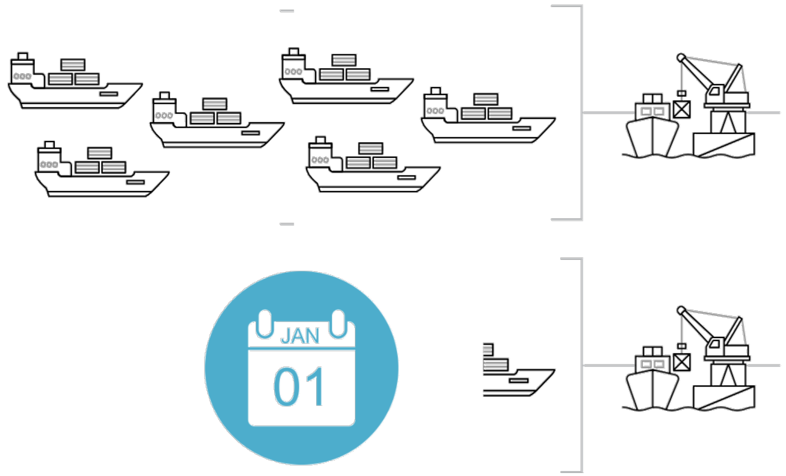
Pipelines Are Approaching Minimum Volume

Regional Movement	Pipeline Name	Current Capacity (TBD)	Estimated Minimum Throughput (TBD)	Current Throughput (TBD)	
Central Valley to San Francisco	KLM Pipeline	90	30-35	80-100	~ **30%**
	San Pablo Bay Pipeline	210	60-65		
Central Valley to Los Angeles	Line 63	60	20-25	120-150	~ **44%**
	Line 2000	110	30-35		
	M-70 Pipeline	110	30-35		
	Chevron	30	10-15		
Central Coast to Los Angeles	Texaco	28	10-15	34	~ **40%**
	Southern California Pipeline System	55	20-25		

Source: CalGEM, CEC, California State Lands Commission, TM&C analysis

Ports Face Congestion & Vessel Limits

- Starting January 1, 2025, the California Air Resources Board (CARB) will implement "At-Berth" regulations that require ocean-going tanker vessels in Southern California ports to cut emissions using shore power or CARB-approved technologies:
  - The California tanker fleet, as a whole, is NOT currently equipped to use shore power;
  - Sufficient infrastructure is NOT in place to supply the needed electricity;
  - Stack emissions control systems are still in the testing phase, and likely a long way from full deployment at scale.
- Economic decisions may lead to a significant decline in supply of crude and other transportation fuel products needed to meet the state's energy demand.



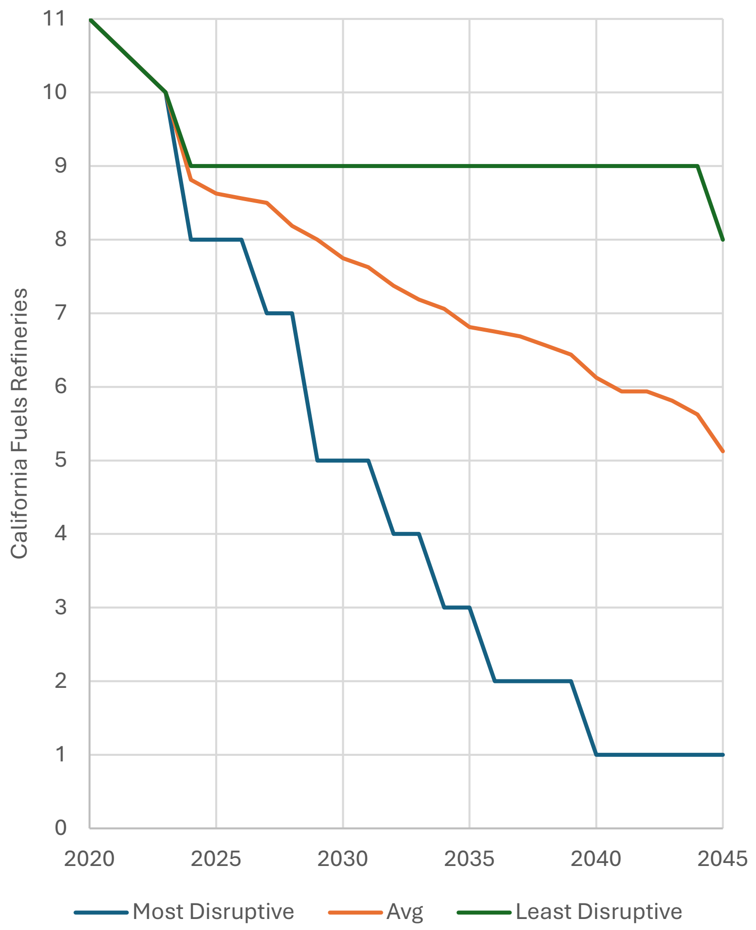
Refinery Shutdowns Loom in All Scenarios

- TM&C evaluated potential refinery closures across 16 scenarios covering combinations of:
  - Transportation fuel demand cases
  - Crude oil production profiles
  - Logistics constraints
  - Refining operating environments

- In all scenarios, up to half of California's fuel refineries could shut down by 2045. In the worst-case scenario, only one refinery may be left by 2040.

- "At-Berth" restrictions could quickly shutdown 3-4 refineries.

- None of these scenarios take into account the proposed gasoline margin cap penalty.

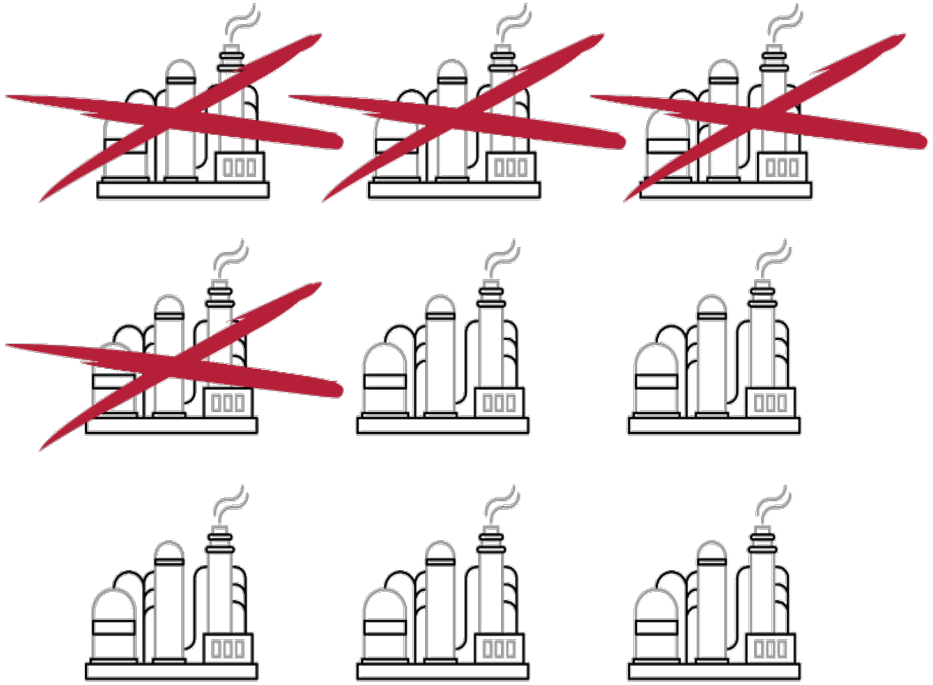


Note: Refinery utilization falls to 65% before shut-down

WSPA

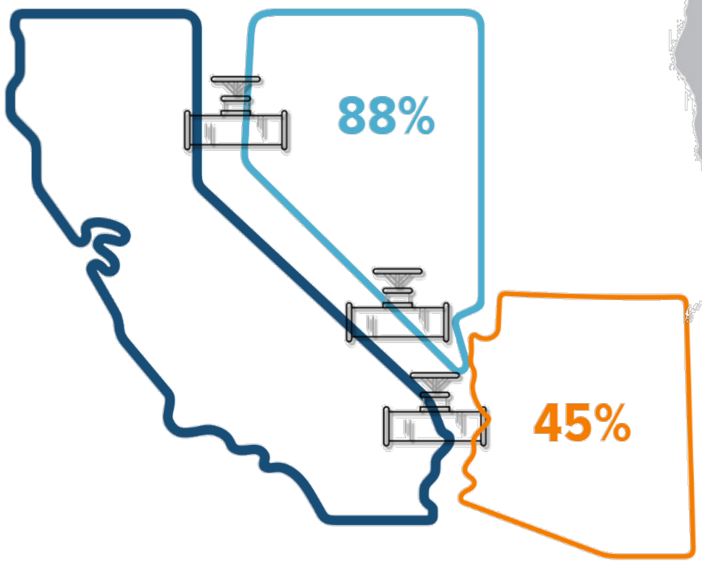
Refinery Shutdowns Loom in All Scenarios

- If onshore power is unavailable or on-ship capture is infeasible, full enforcement of “At-Berth” restrictions could close 3-4 refineries almost immediately
- Refineries may close faster than demand declines, which could put pressure on marine logistics and vessel traffic limits.
- Reality usually strikes faster and harder than models.



Arizona and Nevada Depend on California

- California refineries supply 45% of Arizona's and 88% of Nevada's transportation fuels, so any disruption in California impacts all three states.
- California's northern and southern fuel supply systems are not connected, requiring ocean-going vessels to transport fuel between them.



Discussion

Please direct inquiries to:

Dr. Mark Nechodom
Senior Director for Science and Technology
Western States Petroleum Association
mnechodom@wspa.org
916-591-1444

Attachment 2

A STUDY
OF
CALIFORNIA GASOLINE PRICES

Michael A. Mische
University of Southern California
Marshall School of Business

***Business of Energy Transition* Initiative**
March 16, 2025
(Released March 16, 2025, 1800 hours, PST)

Disclaimer & Statement of Independence

This paper solely represents the author's independent work, analysis, perspectives, and opinions. It does not, in any manner, explicitly or implicitly, reflect, represent, or describe the views, opinions, and positions of the University of Southern California, the Marshall School of Business and its faculty, employees, administration, or students, or the USC *Business of Energy Transition Initiative.*

In creating and presenting this work, the author has made all reasonable attempts to ensure the accuracy and consistency of the data, attribution to data sources, analysis, and calculations. Nonetheless, variances in data and presentation may exist to some degree. In the author's opinion, such variances do not materially change the tenor, trajectories, impressions, interpretations, conclusions, or possible implications associated with the data, data sources, and related analysis.

The work presented herein is provided for informational, research, discussion, policy, and educational purposes. In performing this work, the author has not received any special compensation and has no promise or anticipation of any future compensation for the work presented herein. This work and the author are entirely independent and not affiliated with, in any form, and are not advocating on behalf of or representing any petroleum company, organization, or foreign entity.

ABSTRACT
The "Golden State" consistently ranks among the highest retail gasoline prices in the U.S. and, for most of 2024, held the #1 ranking for the highest taxes and regulatory mandated taxes and fees per gallon of gasoline in the U.S.[1] [2]

Californians are no strangers to paying some of the highest retail gasoline prices in the nation. Since January 1995 through January 20, 2025, Californians have been paying, on average, 13.1% more for their gasoline than the rest of the nation. Not surprisingly, the average price of retail gasoline in California on March 11, 2025, was $4.694 a gallon, or 52.35% higher per gallon for all formulations than the national average price for gasoline at $3.081, according to AAA.[3] Within California, retail gasoline prices vary considerably. For example, on the same day (03/11/25), the retail price for reformulated gasoline in Mono County was $5.82 a gallon, or 88.89% higher than the national average and 23.98% higher than the average for all California counties.[4]

It's not just gasoline that Californians pay a premium for. According to California's own Legislative Analyst's Office (LAO), greenhouse emissions policies have contributed to the second highest monthly electricity rates for residential service in the U.S.[5] For the 2019 to 2024 period, the LAO reports that residential electrical utility rates in California increased by 47%. In the Golden State, Californians monthly utility bills average $438.[6] [7]

California is the second largest consumer of petroleum in the U.S. Notwithstanding its proven crude oil reserves which are the 5th largest in the U.S., California represents less than 3% of all U.S. oil production.[8] While overall U.S. oil imports from foreign sources have declined considerably, California oil imports from petrostates such as Saudi Arabia and Iraq have increased significantly. As a consequence of declining in-state oil production, California is highly dependent on oil imports from petrostates such as Iraq (21.26%), as well as South American sources such as Brazil (20.41%), Guyana (15.80%), and Ecuador (13.60%). In 1982, California imported 5.6% its crude oil from foreign sources. In 2024, the Golden State imported 60.7% of its oil from foreign sources. As a consequence, California is highly vulnerable than the U.S. to geopolitical situations that effect crude prices.

As in other jurisdictions, the sentiment of California's state and local government, policies, elections, and regulations affecting the oil and gas industry have consequences that influence gasoline production and prices. Within 72 hours of passing ABX-1-2, which required California refiners to hold additional inventories of finished gasoline stock, Phillips 66 announced the closing of its Los Angeles refinery

[1] Stinson, R. V., & updated, D. M. last. (2021, August 9). *10 States with the Highest Gas Taxes*. Kiplinger.com. https://www.kiplinger.com/taxes/state-tax/603259/states-with-the-highest-gas-taxes
[2] *Gas Tax Rates by State, 2024*. (2024, September 3). Tax Foundation. https://taxfoundation.org/data/all/state/state-gas-tax-rates-2024/
[3] *AAA fuel prices*. (n.d.). https://gasprices.aaa.com/?state=CA
[4] *AAA fuel prices*. (n.d.). https://gasprices.aaa.com/?state=CA
[5] Spady, A. (2025, January 8). California's "ambitious" policies to reduce greenhouse gases drive surge in electricity costs: report. *Fox Business*. https://www.foxbusiness.com/fox-news-politics/californias-policies-greenhouse-gases-electricity-surge
[6] https://www.foxbusiness.com/fox-news-politics/californias-policies-greenhouse-gases-electricity-surge
[7] Carey, R. (n.d.). *How much does it cost to live in California? Housing, utilities, and more*. Unbiased. https://www.unbiased.com/discover/banking/what-is-the-cost-of-living-in-california#:~:text=California's%20average%20cost%20of%20living,on%20top%20of%20your%20finances.
[8] https://constructioncoverage.com/research/states-with-the-most-oil-reserves

by the end of 2025.[9] [10] The Phillips 66 refinery that is slated to close represents 8.13% of California's refining capacity. It's doubtful that demand will drop commensurate with the closing of the refinery, and simple economics states that when supply drops more than demand, prices will rise. To compensate for the closure of the Phillips 66 refinery, California will most likely have to increase its imports of California-compliant gasoline, which is costly, and surviving refineries may have to increase capacity utilization.[11]

Additional considerations related to importing California compliant gasoline involve the security of sources, travel distances, transit times, and mode of transportation, all of which influence and increase consumer prices and impact greenhouse gas (GHG) emissions and California's "well to wheel" carbon footprint. For example, if California compliant gasoline is imported to meet demand, it will most likely come from the Gulf Coast refineries requiring transit via maritime tankers in large quantities through the Panama Canal to Los Angeles or from Washington state which also contributes to additional greenhouse gas emissions and more costs leading to higher retail prices for the public at the pump.

The 2024 passage of SBX2-1, mandating California refineries to switch to producing a lower carbon fuel, will, most likely, according to the CARB, University of Pennsylvania, and USC studies, increase the retail price of gasoline at the pump from $0.47 to over $1.15 a gallon for Californians.[12] [13] Furthermore, price increases in California will mostly likely also be reflected in retail prices in Nevada, which is almost entirely dependent on California refineries for its gasoline, and to a lesser extent Arizona.[14] Nevada and Arizona have no gasoline refinery capacity and limited inbound gasoline pipelines. Consequently, Nevada imports 88% of its gasoline from California, while Arizona relies on California for 48% to meet its gasoline needs.[15] California production and prices have a direct influence on consumer prices in Nevada and Arizona. The long-term correlation for the period of January 1983 to March 2022 between Nevada gasoline prices and California gasoline wholesale prices is .995, in absolute terms, and .905 for monthly percentage changes in wholesale prices. Stated differently, what happens in California to the oil and gasoline industry regarding gasoline prices will happen to Nevada and, to a lesser extent, Arizona. In response to California's recent regulatory actions, both Governor Joe Lombardo of Nevada and Katie Holmes of Arizona documented their concerns to California's Governor Newsom in a letter dated September 10, 2024.[16] Notwithstanding, both states have exposure to California's actions and, as such, should anticipate increasing in retail gasoline prices for their consumers.

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[9] *Phillips 66 provides notice of its plan to cease operations at Los Angeles-area refinery*. (2022). Phillips66.com. https://investor.phillips66.com/financial-information/news-releases/news-release-details/2024/Phillips-66-provides-notice-of-its-plan-to-cease-operations-at-Los-Angeles-area-refinery/default.aspx

[10] Zavala, A. (2024, October 16). *Days after Newsom signs bill aimed at "big oil," Phillips 66 says it plans to stop operating refinery*. KCRA. https://www.kcra.com/article/phillips-66-california-refinery-announcement-gas-prices/62629019

[11] *California law and refinery closure reflect ongoing challenges for the state's fuel market - U.S. Energy Information Administration (EIA)*. (n.d.). https://www.eia.gov/todayinenergy/detail.php?id=63944

[12] Lazo, A. (2024, November 9). *California enacts new climate rules — which could boost gas prices*. CalMatters. https://calmatters.org/environment/climate-change/2024/11/california-fuels-standard-gas-prices-climate-change/

[13] *California's Low Carbon Fuel Standard*. (2024, October 14). Kleinman Center for Energy Policy. https://kleinmanenergy.upenn.edu/research/publications/californias-low-carbon-fuel-standard/

[14] California supplies between 84% to 88% of Nevada's gasoline.

[15] https://www.wsj.com/opinion/california-oil-refinery-tax-nevada-arizona-gavin-newsom-katie-hobbs-joe-lombardo-4aaf3553#

[16] *2024-09-10_governor-lombardo-and-hobbs-urge-governor-newsom-to-halt-legislation*. (2024, September 10). https://gov.nv.gov/Newsroom/PRs/2024/2024-09-10_governor-lombardo-and-hobbs-urge-governor-newsom-to-halt-legislation/

OBJECTIVES

The primary objective of this research is to address the issue of *"Why are retail gasoline prices in California so high?"* Secondary and complementary objectives include:

(1) Contributing to the body of research related to California oil and retail gasoline prices,
(2) Providing additional data-driven insights as to California retail gasoline prices and the determinants of retail gasoline prices,
(3) Identifying the factors contributing to California's high retail gasoline prices.

FOUR ESSENTIAL QUESTIONS

California's persistent and historically high retail gasoline prices and price differentials compared to the U.S. average represent an exceedingly complex series of questions involving the interactions between public and private sectors, as well as individual consumers. This study has endeavored to address four essential questions:

(1) "Why are retail gasoline prices in California so high?"
(2) What factors contribute to gasoline production and distribution costs in California, and to what extent do those factors influence retail gasoline prices?
(3) To what extent, if any, is there price gouging, profiteering, and or a 'mystery surcharge' placed on the California consumer by the refiner?
(4) To what extent have legislation and regulation influenced the gasoline retail prices in California?

This paper addresses those questions and offers data-driven insights into California gasoline prices.

METHODOLGY

Addressing the above research objectives required extensive analysis of data and comparative analytical methods. For this research effort, a series of critical questions were developed, and data related to addressing those critical questions was identified, obtained, organized, and analyzed. The research involved 10 to 50 years of data. The research involved in this work is widely available and includes but is not limited to verifiable sources such the California Energy Commission, U.S. Energy Information Agency, Bloomberg, U.S. Department of Energy, SEC filings, International Energy Agency, Oil & Gas Journal, American Petroleum Institute, the California Department of Tax and Fee Administration, the U.S. EPA, California Air Resources Board, Statista, The Federal Reserve Bank, the California Attorney General's Office, the California Legislative Analyst's Office, U.S. Department of Interior, Bureau of Labor Statistics, California DMV, and the U.S. Oil and Gas Association. Readers are strongly encouraged to avail themselves to over 350 sources and authorities footnoted herein. In instances where research and data were derived from proprietary sources, appropriate annotations have been provided.

In performing quantitative analysis, applied several different methods, including simple regression analysis, z-scores, percentage change analysis, comparative analysis, ratio analysis, and other techniques that, in the professional judgment of the author, were appropriate and reasonable.

ACKNOWLEDGEMENTS
The author wishes to extend a very and sincere "Thank you" to Graduate Assistants Mark Duling (USC-Marshall MS, 2025) and D. J. Nielsen (USC-Marshall MBA, 2024) for their research, dedication, and various contributions to this work. Both of you worked hard and your efforts are greatly appreciated. Additionally, the author wishes to extend acknowledgement to Professor Shon Hiatt, Director, USC *Business of Energy Transition Initiative.* To all, thank you.

Information and inquiries related to this work may be directed to:

Professor Michael A. Mische
Marshall School of Business
University of Southern California
Email: mische@marshall.usc.edu

Released
March 16, 2025
1800 Hours, PDT
Los Angeles, California

A STUDY OF CALIFORNIA GASOLINE PRICES
<u>TABLE OF CONTENTS</u>

A STUDY OF CALIFORNIA GASOLINE PRICES
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4.0 California Oil Imports & Foreign Oil Sources

5.0 Refinery Operations

6.0 California Gasoline Pricing

EXECUTIVE SUMMARY

Few topics in the Golden State are as contentious and perhaps as misunderstood by consumers, activists, policymakers, educators, and researchers as California gasoline prices. Depending on one's perspective, California has either an exceptionally progressive or extraordinarily repressive political policy, legislative history, and sentiment toward its oil and gas industry.

California has the highest tax, regulatory fees, and cost burden per gallon of gasoline in the U.S., and that burden is anticipated to increase in 2025 and beyond. Included in or added to the retail price of gasoline at the pump is a litany of 6 different regulatorily mandated taxes, costs, and fees such as underground tank storage fees, state and local taxes, the California special blend premium, the California Cap and Trade Program, and other California environmental taxes. Collectively, the sum of all federal, state, and local taxes and fees, as well as regulatory-mandated costs, total approximately $1.638 a gallon, as of March 10, 2025. Comparatively, at $0.596 a gallon in state excise taxes, California's "profit" on a gallon of gasoline sold is almost 4 to 5 times higher than the net profits on the same gallon sold by the gas station operator and is currently estimated to be 3 to 20 times more than that of the refiner. Recently, over a recent 9-month period, the CEC reported that California refineries were operating at a loss of $0.02 a gallon and have incurred losses of as much as $.14 a gallon.

It is uniformly acknowledged that California has the most stringent regulatory, some would argue, again, that depending on perspective, either a toxic or visionary environment, for oil and gas companies in the world. In California, oil producers and refiners must navigate more than 25 federal, state, and local agencies overseeing oil and gas production. Additionally, California has some 518 state agencies, boards, and commissions regulating business practices. Regulatory oversight, irrespective of one's perspective, are layered into and accumulate throughout the supply change ultimately adding to the cost burdens of compliance for oil and gas industry operators, which, in turn, contribute to higher consumer prices at the pump.

California policy and law makers have little actual incentive for lowering consumer gasoline prices in the Golden State. In fact, their actions, such as cap and trade, have led to increases in prices. California is on a stated mission to eliminate internal combustion vehicles by 2035 and beyond, and the policy actions taken appear to be an apparent strategy to force gasoline prices higher as a means of compelling consumers to adopt EVs and ZEVs. With the 2035 elimination of internal vehicle sales in the Golden State looming, California refiners, oil producers, wholesalers, transporters, and gas station retail owners and operators are facing the sunset of their businesses and have little incentive to continue to operate. As California nears closer to 2035, it's doubtful that demand for gasoline will decline at a faster rate than the rate of decline in gasoline supplies resulting in supply stresses in the very near term. For 2023 and 2024, the adoption of EVs in California, as measured by sales, has flattened. Golden State consumers can expect higher and higher gasoline prices as production, supply, and the number of gas stations begin to exit their businesses.

To many, California has a relatively inhospitable business climate, as measured by various studies and surveys. At 5.2%, CA has the third highest unemployment rate in the nation, and with over 180,000 homeless people, California ranks #1 in the U.S. in homelessness. CNBC graded California as an "F" for business friendliness and ranked it 45th out of 50 states for the cost of doing business and 49th in the cost of living. Since 2018, more than 360 companies, such as Oracle, Tesla, Nissan, Toyota, Nestle, and Hewlett Packard Enterprises, have exited the Golden State. Major companies such as X, Meta, Salesforce, and PayPal have fled San Francisco. More recently, Chevron and Phillips have announced plans to leave California. Under prevailing conditions, refiners and retail gasoline station operators are under constant cost and regulatory pressures, and we can expect more to exit the state.

The California Consumer Price Index (CCPI) has outpaced that of the overall U.S. (CPI) and has experienced higher inflation than the overall U.S. Higher inflation, higher refining costs, higher operating costs, higher regulatory compliance costs, and higher transportation and distribution costs have a compounding effect throughout petroleum supply chains, ultimately culminating at the local gas station owner/operator level, resulting in higher prices for the consumer. The correlations between spot oil prices through the California supply chain and the retail outlet indicate, expectedly, growing variances. The price at retail is a function of wholesale and regulatory costs but is ultimately determined by individual retailer pricing strategies and preferences that are reflected in the selling price of gasoline to the consumer.

California's policies and regulations may also have profound national security implications and extend across state lines. California is home to the U.S. Pacific and Third Fleets and multiple U.S. military, Marine, and National Guard installations.[17] California refineries provide aviation fuels to U.S. military forces based in Arizona, California, and Nevada, as well as diesel, gasoline, and propane fuels to U.S. Marine and Naval forces based in Southern California. National security interests with respect to fuel production and priorities would naturally take precedence over those of the California, Nevada, and Arizona consumers, and as California refinery production is in its legislative sunset period and is inevitably declining, consumer prices will inevitably increase, as well as national security concerns.

CONCLUSIONS

Based on 30 to 50 years of data, the primary conclusion from this study is that California's high gasoline prices and supply dilemmas are, by design, engineering or serendipitously, largely self-inflicted, and the result of directed policies and a litany of regulations, taxes, fees, and costs. The economic evidence is abundant; California refiners have not engaged in widespread price gouging, profiteering, price manipulation, "unexplained residual prices" or surcharges, magical or otherwise. The Golden State's gasoline price dilemma is the result of the complex interactions regulatory and political policies, and the subtleties of refinery operations and global crude oil prices and in-state centric supply and demand. Specifically, California's high gasoline prices can be attributed to:

1. Aggressive environmental policies, which are layered on the oil and gas industry, add costs throughout the petroleum supply chain resulting in higher retail gasoline prices.
2. Costly reporting and compliance to regulatory and environmental mandates are added to the retail price of gasoline, including California's special blend gasoline requirements, the highest state excise tax in the U.S., as well as growing cap and trade costs, local taxes, and other environmental program costs, thereby increasing consumer prices at the pump.
3. In-state business general operating and refinery costs are which are considerably higher in California than across the U.S., are reflected in the retail price of gasoline.

[17] California, S. O. (n.d.). *California Military Bases | Military Council*. https://militarycouncil.ca.gov/s_californiamilitarybases/

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

4. Declining in-state oil production and increasingly greater reliance on foreign sourced imports and exposure to geopolitical conditions contribute to supply concerns and retail price volatility.
5. Refinery gasoline production, which is decreasing at a faster rate than gasoline consumption, creates stresses on supply gasoline stocks, thereby contributing to higher consumer prices.
6. Increasingly higher taxes and policy and regulatory costs, such as cap and trade, gasoline inventories, and the LCFS, which are influencing the exit of refiners from the Golden State adding to supply stresses, and price volatility, influence retailing pricing strategies by operators.
7. General disincentives associated with Governor Newsom's mandate and California Air Resource Board's (CARB) 2035 objective to eliminate internal combustion vehicles (ICV) in favor of zero-emission vehicles (ZEV) as a method to force consumer adoption of ZEVs through gasoline costs serve to dissuade new operators from entering the California market and motivate existing ones to exit.

With 2035 less than a decade away, there is no incentive for or benefit to California oil producers or refiners to invest in additional capacity or capital improvements in the Golden State. Ultimately, with the potential for the loss of two or more major refineries, combined with new special blend gasoline standards (LCFS) and the new finished gasoline stock inventory requirements, Californians are inevitably facing escalating gasoline prices at the retail pump, and most likely, increased taxes and fees to compensate for lost gasoline and cap and trade revenues.

Exhibit ES 1.0

OBSERVATIONS

State Excise Tax: California's state excise on gasoline is a direct addition to the consumer price of gasoline. Since 2003, California's state excise tax on gasoline sales has increased 200%, from $0.10 in 2003 to $0.596 in 2024. California's state excise tax on gasoline is based on and indexed to the California CPI (CCPI). Consequently, as the overall CCPI rises, so does the state excise tax on gasoline, which, in turn, increases retail gasoline prices and, ultimately, increases California state revenues. On June 14, 2022, when average gasoline prices in California hit an all-time historical high of $6.294 per gallon, or 7.02% higher than the average price in May 2022, the California state excise tax increased by 5.48% from $0.511 to $0.539 a gallon. For the June 30, 2021, to July 21, 2024, period, while the average price of gasoline per gallon in California decreased by 27.1%, the California state excise tax on gasoline per gallon increased by 11.35%. The state excise tax is anticipated to automatically increase on July 1, 2025, from $0.61 to $0625 a gallon.

State and Local Taxes. California's local tax on gasoline is a direct addition to the consumer price of gasoline in California. In addition to the state excise tax, local taxes are also included. For 2023, the base tax is 2.27%. However, local gasoline taxes vary from county to county and municipality and collectively average 3.06% (unweighted).

California Cap and Trade Costs: California's cap-and-trade cost is a direct addition to the consumer price of gasoline in California. California mandates that refiners comply with the State's Cap and Trade program. Since taking full effect in 2015, California's Cap and Trade program cost has increased by 200% from $0.18 a gallon to $0.30 in 2024, while other environmental program costs add another $0.21 a gallon, adding $.51 to the consumer price of gasoline. From 2000 to 2025, the price differential between California's average weekly regular reformulated gasoline prices and the U.S. average for reformulated regular gasoline pre-cap and trade averaged 7.84%. After the full implementation of the cap-and-trade program in 2015, the price differential between California and the U.S. based on weekly gasoline prices for regular reformulated fuel expanded to 23.56% by March 2025. The cap-and-trade cost is anticipated to significantly increase in 2025. Initially passed in 2013 as a "backstop" for funding various environmental programs, California's cap and trade program was scheduled to phase out by 2020. The California Legislative Analyst's Office (LAO) noted in a November 2023 report, "To our knowledge, no studies have produced a reliable estimate of the emission reduction achieved by the cap-and-trade program so far." By law, 25% of the funds associated with California's cap and trade program must be directed to California's controversial High Speed Rail Project (CHSR), which is far behind its promised completion date and will now cost at least $106 billion, which over 3 times its initial budget estimate. The CHSR is currently under Federal Department of Transportation review.

California Economy and Inflation: California's higher than the U.S. average for inflation is reflected in the cost of production and distribution and retail price of gasoline and increases in the price of gasoline per gallon. Inflation, which is endemic to any economy, grew 1.13 times faster in the Golden State than in the overall U.S. Understandably, California's CCPI is highly correlated with the U.S. CPI at .998. For the 1983 to 2024 period, California's inflation, as measured by the California Consumer Price Index, was 229.4%, as compared to the overall U.S. at 202.41% (base year = 1983 = 100).

Retail Gasoline Prices: Retail gasoline prices are a function of crude oil prices, the supply of gasoline, the demand for gasoline, refinery operating efficiencies, competition, and regulatory costs. Gasoline prices in the U.S. and California are seasonal, as the price reflects the summer and winter blends, and summer blends are higher priced. Gasoline prices also reflect demand. Prices tend to drift upward during the peak driving months of the summer and drift lower after Labor Day in September. Demand tends to be at its lowest during the January to mid-March period.

Because of the decline in the number of refineries, lack of inbound pipelines, exposure to unplanned production disruptions, and heavy reliance on foreign oil sources, the Golden State is extremely sensitive to any interruptions to its foreign supply chains or discontinuities in refinery production.

When refineries shut down for planned maintenance, prices in California tend to drift up. When refineries in California switch from summer to winter and back to summer blends, production is affected, and prices drift up. When refineries have unplanned shutdowns or catastrophic events, such as fires, prices will spike. However, those conditions also exist in other markets.

From January 2, 1994, to March 10, 2025, the average weekly retail price of California gasoline has increased by 274.2%, from $1.264 a gallon to $4.73, on a non-inflation-adjusted basis. Adjusting for general and California specific inflation, the 1994 price would be $3.051 today. For the 2000 to 2022 period, the average price for gasoline in the Golden State increased by 174%. From 2/23/2015 to 3/02/2015, the average retail price of California reformulated gasoline jumped 15.5%, from $2.959 a gallon to $3.418 a gallon. For the period from July 6, 2015, to March 10, 2025, the average weekly retail price of reformulated gasoline in the Golden State increased by 38.3%, from $3.432 a gallon to $4.73. For the 1995 to 2025 period, the California weekly retail gasoline prices, as compared to the overall U.S. average weekly gasoline prices, indicate a .9786 correlation and, understandably, a .998 correlation with West Coast PADD 5 retail prices. For the 1994 to 2025 period, the weekly percentage change in California gasoline prices as compared to the overall U.S. average weekly percentage in retail gasoline prices indicates a .845 correlation. For the 1/2/24 to 1/20/25 period, the correlation between the average price for gasoline in California as compared to the average price for the U.S. indicates .9004. For the 1/2/95 to 1/20/25 period, the correlation between U.S. average weekly prices for reformulated gasoline and CA reformulated grades average weekly prices indicated .9768. With some exceptions, as described in Section 6.0, California gasoline prices, although significantly higher than the U.S., move consistently with the overall U.S. and do profile any significant long-term anomalies.

Price Gouging: There is no economic evidence of widespread price gouging, price manipulation, undefined price residuals, surcharges, or profiteering by California refiners. For the 1/2/95 to 1/20/25, California's average weekly retail reformulated gasoline prices indicate a .866 correlation with overall oil spot market prices. Investigations dating back to 2000 by the California State Attorney General have failed to prove price gouging by California refiners. Practical and academic studies were performed by the Federal Trade Commission and the Federal Reserve Bank of Dallas, and this researcher failed to discover or prove price gouging and excessive profiteering by California refiners. In fact, both the State's own California Energy Commission (CEC) and the California Attorney General have, at various times, concluded that California's chronically high retail gasoline prices are a function of the high operating costs in California, tight in-state supply due to diminishing refineries and lower gasoline stocks, the lack of secondary supplies and sources, lack of in-bound pipelines, and the high tax and regulatory cost environment imposed on oil producers, refiners, and gas station operators. The Federal Reserve of Dallas concluded that California gasoline prices are a function of "market factors" and there is no evidence as a result of this research to suggest otherwise.

California Gasoline Consumption: For the 2001 to 2024e CY period, overall CDTFA reported gasoline sales have fallen 11.12 %. California is the 2nd largest consumer of petroleum and the largest consumer of aviation fuel in the U.S. In 2023, Californians consumed 13.119 billion gallons of gasoline and over 216 million gallons of aviation fuel, based on CDTFA revenue data. The decline in gasoline consumption can be attributed to a number of factors, including the increase in EV registrations, improved miles per gallon associated with internal combustion engines, COVID-19 restrictions of 2020 and 2021, and the decline in California's population. The annual percentage change in CDTFA gasoline sales is relatively consistent, shows a minimal annual variance of -.46%, and is highly correlated to the annual percentage change in overall U.S. gasoline consumption.

California Oil Production: Once a global leader and ranking fourth in the world in oil production, California today accounts for only around 2.7% to 3.1% of all U.S. crude production and is producing only 23.7% of its own in-state needs. For the 1982 to 2023 period, in-state oil production fell by 69% from its peak in 1985 (398,280 b/d) to a historic low in 2023 of 123,947 barrels a day. Meanwhile, as refinery production fell, California's population and number of vehicle registrations increased.

California Refineries: Since 1984, the number of oil refineries in California has decreased by nearly 70%, from 43 to 13 operable refineries. From 1984 to the present, California's oil refining capacity has decreased by 36%, from 2.5 million barrels a day to 1.7 million a day. Since 2023, the daily refining capacity for California's surviving refineries has declined 5.16%, from 1,710,371 barrels a day to 1,622,171 barrels a day. From 2023 to the end of 2025, refinery production is estimated to decline by another 8.57% to 1,483,177 barrels a day when the Phillips refinery closes down, as announced. The reduction in supply (production), which is more rapid than the decrease in consumption (demand), will result in higher gasoline prices for the California consumer. To compensate for the reduction in refinery production of California compliant gasoline, importers will have to source gasoline from alternative sources. Alternative sources for gasoline are located out of the Golden State, necessitating importers to transport it from distant suppliers. If the sources are from Gulf Coast refineries, the transit time is around 11 days. California consumers will experience higher prices at the pump as a result of out of state sources and transportation costs and may face shortages due to shipping times and the lack of out of state refineries that produce or are willing to produce California compliant gasoline (CARBOB).

California Revenues from Gasoline Sales: Gasoline sales, which drive stare excise tax revenues, as well as numerous other revenue streams, such as Cap and Trade, which, by statute, funds the California High Speed Rail Project, are estimated to range between $9.1 to $10.0 billion for 2024. For the 2000 to 2025 period, revenues from gasoline sales increased by 129%. As California pursues the transition to 2035 objectives of eliminating the sale of internal combustion vehicles, it is unclear how the State intends to replace the lost revenues attributed to gasoline sales. However, the State's own Legislative Analyst's Office (LAO) indicates that additional or increased taxes and fees are a viable means.

Consumer Preferences: On average, for the 2013 to 2023 period, the retail price differential between California branded and unbranded gasoline averages $0.284 per gallon. Californians have a distinct preference for branded gasolines. Overall, California sells more branded gasoline as a percentage of all gasoline sold than the rest of the U.S. Perhaps as a consequence of having the highest concentration of luxury and high-performance vehicles, such as Porsche, Ferrari, Bentley, Lamborghini, Mercedes Benz, and BMW in the U.S., as well as home to the third highest number of Corvettes and classic "muscle" cars in the nation, Californians, on average, consume more premium grade branded fuels, than the rest of the U.S. Premium and high octane fuels are more expensive to produce and command higher prices. Branded gasoline adds between $0.5 to $0.10 per gallon at the wholesale level. The percentage difference between California's regular and premium gasoline and the national average is 26%. Branded premium fuels command higher retail pump prices. High income individuals and owners of high-performance, classic muscle cars and high-end luxury vehicles are inelastic with respect to gasoline prices. Owners of high-performance and luxury automobiles are highly inelastic with respect to gasoline prices and will not change fuels out of concern for performance and engine damage.

California Special Blend (CARBOB): California's CARBOB adds $0.12 to $0.17 a gallon to gasoline and is a direct addition to the consumer price of gasoline in California. The CARB requires a special gasoline blend (CARBOB) to be sold in California as part of its clean air and environmental objectives. Consequently, California gasoline is unique in its formulation and composition, which differs from the rest of the U.S. Since CARBOB is specific only to California, the California special blend gasoline is significantly more costly to produce, thus resulting in higher consumer prices at the pump. For the 2000 to 2022 period, California's GHG efforts have reduced passenger vehicle CO2 emissions by 16%, from approximately 124 million metric tons to around 105 million metric tons. CARB's intended change in the special blend for 2025 may add another $0.23 to $0.67 a gallon ($0.47 based on CARB estimates), by December 2025 and will be a direct addition to the consumer price of gasoline in California.

Seasonal Gasoline Blend: Seasonal blends add $0.13 to $0.15 to the price of a gallon of gasoline and are a direct addition to the consumer price of gasoline in California. Both the EPA and CARB require seasonal blends. The seasonal blends are intended to reduce emissions from internal combustion vehicles.

California Refinery Operating Costs: California's higher operating costs are reflected in higher consumer prices. According to the California Joint Agency Report dated May 2024, refinery operating costs in California are, on average, 128% higher (non-weighted) in the Golden State than the overall U.S. average. Likewise, California's general business operating costs incurred by businesses such as refiners, wholesalers, shippers, and gas station operators are, on average, 38% higher in California. Higher operating costs are reflected in consumer prices at the pump.

Refiner Margins and Profits: Profits and margins in the oil and gas industry are highly volatile. The CEC estimated that refinery gross profits ranged between $1.00 and $2.31 a gallon for the 2002 to 2022 period. The gross margins for three California refiners, as reported by the CEC for a 23-month period, fell by 87%, from a high of $1.64 a gallon in September 2023 to a low of $0.22 a gallon in January 2024. For all three refineries, the average gross profit per gallon was $0.84. However, gross margins are just a partial representation of refinery profitability. A more complete measure is net profit margin since net profits generate free cash flows after all costs are considered. For the 2023 to 2024 period, California refiners averaged around $0.09 a gallon in net profits. CSI Market ranks oil refineries 93rd in net profitability, 103rd in gross profits, 88th for return on assets, and 91st for return on equity. Based on CSI Market data, the gross profit margin for oil refineries averaged 4.256% and .338% for net margins for five quarters from Q4-2023 to Q4-2024. An NYU Stern study found that across all industries, the gross profit and net profit margins were 36.56% and 8.54%, respectively. As California continues to push renewable diesel fuels, refiner profitability may fall.

Revenues and profits fluctuate wildly from period to period. When the cost of crude oil is high, refinery margins improve, and profits increase. When the cost of crude oil falls, so do revenues and profits. When demand is high, profits are high. When demand is low, profits fall.

Heavy Oil: Oil refineries are highly sophisticated and are classified and rated on a standard scale known as The Nelson Complexity Index (NCI), and California has some of the most sophisticated and high NCI rated refineries. Due to the sophistication of California refineries, high NCI, and use of heavy crude oils, California's operating and profit margins are higher. Heavy oil refineries with high NCI ratings and operating at higher capacity utilization rates, such as those in California, tend to generate higher margins and crack spreads due to operation efficiencies and the diversity of products produced.

Pipelines: California has an extensive network of pipelines within the state. However, California's gasoline dilemma is further exasperated by the absence of any inbound pipelines from other states for oil or gasoline. As a result, California is isolated and has become increasingly dependent on foreign oil imported mostly by large maritime tankers and, to a lesser extent, rail and truck transports. Consequently, 98% of all foreign sourced inbound crude oil is supplied to California via maritime vessels. The lack of inbound pipelines from other states isolates California from U.S. and Canadian sources and places the State in a vulnerable position with respect to oil and gasoline supplies.

Dependency on Imports: No state in the U.S. imports more dependent on foreign sourced oil than California. While U.S. dependency on foreign oil has declined, California's dependency has increased…substantially. Consequently, California is vulnerable to price changes and supply interruptions associated with the geopolitical environment. Since 1982, California's dependency on non-U.S. oil has increased 857%. In 1982, California produced 61% of its oil needs, imported 33% from Alaska, and imported only 5.6% from foreign sources. By 2023, and based on CEC data, the composition of California in-state oil stocks reversed to 23.4% in-state sourced, Alaskan oil imports declined to 16%, and foreign sourced imports from petrostates such as Iraq and Saudi Arabia surged to 60.7%. However, in 2024, California changed its mix of non-U.S. foreign imports. Iraq, which provided 68,406 barrels of oil composed 21.26% of its non-U.S. oil imports. Brazilian oil imports increased to 20.41%, and as production scaled in Guyana, imports from that South American country increased exports to California to 50,840 barrels or 15.80% of total 321,831 barrels of non-U.S. imported oil. According to various estimates, California ranks #1 in payments to foreign sources of oil and pays more than $61.8 million per day, or $22.5 billion annually, based on Brent market prices, or $54.41 million a day, or $19.8 billion annually, based on WTI market prices, to foreign countries such as Iraq, UAE, and Saudi Arabia and others for its oil imports.

Exhibit ES 2.0

SUMMARY OF CORRELATIONS		
Summary of Selected Correlations		
Correlation Factors	**Correlation**	**Period**
Avg. CA Weekly Retail Prices to Avg. West Coast Retail Prices	0.9998	1/2/95-1/20/25
CA. Consumer Price Index to U.S. Consumer Price Index	0.9980	1984 to 2024
CA. Crude Oil Prices to U.S. Crude Oil Prices (First Purchase)	0.9904	5/2000 - 5-2022
Avg. West Coast Weekly Prices to Avg. Weekly U.S. Prices	0.9812	1/2/95-1/20/25
U.S. Avg. RF Gasoline to W.C. Avg. RF Gasoline	0.9811	1/2/95-1/20/25
Avg. CA Weekly Retail Prices to Avg. U.S. Weekly Retail Prices	0.9786	1/2/95-1/20/25
U.S. Avg. RF Gasoline to CA Avg. RF Gasoline	0.9768	1/2/95-1/20/25
CA. Avg. RF Gasoline to W.C. Avg, .RF Gasoline	0.9768	1/2/95-1/20/25
Oil Spot Prices to U.S. Avg. Retail RF Gasoline	0.9539	1/2/95-1/20/25
% Change CA Crude Prices to % Change U.S. Crude Prices	0.9190	5/200 - 5-2022
Avg. U.S. Retail Price to Avg. CA Retail Price	0.9004	1/2/24 -1/20/25
Percentage Change CA. CPI to U.S. CPI	0.8940	1984 to 2024
Oil Spot Prices to W.C. Avg. Retail RF Gasoline	0.8750	1/2/95-1/20/25
% Change CA Retail Prices to % Change CA Wholesale Prices	0.8680	5/2000 - 5-2022
Oil Spot Prices to CA. Avg. Retail RF Gasoline	0.8660	1/2/95-1/20/25
Weekly Percentage Change in CA Avg. Gasoline Prices to U.S. Weekly Percentage Change	0.8450	1994 to 2025
% Change CA Wholesale Prices to % Change U.S. Crude Prices	0.6860	5/2000 - 5-2022
Net CETA Gasoline Sales Volume to EIA Refiner Sales to Retailers	0.6338	Annual

SECTION 1.0
UNDERSTANDING GLOBAL & U.S. PETROLEUM

A STUDY OF CALIFORNIA GASOLINE PRICES
Section 1.0
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1.0 UNDERSTANDING GLOBAL & U.S. PETROLEUM

1.1 Introduction

From primitive cooking and lighting to the manufacturing of cellular telephones, agricultural production, medical and pharmaceutical products, and alternative energy production, petroleum is essential to any economy and modern society. Although oil is universally known as a source of energy, petroleum is used in the manufacturing of fibers, such as polyester and nylon, certain types of medical devices, the screens that are used in monitors, televisions, cell phones, computers, cement, asphalt, wind turbines, steel, herbicides, and fertilizers.[18] Petroleum, in the form of gasoline, diesel, and aviation fuels, is essential to transportation and the movement of products. According to the U.N., in 2023, a total of 12.3 billion tons of cargo was transported using maritime vessels, which represents around 80% of all global trade.[19] [20] Maritime tankers burn diesel fuels for propulsion.

Oil is essential to any modern economy. Globally, for 2023, around 101.81 million barrels of oil were produced per day.[21] For 2024, world production is expected to increase by 1.2% to 103 million barrels a day.[22] According to the IEA, the energy sector, including the oil and gas industry, employs 65 million people worldwide (2019 est.), or about 2% of all global employment.[23] Oil represents the largest employment sector, with 8 million or 12% of total employment in the industry.[24] The five largest concentrations of energy workers are in China, followed by Asia Pacific nations, India, North America, and Europe.[25] On a comparative basis, the energy sector has more highly skilled labor as a percentage of its labor force, 45%, than the overall average of all industries, which is 25% for highly skilled labor.[26]

The U.S. leads the world in petroleum production, of which 75% is concentrated in ten nations. As indicated in the chart below, based on EIA data, the U.S. also leads in the consumption of petroleum, with The People's Republic of China a close second.

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Exhibit 1.1

2022/23- GLOBAL PRODUCTION & CONSUMPTION- TOP 10 NATIONS					
WORLD PRODUCTION- 2023			**WORLD CONSUMPTION- 2022**		
Nation	**Million of Barrels per day**	**Percent of World Total**	**Nation**	**Million of Barrels per day**	**Percent of World Total**
United States	21.91	22%	United States	20.01	20%
Saudi Arabia	11.13	11%	China	15.15	15%
Russia	10.75	11%	India	5.05	5%
Canada	5.76	6%	Russia	3.68	4%
China	5.76	6%	Saudi Arabia	3.65	4%
Iraq	4.42	4%	Japan	3.38	3%
Brazil	4.28	4%	Brazil	3.03	3%
United Arab Emirates	4.16	4%	South Korea	2.55	3%
Iran	3.99	4%	Canada	2.41	2%
Kuwait	2.91	3%	Germany	2.18	2%
Total Top 10	74.59	73%	Total Top 10	61.08	61%
World Total-Production	**101.81**		**World Total-Consumption**	**99.95**	

(Source: EIA. https://www.eia.gov/tools/faqs/faq.php?id=709&t=6)

The U.S. oil and gas industry is a large, integral, and critical part of the U.S. economy and is vital to national and economic security. At $1.7 trillion, the oil and gas industry comprises around 8% of the U.S. GDP and employs around 11.3 million people, representing 5.6% of total U.S. employment.[27] An additional 3.4 million jobs are associated with oil and gas affiliated industries and businesses.[28] In the U.S., the oil and gas industry pays, on average, around 85% higher than the national average annually.[29] On average, the oil and gas industry accounts for around 16% of total capital expenditures annually in the U.S.[30] In contrast, the transportation and healthcare sectors account for 5.3% and 6.3% of capital expenditures, respectively.[31] In the U.S., the EIA estimates that Americans spent around $1.0 trillion on energy, of which $503 million was related to gasoline, jet fuel, and diesel fuels in 2020, which collectively accounts for 4.8% of the U.S. GDP.[32]

Illustrated in the exhibit below is the percentage change in U.S. oil field production as compared to the percentage change in U.S. GDP.

[27] https://www.api.org/-/media/Files/Policy/Taxes/DM2018-086_API_Fair_Share_OnePager_FIN3.pdf. See also, *New analysis: American-Made natural gas and oil drives U.S. economic recovery, Strengthens all industries*. (2021b, July 20). https://www.api.org/news-policy-and-issues/news/2021/07/20/2021-pwc-analysis

[28] *New analysis: American-Made natural gas and oil drives U.S. economic recovery, Strengthens all industries*. (2021, July 20). https://www.api.org/news-policy-and-issues/news/2021/07/20/2021-pwc-analysis

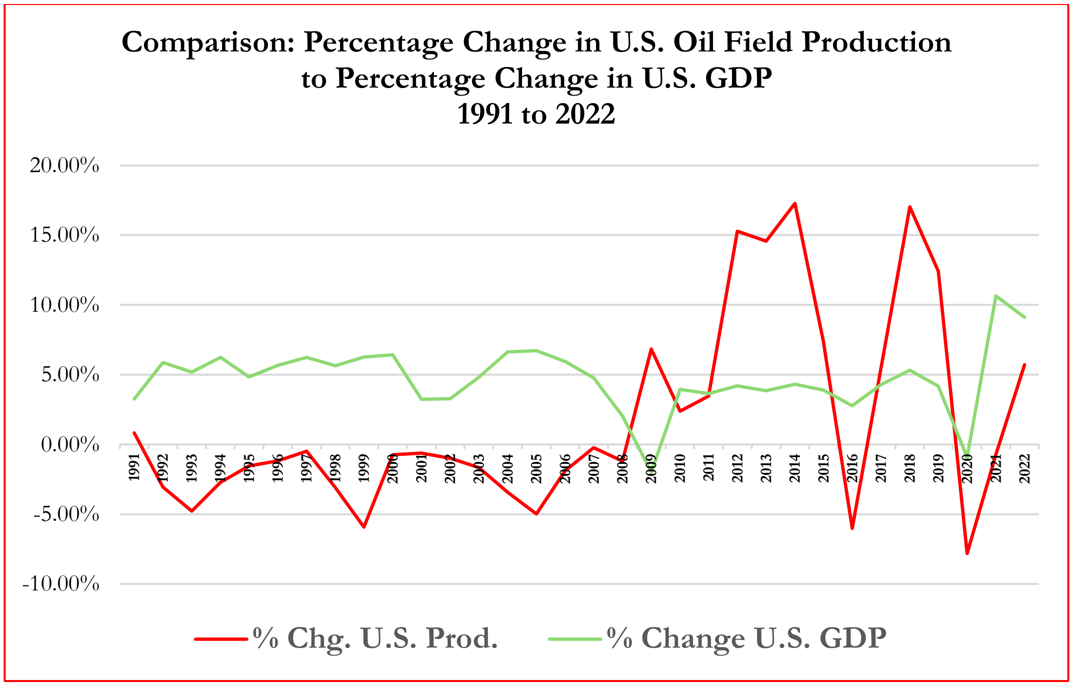
[29] American Petroleum Institute. (2019). *Oil & Natural Gas Contribution to U.S. Economy Fact Sheet*. Api.org. https://www.api.org/news-policy-and-issues/taxes/oil-and-natural-gas-contribution-to-us-economy-fact-sheet

[30] American Petroleum Institute. (2019). *Oil & Natural Gas Contribution to U.S. Economy Fact Sheet*. Api.org. https://www.api.org/news-policy-and-issues/taxes/oil-and-natural-gas-contribution-to-us-economy-fact-sheet

[31] American Petroleum Institute. (2019). *Oil & Natural Gas Contribution to U.S. Economy Fact Sheet*. Api.org. https://www.api.org/news-policy-and-issues/taxes/oil-and-natural-gas-contribution-to-us-economy-fact-sheet

[32] *2020 inflation-adjusted U.S. energy expenditures lowest since 2002*. (n.d.). Www.eia.gov. https://www.eia.gov/todayinenergy/detail.php?id=53620

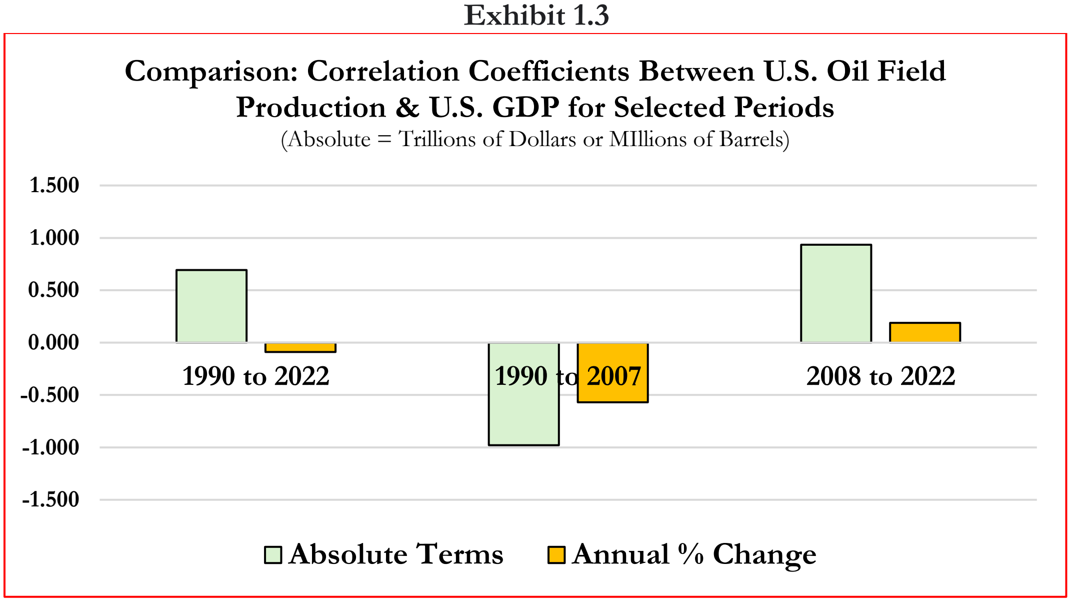
Exhibit 1.2



(Source: EIA and Federal Reserve)

On a percentage change basis, the correlation between U.S. oil field production and U.S. GDP is a negative .09, largely due to the significant variances that occurred for the 2009 to 2023 period and as imports of oil fell. For the 1990 to 2022 period, in terms of absolute U.S. oil field production, as measured in millions of barrels a day, compared to real GDP, the correlation is .69.

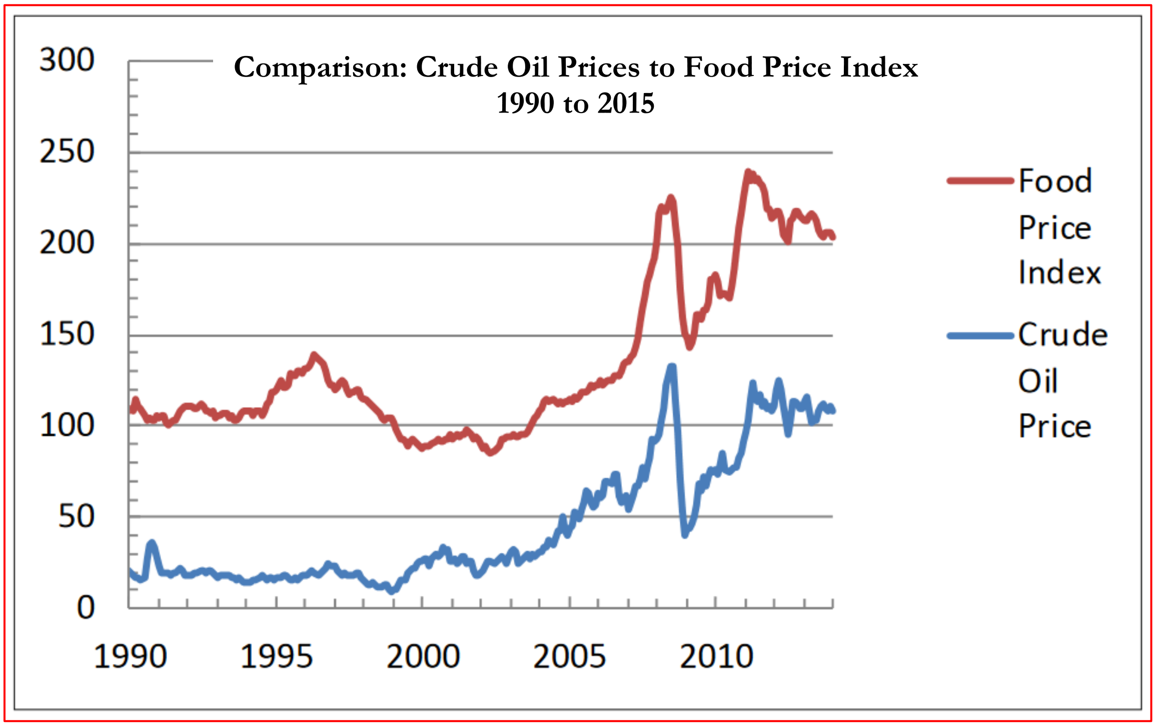
Exhibit 1.3



(Source: EIA and Federal Reserve)

Petroleum is a key component in agricultural production and, of course, is necessary to move food stocks from farm to processor, to distributor, to the retail store. Consequently, as was indicated during the inflationary period of 2021 to 2024, when general inflation outpaced real wages and peaked at 9.1%, and crude oil prices increase and subsequently stimulate increases in retail gasoline and diesel fuel prices, food prices for consumers go up.

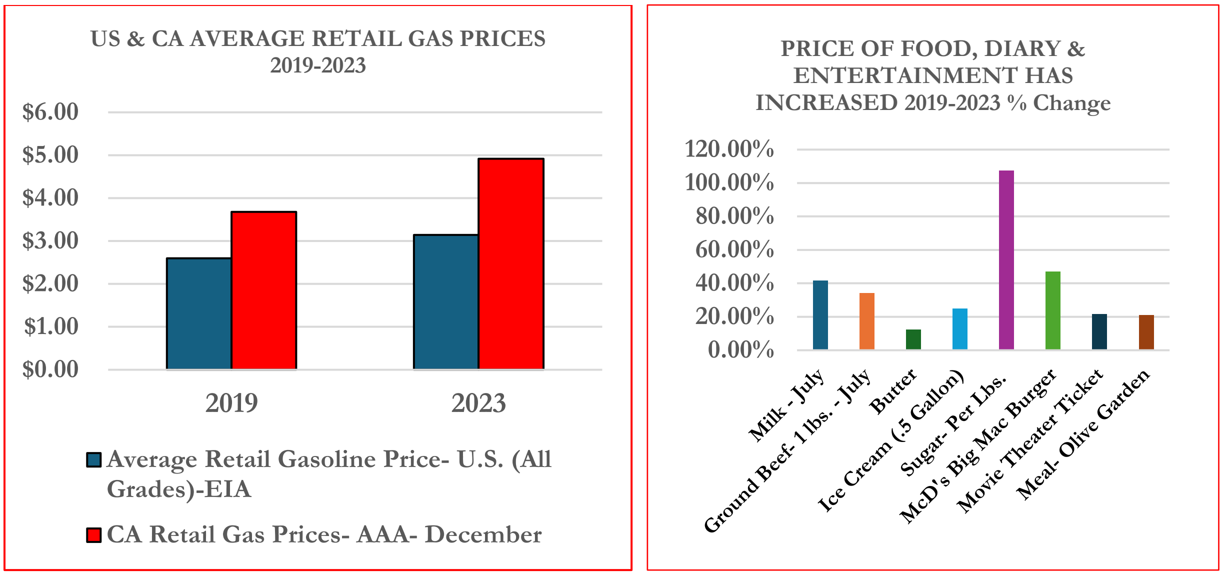
Exhibit 1.4



(Source: https://extension.psu.edu/fuel-ethanol-hero-or-villain#:~:text=Gasoline%20is%20not%20water%20soluble,performance%20if%20not%20dealt%20with)

Petroleum products, such as gasoline and diesel fuels, are significant components in the determination of the cost of food production and retail grocery prices. As indicated in the exhibit below, as gasoline prices increased, the cost of staples such as milk, ground beef, and sugar also increased.

Exhibit 1.5



(Source: Mische & Keyes, Bidenomics: Facts, Figures & Everything Americans Should Know. 2024)

Petroleum is derived from crude oil. Crude oil, or simply 'crude,' is a fossil fuel and the product of millions of years of geological activity and organic decay. Oil deposits are found in the ground, either onshore or offshore, at the bottom of an ocean, lake, or river. To locate deposits, oil producers expend considerable effort and funds to explore and "discover" petroleum deposits, which are reservoirs, pockets or patches of oil, or oil fields.

Once located, the oil must be extracted, usually via drilling.[33] The extracted oil is then refined into various products, such as gasoline, diesel fuel, aviation fuels, heating oils, and other derivatives. As described by the State of Louisiana Department of Natural Resources, gasoline is a product of oil refinement, which involves the breaking down and conversion of various liquid hydrocarbons into different products.[34] Significant economic and utilitarian value is created from crude oil through a long stream of refinement and embellishment activities. For example, both gasoline and aviation (jet) fuel are derived from petroleum, that is, crude oil that has been refined using sophisticated methods to produce a specific product to a specific standard.

There are multiple types of crude that define its quality, and no two barrels of oil are exactly identical. Petroleum is characterized by its origin and its API rating.[35] Some crude oils are "sour and heavy to extra heavy," making them more costly to produce and refine into end products. In contrast, other crudes are "sweet and light/lite," which are less expensive to refine. The quality of the crude oil is an important factor in the grade and type of gasoline produced, as well as the associated refining costs and price that is charged at the gas station. Crude oil quality is rated by various agencies using several

[33] *Petroleum*. (n.d.). https://education.nationalgeographic.org/resource/petroleum
[34] *Department of Energy and Natural Resources | State of Louisiana*. (n.d.). http://www.dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=244
[35] API Definition: According to the American Petroleum Institute, the API rating is "An arbitrary scale expressing the gravity or density of liquid petroleum products." The higher the API gravity (rating), the lighter the oil. In general, light oil crude has an API rating of 38 degrees or more. Intermediate or medium grade oil has an API gravity rating of 22 to 38 degrees. Crude oil with API ratings of 38 and above are considered heavy and extra heavy. The characterization of oil crude as "sweet" or "sour" is related to its sulfur content. See, *Table Definitions, Sources, and Explanatory Notes*. (n.d.). Www.eia.gov. https://www.eia.gov/dnav/pet/TblDefs/pet_pnp_crq_tbldef2.asp

different scales. The predominant method for assigning a quality rating to crude oil is "gravity" (viscosity) as defined, measured, and rated using the standard established by the American Petroleum Institute (API).[36] According to McKinsey, "API gravity is a commonly used index of the density of crude oil or refined products."[37] Crude oil will typically rate between 15 to 45 on the API scale. Crude oils that rate 35-45 on the API scale are called "light crude" and are considered the highest quality and yield the highest value products from refining. Crude oils rated at 15 or lower are called "extra-heavy" and typically require more refining processes, cost more to refine, and yield lower outputs and quality used for proposes other than gasoline, diesel, and jet fuels. Crude oils with high sulfur content are generally referred to as "sour," while those with lower sulfur content are characterized as "sweet." Hence, in discussing oil, the term "Light sweet crude" would be used to describe an oil that has a high API rating and low sulfur content. The quality and origin of oil also influence the amounts of greenhouse emissions, as do extraction processes, transportation and distribution methods, and refining efficiencies associated with the oil and the production of end products, such as gasoline.

A combination of factors — including geology, location, chemistry, and climate — makes each type of oil unique, possessing specific properties that can be refined for intended uses. For example, oil found in Texas can and will be different than oil in California. Even oil derived from Texas will have unique and specific differences. West Texas oil has a different chemistry from East Texas oil. Oil found in Alaska's North Slope has a chemical profile different from that found off the Gulf Coast of the U.S. The varying chemical profiles of oil, along with its intended end use as a product, require different refining methods and different costs. Some oils are more expensive to extract, transport, and refine than others. Some oils with additives and diluents are used as feedstocks in the production of other petroleum products. Gasoline, for example, may use a blending of different oils and additives in the refinement process to comply with emissions standards and achieve desired end-market performance profiles.

1.2 U.S. & World Petroleum Reserves

Globally, the amount of oil in the world fluctuates based on three predominant factors: (1) consumption (demand), (2) production from existing proven sources, and (3) the discovery of new oil sources (reserves). For example, in 1960, crude oil reserves were estimated to be around 291 billion barrels.[38] In 2023, world crude reserves were estimated to range between 1.5 to 1.73 trillion barrels of oil.[39] [40] [41] Reserve oil is petroleum that has been discovered and properly approximated (proven) but has not yet been harvested (produced). The majority of proven reserves, around 79%, are located in OPEC member countries.[42] Of the OPEC members, Venezuela has the largest reserves and the largest reserves in the world. Current estimates place Venezuela's proven oil reserves at around 304 billion barrels, which represents close to 18% of the world's total proven petroleum reserves, ranking Venezuela #1 globally in proven oil reserves. [43] [44]

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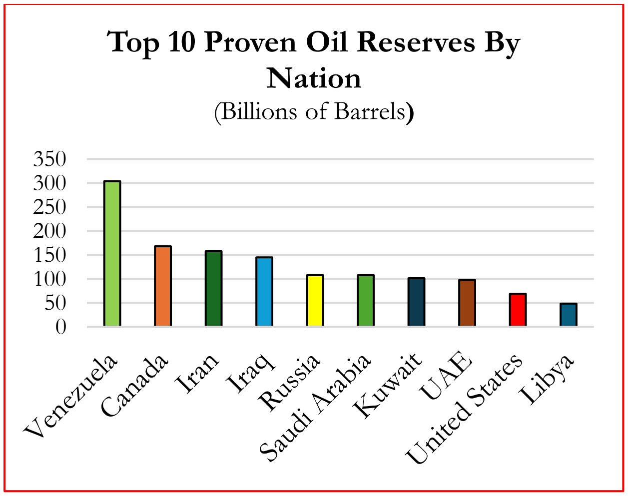
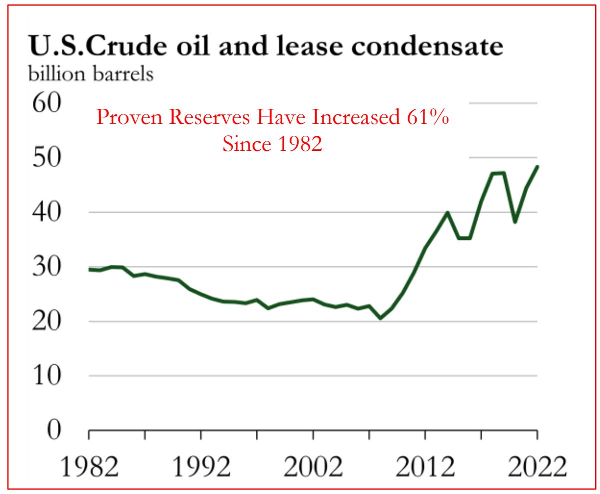
[36] *Oil categories*. (n.d.). https://www.api.org/products-and-services/engine-oil/eolcs-categories-and-classifications/oil-categories
[37] *API gravity*. (n.d.). Www.mckinseyenergyinsights.com. https://www.mckinseyenergyinsights.com/resources/refinery-reference-desk/api-gravity/
[38] Statista. (2024, July 23). *Global crude oil reserves 1960-2023*. https://www.statista.com/statistics/236657/global-crude-oil-reserves-since-1990/
[39] Ibid.
[40] Chen, J. (2024, July 25). *Oil reserves*. Investopedia. https://www.investopedia.com/terms/o/oil reserves.asp#:~:text=Oil%20reserves%20are%20an%20estimate,oil%20reserves%20in%20the%20world.
[41] *World Oil Statistics - Worldometer*. (n.d.). https://www.worldometers.info/oil/
[42] OPEC. (2024). *OPEC : OPEC Share of World Crude Oil Reserves*. Opec.org; Organization of the Petroleum Exporting Countries. https://www.opec.org/opec_web/en/data_graphs/330.htm
[43] *International - U.S. Energy Information Administration (EIA)*. (2020, November 30). https://www.eia.gov/international/analysis/country/VEN
[44] *Data download*. (n.d.). Asb.opec.org. https://asb.opec.org/data/ASB_Data.php

For 2022, the EIA reports that the U.S. has proven reserves of at least 48.3 billion barrels of oil.[45] Comparatively, the U.S. has the 9th largest proven oil reserves in the world. However, U.S. technologies and the opening of previously closed areas could significantly increase U.S.-proven reserves. Based on current and planned consumption rates and EIA current estimates, the U.S. has about 290 years of proven and technically recoverable oil reserves.[46] The exhibit below provides an illustration of U.S. oil reserves and the top ten proven reserves by nation.

Exhibit 1.6





(Sources: https://wisevoter.com/country-rankings/oil-reserves-by-country; https://asb.opec.org/data/ASB_Data.php; https://www.eia.gov/naturalgas/crudeoilreserves/#:~:text=U.S.%20crude%20oil%20and%20lease,end%202022%20(Table%201)

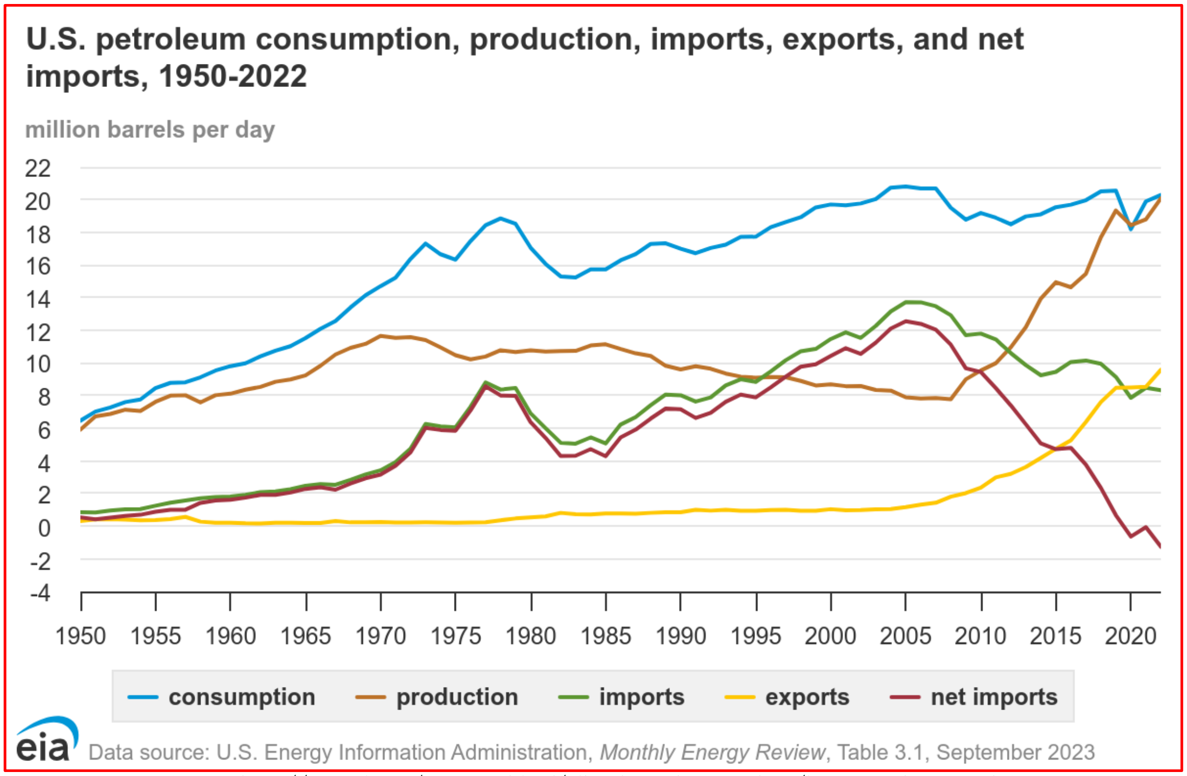
When shale sources are factored in, the U.S. has considerably larger reserves than most other countries and is considered to have the largest proven reserves in the world. On a comparative basis, the U.S. currently ranks 9th in the world in proven oil reserves.[47] As of July 5, 2022, the U.S. has an estimated 264 billion barrels in total recoverable, as well as potential oil reserves (unproven), according to Norway's Rystad Energy.[48]

In response to demand and the growth of the U.S. economy, U.S. production of oil has increased significantly. The increase in oil production can be attributed to many factors, among the most prominent being new oil deposit discoveries, new discovery and production technologies, innovation in refining processes, and the growing demand of both American businesses and consumers. For example, from 1915 to 2024, the number of registered motor vehicles (all vehicles) in the U.S. grew from around 2.5 million to 297 million or 11,780%.[49] [50] Concurrently, the estimated population of the

[45] U.S. Energy Information Administration. (2017). *U.S. Crude Oil, Natural Gas, and Natural Gas Proved Reserves, Year-end 2017*. Eia.gov. https://www.eia.gov/naturalgas/crudeoilreserves/
[46] Ier. (2022, June 22). *Global Oil and Gas proved reserves increase in 2021 - IER*. IER. https://www.instituteforenergyresearch.org/fossil-fuels/gas-and-oil/global-oil-and-gas-proved-reserves-increase-in-2021/
[47] *Oil Reserves by country 2024*. (n.d.). https://worldpopulationreview.com/country-rankings/oil-reserves-by-country
[48] Egan, M. (2016, July 5). *U.S. has more untapped oil than Saudi Arabia or Russia*. CNNMoney. https://money.cnn.com/2016/07/05/investing/us-untapped-oil/index.html
[49] Statista. (2024a, February 28). *U.S. motor vehicle registrations 1990-2022*. https://www.statista.com/statistics/183505/number-of-vehicles-in-the-united-states-since-1990/
[50] Hedges & Company. (2024, January 23). *US VIO vehicle registration statistics: How many cars in the US*. https://hedgescompany.com/automotive-market-research-statistics/auto-mailing-lists-and-marketing/

U.S. grew from 92.3 million in 1915 to over 345 million in 2024, or 273.8%.[51] [52] Correspondingly, to meet the demands of the market, industry, and consumers, oil production grew. Below is a chart comparing U.S. oil production to consumption, imports, and exports from 1950 to 2022.

Exhibit 1.7



(Source: https://www.eia.gov/energyexplained/oil-and-petroleum-products/imports-and-exports.php)

1.3 Product Yields & Composition

To better understand and unravel the pricing complexities and paradox of gasoline prices and practices, it's logical to begin with the most fundamental component: a barrel of crude oil. The standard measure for crude oil is a barrel, which contains 42 gallons or 159 liters. As a general rule and as an informal estimate, one gallon of oil produces between .47 to .67 gallons of refined gasoline, so one barrel of oil (42 gallons) yields 17-28 gallons of gasoline.

The yield rate of oil to refined gasoline varies depending on the quality of the oil crude stock used, number of refining processes required, the efficiency of refining operations, the intended end-product blends, and the seasons.[53] [54] The geological origin, source, type, and quality of crude oil significantly affect costs, yields, and the quality and price of resulting petroleum products. Certain oils, such as those that are classified as "heavy or extra-heavy, and sour," require more refining steps than oils that

[51] US Census Bureau. (2022, August 6). *Historical Population change data (1910-2020).* Census.gov. https://www.census.gov/data/tables/time-series/dec/popchange-data-text.html

[52] *United States population (2024) - Worldometer.* (n.d.). https://www.worldometers.info/world-population/us-population/#google_vignette

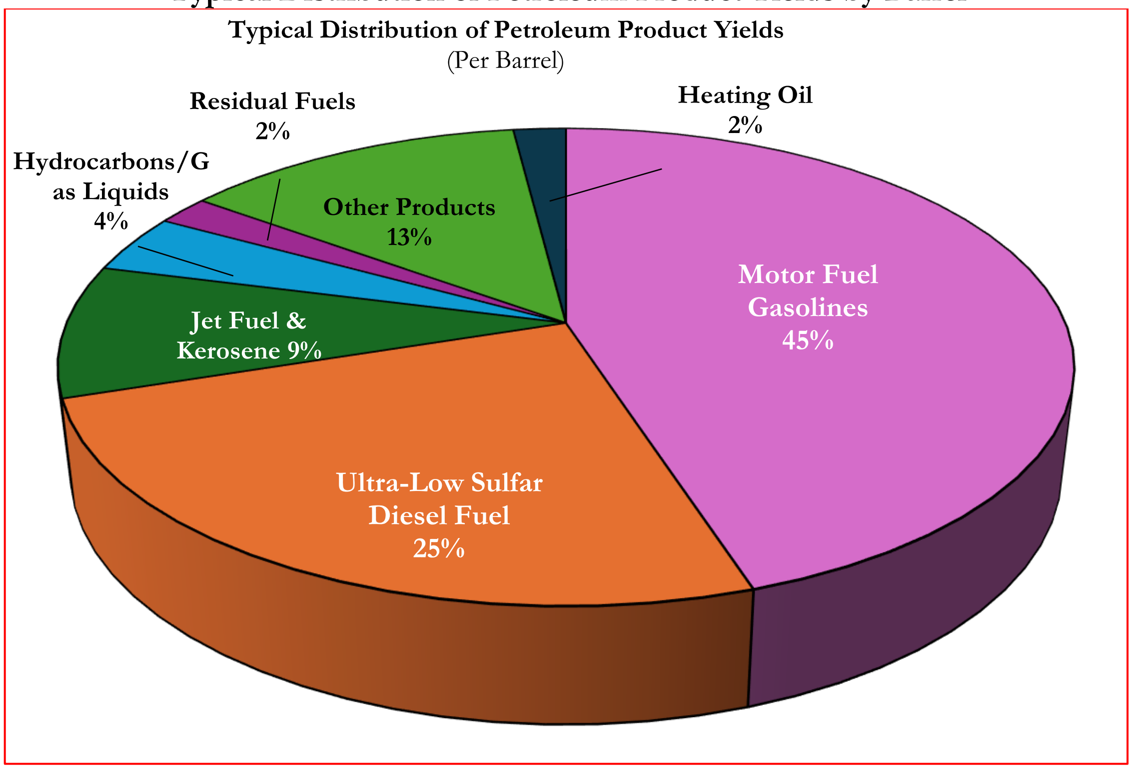
[53] Suermann, John. "Ask a Scientist." Newton. (Sept. 30, 2009) as cited in https://science.howstuffworks.com/environmental/energy/crude-oil-market.htm

[54] *How many gallons of gasoline and diesel fuel are made from one barrel of oil? - FAQ - U.S. Energy Information Administration (EIA).* (2016). Eia.gov. https://www.eia.gov/tools/faqs/faq.php?id=327&t=9

are characterized as "light, sweet." Additionally, certain types of gasolines, such as those required in California, require special refining processes and equipment, which add significantly to the cost of production, influence production yields, and are ultimately reflected in the retail pump prices paid by the public.[55]

Once oil is refined into products, the standard barrel of oil may yield far more economic value in final products than the original 42 gallons of crude oil. On average, a barrel of oil, once refined, will yield 45 gallons of total product or about 1.1 times the original volume.[56] Additionally, a single barrel of crude oil typically produces 138,095 Btu of energy.[57] Below is a chart of typical product yields from a single barrel of oil.

Exhibit 1.8
Typical Distribution of Petroleum Product Yields by Barrel



(Source: https://www.breakthroughfuel.com/blog/crude-oil-barrel/)

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[55] CDTFA_CEC joint report 2024 review of the gasoline in ... (n.d.-b). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf
[56] EIA, Petroleum Supply Monthly, April 2019
[57] *Facts about Oil.* (2020). Www3.Uwsp.edu. https://www3.uwsp.edu/cnr-ap/KEEP/Documents/Activities/Energy%20Fact%20Sheets/FactsAboutOil.pdf

1.4 Crude Oil & Gasoline Prices

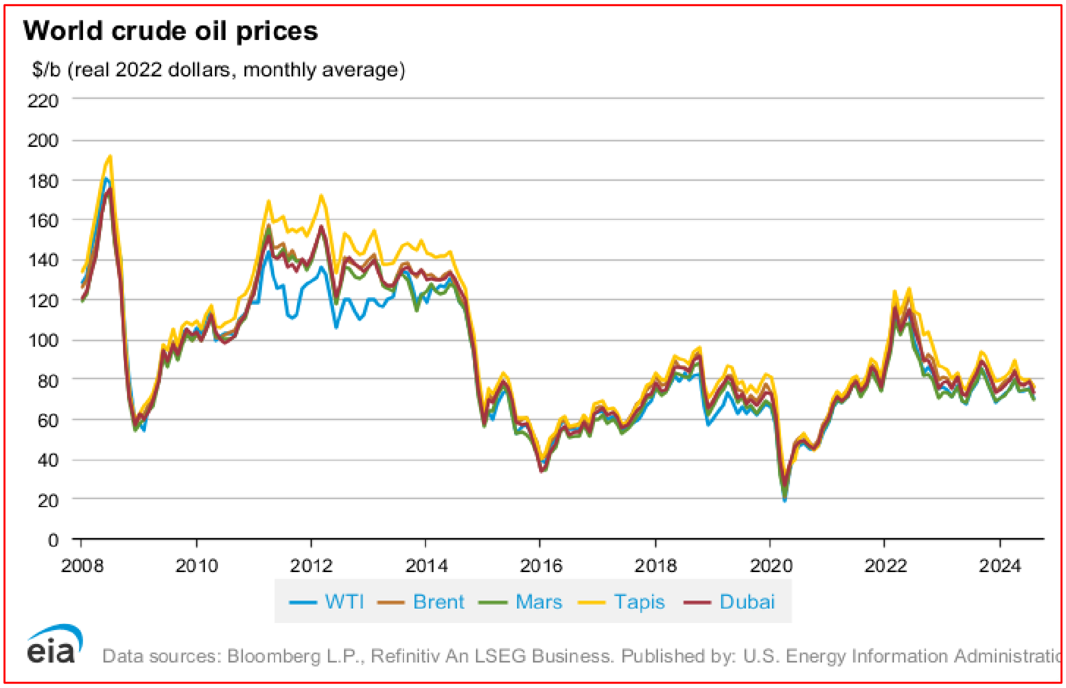
As a global commodity, crude oil prices are set and traded on various international markets. Oil and gasoline pricing are very complex and subject to wide variations from day to day, even by the hour to hour, and in some instances, by the minute. The price of crude oil is primarily driven by the basic economic laws of supply and demand. When demand is strong and supply is low, the price of oil and gasoline escalates. However, geopolitical, domestic, political, and regulatory actions conflate the basic market powers of supply and demand. Five factors influence the spot price of oil: **1-** supply, **2-** demand (consumption), **3-** geo-political events, **4-** national and local government policies and regulations, and **5-** trading/financial markets. As petroleum is a global commodity, its pricing is subject to extreme volatility. The retail price of oil and gasoline is also informed by a "build-up" of costs as the product moves through the supply chain from the well to the refinery and, finally, to the retail gasoline pump. Notably, any significant disturbance to any of these influencing factors will have an impact on the price of oil and, ultimately, the price of retail gasoline. The only issue is one of severity.

Crude oil prices, and, in turn, gasoline prices, are influenced by political policies, taxes, regulations, the origin of oil's political system (democracy vs. socialism vs. monarchy vs. dictatorship), regional conflicts, and wars (particularly in the Middle East). Oil is a global currency and a powerful economic asset (and weapon) for petrostates. Since 77% of the world's oil reserves are located in state-owned or state-controlled areas, the spot price for crude oil can be, and often is, heavily influenced and even manipulated by the state-owned producers, their governments, and cartels, such as OPEC. Prices are set for various types of crude oil grades and sources, such as WTI, Brent, Arab Light, etc., on global markets.

Oil is traded using long term contracts and spot pricing in multiple markets, with the New York Mercantile (NYMEX) and Intercontinental Exchange (ICE) being predominant. Gasoline is also traded on global markets and in California on spot markets in San Francisco and Los Angeles. The trading prices of various oil types and grades are highly correlated and generally move in the same direction with similar degrees in magnitude of movement. Future oil prices are speculative and can fluctuate wildly. For example, on April 20, 2020, the price of oil fell 306% from its May 2020 futures crude contract price to a negative price of $37.63 a barrel on the New York Mercantile Exchange.[58] Technically, this type of inversion between current and future prices meant that the seller would have to pay the buyer to purchase the seller's oil. Under those circumstances, producers have little incentive to produce more products. Illustrated on the chart below are the various crude oil prices for various grades for the 2008 to 2024 period. As indicated, prices tend to move in correlation with one another, which is not unusual for a commodity.

[58] Saefong, M. P. (2021, April 19). *Oil prices went negative a year ago: Here's what traders have learned since*. MarketWatch. https://www.marketwatch.com/story/oil-prices-went-negative-a-year-ago-heres-what-traders-have-learned-since-11618863839

Exhibit 1.9

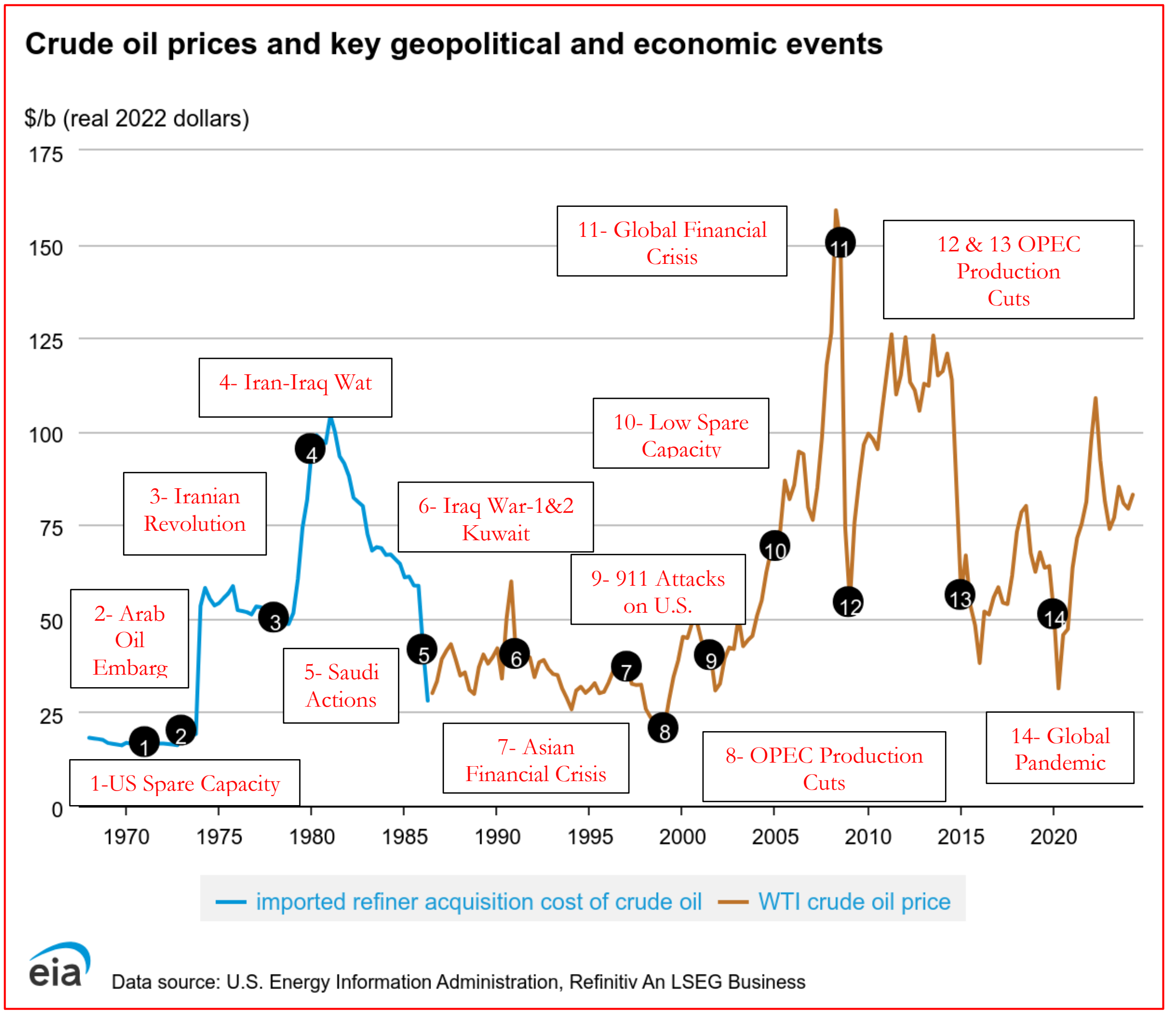


(Source:https://www.eia.gov/finance/markets/crudeoil/spot_prices.php#:~:text=Crude%20oil%20is%20traded%20in,that%20are%20lower%20in%20quality)

Notwithstanding the basic principles of economics and political events, there are many other factors that influence crude oil and gasoline prices. In California, earthquakes, fires, and flooding can cause disruptions in production and distribution (transportation). Furthermore, refinery shutdowns, transitions, and decommissions adversely affect supply and retail gasoline stocks. When those events occur, the spot prices for crude oil stock can spike and are ultimately reflected in higher prices for retail gasoline. Environmental factors such as weather and natural events (e.g., storms, hurricanes, freezes, flooding, earthquakes, etc.) also influence both crude oil and retail gasoline prices. The retail price of oil can also be further affected by other factors such as labor disputes and strikes involving rail and trucking, maritime terminal operational efficiencies, employment rates, truck and rail transport, government lockdowns, such as COVID-19, and other situations.

Illustrated below are oil price movements for the 1970 to 2023 period as related to major historical political and business events.

Exhibit 1.10



(Source: Author and https://www.eia.gov/finance/markets/crudeoil/spot_prices.php#:~:text=Crude%20oil%20is%20traded%20in,that%20are%20lower%20in%20quality)

In the 1970's, the U.S. experienced two episodic events or oil "shocks." The first occurred in 1973, and the second was in 1978. On October 6, 1973, the Fourth Arab-Israeli war broke out between Israel and a collation of Arab nations, including Saudi Arabia, Egypt, and Syria.[59] [60] The U.S., which had and continues to maintain formal defense alliances with Israel, supported Israel with a $2.8 billion (equivalent to $20.2 billion in 2024) defense aid package. In retaliation to the U.S. support of Israel, the Arab members of OPEC lowered oil production by 5% and initiated an oil embargo on the U.S. Overall, global oil supplies fell by 14%. Within days of the onset of hostilities, the reduction in production, and the embargo, petroleum prices surged by 71%, rising from $3.01 to $5.12 per barrel. The rapid and unexpected surge in prices dealt a severe, almost debilitating blow to the U.S. economy. Less than three months later, in December 1973, Arab member OPEC oil producers again cut

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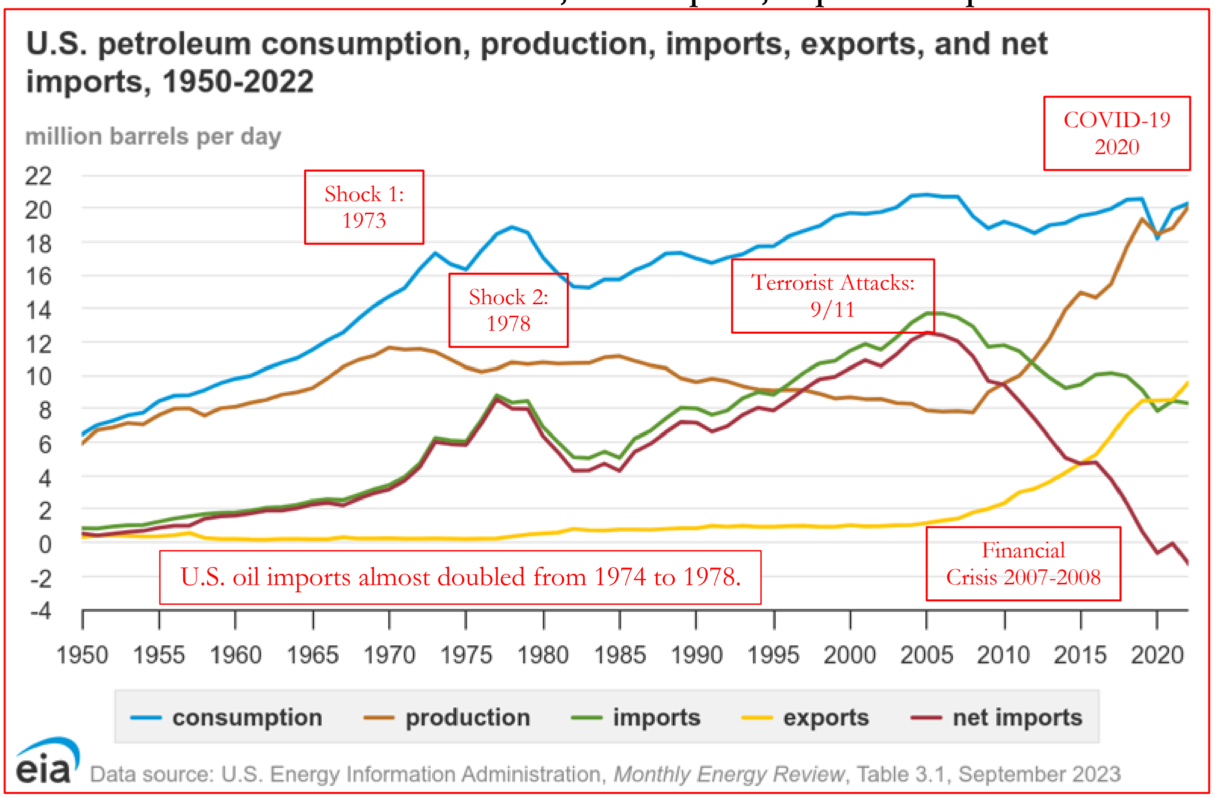
[59] The Editors of Encyclopedia Britannica. (2018). Yom Kippur War | Summary, Causes, Combatants, & Facts. In *Encyclopædia Britannica*. https://www.britannica.com/event/Yom-Kippur-War

[60] Also known as the Yom Kippur War, or Ramadan War.

production by 25% from its September levels. In reaction, the price to the U.S. for OPEC-sourced oil rocketed to $11.65 a barrel — an increase of 287% in about 90 days. What followed were gasoline shortages, price spikes, and high inflation. By March 1974, the oil embargo was formally ended by the Arab nations, but its influence on the U.S. economy lasted well into the 1980s. Recognizing its vulnerability to foreign sources and spot market prices, the U.S. Congress established the Strategic Petroleum Reserve (SPR) in December 1975.[61]

Exhibit 1.11
U.S. Oil Shocks: Production, Consumption, Exports & Imports



With surplus oil sources and stocks, the 1980s were characterized by a worldwide collapse in oil prices. Over a six-year period, from 1980 to 1986, crude oil prices fell by 50% from their 1979 peak highs. In one year, from August 1985 to August 1986, the price of crude dropped by 71% from $28 a barrel to $8 a barrel. Led by Saudi Arabia, OPEC members agreed to lower production to pre-determined levels in order to support prices. However, despite agreements, many OPEC members produced oil in amounts far exceeding their agreements. In particular, Saudi Arabia, recognizing that adhering to its agreement to lower production was contrary to its self-interests, unilaterally removed itself from the production quotas and increased its output from 2 million barrels a day to 5 million.[62] As a result of the various actions by OPEC members, in 1986, a glut of oil was flooding into the world markets,

[61] 42 U.S. Code § 6231and 42 U.S. Code § 6234
[62] *Oil & Energy Online :: Major Oil Market Crashes in History.* (n.d.). See also, *Oil & Energy Online :: Major Oil Market Crashes in History.* (n.d.). Oilandenergyonline.com. https://oilandenergyonline.com/articles/all/major-oil-market-crashes-history/

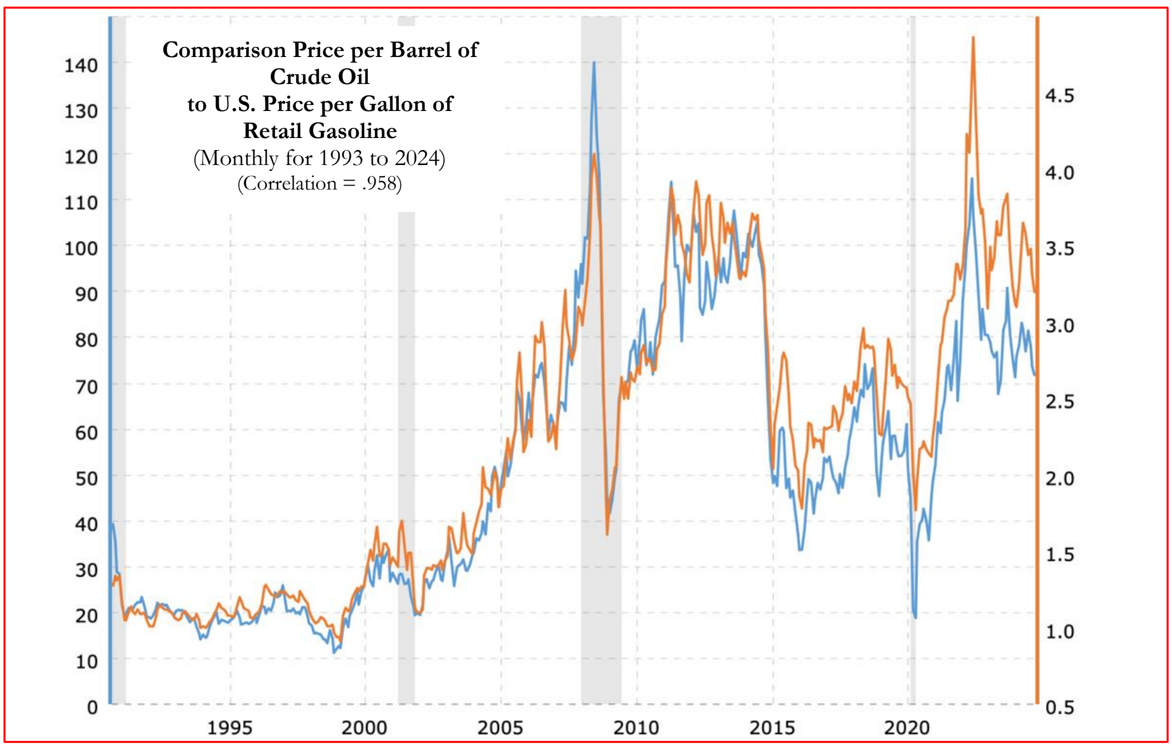
which contributed to the collapse of oil prices.[63] Throughout much of the decade, while oil supplies were increasing, demand was moderating, placing further downward pressures on oil prices.

1.5 Pricing Components: Crude Oil Prices & Gasoline

Crude oil prices drive gasoline prices, and the largest component of gasoline prices is crude oil. Crude oil prices are the largest single determinant of retail gasoline prices. For the April 1993 to December 1, 2024, period, the correlation coefficient between monthly crude oil prices and monthly retail gasoline prices is .958, which represents an exceptionally statistically strong relationship. The other price components include transportation, storage, distribution, refining, selling costs, and taxes and fees. The U.S. government, as well as state and local governments, impose a variety of taxes and fees on the sale of gasoline to the retail consumer.

The price of crude oil is highly volatile and subject to dramatic swings and shifts, which, in turn, influence retail gasoline prices. Consequently, as the price of crude oil goes, so does the price of gasoline, and producer, refiner, and gas station retailer profits follow both. However, in oil and gasoline, as in other commodity industries, prices are quick to accelerate and slow to come down.

Exhibit 1.12



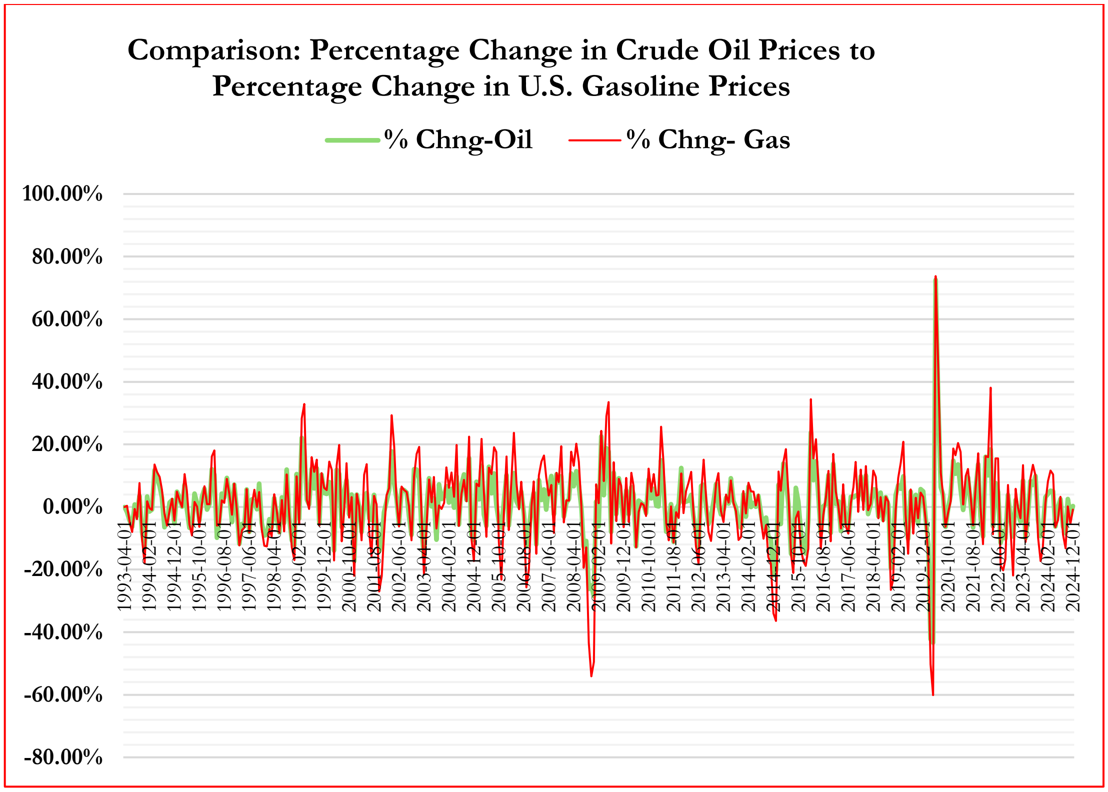
(Source: EIA https://www.eia.gov/dnav/pet/hist/leafhandler.ashx?f=m&n=pet&s=emm_epm0_pte_nus_dpg and Fed. Reserve Link: https://fred.stlouisfed.org/series/WTISPLC)

Understandably, changes in the price of gasoline closely emulate the price of crude oil, but there are many additional factors that influence the price that consumers pay at the gas pump. In addition to the volatility in global oil stock prices and federal and state excise taxes, state and local sales taxes

[63] https://www.brookings.edu/wp-content/uploads/1986/06/1986b_bpea_gately_adelman_griffin.pdf

regulatorily required special formulation blends, seasonal blends, underground storage fees, cap and trade fees, etc.

Exhibit 1.13



(Source: EIA)

For the April 1993 to December 1, 2024, period, the correlation coefficient between monthly crude oil prices and monthly retail gasoline prices is .601 and is generally considered a strong statistical relationship.[64] Section 6.0 provides a more complete description of gasoline prices in California.

1.6 Brief History of Petroleum in California

In the early 16th century, the Spanish observed California' indigenous peoples, the Tataviam and Tongva native Americans, using heavy oil (similar to tar) as waterproofing and construction material for dwellings, canoes, baskets, and weapons.[65] In the mid-1800s, settlers migrating to Southern California observed oil seeps, pools of oil oozing out of the ground. They would stop and use the seepage to lubricate their wagon wheels and most likely "refine" (distillation) it into lighting and cooking oil.[66] Other than some effort to create lighting oil for the San Fernando Mission, there was no significant commercial or economic development of the resource.

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[64] In general, "for absolute values of r, 0-0.19 is regarded as very weak, 0.2-0.39 as weak, 0.40-0.59 as moderate, 0.6-0.79 as strong and 0.8-1 as very strong correlation…" For a more thorough explanation see, https://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one/11-correlation-and-regression#.

[65] "Oil and Gas Production: History in California" (PDF). *State of California*. March 18, 2013.

[66] Ibid.

On August 27, 1859, oil was formally discovered for commercial purposes in the U.S. in Titusville, Pennsylvania, by Colonel Edwin Drake. Drake struck oil at a depth of 69.5 feet.[67] In California, commercial interest in petroleum began around 1865 and after the Pennsylvania strike. Apparently, a Yale professor named Benjamin Silliman published a report in 1864 extolling the abundance of oil associated with Sulphur Mountain in Ventura County, California.[68] [69] Reports of oil seepages in Ventura County and Northern California stimulated speculators and investors. Early speculation and investment transpired in Northern California in Contra Costa, Marin, Mendocino, Santa Clara, and Santa Cruz Counties. Early efforts in Marin and Humboldt Counties would prove to be non-sustainable, but Southern and Central California would be considerably different. The growth of California's oil industry and the economic windfalls that financed much of the State's post-Civil War growth were predominantly sited in the southern and central parts of the State.

The first California commercial (production) oil well was sited in 1861 in Humboldt County. A second was drilled in Humboldt County in 1865 by the Union Mattole Oil Company.[70] However, Northern California's oil production was not scalable then, and production declined and ultimately ceased. Production setbacks notwithstanding, California's fledging petroleum industry continued to develop, especially in Southern California. In the 1860s, California achieved oil production through tunnels designed by Josiah Stanford, brother of Leyland Stanford, dug into mountains by Chinese laborers supplied by railroad and banking magnate Charles Crocker.[71] [72] Stanford's tunneling design relied on a downward slope that allowed the oil seepage to drain into collection pools and then, based on gravity, move through tunnels to collection points.[73] [74] The tunnel oil production method proved highly lucrative for Josiah and his brothers, yielding 20 barrels a day. The oil was sent to Stanford's San Francisco refinery and used until it was capped in 1998.[75]

In 1865, the Pioneer Oil Refinery, dedicated solely to refining oil, was built in Newhall, and a two-inch pipeline was installed between it and Pico Canyon.[76] On September 26, 1876, the Star Oil Works drilled the "Pico 4" well in the Santa Susana Mountains. Pico No. 4 struck oil at a depth of 370 feet and became California's first major successful oil well. Pico No. 4 produced oil for 114 years before operations ceased, and the well was capped in 1990. Today, Pico No. 4 is considered the cradle of the petroleum industry in the Golden State and is a state landmark.[77]

California's oil industry grew accelerated in Southern California and Central California. In 1890, oil was discovered in Kern and Fresno Counties (Coalinga). Although attempts were made to extract oil in the Coalinga Oil Field in 1867, the 1898 "Blue Goose" gusher solidified the area as a major oil-

[67] *Visit*. Carnegie Museum of Natural History. (n.d.). https://carnegiemnh.org/the-story-of-oil-in-western-pennsylvania/
[68] *Sulphur Mountain High Point - Peakbagger.com*. (2022). Peakbagger.com. https://www.peakbagger.com/peak.aspx?pid=50714
[69] Bard, T., Stanford, J., & Nelson, M. (2001). *and the 1860's Hunt for California Crude*. https://vcrma.org/wp-content/uploads/2024/04/pacific-petroleum-geologist-newsletter-california-crude.pdf
[70] Parks, C. S. (n.d.). *CALIFORNIA'S FIRST DRILLED OIL WELLS*. California State Parks. https://ohp.parks.ca.gov/ListedResources/Detail/543
[71] *The Stanfords — Camron-Stanford House*. (n.d.). Camron-Stanford House. https://www.cshouse.org/the-stanfords
[72] Wikipedia Contributors. (2023, February 21). *Charles Crocker*. Wikipedia; Wikimedia Foundation. https://en.wikipedia.org/wiki/Charles_Crocker
[73] I *The Stanfords — Camron-Stanford House*. (n.d.). Camron-Stanford House. https://www.cshouse.org/the-stanfords
[74]Bard, T., Stanford, J., & Nelson, M. (2001). *and the 1860's Hunt for California Crude*. https://vcrma.org/wp-content/uploads/2024/04/pacific-petroleum-geologist-newsletter-california-crude.pdf
[75] Bard, T., Stanford, J., & Nelson, M. (2001). *and the 1860's Hunt for California Crude*. https://vcrma.org/wp-content/uploads/2024/04/pacific-petroleum-geologist-newsletter-california-crude.pdf
[76] See, California Registered Landmark 172.
[77] See, California Registered Landmark 172.

producing region. At a depth of 1,000 feet, the Blue Goose yielded over 1,000 barrels of oil a day.[78] In 1892, California may have experienced its first oil-related environmental disaster when Union Oil Company's Well No. 28 expelled an estimated 40,000 barrels into the Santa Clara River.[79] Well, No. 28 is considered one of the first real "gusher" in California's long petroleum history. The following year, 1893, saw the first significant discovery and production of oil in Los Angeles County. Known as the Los Angeles City Field, the site produced 750,000 barrels, or around 62% of all California production.[80] In 1896, the first deep water wells were drilled off the shore of Santa Barbara. More oil was discovered between 1920 and 1930, and from 1960 to 1970, more offshore oil was discovered in the Pacific off of Carpinteria in Santa Barbara County.

By 1909, California was the leading producer of oil in the U.S. In 1900, when California's population was 1.48 million, California was producing 4.3 million barrels a day. The industrialization and post-World War I period saw California's population grow to 3.4 million while state oil production increased to 77 million barrels a day. In 1929, California oil production peaked at 292.5 million barrels annually.[81] By the end of the "Roaring '20s," California accounted for around 25% of global crude oil production and 35% of U.S. crude production.[82]

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[78] Oil and Gas Production History in California Archived 2012-01-30 at Archive-It; published by California Department of Oil and Gas
[79] "Oil and Gas Production: History in California" (PDF). *State of California*. March 18, 2013.
[80] Ibid.
[81] https://www.rand.org/content/dam/rand/pubs/reports/2008/R1850.pdf
[82] Ibid.

SECTION 2.0
CALIFORNIA GASOLINE CONSUMPTION

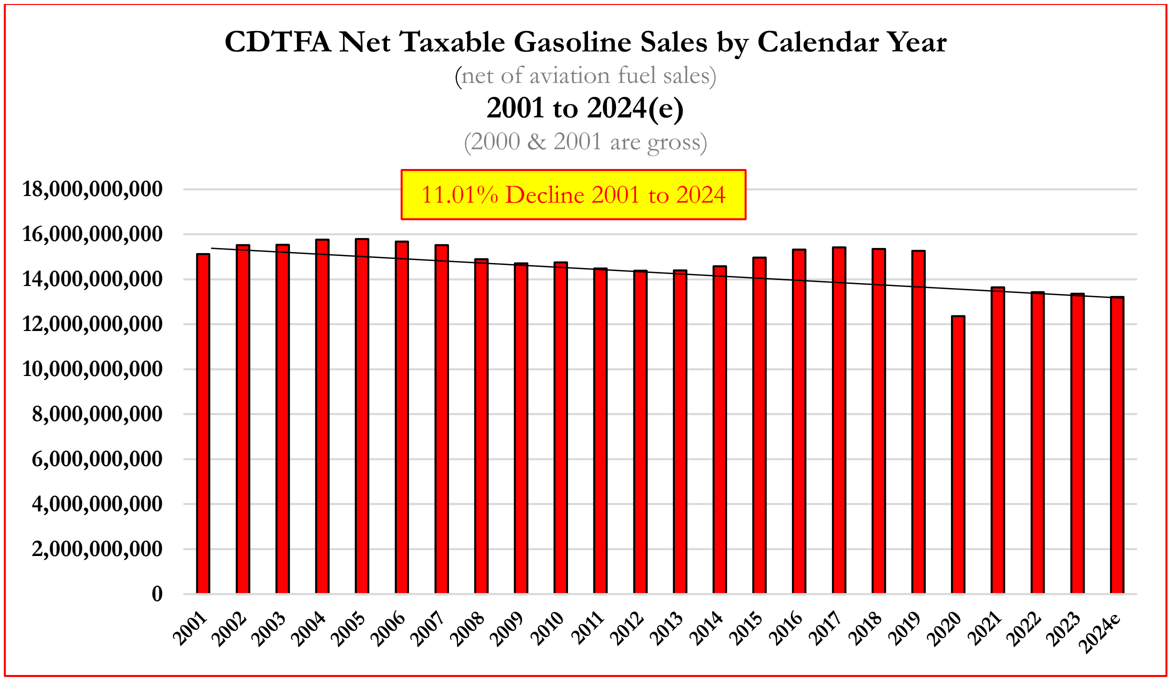
A STUDY OF CALIFORNIA GASOLINE PRICES
Section 2.0
Table Of Contents

2.0 CALIFORNIA CONSUMPTION

2.1 California Gasoline Consumption

California is the 2nd largest consumer of petroleum and the largest consumer of aviation fuel in the U.S.[83] In 2023, Californians consumed 13.119 billion gallons of gasoline and over 216 million gallons of aviation fuel, based on CDTFA revenue data.[84] From 2001 to 2024, overall, CDTFA reported gasoline sales had fallen 11.12 %.[85]

Exhibit 2.1



(Source: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm)

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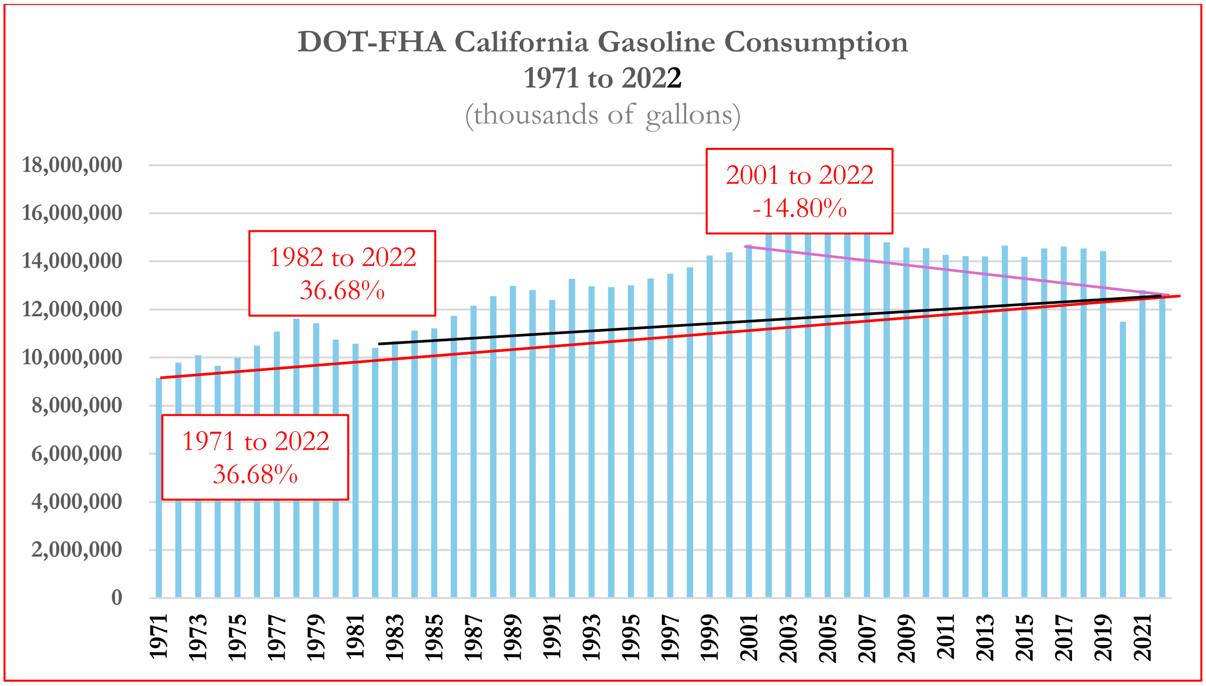
[83] U.S. EIA, Crude Oil Production, Annual, Thousand Barrels, 2023.

[84] California Department of Tax and Fee Administration. (n.d.-b). *Fuel Taxes Division Statistics & Reports – 2010*. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm

[85] *Fuel Taxes Division Statistics & Reports – 2020*. (2020). Ca.gov. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts20.htm

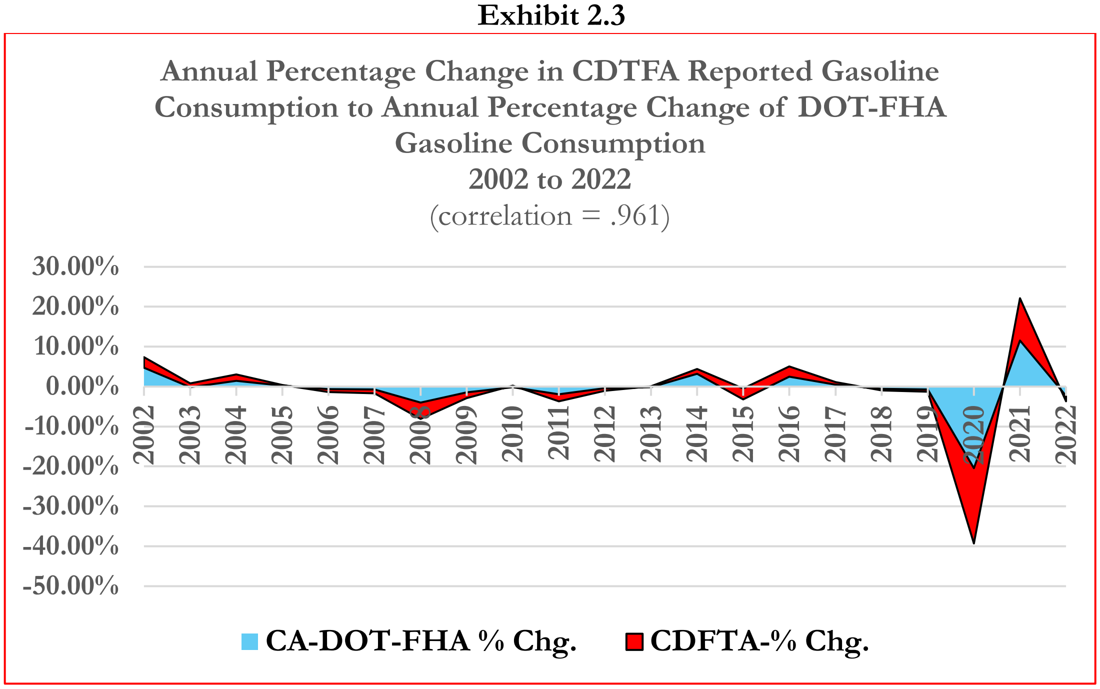
Exhibit 2.2



(Source: https://www.fhwa.dot.gov/policyinformation/statistics/2022/mf226.cfm)

On a comparative basis, the annual percentage of gasoline consumption based on CDTFA sales to U.S. DOT-FHA gasoline consumption is highly correlated.

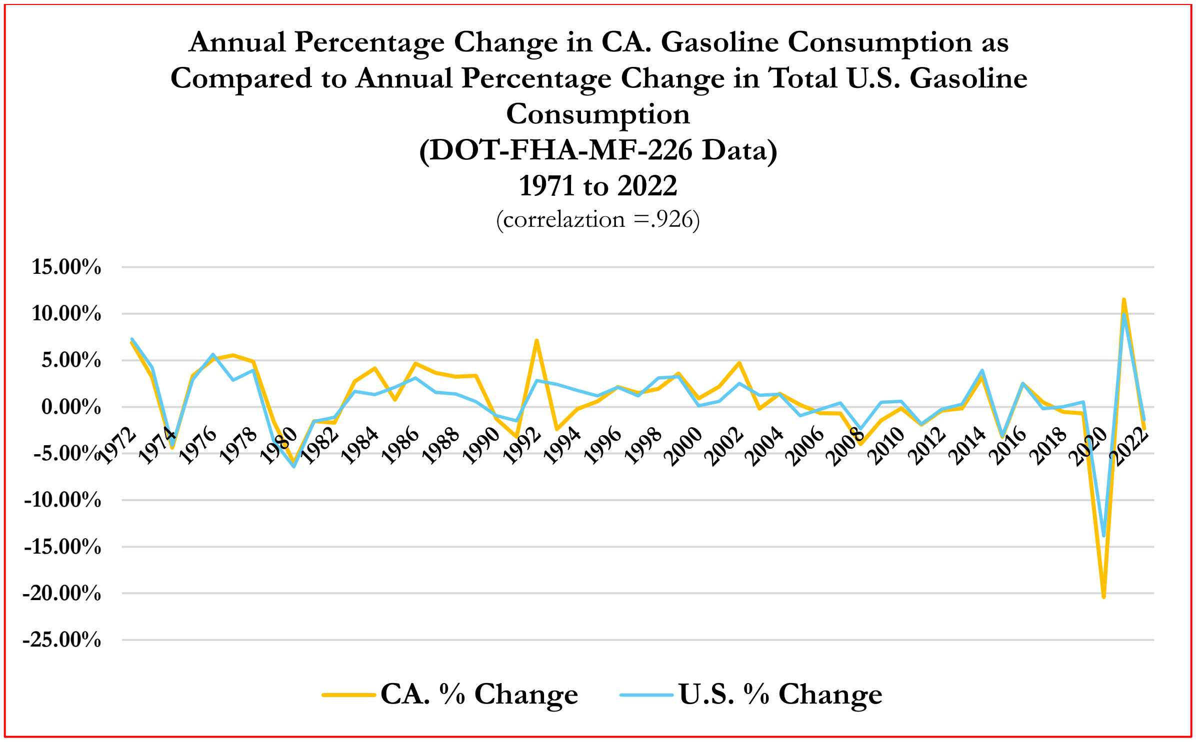
Exhibit 2.3



(Source: https://www.fhwa.dot.gov/policyinformation/statistics/2022/mf226.cfm, and https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm)

The annual percentage change in CDTFA gasoline sales is relatively consistent. It shows only a modest annual variance of -.46% and is highly correlated to the annual percentage change in overall U.S. gasoline consumption.

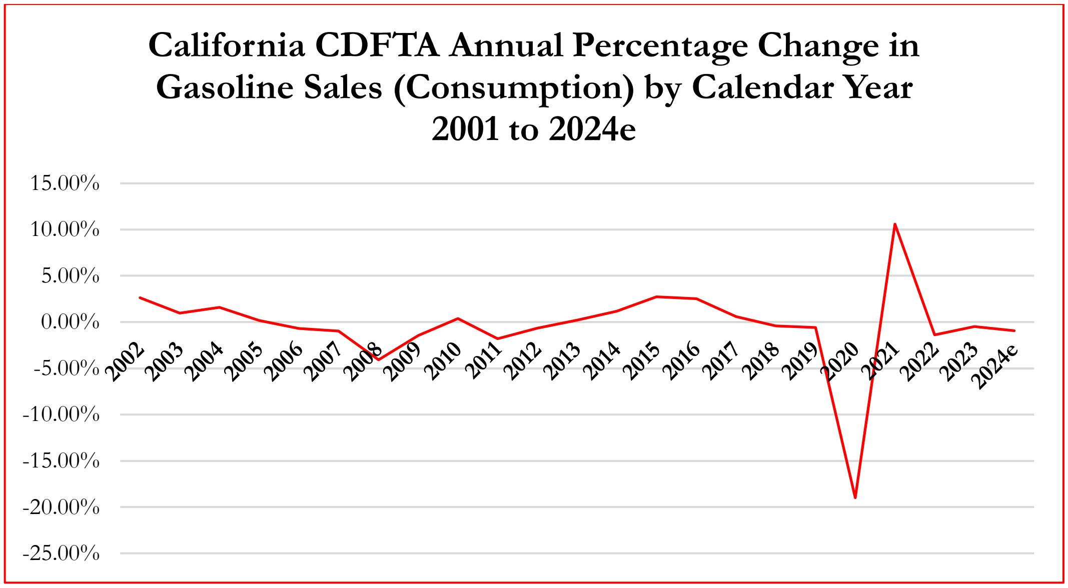
Exhibit 2.4



(Source: https://www.fhwa.dot.gov/policyinformation/statistics/2022/mf226.cfm)

With the exception of the Covid years and their related restrictions, the annual percentage change in California consumption is relatively consistent.

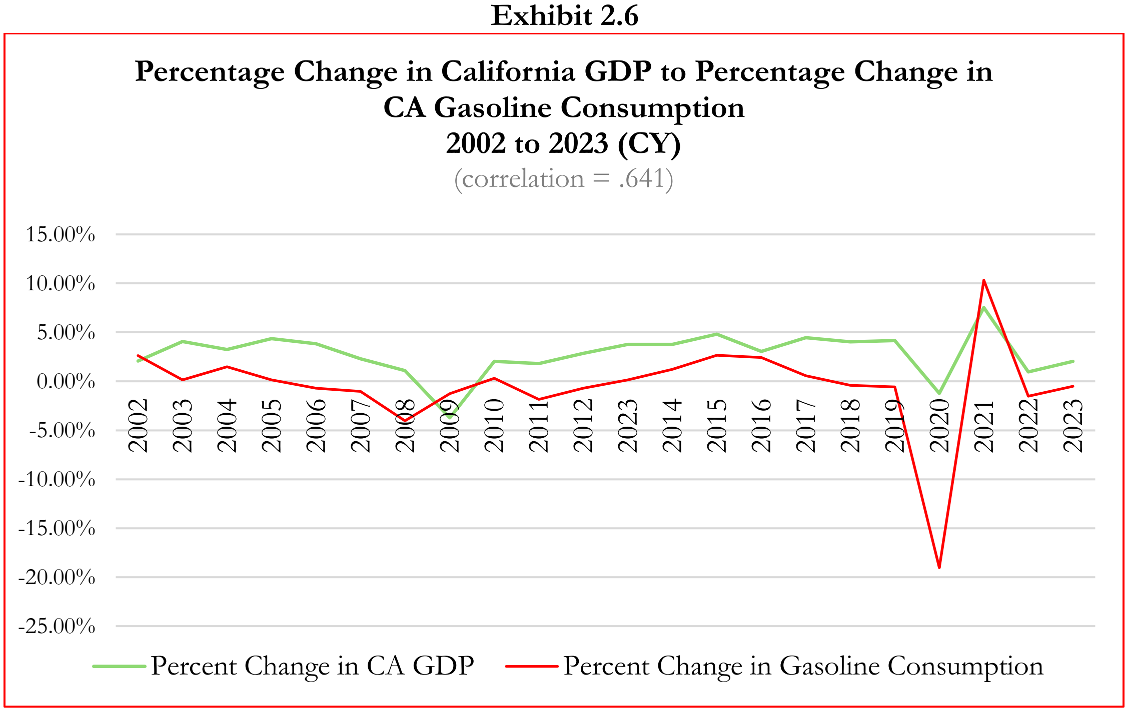
Exhibit 2.5



(Source: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm)

Notwithstanding oil shocks and geopolitical events that disrupt supply chains, gasoline consumption in California generally follows overall California GDP and economic health and growth.

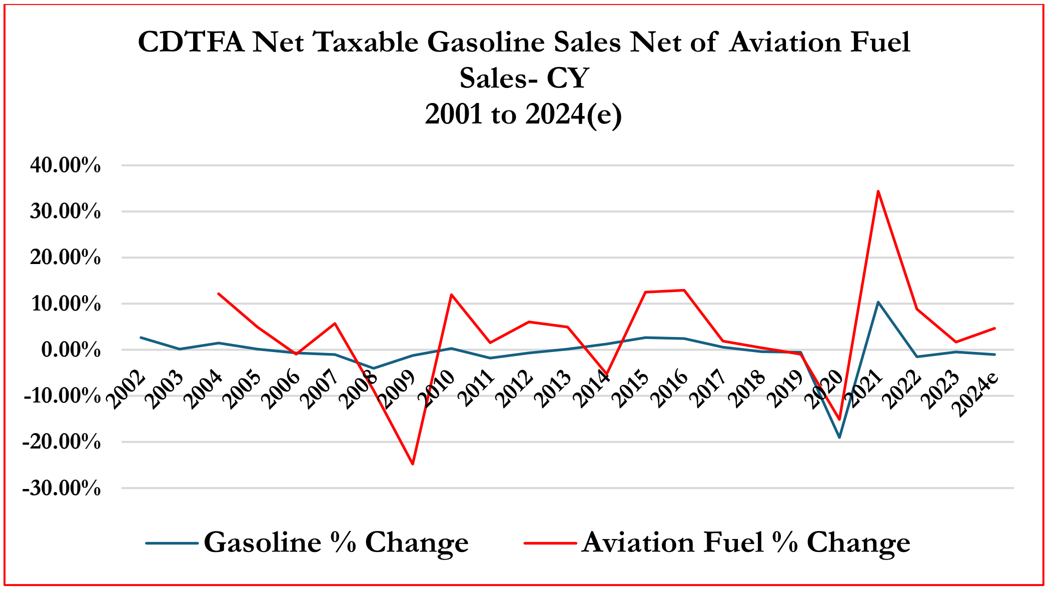
Exhibit 2.6



(Source: https://fred.stlouisfed.org and CDTFA)

Conversely, CDTFA sales of aviation (jet) fuels have increased 72.08% for the 2003 to 2024e period.[86] The largest percentage increase in aviation fuel sales occurred in 2015, 2016, and 2021, while the largest declines were in 2009 and 2020.

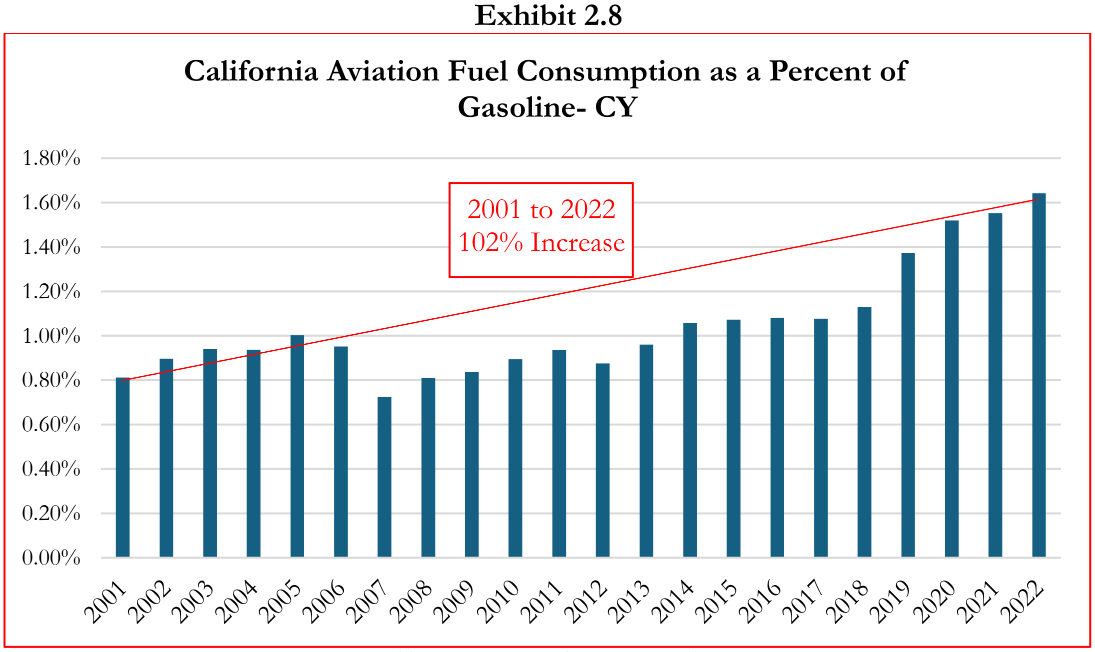
Exhibit 2.7



(Source: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm)

Aviation fuel consumption grew by 102% from 2001 to 2022.

Exhibit 2.8

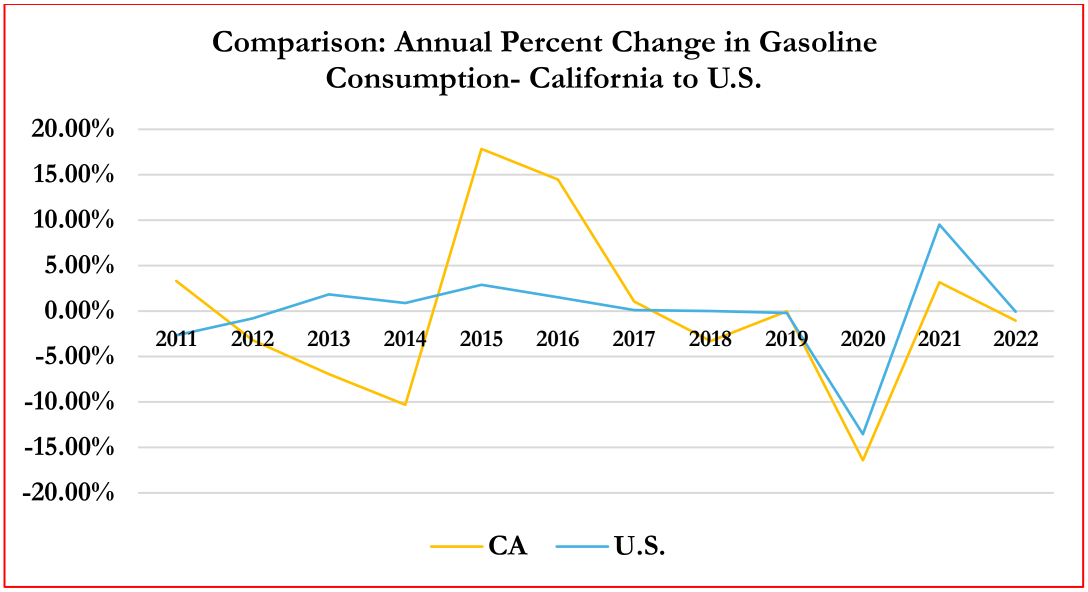


(Source: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm)

[86] *Fuel Taxes Division Statistics & Reports – 2020.* (2020). Ca.gov. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts20.htm

Gasoline consumption from 2011 to 2022 declined slightly by 6%. Since 2017, California's gasoline consumption pattern, as measured on a percentage change basis, closely mirrors that of the U.S.

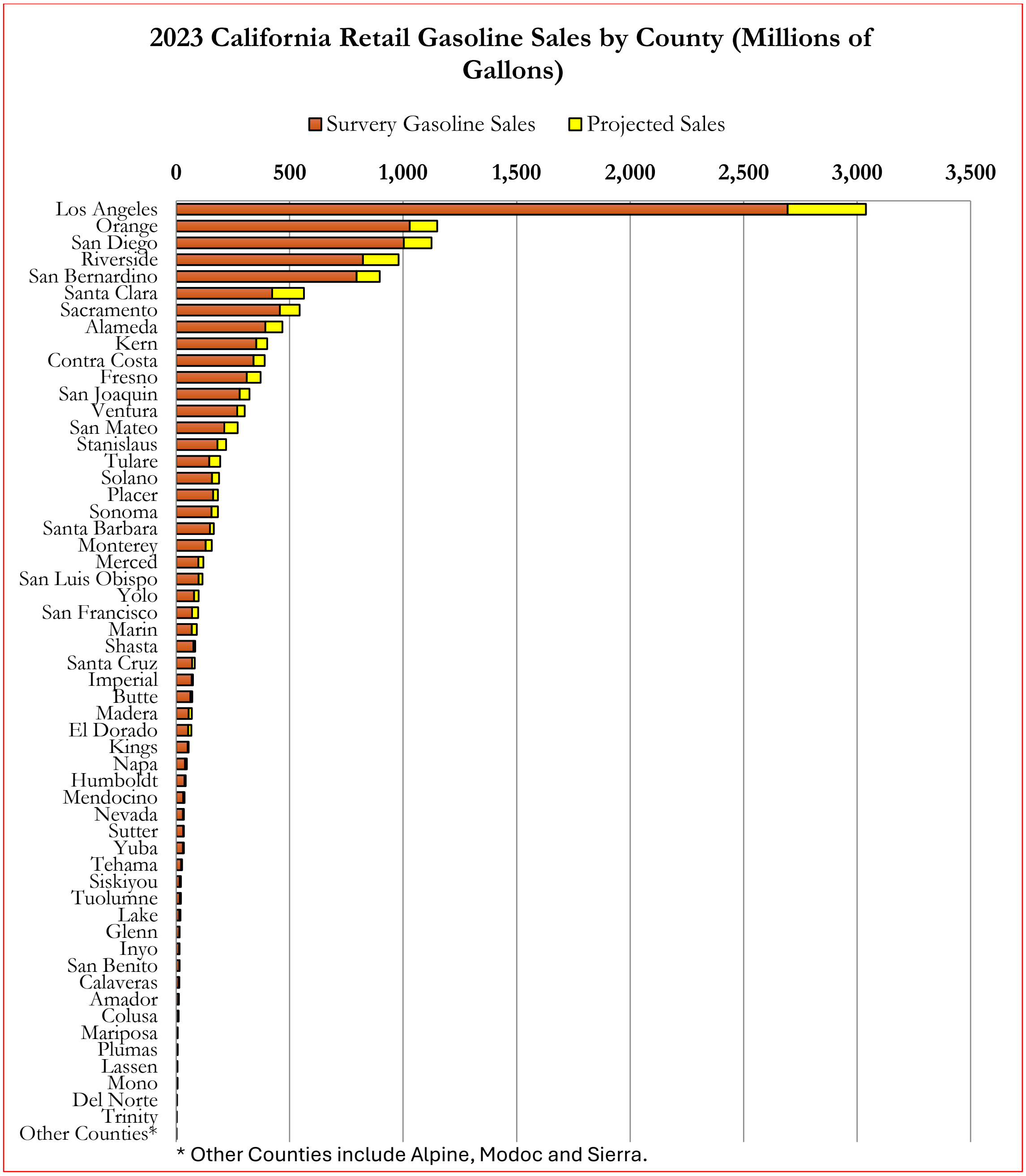
Exhibit 2.9



(Source: EIA and CEC Data)

California retail gasoline sales by county are generally informed by the population of the county.

Exhibit 2.10



(Source: Transportation Fuels Market Unit CEC-A15 report)

2.2 Factors Contributing to the Reduction in Gasoline Consumption

The decline in gasoline consumption can be attributed to a number of factors, including the increase in EV registrations, improved miles per gallon in internal combustion engines, COVID-19 restrictions of 2020 and 2021, and the decline in California's population. Some specific factors include:

- **Population Decline.** Since 2016, California has experienced a net reduction in population of -.47%. Since 2020, California's population has declined by 1.362%, resulting in a loss of one seat in the U.S. House of Representatives.[87]

- **Work at Home and Tele-commuting.** In 2005, California, along with the rest of the U.S., averaged about 5% of its labor workforce working from home.[88] California's work at home percentage of its labor force increased to 7% in 2019. Commencing with the outbreak of Covid and the California "stay-at-home" mandates, the percentage of at-home work increased and peaked at 22% in 2021, as compared to the overall U.S. at 18%.[89] [90] By 2022, the percentage of the California workforce that stayed at home had fallen to 17%, which was still higher than the overall U.S. at 15%.[91] Work at home, telecommuting, and hybrid work modes (in-office and home) reduce the number of miles associated with commuting to work. A 2024 MIT study indicates that, in general, a "1 percent decrease in onsite workers leads to a roughly 1 percent reduction in [automobile] vehicle miles driven, but a 2.3 percent reduction in mass transit ridership."[92] [93]

- **Increase in EV, Hybrid, and Hydrogen Vehicles.** California has the most aggressive policy in the U.S. with respect to zero emission vehicles (ZEV). Illustrated in the exhibit below are the projected adaptation rates for California's ZEV aspirations. As indicated in the comparative exhibits below, ZEVs, or more especially, EVs were projected to achieve a 35% market share by 2026, which will be challenging and optimistic given the 25.31% share in 2025.

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87 US Census Bureau. (2021, April 26). *Historical Population Change Data (1910-2020)*. Census.gov. https://www.census.gov/data/tables/time-series/dec/popchange-data-text.html

88 Bohn, S., Johnson, H., & McGhee, E. (2024, June 4). *Remote Work Is Reshaping the California Labor Market*. Public Policy Institute of California. https://www.ppic.org/blog/remote-work-is-reshaping-the-california-labor-market/

89 *Limited Stay At Home Order November 2020*. (n.d.). Www.cdph.ca.gov. https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/limited-stay-at-home-order.aspx

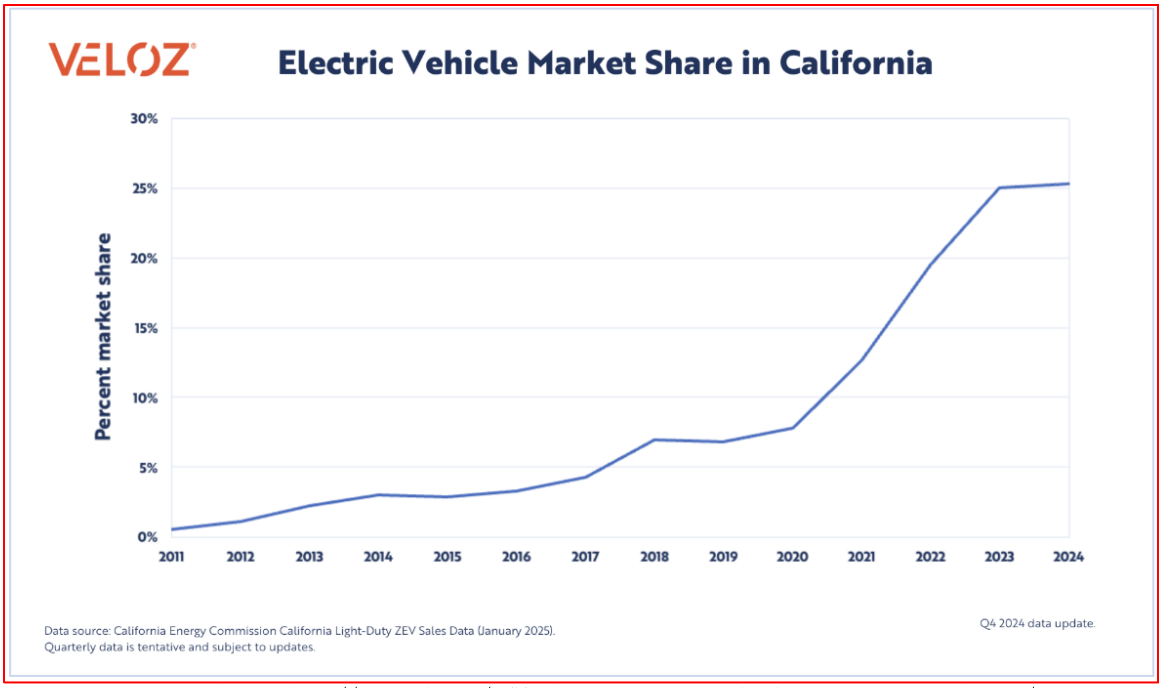
90 Bohn, S., Johnson, H., & McGhee, E. (2024, June 4). *Remote Work Is Reshaping the California Labor Market*. Public Policy Institute of California. https://www.ppic.org/blog/remote-work-is-reshaping-the-california-labor-market/

91 Bohn, S., Johnson, H., & McGhee, E. (2024, June 4). *Remote Work Is Reshaping the California Labor Market*. Public Policy Institute of California. https://www.ppic.org/blog/remote-work-is-reshaping-the-california-labor-market/

92 *Has remote work changed how people travel in the U.S? | MIT Sustainability*. (2024, April 9). Mit.edu. https://sustainability.mit.edu/article/has-remote-work-changed-how-people-travel-us

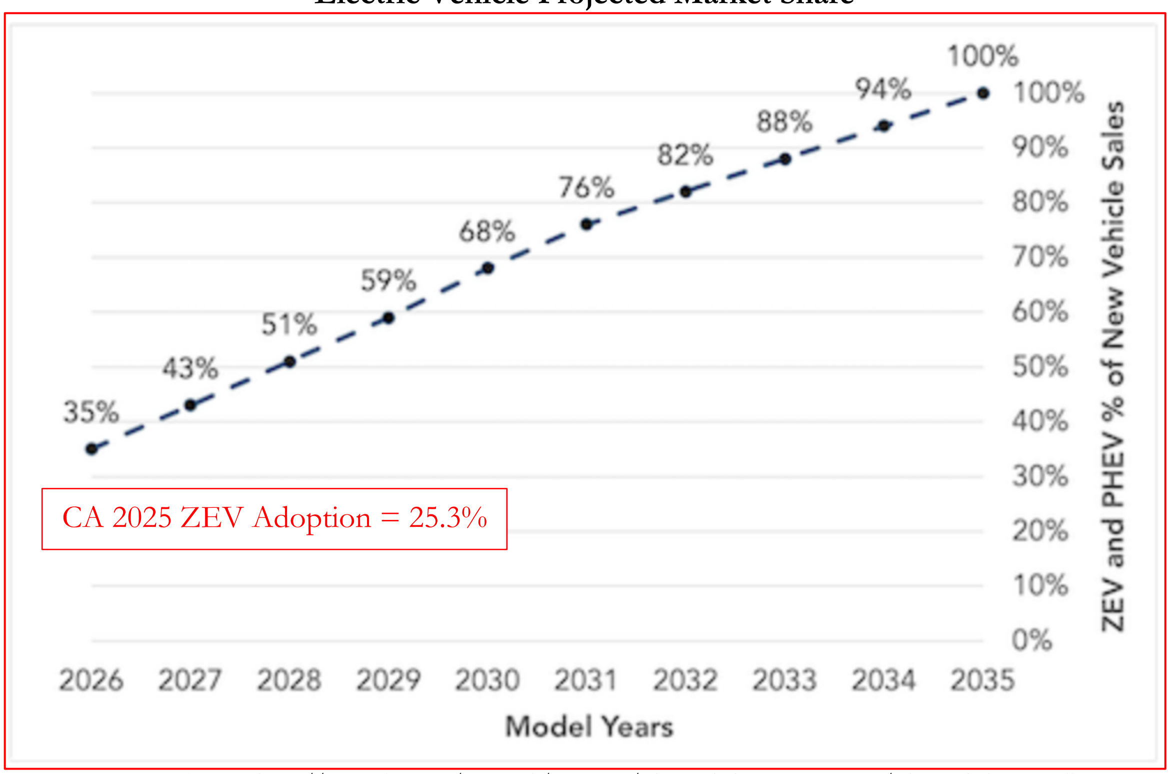
93 See also, Hassan Obeid, Michael L. Anderson, Mohamed Amine Bouzaghrane, Joan Walker, Does telecommuting reduce trip-making? Evidence from a U.S. panel during the COVID-19 pandemic, Transportation Research Part A: Policy and Practice, Volume 180, 2024.

Exhibit 2.11



(Source: https://www.veloz.org/californias-q4-2024-new-ev-sales-show-6-year-over-year-increase/)

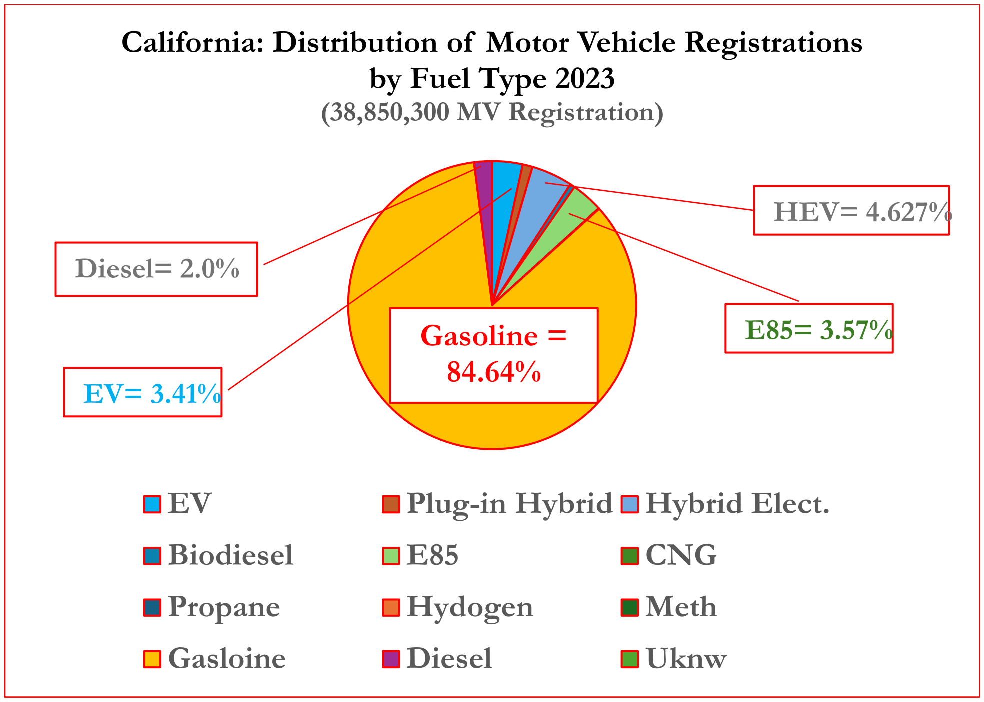
Exhibit 2.12
Electric Vehicle Projected Market Share



(Source: https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii)

In California, 25.3% of all registered cars (excludes light and heavy-duty trucks) are ZEV.[94] Understandably, California has the largest share of ZEV in the U.S. at 14.4%.[95] However, consistent with early adopter behavior, after a period of rapid adoption by the "passionate and the curious," sales of zero emissions vehicles for 2024 and early 2025 have slowed down considerably. Additionally, consumers' analysis indicates that the majority of EVs are bought by white or Asian higher income Californians living in affluent areas such as Atherton, Palo Alto, Sunnyvale, and Mountain View.[96] Nonetheless, as compared to the overall U.S. average of around 9%, California has more registered zero emission vehicles.[97]

Exhibit 2.13



(Source: https://afdc.energy.gov/vehicle-registration)

- **Annual Miles Driven and Gasoline Prices.** California gasoline prices peaked at an all-time historical high in June 2022, when they averaged $6.294 per gallon, and higher in counties such as Humboldt, Mendocino, and Mono.[98] [99] Spikes in gasoline prices, if protracted, can modify lifestyle choices and mileage driven.

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[94] Lazo, A. (2025, February 6). *California's surge in EV sales has stalled — so what happens to its landmark mandate?* CalMatters. https://calmatters.org/environment/climate-change/2025/02/electric-car-sales-stall-california/

[95] Understanding MPG trends across states. (n.d.-k). https://www.wjbf.com/automotive/understanding-mpg-trends-across-states/

[96] Lopez, N., & Yee, E. (2023, March 22). *Who buys electric cars in California - and who doesn't?* CalMatters. https://calmatters.org/environment/2023/03/california-electric-cars-demographics/?series=california-electric-vehicles

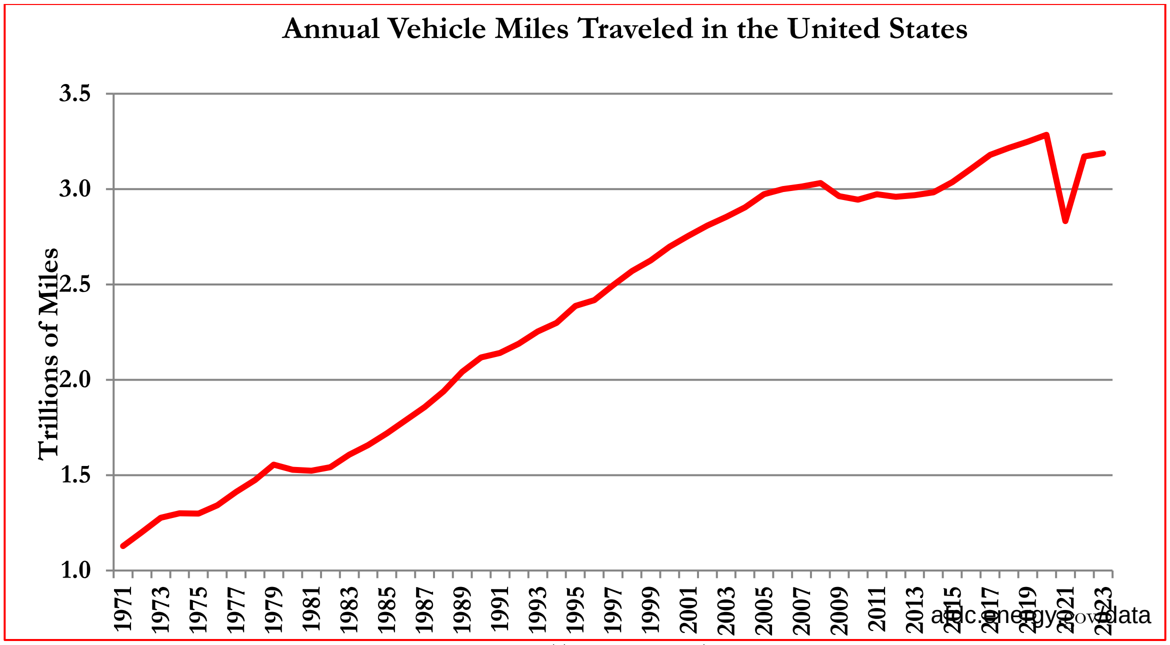
[97] Montoya, R. (2024, January 12). *What Is the Percentage of Electric Cars in the U.S.?* Edmunds. https://www.edmunds.com/electric-car/articles/percentage-of-electric-cars-in-us.html.

[98] *California All Grades All Formulations Retail Gasoline Prices (Dollars per Gallon)*. (2010). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_sca_dpg&f=m

[99] Harper, L. (2023, December 19). Gas hit nearly $10 per gallon in this California city — the most expensive in the nation. *Deseret News*. https://www.deseret.com/u-s-world/2022/6/9/23161559/gas-prices-california-most-expensive-in-nation-where-is-cheapest-gas/#:~:text=Gas%20prices%20keep%20increasing%20with%20no%20end%20in%20sight&text=Mendocino%2C%20California%2C%20has%20taken%20the,a%20whopping%20$9.60%20per%20gallon.&text=Driving%20the%20news:%20A%20northern,average%2C%20according%20to%20ABC%2030.

Covid lockdowns and restrictions notwithstanding, since 1971, the total annual miles driven in the U.S. has increased 182% from 1.13 trillion miles to 3.19 trillion miles.[100] On an average annual miles driven basis, California drivers incurred 16% less miles than the overall U.S. average. On average, a U.S. driver drove 13,596 miles in 2022 as compared to 11,409 miles for a California driver.[101] Overall, for the 2010 to 2022 period, although the number of licensed drivers increased by approximately 12%, the average annual miles driven per driver declined by 3.7%.[102]

Exhibit 2.14

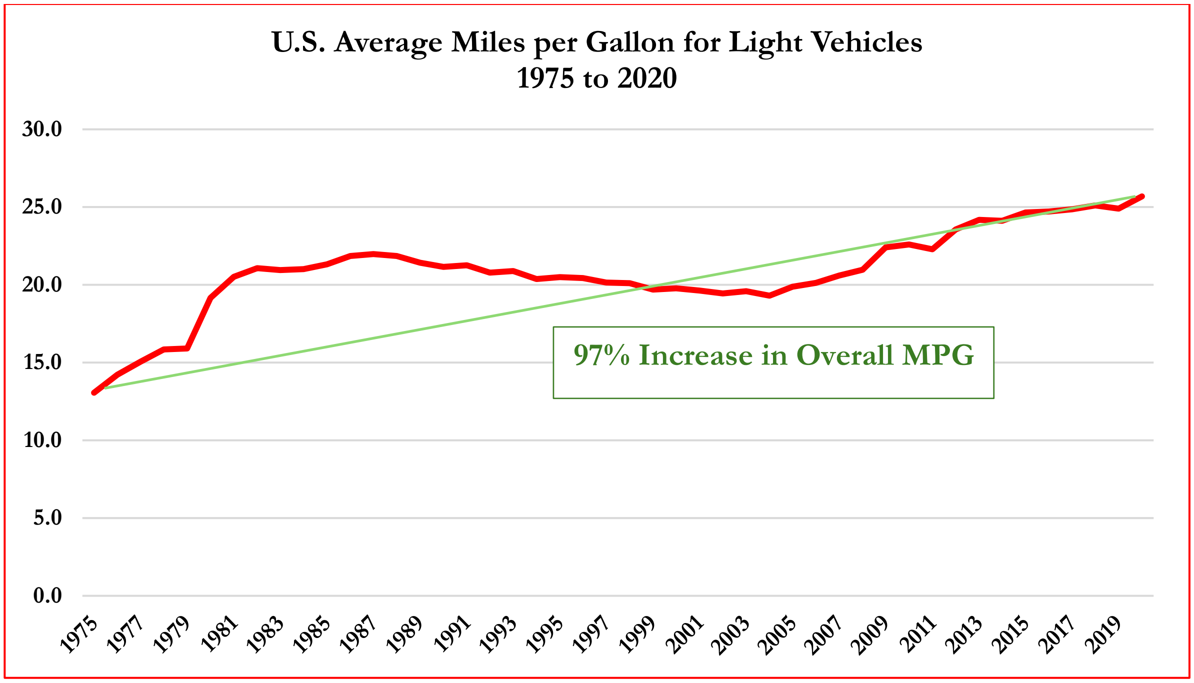


(Source: https://afdc.energy.gov/data)

- **Engine and Drivetrain Efficiency.** Over the last 40 years, automotive engines and drivetrains have become more efficient, resulting in improved miles per gallon. In 2024, California ranked first in the U.S. for average miles per gallon at 33.5 as compared to the national average of 27.5 mpg.[103]

[100] ConsumerAffairs. "How many miles does the average person drive a year? 2025 [2024]" ConsumerAffairs.com. Apr. 03, 2024, https://www.consumeraffairs.com/automotive/how-many-miles-does-the-average-person-drive-a-year.html
[101] ConsumerAffairs. "How many miles does the average person drive a year? 2025 [2024]" ConsumerAffairs.com. Apr. 03, 2024, https://www.consumeraffairs.com/automotive/how-many-miles-does-the-average-person-drive-a-year.html
[102] ConsumerAffairs. "How many miles does the average person drive a year? 2025 [2024]" ConsumerAffairs.com. Apr. 03, 2024, https://www.consumeraffairs.com/automotive/how-many-miles-does-the-average-person-drive-a-year.html
[103] Understanding MPG trends across states. (n.d.-k). https://www.wjbf.com/automotive/understanding-mpg-trends-across-states/

Exhibit 2.15



(Source: https://www.epa.gov/automotive-trends)

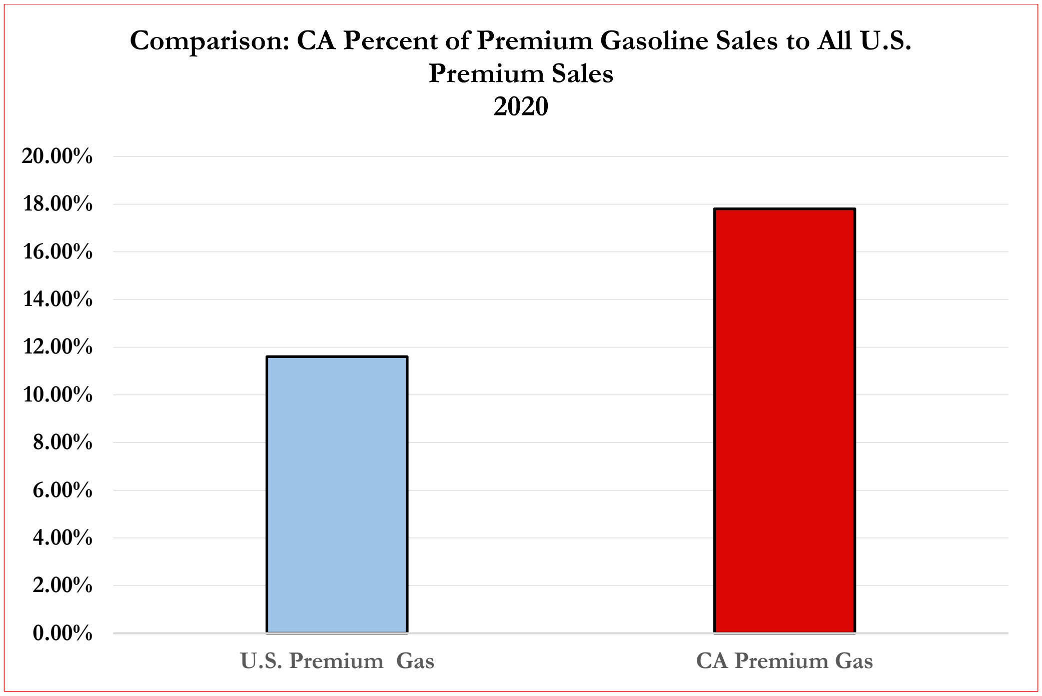
2.3 Octanes and Brands

According to CEC data, Californians favor branded gasoline products and consume more premium (higher octane) gasoline than the rest of the U.S. The choice of which octane to purchase is a consumer's choice, and refiners and retailers will respond to consumer demands. On average, Californians consume more higher-octane grades than the rest of the U.S.[104] Based on CEC and EIA, the consumption of premium grade gasoline represented 17.8% of gasoline sales in 2020, as compared to around 11% for the U.S.[105]

[104] October. (2021). *Gasoline Retail Prices by Brand Diesel Retail Prices by Region NACS Store Counts 2020 Gasoline Sales by County Top California Cities by Gasoline Sales in 2020 Total Station Counts by Ownership Total Gasoline Sales by Fuel Grade Featured Topic: Retail Fuel Outlet Annual Report PETROLEUM WATCH REFINERY NEWS INSIDE CALIFORNIA DIESEL RETAIL PRICES BY REGION CALIFORNIA GASOLINE RETAIL PRICES BY BRAND.* https://www.energy.ca.gov/sites/default/files/2021-11/2021-10_Petroleum_Watch.pdf?utm_source=chatgpt.com

[105] October. (2021). *Gasoline Retail Prices by Brand Diesel Retail Prices by Region NACS Store Counts 2020 Gasoline Sales by County Top California Cities by Gasoline Sales in 2020 Total Station Counts by Ownership Total Gasoline Sales by Fuel Grade Featured Topic: Retail Fuel Outlet Annual Report PETROLEUM WATCH REFINERY NEWS INSIDE CALIFORNIA DIESEL RETAIL PRICES BY REGION CALIFORNIA GASOLINE RETAIL PRICES BY BRAND.* https://www.energy.ca.gov/sites/default/files/2021-11/2021-10_Petroleum_Watch.pdf

Exhibit 2.16



(Source: CEC and EIA)

Notwithstanding consumer preferences, automobile manufacturers recommend octanes to owners of their vehicles. Certain engines, such as those in high performance cars, engines with high compression ratios, and or engines with turbochargers, operate more efficiently with higher octane rated fuels.[106] A 2019 *Car and Driver* magazine test found distinct differences in horsepower and engine performance in four high performance cars based on the octane used.[107] Below is a chart summarizing the *Car and Driver* test results.

Exhibit 2.17
Comparative Analysis of Octane on the Performance of Selected Cars

All Cars are 2019	FORD F-150 Pickup Truck		HONDA CR-V-Touring		DODGE Charger R/T	
Metric	**87 Octane**	**93 Octane**	**87 Octane**	**93 Octane**	**87 Octane**	**93 Octane**
Measured Horsepower	360	380	164	172	318	332
Measured Torque- lb-ft.	463	475	168	168	364	387
0-100 MPH Time	16.0 sec.	14.2 sec.	20.4 sec.	20.2 sec.	11.9 sec.	11.7 sec.
75- MPH Fuel Economy	17.0 mpg	17.6 mpg	27.3 mpg	27.6 mpg	23.2 mpg	23.5 mpg

(Source: https://www.caranddriver.com/features/a28565486/honda-cr-v-vs-bmw-m5-ford-f-150-dodge-charger/)

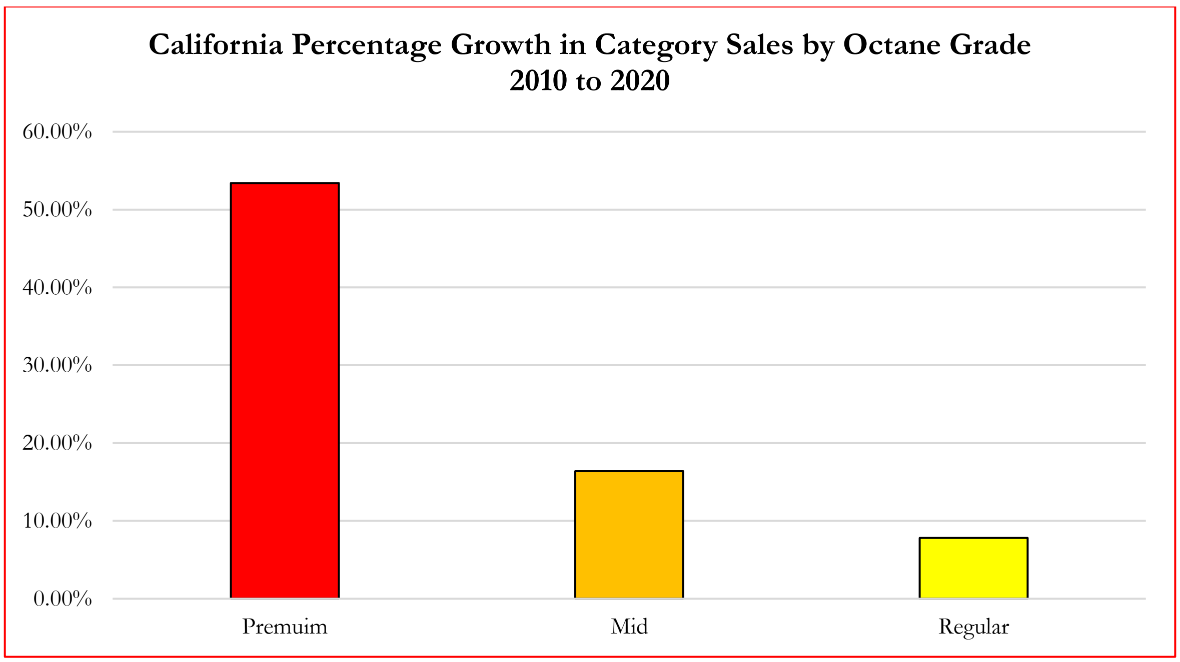
General tests conducted by AAA also indicate that, on the whole, there was some improvement in performance metrics, such as hauling, towing, and rapid acceleration associated with premium grades. However, vehicles not designed to run on premium fuels generally do not experience advantages using

[106] *Should You Use Premium Gas?* (2022, December 12). Kelley Blue Book. https://www.kbb.com/car-advice/should-you-use-premium-gas/
[107] Tingwall, E. (2019, August 4). *Is Premium Gas Worth It? We Test High Octane on 4 Popular Vehicles*. Car and Driver. https://www.caranddriver.com/features/a28565486/honda-cr-v-vs-bmw-m5-ford-f-150-dodge-charger/

higher octane ratings.[108] AAA data also indicates that the price differential between premium and lower grades has widened since 2010.[109]

As indicated in the exhibit below, the fastest growing octane segment in California since 2010 is the premium grade. A number of factors may explain this. California is home to the largest number of registered BMW, Corvettes, Jaguar, Land Rover, Mercedes Benz, and Porsche automobiles in the U.S., all of which recommend premium fuel usage. At 27.9%, California also ranks third in the U.S. for the highest share of the luxury car market.[110] Luxury car manufacturers, such as BMW, typically recommend premium fuels. California also ranks above the all-U.S. average in consumer brand loyalty scores.[111] Additional factors may include individual brand preference for a particular grade, convenience, proximity to retail outlet, attractiveness and safety of retail outlet, and other factors that influence and shape consumer behavior. Of the three octane grades sold in California, and based on CEC reporting, premium fuels have grown the fastest in terms of percentage of total gallons sold for the 2010 to 2020 period.

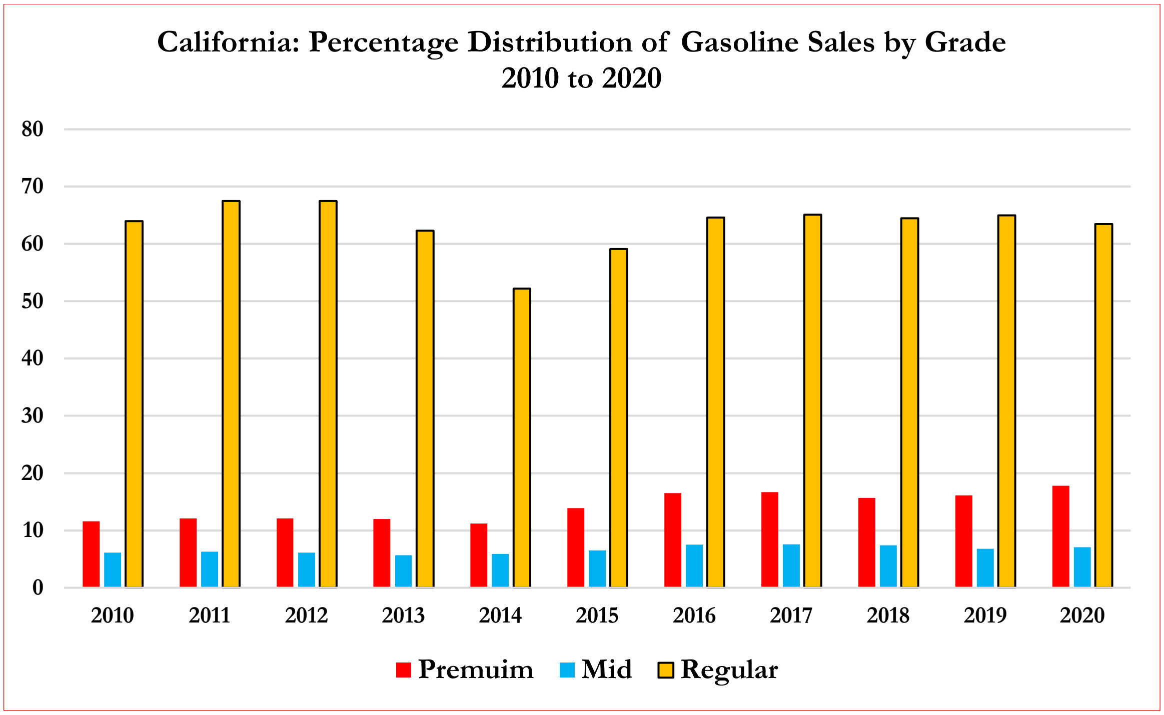
Exhibit 2.18



(Source: https://www.energy.ca.gov/sites/default/files/2021-11/2021-10_Petroleum_Watch.pdf)

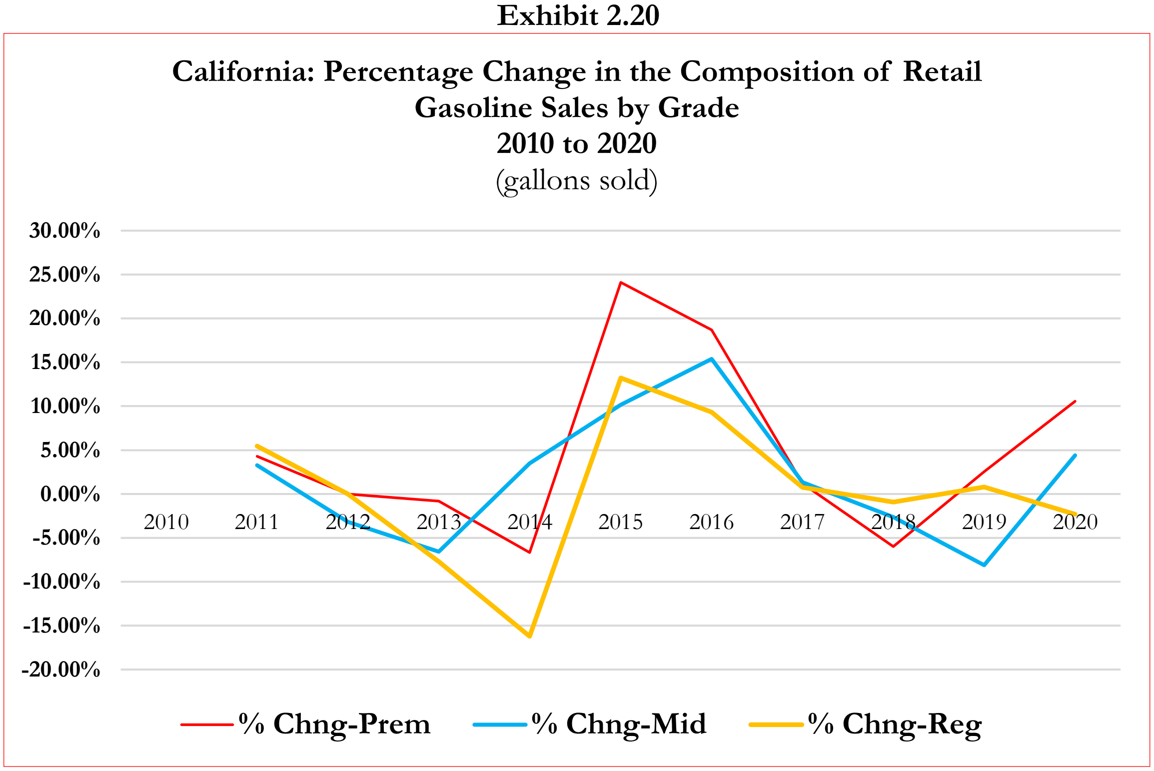
[108] *AAA Gas Prices*. (2024). Aaa.com. https://gasprices.aaa.com/premium-fuel-research/
[109] *AAA Gas Prices*. (2024). Aaa.com. https://gasprices.aaa.com/premium-fuel-research/
[110] iSeeCars. (2024, February 11). *Which states have the most luxury cars?* FOX 2. https://fox2now.com/automotive/which-states-have-the-most-luxury-cars-2/
[111] Small, A. (2025, February 6). *The 2025 Brand Loyalty Index - Go Fish Digital.* Go Fish Digital. https://gofishdigital.com/blog/2025-brand-loyalty-index/

Exhibit 2.19



(Source: https://www.eia.gov/dnav/pet/pet_cons_refmg_d_nus_vtr_mgalpd_a.htm, and https://www.energy.ca.gov/sites/default/files/2021-11/2021-10_Petroleum_Watch.pdf)

Exhibit 2.20



(Source: https://www.eia.gov/dnav/pet/pet_cons_refmg_d_nus_vtr_mgalpd_a.htm, and https://www.energy.ca.gov/sites/default/files/2021-11/2021-10_Petroleum_Watch.pdf)

2.4 California Retail Distribution Models

Retail gasoline is sold to Californians through three types of outlets: 1- branded fuel stations, 2- unbranded fuel stations, and 3- hypermarkets (see also Section 3.0). Since 2012, the number of gas stations in California has remained relatively consistent; however, that is changing. Bans and moratoriums on gasoline station construction have been enacted by many California cities and counties, including San Anselmo, Calistoga, and Novato. Los Angeles County is also considering a range of bans on retail gasoline stations.[112] Furthermore, with California's 2035 mandate eliminating the sale of internal combustion vehicles, California does not present an attractive environment for new operators to enter the market or for existing operators to invest in established operations.

In 2023, California had 10,957 gas stations.[113] Of that total, 8,435 stations, or 77%, sell California compliant gasoline for motor vehicles. Most stations (stores or outlets) are also engaged as convenience stores, which generate the preponderance of the operator's profits. The majority of gasoline stations, around 4,500 stores, are located in close proximity to freeways (less than .25 miles) and in higher populated counties.[114] The greatest concentration of gasoline stations is in Los Angeles County, which also accounts for the highest volume of gasoline sold in the Golden State in terms of gallons. Collectively, California's gasoline stations crate and support, directly or indirectly, around 125,400 jobs.[115]

Over 95% of fueling stations in California are operated by small business owners, and 60% are operated by owners of a single business.[116] Furthermore, approximately 43% of gasoline stations in California are minority-owned, while 61% of owners are foreign born.[117] Gas stations in California generate around $2.8 billion in wage income.[118]

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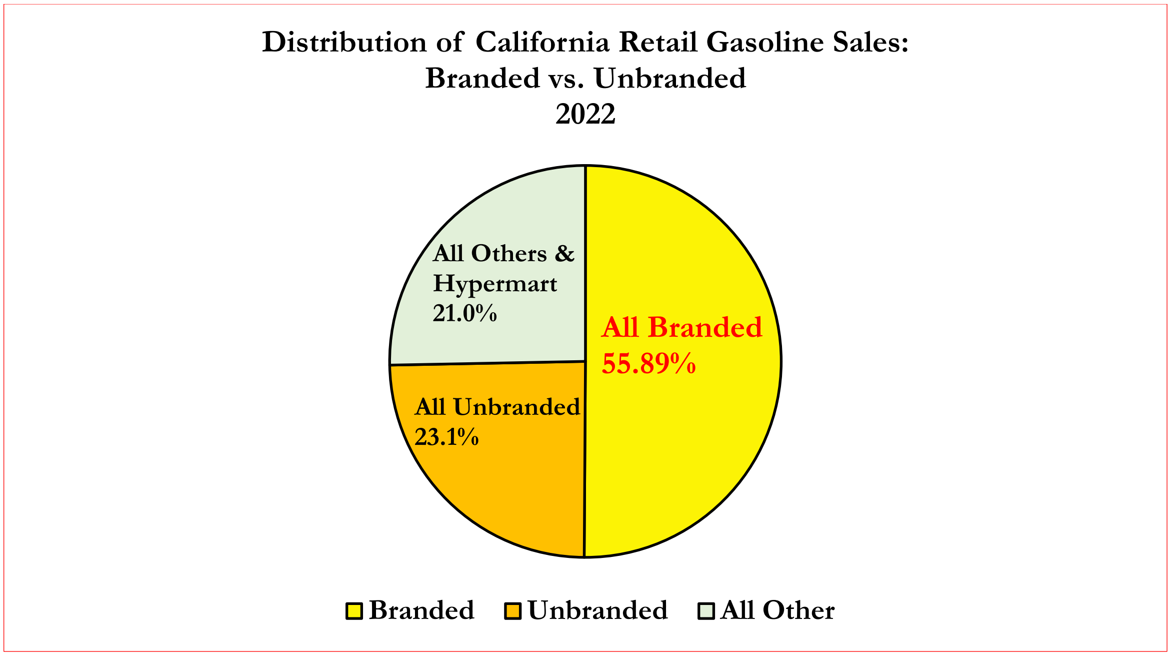
[112] Anguiano, D. (2022, June 22). Los Angeles may ban new gas stations to help combat climate emergency. *The Guardian*. https://www.theguardian.com/us-news/2022/jun/22/los-angeles-ban-new-gas-stations-climate
[113] California Energy Commission. (n.d.-b). *California Retail Fuel Outlet Annual Reporting (CEC-A15) results*. https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-retail-fuel-outlet-annual-reporting
[114] *REFINING NEWS*. (n.d.). Retrieved March 1, 2025, from https://www.energy.ca.gov/sites/default/files/2020-02/2020-01_Petroleum_Watch.pdf
[115] https://californiafuelsconveniencealliancecfca.growthzoneapp.com/ap/CloudFile/Download/p0w84k4r
[116] https://californiafuelsconveniencealliancecfca.growthzoneapp.com/ap/CloudFile/Download/p0w84k4r
[117] https://californiafuelsconveniencealliancecfca.growthzoneapp.com/ap/CloudFile/Download/p0w84k4r
[118] https://californiafuelsconveniencealliancecfca.growthzoneapp.com/ap/CloudFile/Download/p0w84k4r

Exhibit 2.21

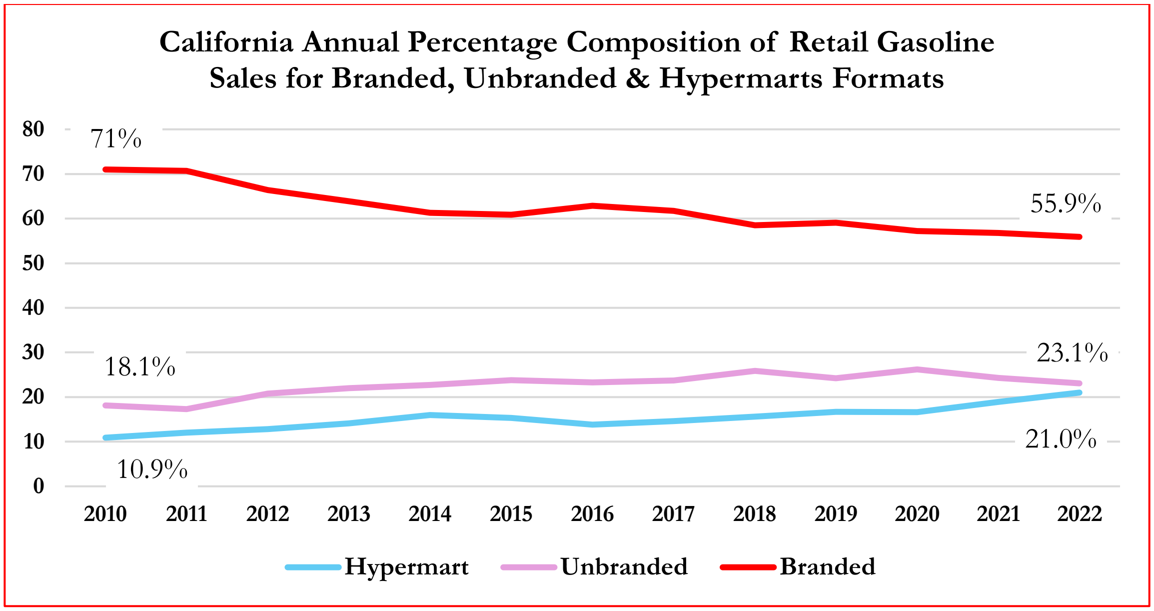


(Source: (Source: CEC as cited in CEC & CDTFA Joint Agency Report, 5/24)

Although hypermarts have a smaller share of the market in terms of the absolute number of outlets (units), hypermarts represent the fastest growing distribution segment in the Golden State as measured by sales volume. According to CEC data, in 2020, hypermarts sold, on average, 760,000 gallons of gasoline per month, or around eight times more gasoline than nonhypermarts which sold on average 96,000 gallons per month.[119] Based on the percentage composition of total gallons sold, since 2010, the selling of gasoline through "hypermarts," such as Costco and Safeway, has increased while sales of branded gasolines through flagged retailers have declined.

[119] Droboniku, G., Johnsen, R., Maduros, N., Mason, J., Neff, B., California Energy Commission, & California Department of Tax and Fee Administration. (2024). CDTFA_CEC Joint Report 2024 Review of the gasoline in California and related impact on state revenues. In *California Energy Commission and California Department of Tax and Fee Administration* (Report CEC-200-2024-007). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf

Exhibit 2.22[120]



(Source: CEC as cited in CEC & CDTFA Joint Agency Report, 5/24)

The election as to whether to make and sell gasoline as branded or unbranded is contingent on the distributor's business model and any contractual relationships with branded refiners. Some of the various factors related to gas station ownership and operations are summarized in the exhibit below.

Exhibit 2.23

Some Attributes of Gas Station Owner & Operators				
Attribute	**Company**	**Lessee**	**Independent**	**Hypermarket**
Owns the Business	Yes	No	Yes	-
Owns the Assets, Land, Buildings, etc.	Yes	No	Yes	-
Leases the Land, Building, Assets*	-	Yes	-	-
Operates all Facets of the Business	Yes	Yes	Yes	Yes
Sells Only Branded Gasoline *	Yes	Yes	Yes	Yes
Can Sell Multiple Gasoline Brands*	No	No	Yes	Yes
Can Sell Unbranded Gasoline*	No	No	Yes	Yes
Benefits from National Marketing	Yes	Yes	No	
Commits to Minimum Volumes		Yes		Yes
* = Subject to contract conditions				

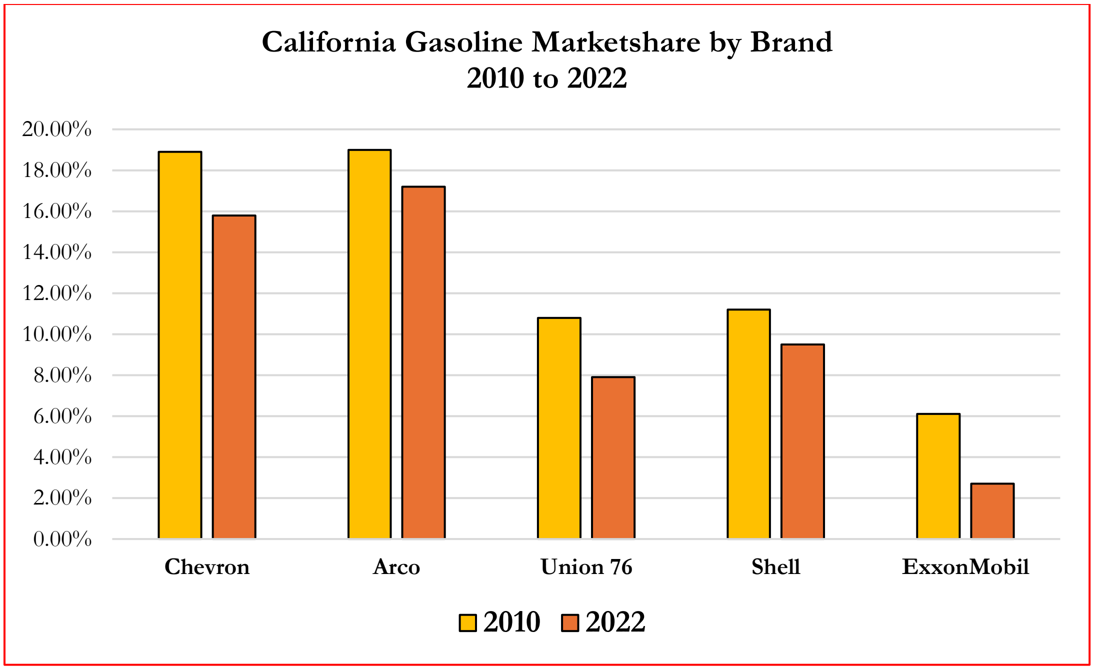
For the 2013 to 2023 period, average prices for branded gasoline formulations increased by 26.35%, while unbranded average prices increased by 18.32%. For the 2013 to 2023 period, the average price

[120] Droboniku, G., Johnsen, R., Maduros, N., Mason, J., Neff, B., California Energy Commission, & California Department of Tax and Fee Administration. (2024). CDTFA_CEC Joint Report 2024 Review of the gasoline in California and related impact on state revenues. In *California Energy Commission and California Department of Tax and Fee Administration* (Report CEC-200-2024-007). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf

differential per gallon was $0.2836, with an average differential of 6.97% per gallon. For 2023, the price differential between branded and unbranded gasoline was $0.48, or 9.36%.

In California, Shell, ARCO, and Chevron are the dominant brands.

Exhibit 2.24[121]



(Source:https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

[121] Droboniku, G., Johnsen, R., Maduros, N., Mason, J., Neff, B., California Energy Commission, & California Department of Tax and Fee Administration. (2024). CDTFA_CEC Joint Report 2024 Review of the gasoline in California and related impact on state revenues. In *California Energy Commission and California Department of Tax and Fee Administration* (Report CEC-200-2024-007). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf

SECTION 3.0
CALIFORNIA OIL & GASOLINE PRODUCTION

A STUDY OF CALIFORNIA GASOLINE PRICES
Section 3.0
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3.0 CALIFORNIA OIL & GASOLINE PRODUCTION

3.1 Introduction

Petroleum has always been one of California's most abundant natural resources and essential economic assets. The California oil industry enabled the industrial base and wealth of Southern California, provided the foundation for statewide economic growth, and created oil barons and philanthropists such as Alphonzo Bell, J. Paul Getty, Josiah Stanford, Demetrius Scofield, and Edward L. Doheny.

The petroleum industry in California has had a long and fascinating history. After the gold rush, it was oil that fueled much of California's economic and industrial growth for the latter part of the nineteenth and much of the twentieth century. During World War II, California oil supplied the U.S. naval, air, and land military forces with fuel to win the war in the Pacific. During the great expansion of California in the 1950s and 1960s, petroleum was essential to constructing freeway systems, and the gasoline that fueled the surge in California's population and car culture.

Oil has also played an important role in funding research and sponsoring higher education in the Golden State. According to Data for Progress, which describes itself as a "Think tank for the future of progressivism," between 2010 and 2020, oil companies (for example, BP, Chevron, and ExxonMobil) provided UC Berkeley, a State funded institution, with $154 million in research funds, and Stanford University, a private institution, with $56 million in research funds.[122] Additionally, investment in oil companies has also supported California's retirement system. The California state retirement system, CalPERS, which at $462 billion, is the largest retirement system in the U.S., reportedly holds around $9.2 billion of stock in both private and state-owned oil companies such as Chevron, ExxonMobil, Phillips 66, Marathon Oil and pipeline companies such as Energy Transfer and Kinder Morgan. CalPERS has also invested in Chinese state-owned oil companies such as Chinese Offshore Oil Corporation (CHOOC) and Chinese Oilfield Services, as well as the Russian energy company Gazprom.[123] [124] [125] [126] According to the Washington Free Beacon, in 2020, CalPERS had invested around $3.0 billion in Chinese companies, of which around $457 million were associated with companies that had been "blacklisted" by the first Trump Administration.[127]

In California, the Department of Conservation's Geologic Energy Management Division (CalGEM) has primary statutory authority for the oversight and regulation of oil production in the state and its oil and gas pipelines. There are, in total, over 25 individual federal, state, and local agencies in California that regulate, to some extent, the oil and gas industry.[128] Some of the California agencies that are involved in the regulation and oversight of oil and gas production in the state include, for

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[122] Krieger, L. (2024, July 16). Stanford keeps oil company financial ties, despite push for divestment. *Silicon Valley*. https://www.siliconvalley.com/2024/07/13/stanford-keeps-oil-company-financial-ties-despite-push-for-divestment/#

[123] *Board of Administration Agenda Item 8c*. (2023). https://www.calpers.ca.gov/docs/board-agendas/202303/full/item8c-00_a.pdf

[124] Gilmore, A. (2024, January 8). CalPERS' CEO pushes back on fossil fuel divestment calls. *Netzeroinvestor*. https://www.netzeroinvestor.net/news-and-views/calpers-ceo-pushes-back-on-fossil-fuel-divestment-calls#:~:text=Currently%2C%20CalPERS%20holds%20investments%20with,in%20China%20and%20Saudi%20Arabia.

[125] *California Public Employees' Retirement System 2023 California Public Divest from Iran Act Legislative Report CalPERS 2023 California Public Divest from Iran Act Legislative Report*. (n.d.). Retrieved January 27, 2025, from https://www.calpers.ca.gov/docs/forms-publications/iran-sudan-divestment-2023.pdf

[126] *CalPERS 13F filings and top holdings and stakes - stockzoa*. (2024). Stockzoa.com. https://stockzoa.com/fund/calpers/

[127] Ross, C. (2021, September 2). *California's State Pension Invests Millions in Chinese State-Owned Companies*. Freebeacon.com. https://freebeacon.com/national-security/californias-state-pension-invests-millions-in-chinese-state-owned-companies/

[128] https://laedc.org/research/reports/oil-and-gas-industry-in-california-2019-report/

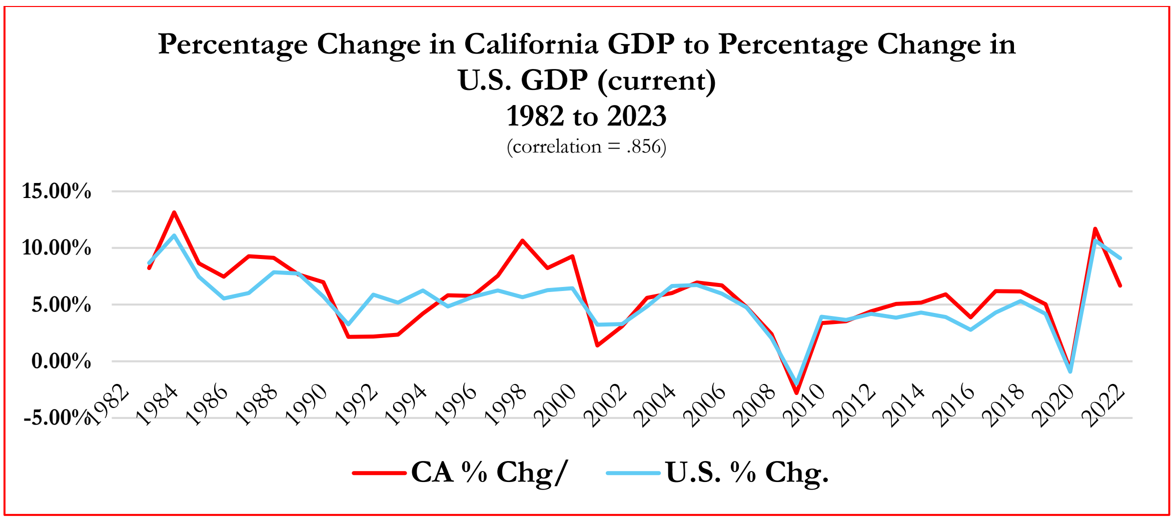
example, CARB, California Coastal Commission, Department of Toxic Substances Control, and California Energy Commission, to list a few.

3.2 Petroleum and the California Economy

With a $3.9 trillion economy (GDP), California comprises 14% of the U.S. GDP, is the nation's largest state economy, and ranks 5th as the largest economy globally.[129] On a per capita basis, California would be the second-largest economy in the world.[130] In dollar terms, California's GDP exceeds the GDPs of Italy, the U.K., Canada, and France.[131] For the 1982 to 2023 period, and on a percentage change basis, California's GDP outgrew that of the overall U.S. by 1.06 times.[132]

As California is the largest state economy in the nation, it stands to reason that the behavior of California's state economy is highly correlated with that of the overall U.S. GDP (.856 correlation) on an annual percentage change basis. For the 1982 to 2023 period, the annual percentage in California's GDP is highly correlated (.865) to the annual percentage change in the overall U.S. GDP.[133]

Exhibit 3.1



(Source: EIA, Fed. Reserve, author)

California has 39 million people, over 31.1 million motor vehicle registrations representing around 11% of all registrations nationally, and over 315,244 million miles of vehicle miles traveled in 2023.[134] [135] Although California also has one of the fastest growing economies in the U.S., based on per capita income, it has also experienced a net migration of population leaving the State. Since 2020, California's

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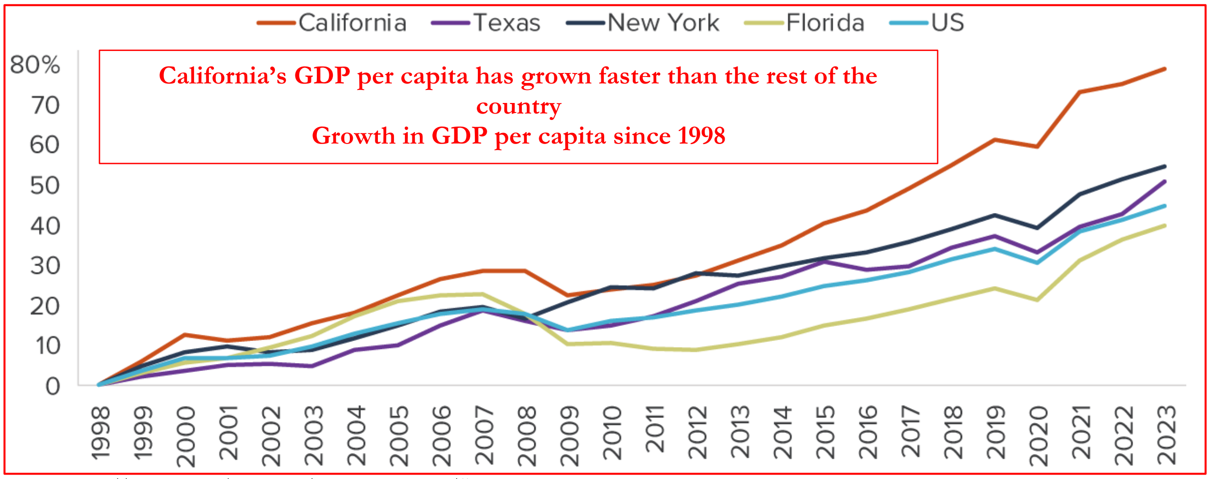
[129] Duan, J., & Bohn, S. (2024, October 14). *California's Economy*. Public Policy Institute of California. https://www.ppic.org/publication/californias-economy/
[130] Duan, J., & Bohn, S. (2024, October 14). *California's Economy*. Public Policy Institute of California. https://www.ppic.org/publication/californias-economy/
[131] Hughes, R. A. (2025, January 6). *If California were a country*. Bull Oak. https://bulloak.com/blog/if-california-were-a-country/
[132] Author calculation.
[133] Author calculation.
[134] *California State Energy Profile*. California Profile. (n.d.). https://www.eia.gov/state/print.php?sid=CA#89
[135] Carlier, M. (2024, December 5). *U.S: Motor vehicle registrations by State*. Statista. https://www.statista.com/statistics/196505/total-number-of-registered-motor-vehicles-in-the-us-by state/#:~:text=In%202022%2C%20California%20was%20the,over%20283.4%20million%20vehicle%20registrations.

population has declined by slightly over one percent, resulting in the loss of one seat in the U.S. House of Representatives.[136]

Exhibit 3.2



(Source: https://www.ppic.org/publication/californias-economy/#:~:text=California%20is%20an%20economic%20powerhouse,%25%20and%208%25%2C%20respectively.)

Along with its weather, environmental diversity, and abundance of natural resources, California is a petroleum-rich state. For 2022, the oil and gas industry comprised around 8% of the Golden State's GDP, with professional, financial, and information services at $520 billion being the largest.[137] As of December 2023, California holds around 1.5 million barrels of oil in proven reserves or around 3.1% of all U.S. proven reserves, ranks fifth largest oil reserves in the U.S., ranks 7th in oil production among 32 oil-producing states, and is home to the Monterey shale reserve.[138] Spanning across five counties and over 1,750 square miles, the Monterey Shale deposit is estimated to contain up to 300 million barrels of oil.[139] It is one of the largest deposits of shale oil in the U.S.[140] [141] At $70 a barrel and 300 million barrels, the Monterey Shale reserve potentially represents around $21.0 billion in raw crude deposits and perhaps over $100 billion of economic value in refined products.[142] For perspective, California's Legislative Analyst Office (LAO) estimates the State's budget deficit to be $55 billion in the fiscal year 2024-2025, with projected revenues to grow slower than expenditures, thus contributing to growing deficits in the future.[143] For further comparison, UCLA Anderson School of Management estimates the losses from the LA wildfires to range between $95 billion and $164 billion.[144]

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136 Walters, D. (2024, November 20). California's political clout will fade as long as population growth remains slow. *CalMatters*. https://calmatters.org/commentary/2024/11/california-political-clout-population-growth/

137 *What is the gross domestic product (GDP) in California? | USAFacts*. (n.d.). USAFacts. https://usafacts.org/answers/what-is-the-gross-domestic-product-gdp/state/california/

138 *California State Energy Profile*. California Profile. (n.d.). https://www.eia.gov/state/print.php?sid=CA#89

139 Early estimates wee up to 15.44 billion barrels of crude. See, Garthwaite, J. (2013, May 30). *Monterey Shale Shakes Up California's Energy Future*. Science. https://www.nationalgeographic.com/science/article/130528-monterey-shale-california-fracking

140 Global Energy Monitor. (2021, April 30). *Monterey Shale*. https://www.gem.wiki/Monterey_Shale#:~:text=Fracturing%20in%20Inglewood-,Shale%20makeup,shale%20play%20in%20the%20US.%22

141 Onishi, N. (2013, February 4). *Vast oil reserve may now be within reach, and Battle Heats up (published 2013)*. The New York Times. http://www.nytimes.com/2013/02/04/us/vast-oil-reserve-may-now-be-within-reach-and-battle-heats-up.html?pagewanted=all&_r=1&

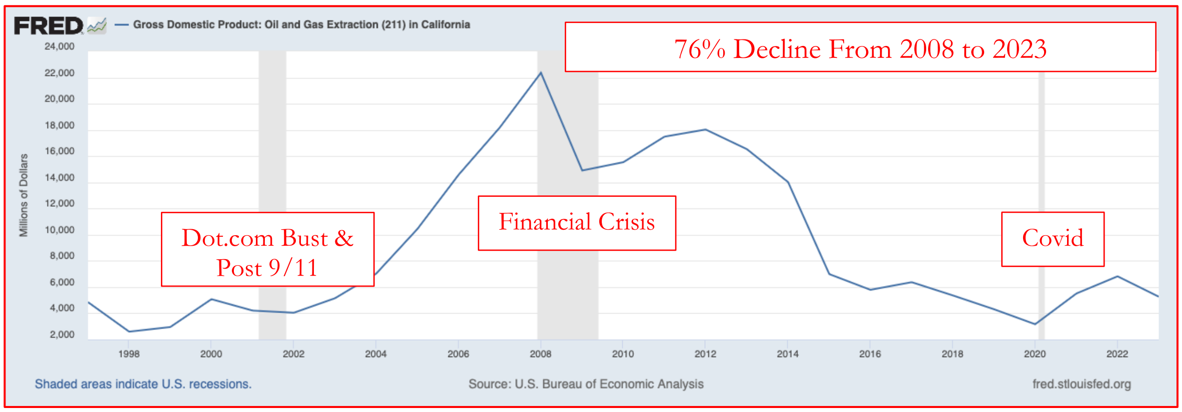
142 Author estimate.

143 *The 2025-26 Budget: California's Fiscal Outlook*. (2024, November 20). Ca.gov. https://lao.ca.gov/Publications/Report/4939

144 UCLA Anderson School of Management. (2025, February 17). *Economic impact of the Los Angeles wildfires*. https://www.anderson.ucla.edu/about/centers/ucla-anderson-forecast/economic-impact-los-angeles-wildfires#:~:text=In%20summary%2C%20the%20total%20property,from%20a%20series%20of%20assumptions.

Notwithstanding its proven reserves and established oil and refining infrastructure, California is highly dependent on foreign oil imports supplied by petrostates, such as Iraq and Saudi Arabia, to supply crude oil to meet its everyday gasoline and petroleum products demands. As such, if any significant disruptions occurred with these foreign oil sources, California could not make up for oil stock deficiencies with either in-state production or imports of U.S. domestically provided oil stocks in the short term. (See Section 4.0 for a more thorough discussion of California oil imports and sources.) Crude oil production in California has always contributed to the State's GDP. As indicated in the chart below, oil production contribution to California's GDP reached a historical peak, in absolute dollars, in 2008. Since the 2008 peak, oil production's contribution to California's GDP, in absolute dollar terms, has declined by 76%, indicating a lesser role in the State's overall economy.[145]

Exhibit 3.3
California: Gross Domestic Product from Oil & Gas Extraction



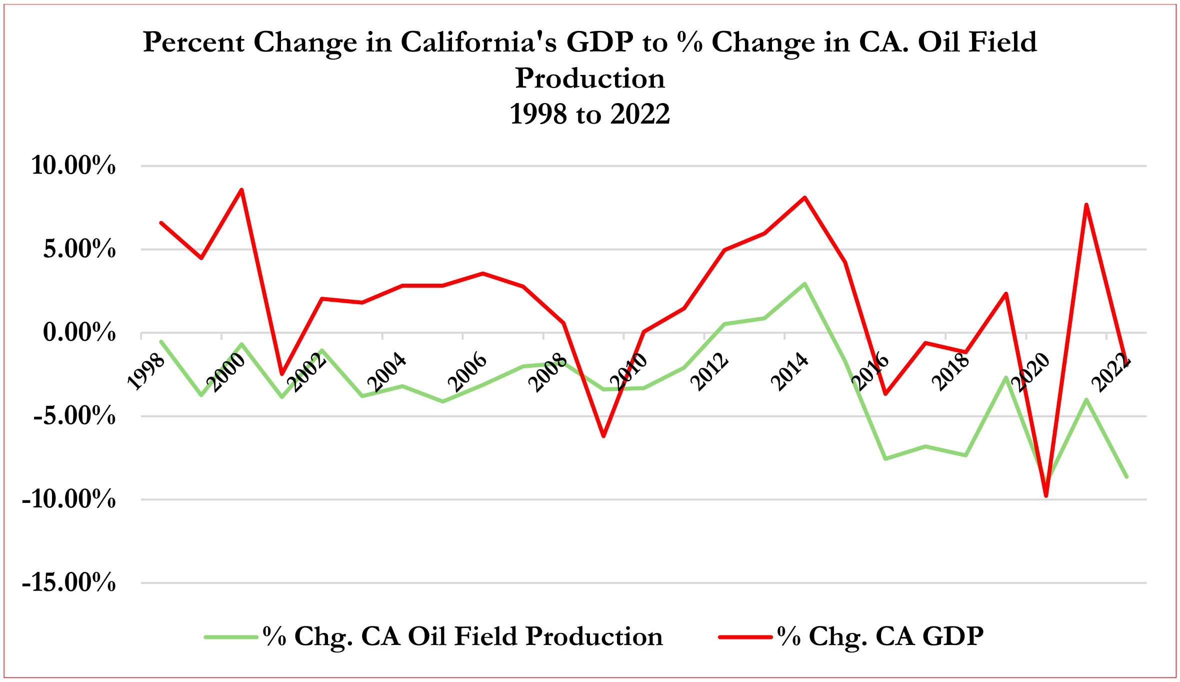
(Source: https://fred.stlouisfed.org/series/CAOILGASNGSP#)

Over the 1998 to 2023 period, although there is some similarity in movement between California's oil field production to its GDP, based on the annual percentage change, the correlation is very low (.11). The low correlation is not unexpected, as oil and gas production has become less significant over the years in California's economy, which has become dominated by the service and technology sectors.

[145] *Gross Domestic Product: Oil and Gas Extraction (211) in California*. (2023). Stlouisfed.org. https://fred.stlouisfed.org/series/CAOILGASNGSP#

Michael A. Mische
University of Southern California
Marshall School of Business

Exhibit 3.4



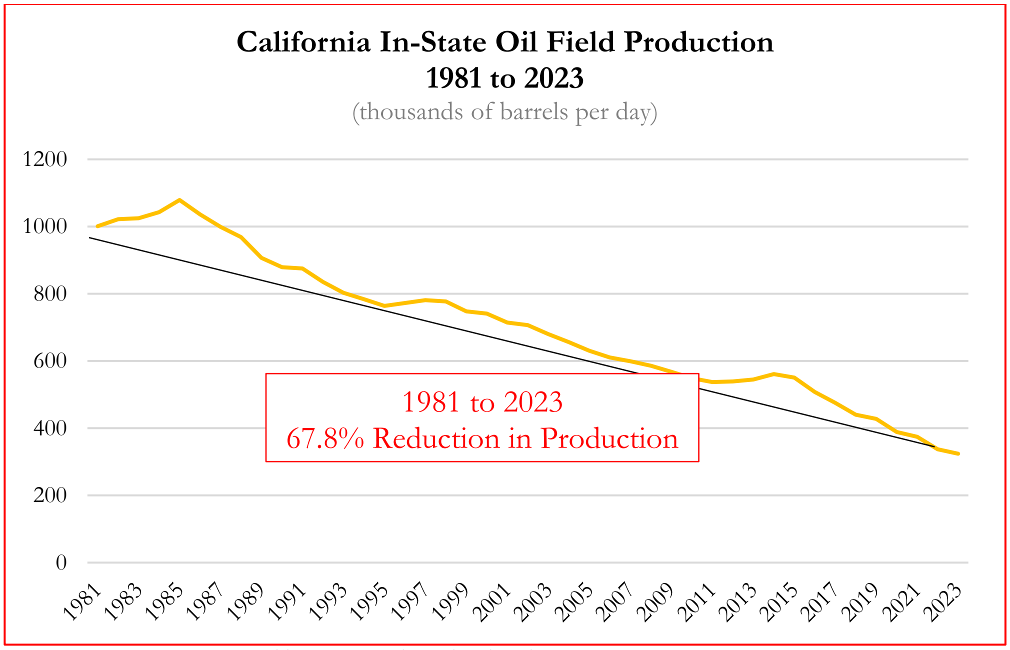
(Source: EIA and Author)

3.3 California Oil Production

Once a global leader and ranking fourth in the world in oil production, today, California accounts for only around 2.5% to 2.7% of all U.S. crude production and is producing only 23.7% of its own in-state needs. According to CEC reporting, California produced 123,947 million barrels of oil in 2023.[146] California's oil and gasoline production has consistently fallen since 1992. In 1992, California produced 320,888,000 barrels of oil.[147] In contrast, in 2022, California produced 124,727,000 million barrels of oil or only 39% of 1992 production. For the 1982 to 2023 period, in-state oil production fell by 69% from its peak high in 1985 (398,280) to a historic low in 2023 of 123,947.

[146] California Energy Commission. (n.d.-a). *Annual oil supply sources to California refineries*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california
[147] California Energy Commission. (n.d.-a). *Annual oil supply sources to California refineries*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california

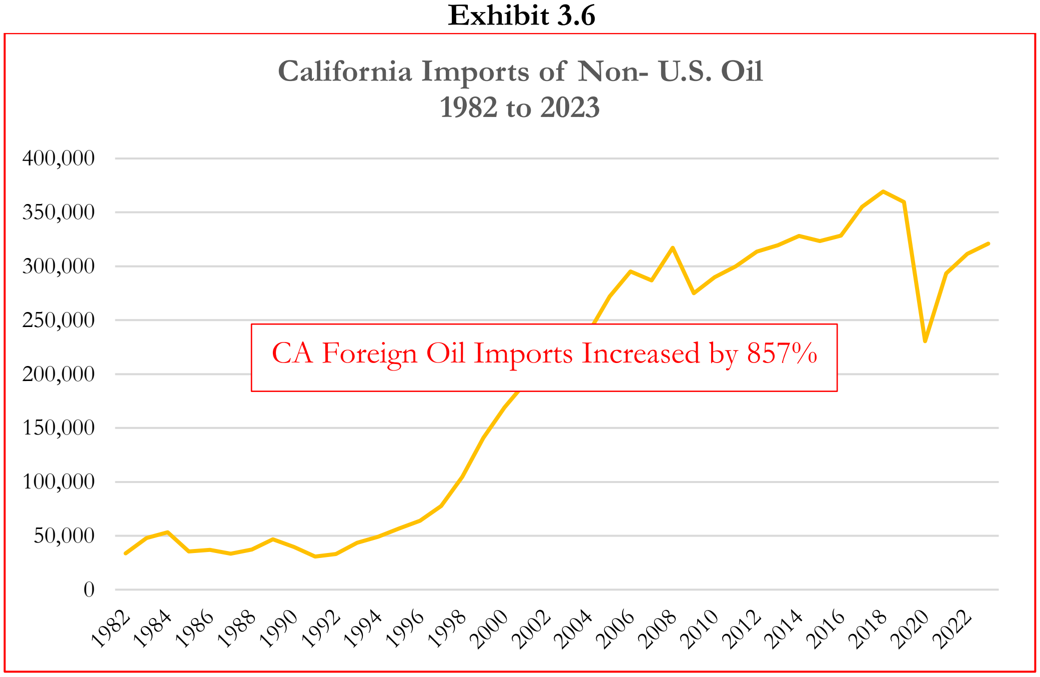
Exhibit 3.5



(Source: EIA https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrfpca2&f=a)

Meanwhile, California imports of non-U.S. foreign oil grew by 1,102% from its historic low in 1991 of 30,723 to 369,386, its peak high in 2018.[148] (See Section 4.0.)

Exhibit 3.6



(Source: CEC)

[148] Based on CEC data.

The exhibit below summarizes the various sources of California in-state and foreign sourced crude oil supplies by region/county, nation, or state, as well as the general grade characteristics and primary method of transportation to California refineries. As indicated, within California, pipelines are the primary mode of transportation to the refinery, and naturally, imports are transported via marine tanker vessels. The predominant crude is heavy, with a viscosity range from light heavy to very heavy. Some California compliant gasoline is imported from Washington State, as needed, but it is minimal.

Exhibit 3.7

California Sources, Grades & Transportation Methods for Crude Oil- 2018 to 2024		
Crude Oil Source	**Crude Grade Characteristic**	**Transportation Method to CA**
U.S. DOMESTIC		
CA- Kern	Very Heavy	Pipeline
CA- Midway Sunset	Very Heavy	Pipeline
CA- Belridge	Very Heavy	Pipeline
CA- San Ardo	Very Heavy	Pipeline
CA- Lost Hills	Light Heavy	Pipeline
CA- Ventura	Light Heavy	Pipeline
CA- Elk Hils	Light Heavy	Pipeline
Alaska- North Slope	Medium	Tanker
Washington State	Gasoline	Tanker
FOREIGN		
Canada	Heavy	Tanker & Rail
Ecuador	Heavy	Tanker
Guyana	Medium/Heavy	Tanker
Russia	Heavy	Tanker
Saudia Arbia	Heavy	Tanker

(Source: https://www.californiaenergyatlas.com/copy-of-crude-oil)

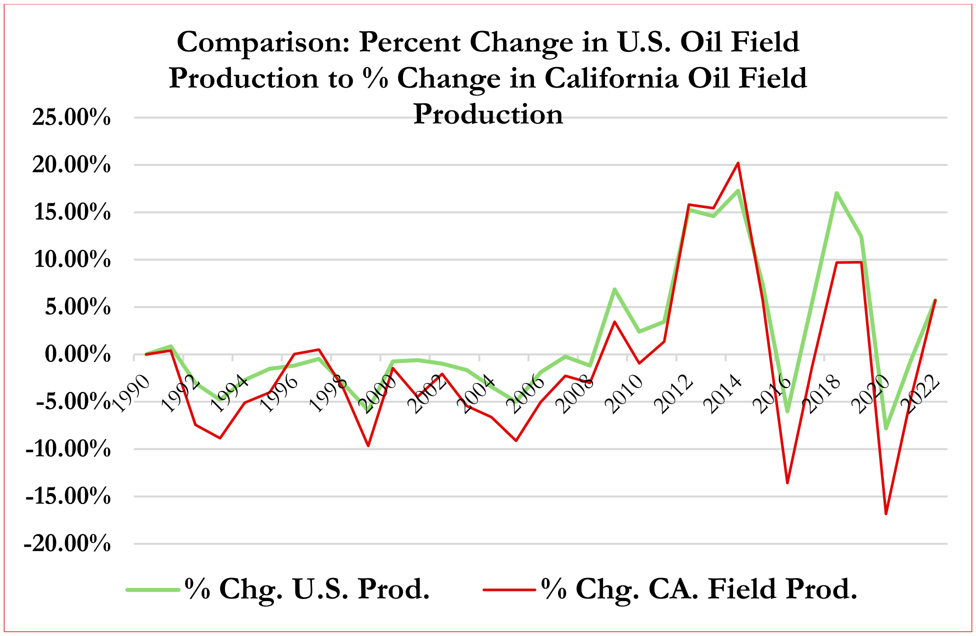
For the better part of the twentieth century, California was self-sufficient in its production of oil and was, for some years, a net exporter of oil to other states. In 1982, California produced 61% of its oil needs in the State.[149] However, since the 1980s, California's in-state oil production has fallen, and its reliance on foreign-sourced oil increased. By 2023, California's in-state oil production was only able to supply around 23% of its needs, and its dependency on foreign-sourced oil, grew. (See Section 4.0 for a discussion of imports.)

On a comparative basis for the 1990 to 2022 period, California's oil field production declined while overall U.S. oil field production grew. The overall correlation between California oil field production and U.S. oil field production in millions of barrels is -.691 in absolute terms and .337 based on annual

[149] California Energy Commission. (n.d.-a). *Annual oil supply sources to California refineries*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california

percentage change. Significant variances, as measured by annual percentage change, began in 2009 and continued through 2019.

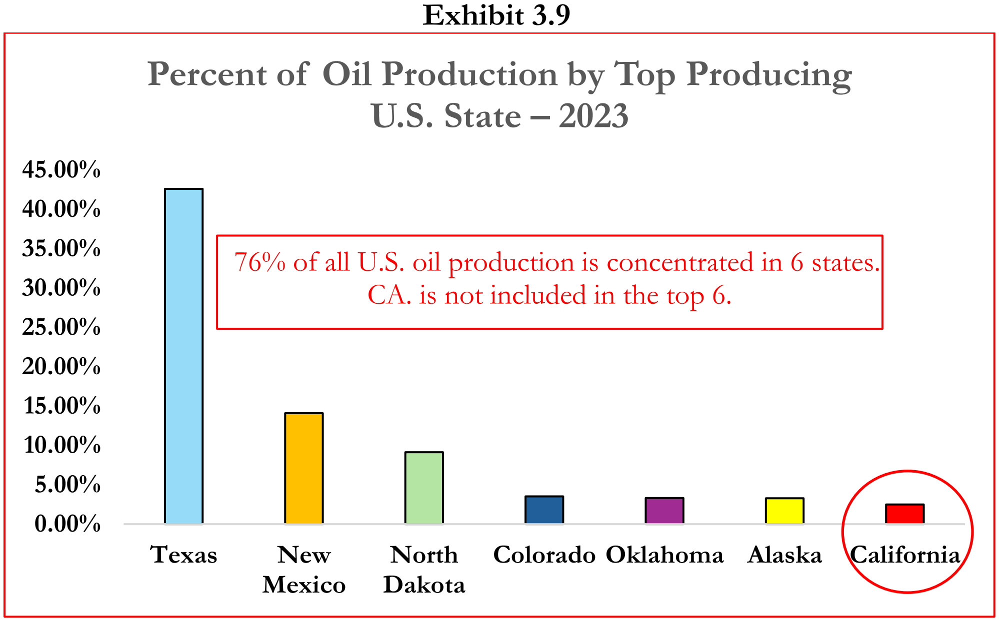
Exhibit 3.8



(Source: CEC and EIA)

Comparatively, California's in-state oil production is dwarfed by Texas, North Dakota, New Mexico, and Alaska. For perspective, Texas produced almost 18 times the amount of oil than California in 2022.

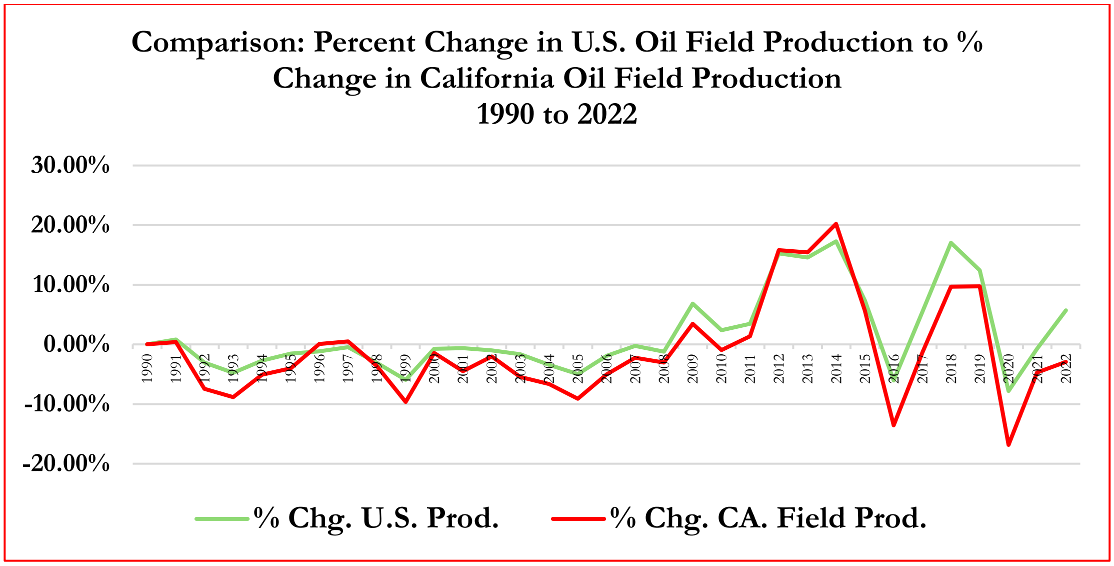
Exhibit 3.9



(Source: Top 11 Oil-Producing States in 2023 ROBERT RAPIER as cited in https://oilandgaspress.com/top-11-u-s-oil-producing-states/. See also, https://www.investopedia.com/financial-edge/0511/top-6-oil-producing-states.aspx#citation-21)

In 2012, the Golden State's in-state oil production was 197 million barrels a day, and California's population was 37.5 million. However, by 2022/23, with California's population at 38.95 million, in-state oil production had fallen by 35% to 127 million barrels. Overall, the decline in in-state production, California's field production profiles that of the overall U.S. on an annual percentage change basis.

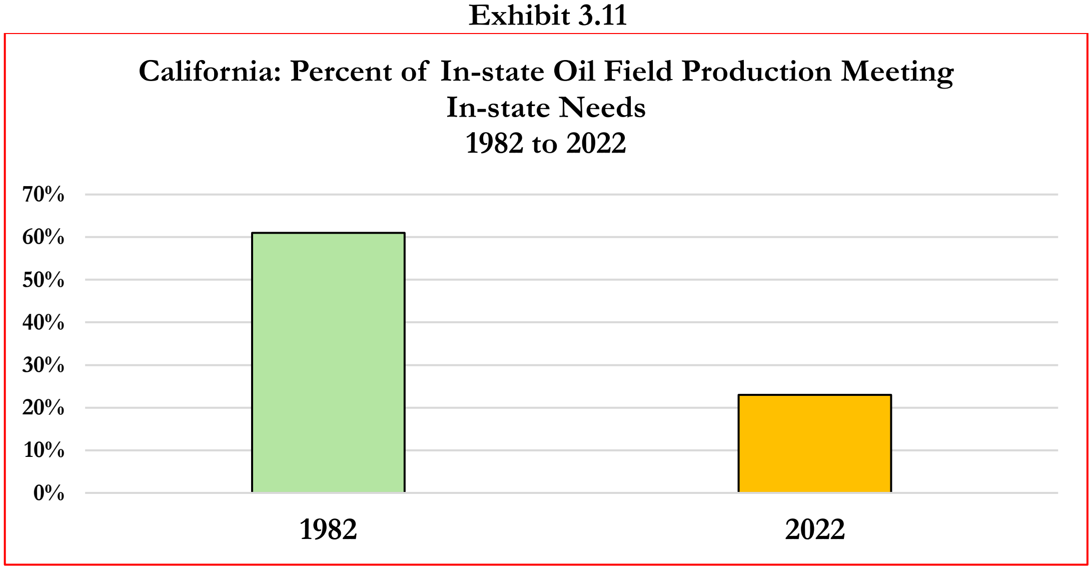
Exhibit 3.10



(Source: EIA & CEC)

Since 1990, while overall U.S. field production has increased 66%, California's field production declined 61%. Since 2018, California's field production has declined 26.4%. Since 1982, California's ability to meet its demand for petroleum through in-state production has fallen from over 60% internally sourced to about 21% in 2023.

Exhibit 3.11



(Source: CEC & EIA)

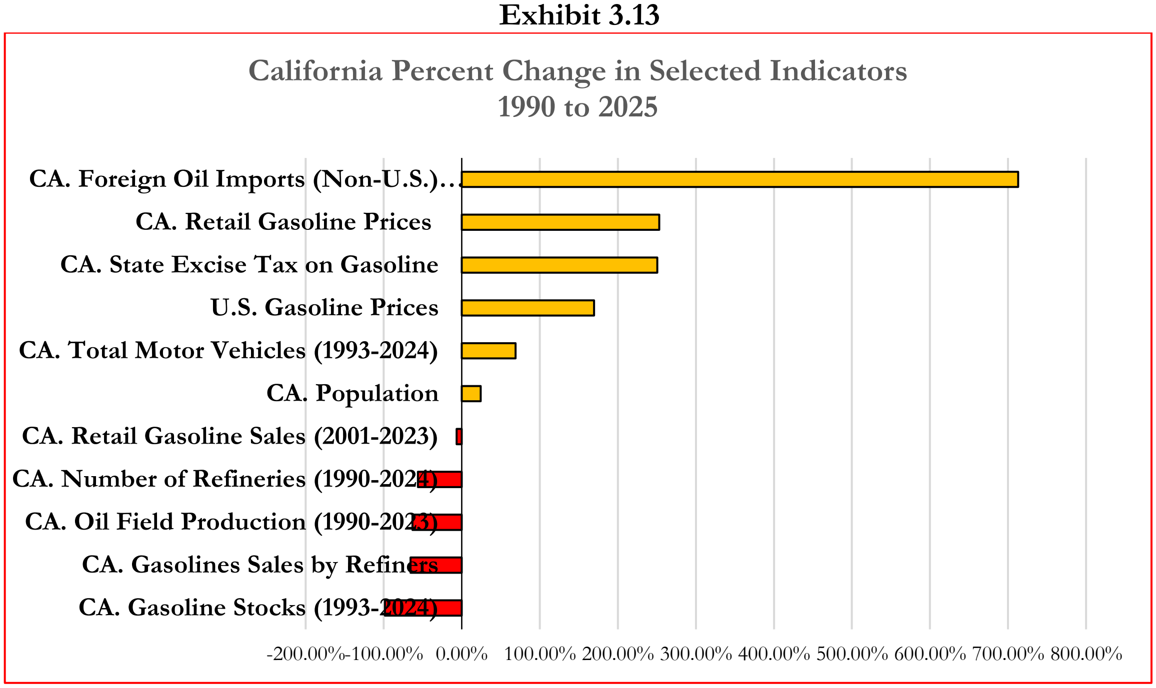
Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

For the 1993 to 2023 period, as California oil production and the number of refineries producing California compliant gasoline decreased, California excise taxes increased by 250%, as well as other regulatory fees, such as those associated with environmental programs, which also increased. Ultimately, excise taxes and other regulatory fees and costs are reflected in the cost of fuel sold and the retail sales price at the pump. The exhibit below summarizes some key indicators related to California's oil production (supply), consumption (demand), and other related factors.

Exhibit 3.12

(Sources: CEC, EIA, Statisica)

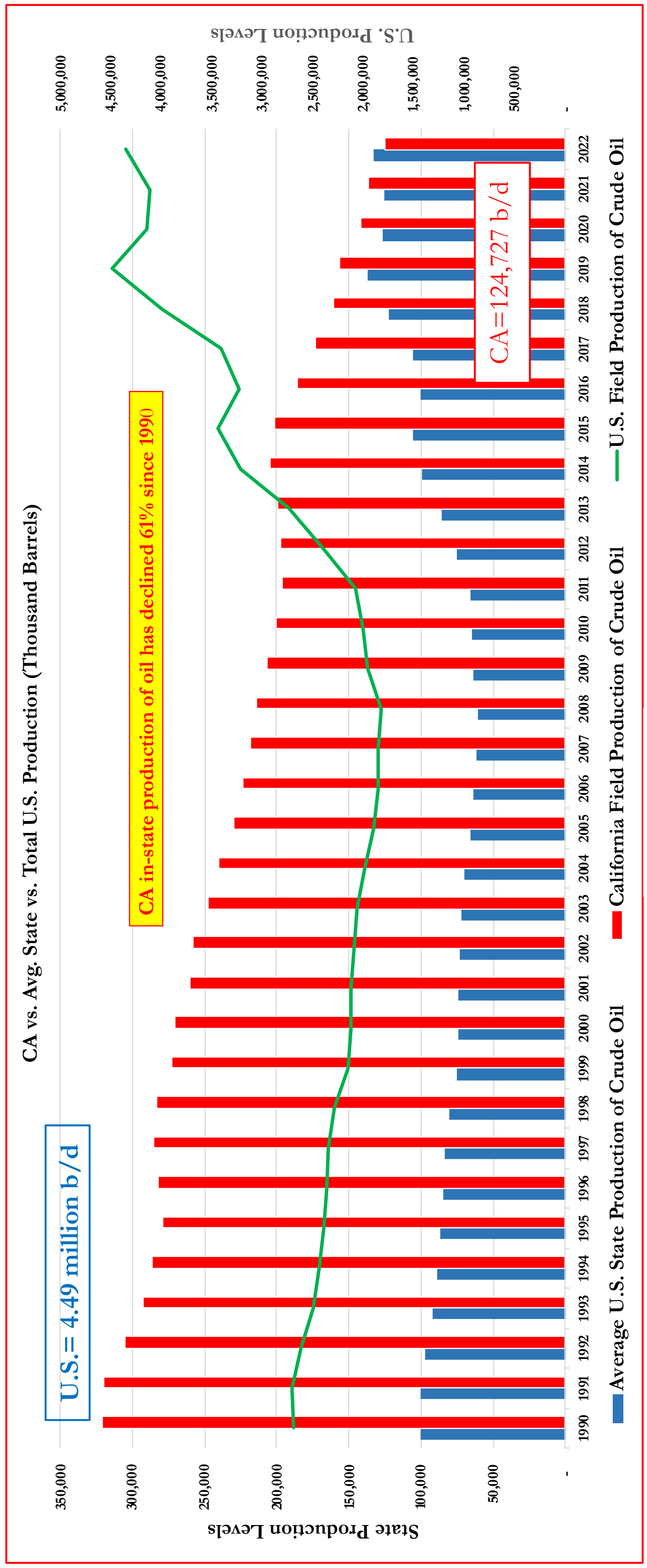
Exhibit 3.13



(Source: CEC, EIA, Author)

As illustrated in the following exhibit, California oil field production declined by over 60% from 1990 to 2022. In contrast, total U.S. oil field production and the average production by petroleum producing States increased.

Exhibit 3.14
Comparison Average California Field Production to All States

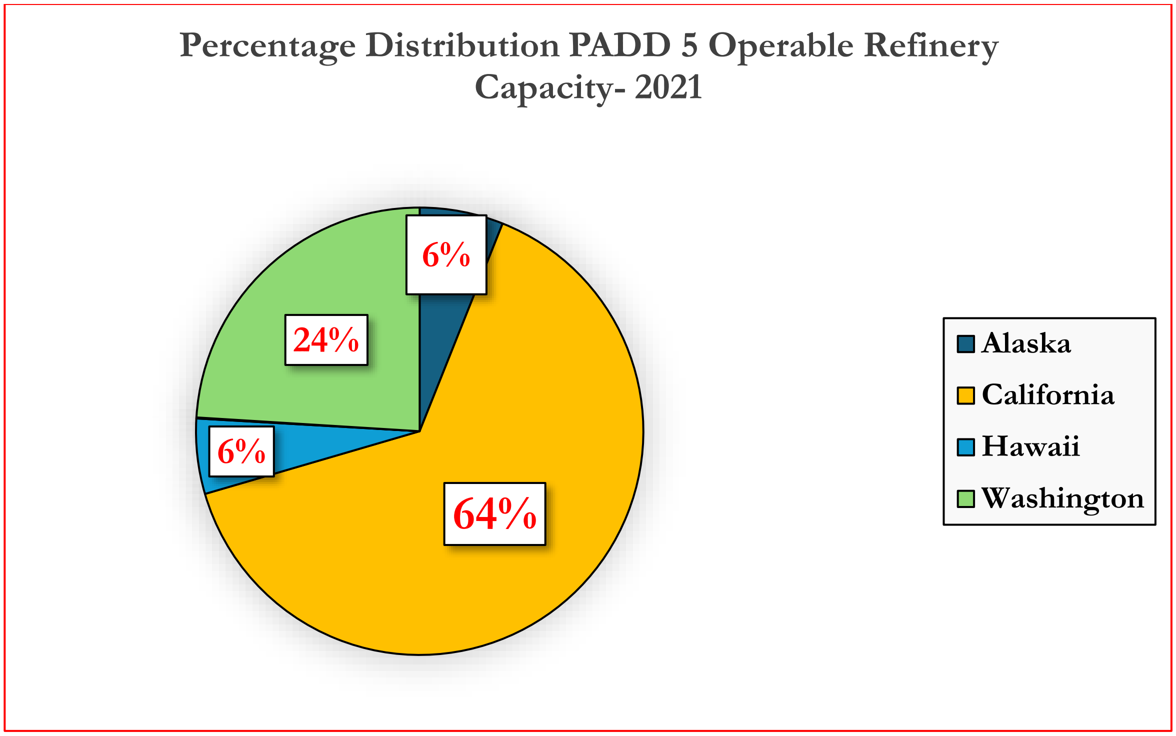


(Source: CEC, EIA)

3.4 California & PADD 5 Production

California's refineries are assigned to PADD Region 5.[150] The PADD 5 region includes Alaska, Arizona, California, Hawaii, Oregon, and Washington. As of January 1, 2021, there were 26 operating refineries in PADD 5, of which 14 are located in California.[151] Washington and Alaska have five refineries each, and Hawaii and Arizona each have one. PADD 5 has an aggregate operable capacity of 2,713,571 barrels per calendar day. Of the total PADD 5 capacity, California composes slightly over 64% with 1,748,171 million barrels of oil a day of operable capacity. Of the total 426.0 million barrels of crude oil stock held in U.S. inventory by refiners, 47.3 million or 11.1% are located in PADD 5.

Exhibit 3.15

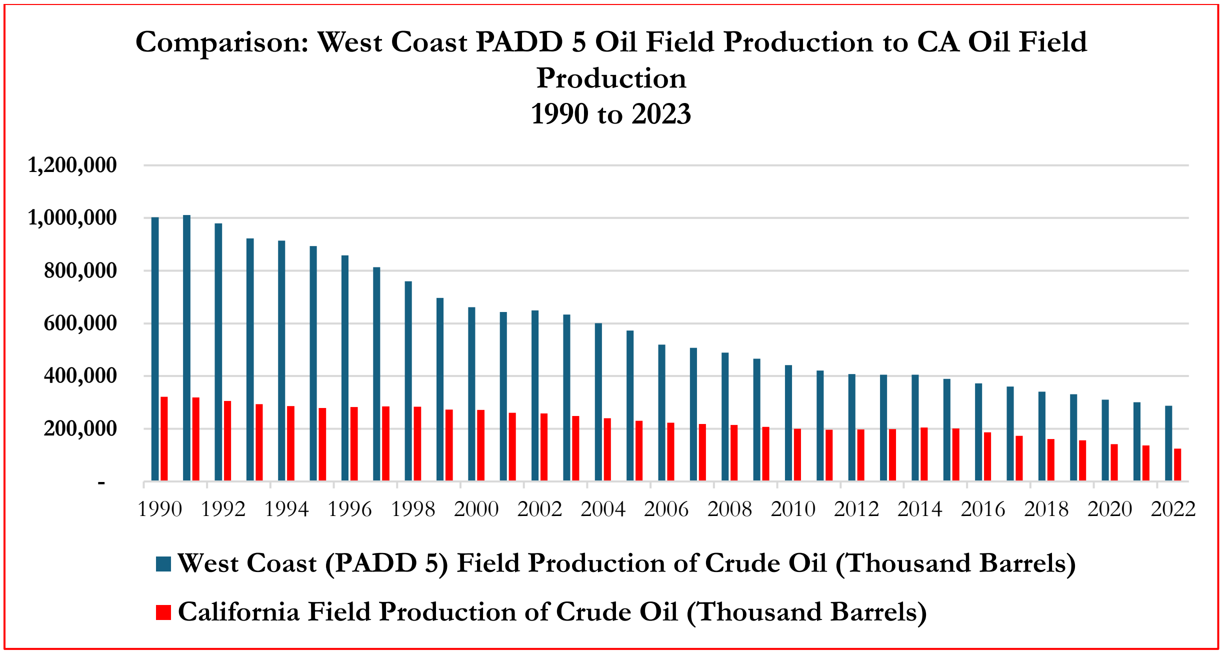


(Source: EIA)

California's percentage of PADD 5 capacity is expected to decline as refiners convert to renewables and others, such as Phillips 66 and Chevron, wind down refinery operations and exit the Golden State in anticipation of additional regulations and 2035 zero emission vehicle (ZEV) mandates.

[150] Petroleum Administration Defense District. The PADDs were created in 1942 by Presidential Executive Order during WW-II as a method for managing petroleum resources. It is currently used to collect data and for data analysis.
[151] *AFPM United States Refining Capacity Report*. (2021). https://www.afpm.org/system/files/attachments/AFPM-Capacity-Report-2021.pdf

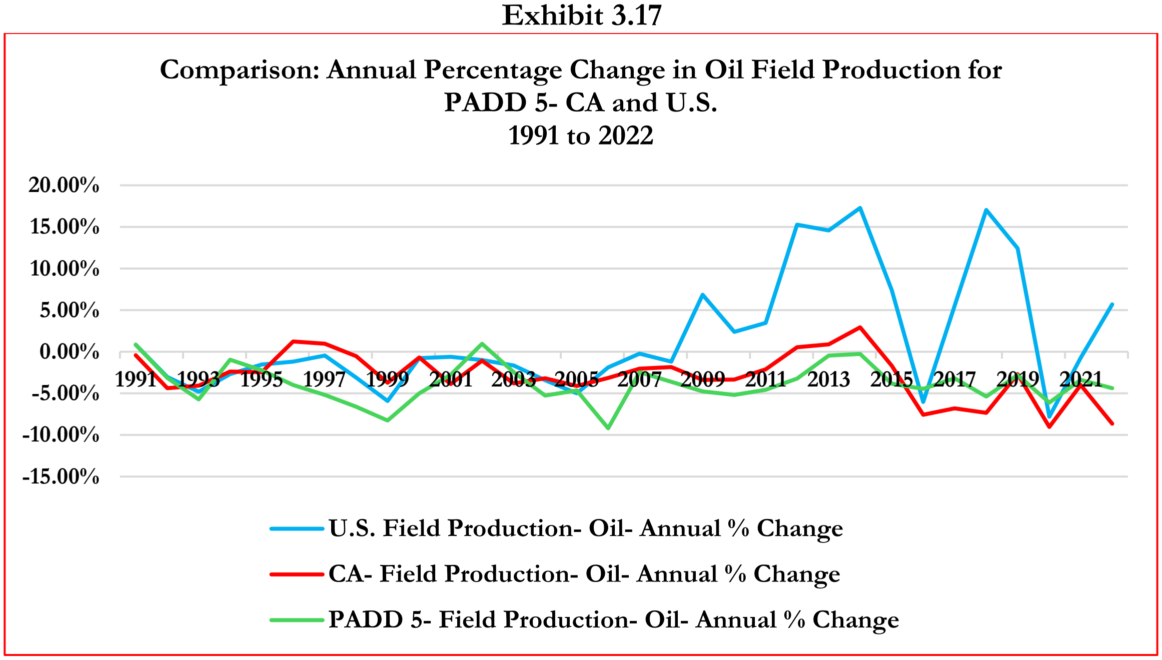
Exhibit 3.16



(Source: EIA)

On an annual percentage change basis, for the 1991 to 2022 period, while U.S. oil field production increased and overall PADD 5 production moderated, California production fell.

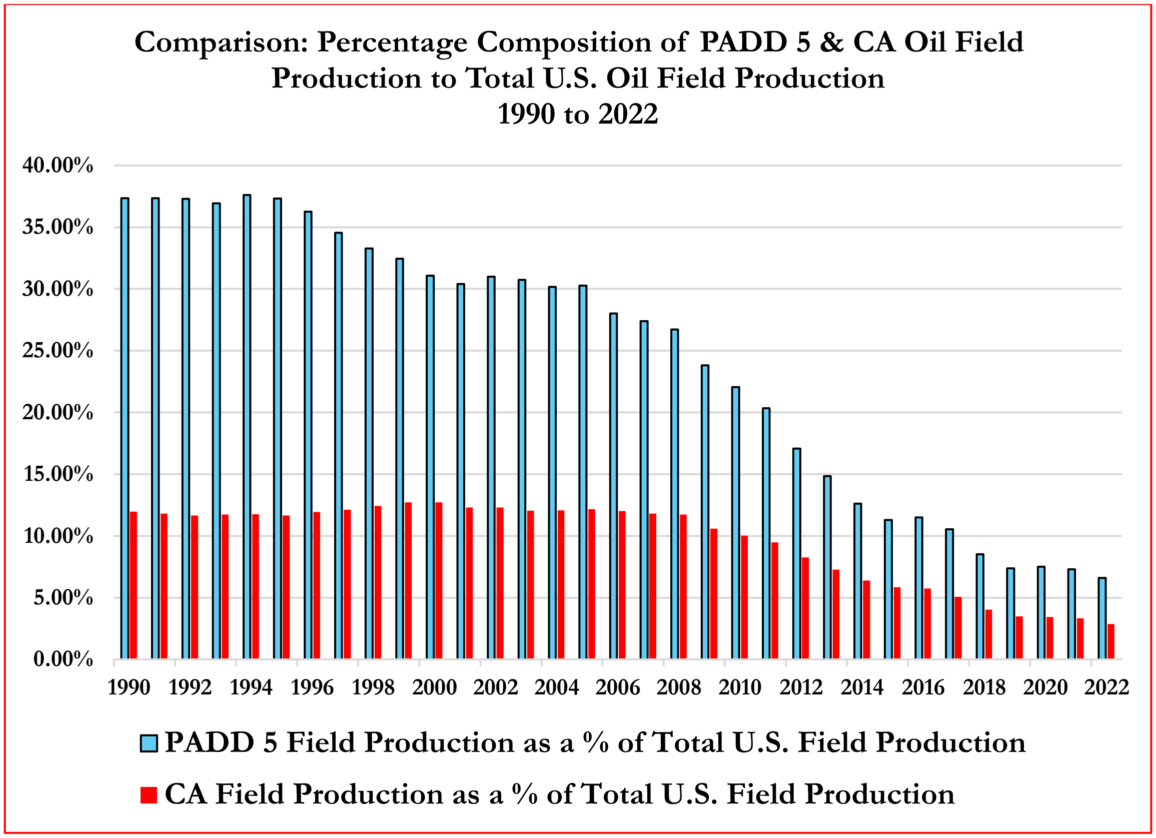
Exhibit 3.17



(Source: EIA)

Although refinery capacity and production for Gulf Coast refineries has increased by 27% since 2000, West Coast refinery production has fallen by 12%. Notwithstanding the growth in California's population, GDP, and motor vehicle registrations, for the 1990 to 2022 period, PADD 5 and California oil field production as a percentage of total U.S. production has declined due to decreased in-state field production.

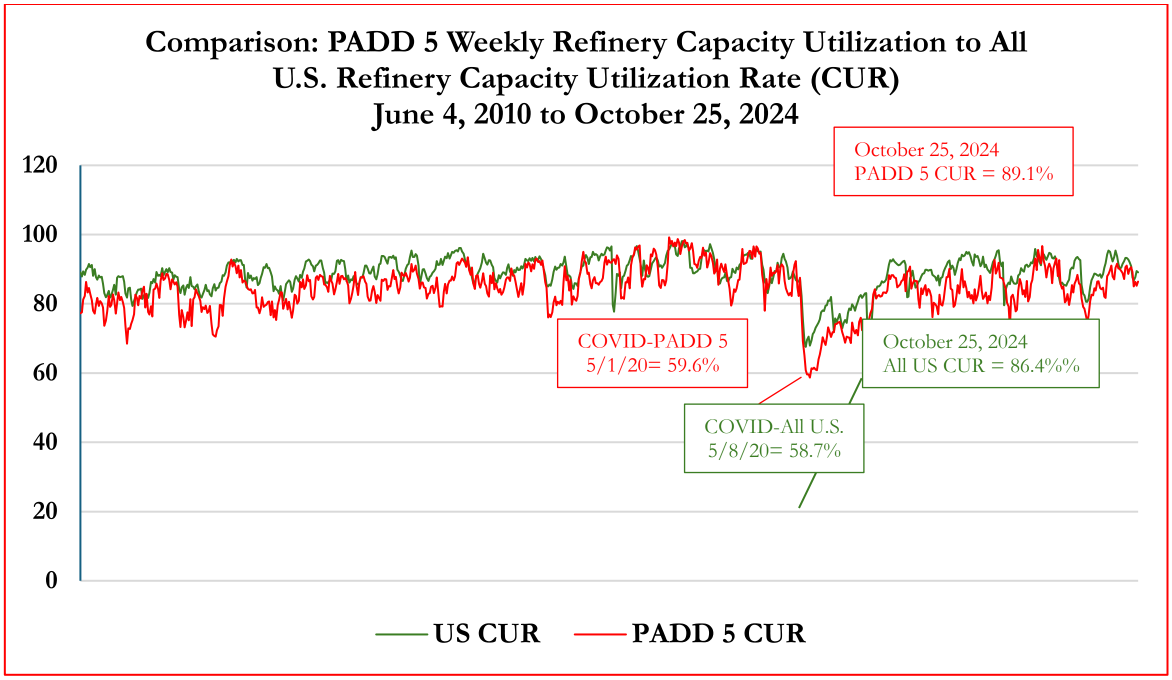
Exhibit 3.18



(Source: EIA)

PADD 5 refinery capacity utilization is consistent with all U.S. refinery capacity utilization and has a relatively high correlation of .781. California's variance of finished gasoline stocks compared to the overall PADD 5 and measured by annual percentage change for the 1993 to 2004 period was relatively consistent and exhibited a high correlation. However, commencing around April 2004 and continuing through August 2024, California's variance in finished gasoline stocks to PADD 5 stocks exhibited high variance, volatility, and a low correlation.

Exhibit 3.19

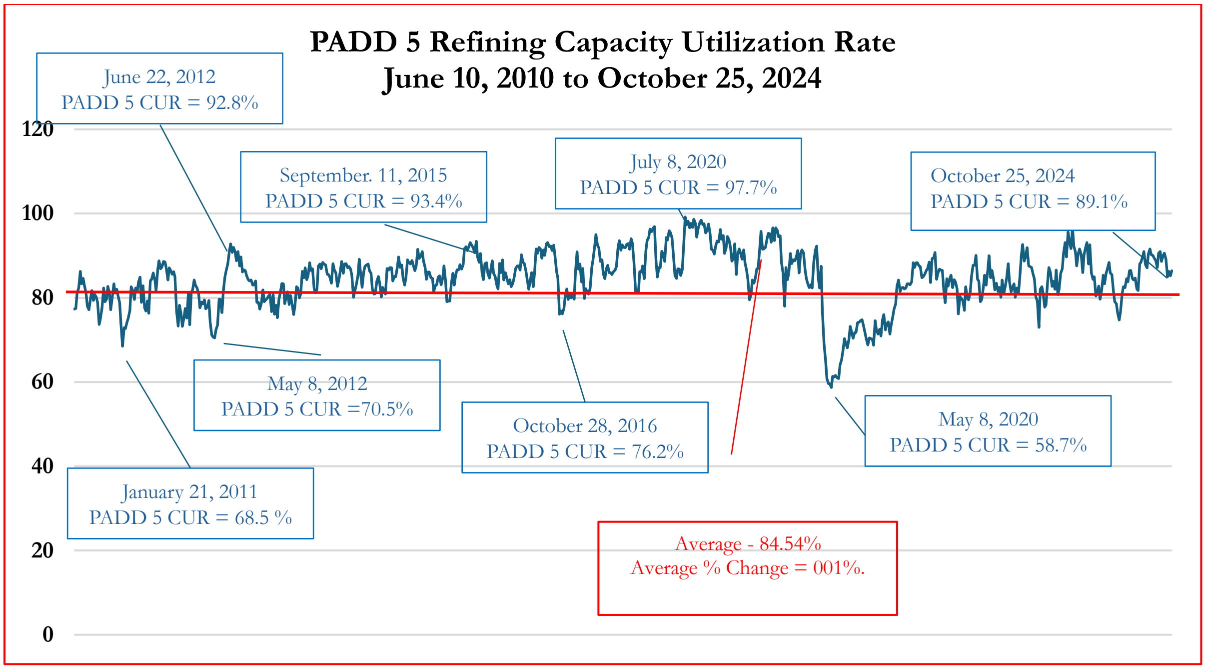


(Source: EIA. Note, dates are "week of")

From January 10, 2010, to October 25, 2024, overall PADD 5 capacity utilization averaged 84.54% and, with some exceptions, has remained consistent with U.S. refineries, with an average of .07% annual percentage change in utilization as compared to .07% for all U.S. refineries.

As the chart below indicates, overall PADD 5 capacity utilization has increased from 77.% in June 2020 to 86.4% in October 2024. Concurrently, the number of refineries declined, particularly in California.

Exhibit 3.20

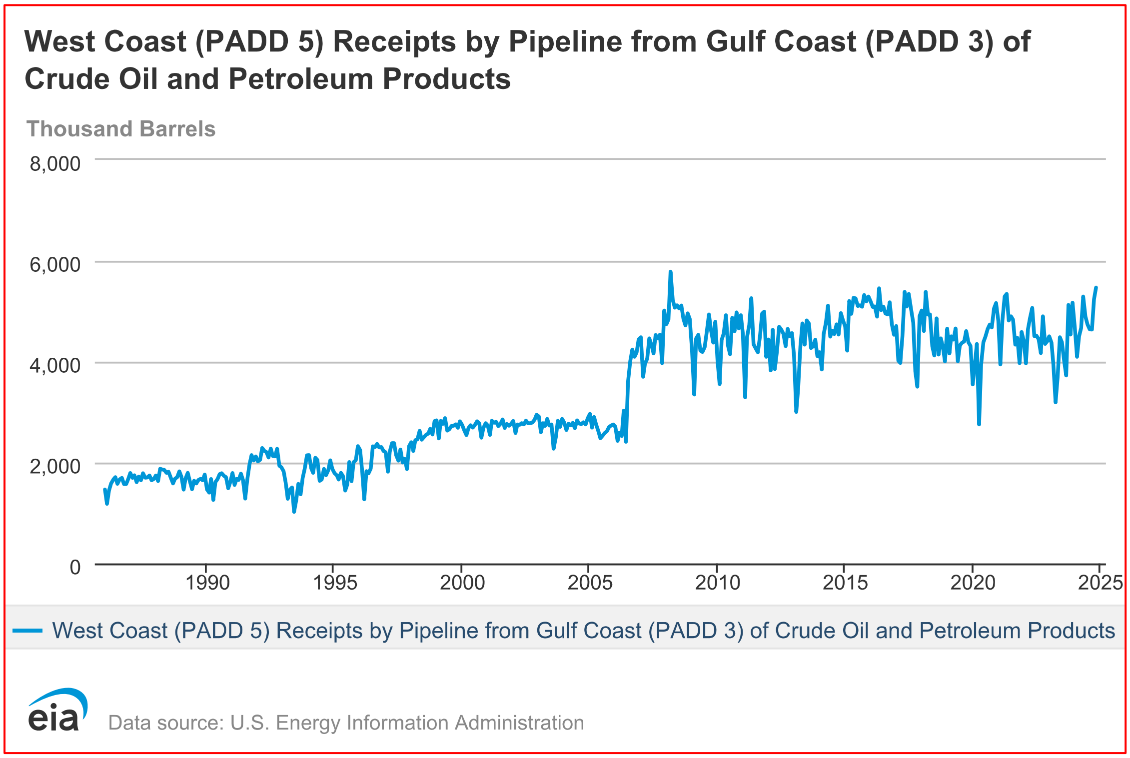


(Source: EIA. Note, dates are "week of"))

Significant variances in PADD 5 capacity utilization occurred on January 21, 2011; May 8, 2012; June 25, 2012; September 11, 2015; October 28, 2016; July 8, 2020; and May 8, 2020. Commencing the week of October 28, 2016, and running through to the week of June 22, 2018, capacity utilization of PADD 5 refineries increased from 76.2% to 96.7%, which was an all-time high for the June 10, 2010, to October 25, 2024, period. Capacity utilization for PADD 5 oil refineries reached its lowest rate on May 8, 2022, at 58.7%, compared to 56.0% for all U.S. refineries on February 26, 2021.

California is isolated from both product and supply perspectives. In the event of shortages, some CaRFG (CARFG) blend stock could be supplied by PADD 5 refineries in Washington State and also by PADD 3 Gulf Coast refineries. However, transferring or 'importing' PADD 3 stocks and gasoline at scale requires 11 to 12 days of transit time and use of the Panama Canal. The exhibit below from the EIA summarizes the oil pipeline transfers from PADD 3 refineries to PADD 5 refineries for the 1986 to November 2024 period.

Exhibit 3.21



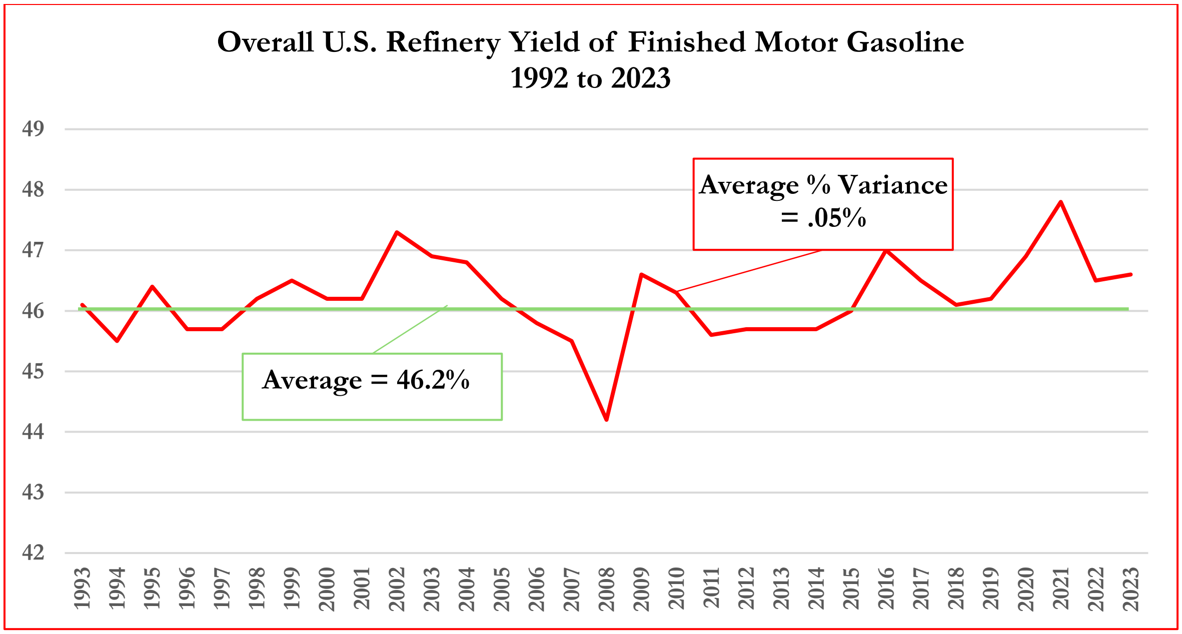
(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MTTMPP5P31&f=M)

Since 1986, pipeline shipments from PADD 3 to PADD 5 have increased by 206.62%; however, since California has no inbound pipelines, the shipments are pipelined to non-California refiners. The greatest annual percentage change in transfers occurred in 2007 when transfers jumped 28.33%.

3.5 California Refineries

The largest refinery in the world is the Jamnagar Refinery complex located in India, which can process 1.2 million barrels of crude oil daily.[152] The largest refinery in the U.S. is Marathon Oil's Galveston Bay Refinery, located in Texas, with a refining capacity of 631,000 barrels of crude oil a day. In the U.S., there are 132 refineries with a combined refining capacity of over 18.4 million barrels of oil a day as of January 1, 2024.[153]

Exhibit 3.22



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfryus3&f=a)

According to the CEC, in 2024, California had an aggregate refinery processing capacity of 1,622,171 barrels of crude oil per day which a 5% reduction from 2023 levels of 1,710,371.[154] A further reduction in refining capacity of 9.3% to 1,483,171 barrels a day is anticipated for 2025, as associated with legislative moves and the announced closure of Phillips refinery in Los Angeles representing 139,000 barrels a day. Supply appears to be falling faster than demand, which, if materialized, generally stimulates price increases.

Collectively, California has the third largest refinery capacity in the U.S.[155] California gasoline refinery capacity is heavily concentrated in three refiners: Chevron, Marathon Oil, and PBF. These refiners collectively represent almost 70% of California's refinery capacity.

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[152] Wikipedia contributors. (2024b, November 4). *List of oil refineries*. Wikipedia. https://en.wikipedia.org/wiki/List_of_oil_refineries
[153] *U.S. Number and Capacity of Petroleum Refineries*. (n.d.). Www.eia.gov. https://www.eia.gov/dnav/pet/pet_pnp_cap1_dcu_nus_a.htm
[154] California Energy Commission. (n.d.-b). *California's oil refineries*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries
[155] Riedl, D., & Saha, D. (2024). In a Clean Energy Future, What Happens to California's Thousands of Oil Refinery Workers? *Www.wri.org*. https://www.wri.org/insights/ca-oil-refineries-just-transition

Exhibit 3.23[156]

California Oil Refineries, Capacity, Volumes & CARB Capability				
California Refineries As of 10/24/2024	**Barrels Per Day**	**% of California**	**CARB Diesel**	**CARB Gasoline**
Marathon Petroleum Corp., Los Angeles Refinery*	365,000	22.50%	Yes	Yes
Chevron U.S.A. Inc., El Segundo Refinery	269,000	16.58%	Yes	Yes
Chevron U.S.A. Inc., Richmond Refinery	245,271	15.12%	Yes	Yes
PBF Energy, Torrance Refinery	160,000	9.86%	Yes	Yes
PBF Energy, Martinez Refinery	156,400	9.64%	Yes	Yes
Valero Energy, Benicia Refinery	145,000	8.94%	Yes	Yes
Phillips 66, Los Angeles Refinery**	139,000	8.57%	Yes	Yes
Valero Energy, Wilmington Refinery	85,000	5.24%	Yes	Yes
Kern Energy, Bakersfield Refinery	26,000	1.60%	Yes	Yes
Sub-total CARB Capable	**1,590,671**	**98.05%**		
San Joaquin Refining Company Inc., Bakersfield Refine	15,000	0.92%	Yes	No
Lunday Thagard, South Gate Refinery	8,500	0.52%	No	No
Valero Wilmington Asphalt Refinery	6,300	0.39%	No	No
Talley Asphalt Inc., Kern Refinery	1,700	0.10%	No	No
Sub-total Non-CARB Capable	**31,500**	**1.93%**		
Grand Total	**1,622,171**	**99.98%**		

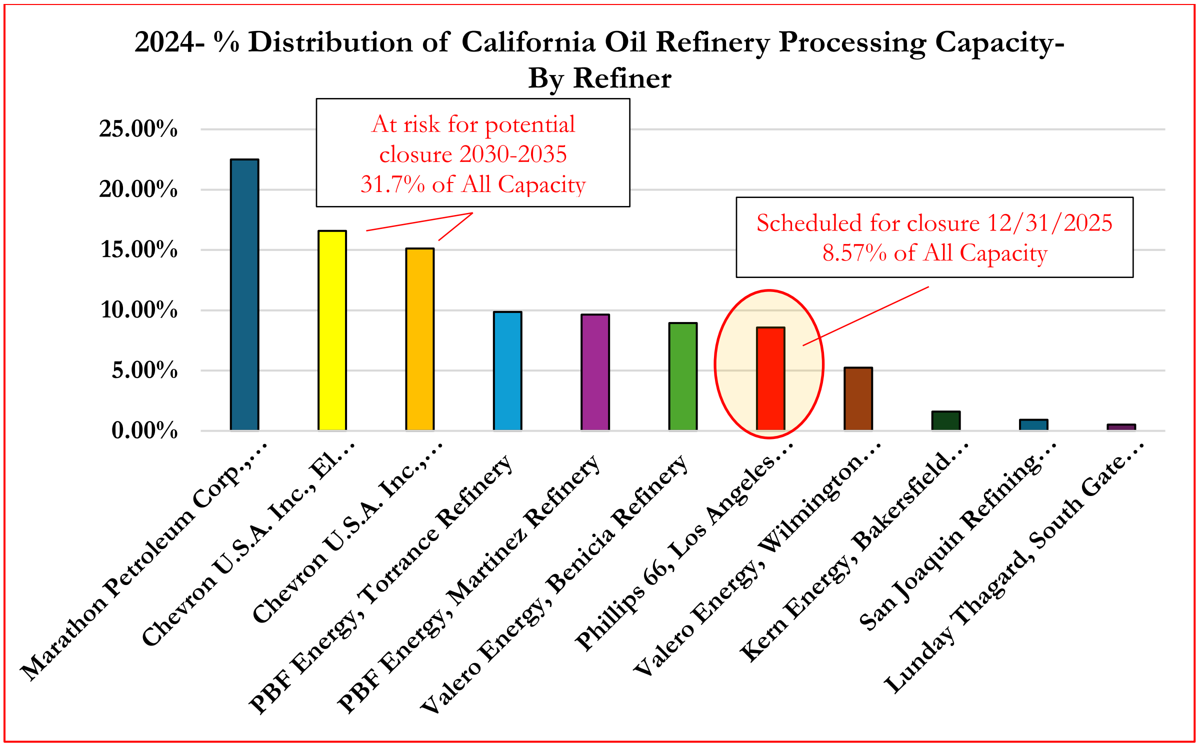
(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries)

Since capacity is related to capital expenditures and permitting, zoning, environmental, and regulatory restrictions, physical capacity in terms of size and volume doesn't vary much from year to year. However, capacity utilization and output (production) do vary considerably from year to year and within a year.

Of California's 13 refineries, 54% of capacity is concentrated in the top 3 refineries, and over 73% is concentrated in the top 5. The largest oil refinery in California is owned and operated by Marathon Oil. Located in Los Angeles, the Marathon complex has a processing capacity of 365,000 barrels of crude oil a day, which represents 22.5% of California's crude oil refinery processing capacity for 2024.[157] With two refineries, Chevron collectively represents 32% of California's refinery capacity. However, California only constitutes 3% of Chevron's sales. As noted, after some 140 years in California, Chevron is following a long list of companies, such as Oracle, Toyota, Honda, Tesla, and Charles Schwab, exiting the Golden State. Four refineries produce 90% of California's compliant gasoline.[158]

[156] California Energy Commission. (n.d.). *California's oil refineries*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries
[157] California Energy Commission. (n.d.-c). *California's oil refineries*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries
[158] CEC data.

Exhibit 3.24



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries)

On October 17, 2024, and after the passing of legislation requiring refiners to hold extensive inventories of finished gasoline products and vesting the CEC with more regulatory and discretionary powers over refinery operations, Phillips 66 announced that it is closing its Wilmington refinery by yearend 2025.[159] The Wilmington refinery constitutes 8.13% of California's 2023 refining capacity. Meanwhile, Chevron and ExxonMobil have written down between $4.5 to $5.0 billion in refinery and other California-based asset impairments. Chevron announced its planned departure from California by 2030/31.[160] [161] As of October 2024, California's 13 refiners have a combined refining capacity of around 1,622,171 barrels of oil a day.[162] With 13 operable atmospheric refineries, California represents 9.1% of all U.S. refining capacity. However, California's oil refining capacity could drop by 8.57% to 1,574,371 million barrels a day in 2025 due to the planned closure of the Phillips 66 complex in Los Angeles.[163] The recent announcement by Phillips 66 is another closure in a long history of refineries either ceasing petroleum refining operations in California or pivoting to other products, such as renewable fuels.[164]

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159 Briscoe, T. (2024, October 19). Phillips 66 refinery closure a welcome surprise to activists - Los Angeles Times. *Los Angeles Times*. https://www.latimes.com/environment/story/2024-10-17/phillips-66-refinery-closure-a-welcome-surprise-to-activists

160 CrowleyBloomberg, J. R. (2024, January 2). *Chevron blames a $4 billion writedown mostly on California's regulations as its war with the state's Democratic-led government heats ups*. Fortune. https://fortune.com/2024/01/02/chevron-4-billion-writedown-california-regulations-democratic-led-government/

161 Chevron Policy, Government and Public Affairs. (2024, August 2). *Chevron announces headquarters relocation and senior leadership changes*. chevron.com. https://www.chevron.com/newsroom/2024/q3/chevron-announces-headquarters-relocation-and-senior-leadership-changes

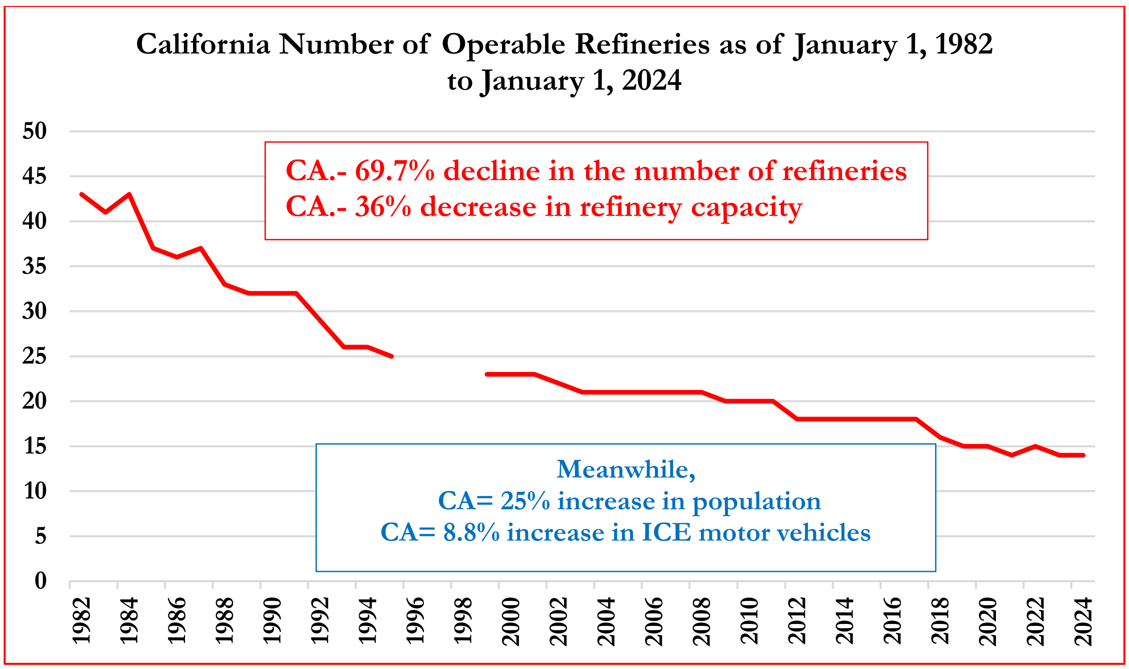
162 Commission, C. E. (n.d.). *California's Oil Refineries*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries

163 Brelsford, R. (2024, October 17). *Phillips 66 to permanently shutter Los Angeles refinery*. Ogj.com; Oil & Gas Journal. https://www.ogj.com/refining-processing/article/55236329/phillips-66-to-permanently-shutter-los-angeles-refinery

164 Need conversions here

Since 1984, the number of oil refineries in California has decreased by nearly 70%, from 43 to 13 operable refineries. Of the 13 remaining refineries, 9 produce California compliant reformulated gasoline (CaRFG/CARFG).[165] From 1990 to 2024, California permanent refinery shutdowns represent 74% of PADD 5 shuttered refinery capacity.[166] Over 100 years, more than 60% of California's refineries have closed.[167] Since 1982, the number of operable refineries in California has declined by 69%. From 1984 to present, California's oil refining capacity has decreased by 36%, from 2.5 million barrels a day to 1.7 million a day. Since 2023, the daily refining capacity for California surviving refineries has declined 5.16%, from 1,710,371 barrels a day to 1,622,171 barrels a day. From 2023 to the end of 2025, refinery production is estimated to decline by another 8.57%, to 1,483,177 barrels a day.

Exhibit 3.25



(Source: CEC, DMV, Bureau of Census)

With the planned closure of the Phillips 66 complex, California will only have nine refineries producing CaRFG-compliant gasoline. However, the formula for CaRFG-compliant gasoline is slated to change, which, most likely, will necessitate refiners changing processes and equipment, which could influence supply and according to CEC estimates, will most likely increase retail pump prices by $0.47.[168] [169]

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165 *California Reformulated Gasoline | California Air Resources Board*. (n.d.). Ww2.Arb.ca.gov. https://ww2.arb.ca.gov/our-work/programs/fuels-enforcment-program/california-reformulated-gasoline

166 *PAD District / Refinery Location Total Atmospheric Distillation*. (n.d.). https://www.eia.gov/petroleum/refinerycapacity/table13.pdf

167 California Energy Commission. (n.d.-a). *California Oil Refinery history*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries/california-oil

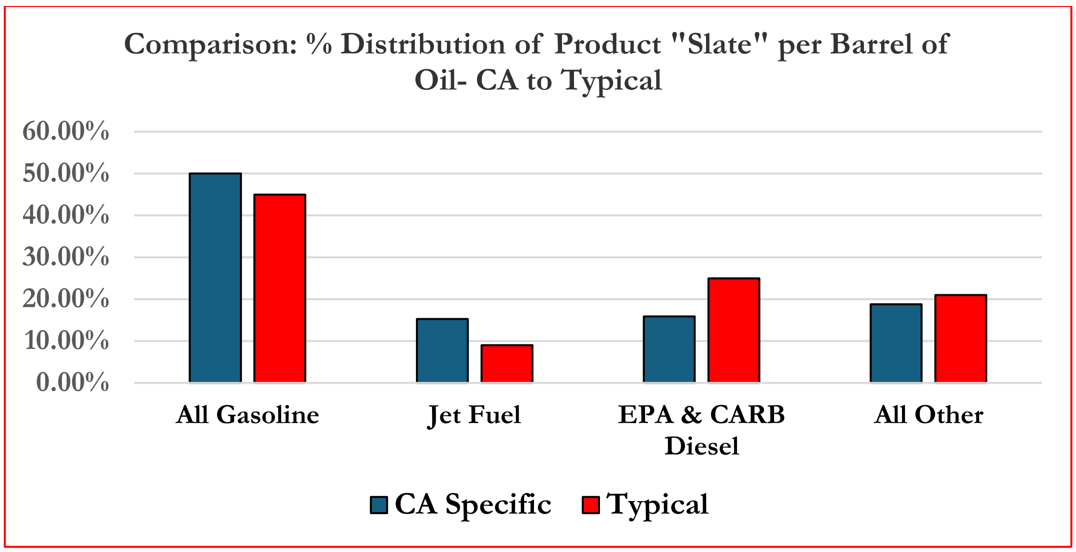
168 Willis, B. (2024, November 9). *California Air Resources Board approves new fuel standards that could increase gas prices*. ABC30 Fresno. https://abc30.com/post/california-regulators-vote-fuel-standard/15528908/

169 Lazo, A. (2024, November 9). *California enacts new climate rules — which could boost gas prices*. CalMatters. https://calmatters.org/environment/climate-change/2024/11/california-fuels-standard-gas-prices-climate-change/

Despite its population and vehicle growth, no new refineries have been opened in California for over 60 years.[170] Since 2017, California has lost 12% of its refining capacity and could lose at least another 8.57% with the planned closing of the Phillips 66 refinery by year end 2025. In 2024, ExxonMobil terminated its onshore production and ceased oil field operations in the Golden State.[171] In 2022, California restricted drilling permits.[172] Refinery conversions to renewable fuels have also reduced the capacity to produce gasoline by around 11%.[173] Consequently, only nine refineries survive today, producing about 90% of California's compliant gasoline.[174]

California refineries produce a slightly different product mix than the "typical" barrel. California has a slightly different product mix and yields on a barrel-to-barrel basis and compared to a "typical" barrel of oil products. Below is a chart comparing the "typical" barrel product mix to the California product mix per barrel based on the published CEC product slate for California 2024.

Exhibit 3.26



(Source: CDTFA_CEC joint report 2024 review of the gasoline in ... (n.d.-b). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

The sheer geographical size of California and its role as an entry and exit portal for global travel (California has abundant long-haul international and domestic flights and high-traffic airports) require that its refiners produce more jet fuels than the national average. For 2020, over 54.3 million

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170 Policy, C. (2024, May 22). *California regulations could cut supply, raise gasoline prices says chevron exec*. Chevron.com; Chevron. https://www.chevron.com/newsroom/2024/q2/california-regulations-could-cut-supply-raise-gasoline-prices-says-chevron-exec

171 Valle, S. (2022, September 1). Exxon, Shell sell California oil assets for $4 billion to IKAV. *Reuters*. https://www.reuters.com/business/energy/exxon-shell-sell-california-oil-joint-venture-asset-manager-ikav-2022-09-01/

172 Marissasaldivar. (2024, September 26). *Governor Newsom signs legislation to restrict polluting oil & gas operations near schools, daycares, and across communities | Governor of California*. Governor of California. https://www.gov.ca.gov/2024/09/25/governor-newsom-signs-legislation-to-restrict-polluting-oil-gas-operations-near-schools-daycares-and-across-communities/#:~:text=This%20allowed%20California's%20law%20requiring%20setbacks%20%E2%80%93,crucial%20protection%20for%20public%20health%20and%20safety.

173 *MSN*. (2025). Msn.com. https://www.msn.com/en-us/money/companies/california-playing-dangerous-game-with-climate-policies-chevron-says/ar-BB1hmygS

174 California Energy Commission. (n.d.-e). *What drives California's gasoline prices?* https://www.energy.ca.gov/data-reports/energy-insights/what-drives-californias-gasoline-prices

passengers passed through Los Angeles (LAX) and San Francisco (SFO) international airports.[175] Jet fuel or aviation turbine fuel, produced from kerosine, requires complex refining methods, is produced to exceptionally stringent standards, and is best transported via pipelines.[176] California consumes and produces more jet fuel than any other state.[177] Below is an exhibit comparing the product yields for California to a "Typical" or average barrel of oil.

Exhibit 3.27[178]

Comparison of Product Types Per Barrel-CA. to U.S.		
Product Type	**Typical U.S. Product Types**	**California Product Types**
CA. CARB Gasoline	0.00%	42.40%
Aviation (Jet) Fuel	9.00%	15.30%
CA CARB Diesel Fuel	25.00%	10.00%
Conventional Gasoline	45.00%	5.20%
EPA Diesel Fuel	0.00%	5.80%
Other RBOB	0.00%	2.40%
Other Diesel	0.00%	0.20%
Total All Fuels	**79.00%**	**81.30%**
All Other Products	21%	18.70%
Grand Total:	**100.00%**	**100.00%**

(Source: CDTFA_CEC joint report 2024 review of the gasoline in ... (n.d.-b)

3.6 Gasoline Production

California's compliant CaRFG (CARFG) gasoline is produced by 11 refineries located in the Golden State from oil stocks largely sourced from foreign suppliers. Section 4.0 discusses California's imports and growing dependency on foreign sourced oil. The production process and economics of refinery operations are discussed in Section 5.0 of this document.

In oil refinery operations, refiners endeavor to match production to consumption as closely as possible and generally maintain only minimal levels of finished gasoline in inventory. Finished gasoline has a high-cost component and a deteriorating life span. Throughout the gasoline supply chain, various components, such as distributors, wholesalers, and retailers, also tend to keep minimal inventories of

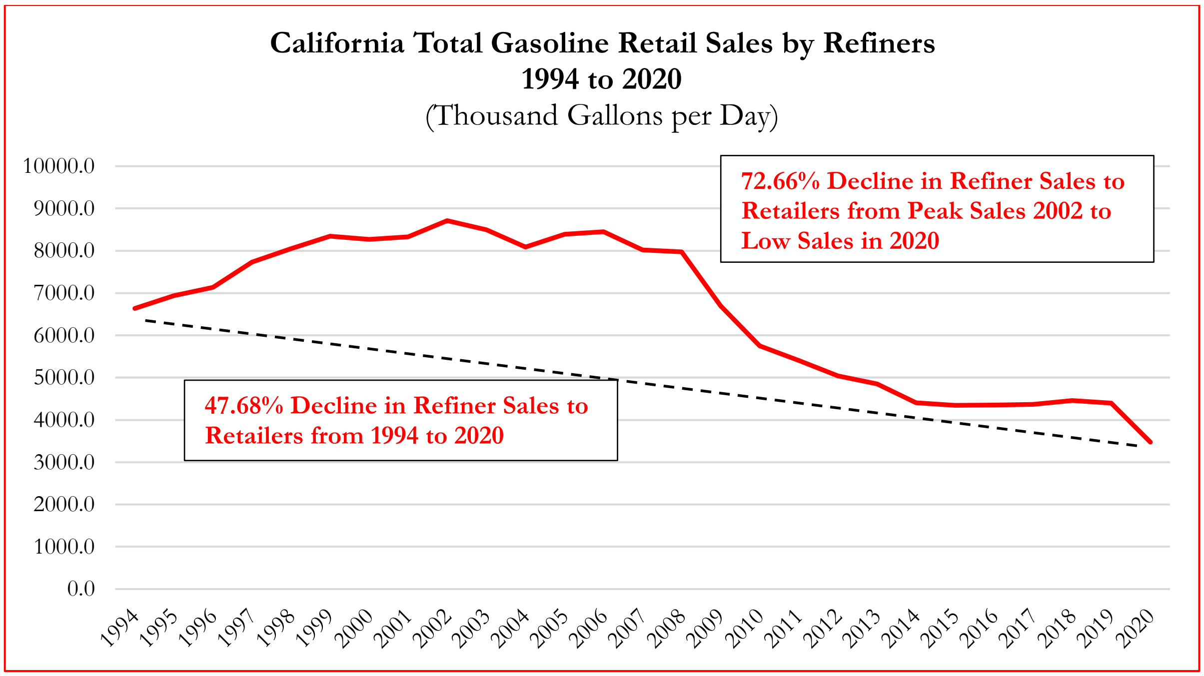
175 Thomas, J. (2024, May 6). *The busiest & biggest airports in the US [Updated for 2024]*. Stratos Jet Charters, Inc. https://www.stratosjets.com/blog/busiest-us-airports/#:~:text=Which%20Airport%20is%20the%20Busiest,almost%201%2C000%20flights%20per%20day.
176 *Jet Fuel: From Well to Wing J A N U A R Y 2 0 1 8*. (n.d.). https://www.airlines.org/wp-content/uploads/2018/01/jet-fuel-1.pdf
177 *Six states accounted for more than half of U.S. jet fuel consumption in 2019 - U.S. Energy Information Administration (EIA)*. (n.d.). https://www.eia.gov/todayinenergy/detail.php?id=46556
178 CDTFA_CEC joint report 2024 review of the gasoline in ... (n.d.-b). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf

finished gasoline. Section 3.8 provides a discussion of crude and finished gasolines inventories and estimated day's supplies.

In measuring gasoline production, three important (of several metrics) measurements are (1) the sale of gasoline from the refiner to the retailer, (2) finished gasoline stocks held by refiners in bulk, and (3) the sale of gasoline from the retailer to the consumer (CDTFA sales) as discussed in Section 2.0.

3.6.1 Refiner Retail Sales to Retailers. For the 1994 to 2020 period, refiner sales to retailers declined 47.68%.[179] Since peaking in 2002, California retail sales by refiners, as reported by the EIA, have fallen 72.66% in 2021.[180] The decline in retail sales by refiners began in 2006 and accelerated through 2020.

Exhibit 3.28



(Source: EIA at https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a)

Sales by refiners to retail profile significant variations on an annual basis, with 2008, 2009, and 2020 showing the greatest volatility based on double digit declines.

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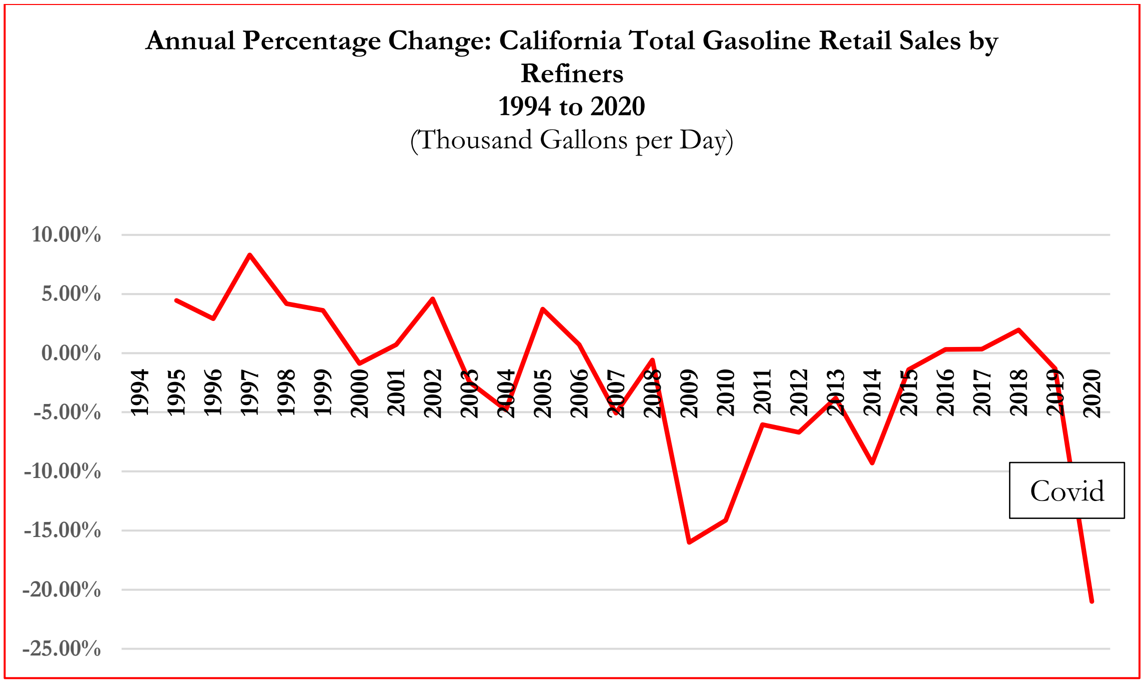
[179] *California Total Gasoline Retail Sales by Refiners (Thousand Gallons per Day)*. (2020). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=a103650061&f=a

[180] *California Total Gasoline Retail Sales by Refiners (Thousand Gallons per Day)*. (2020). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=a103650061&f=a

Exhibit 3.29

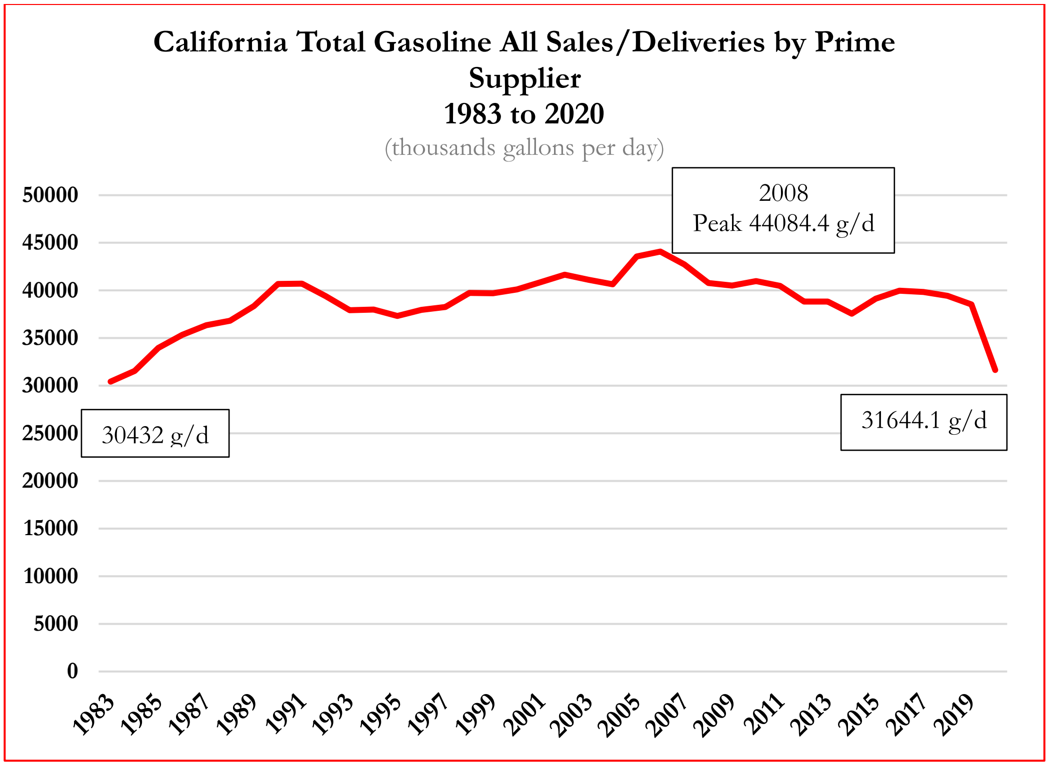


(Source: EIA at https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a)

Gasoline sales, as measured by sales and deliveries by prime suppliers for the 1983 to 2020 period, were relatively consistent despite significant variances on an annual basis. For 1983, 30,432 gallons a day were sold/delivered by prime suppliers, compared to 31,644 gallons a day in 2020.[181]

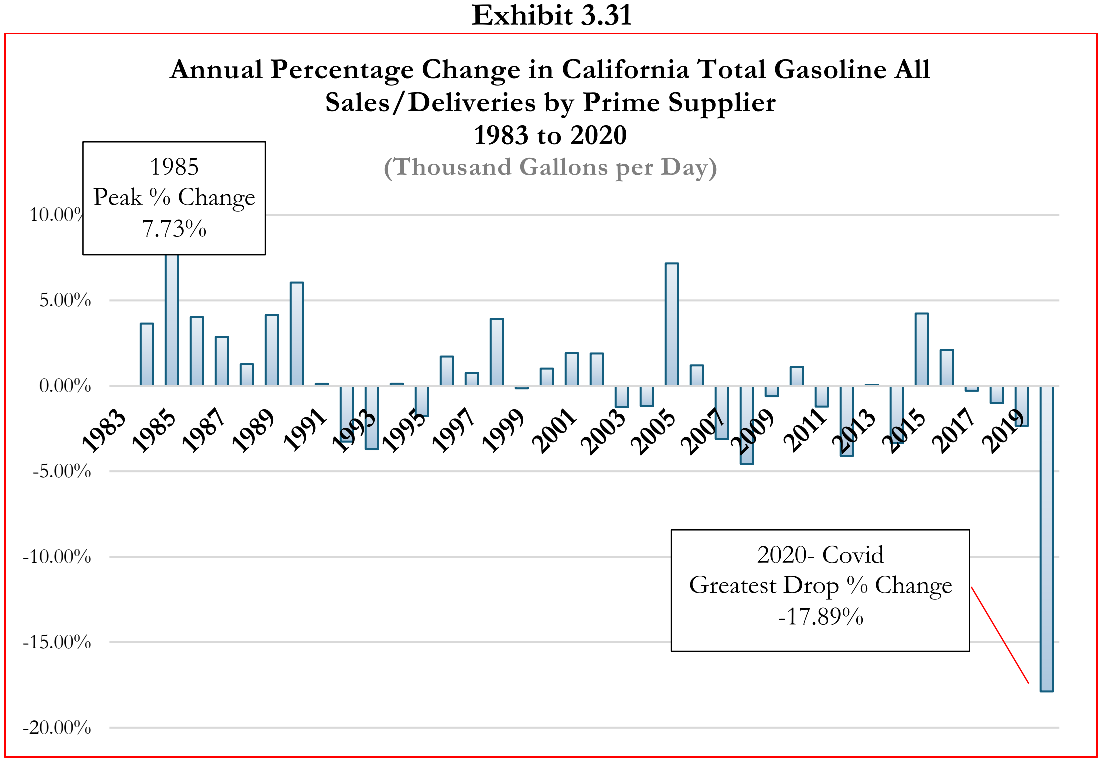
[181] All gallons are in thousands of gallons per day. Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=c100050061&f=a

Exhibit 3.30



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=c100050061&f=a)

Exhibit 3.31



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=c100050061&f=a)

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University of Southern California
Marshall School of Business
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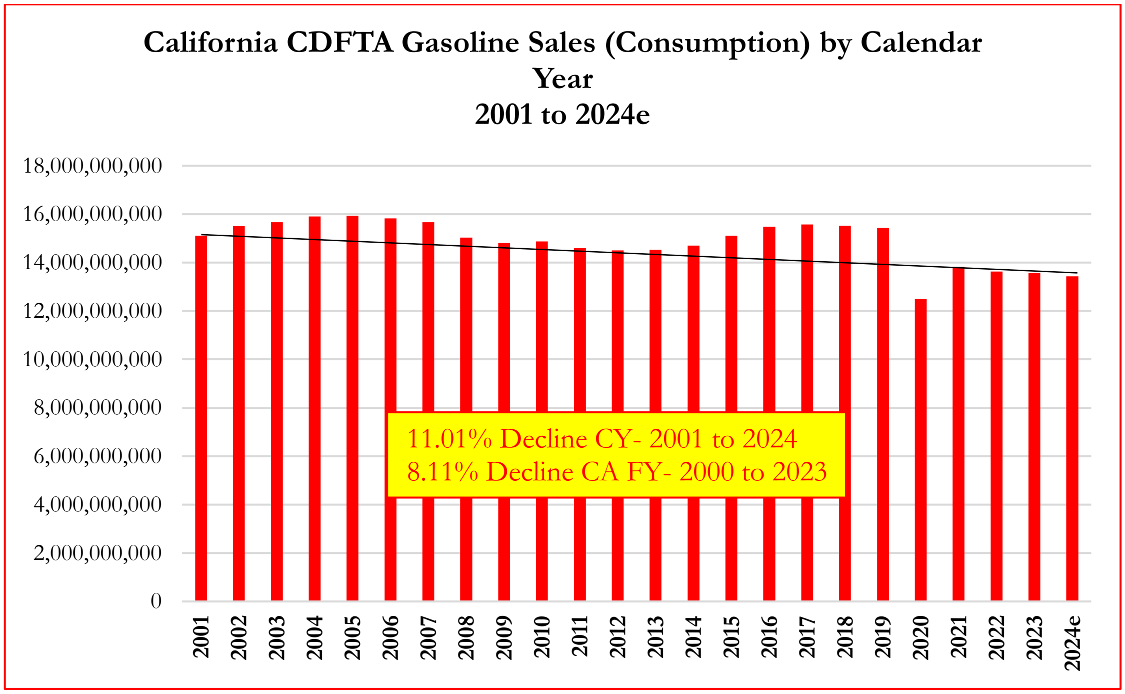
Based on CDFTA revenue data, California gasoline consumption, as measured in millions of gallons sold for the 2001 to 2024 period, has declined 13% (calculations are calendar year) (See Section 2.0).[182]

Exhibit 3.32



(Source: https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm)

3.6.2. Finished Gasoline Stocks. Finished gasoline stocks represent the level of gasoline fuels held by refiners, bulk terminals, and natural gas plants. From 1992 through 2023, California's finished gasoline stocks have fallen from 14,966,000 to 243,000 barrels, representing a reduction of 98.36%.[183]

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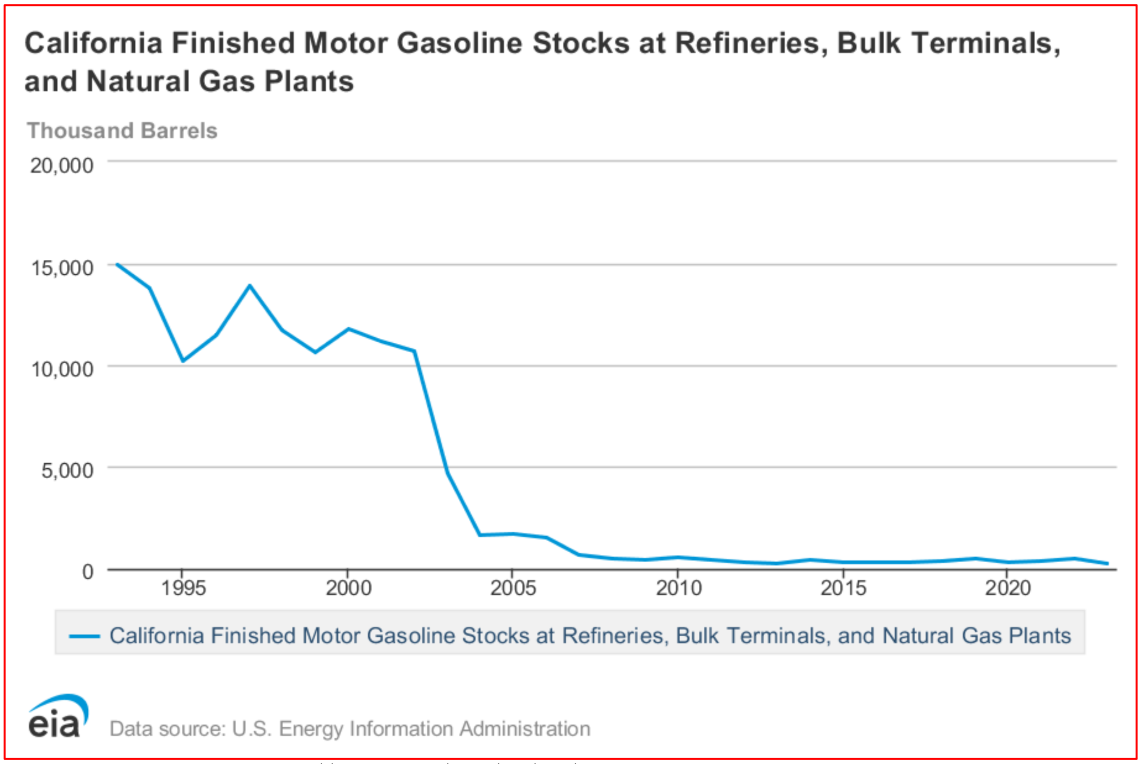
[182] California Department of Tax and Fee Administration. (n.d.). *Fuel Taxes Division Statistics & Reports – 2010*. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm

[183] *California Finished Motor Gasoline Stocks at Refineries, Bulk Terminals, and Natural Gas Plants (Thousand Barrels)*. (2020). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a

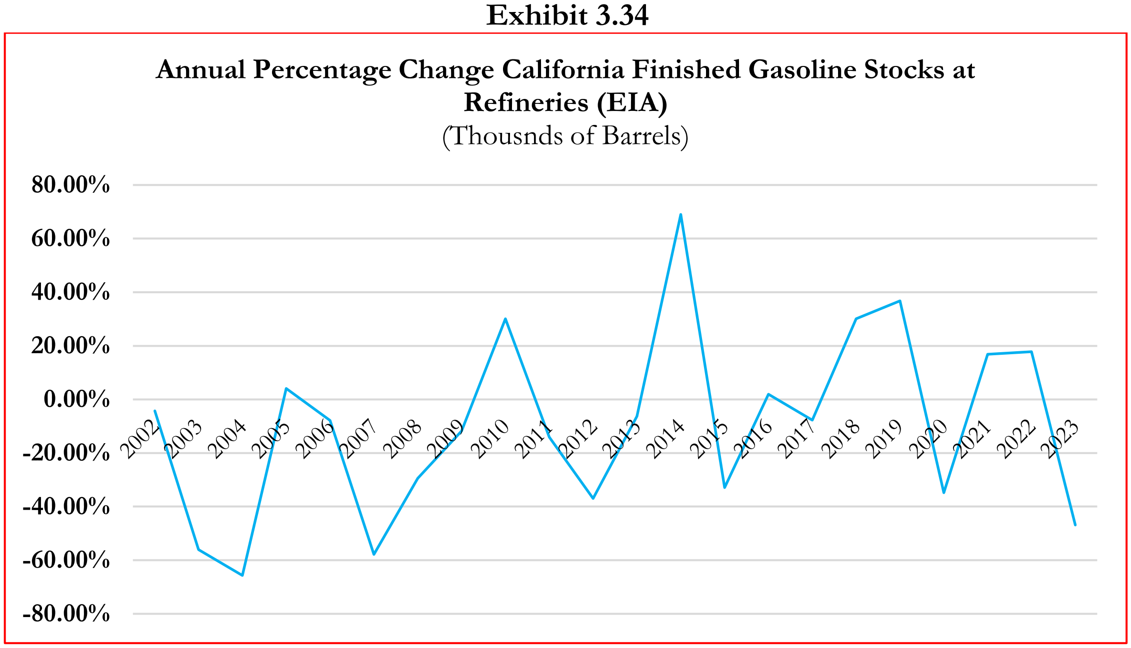
Exhibit 3.33



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a)

On an annual percentage basis, finished motor gasoline stocks for California vary widely from year to year and have, on average, declined 7.51% annually since 1993.

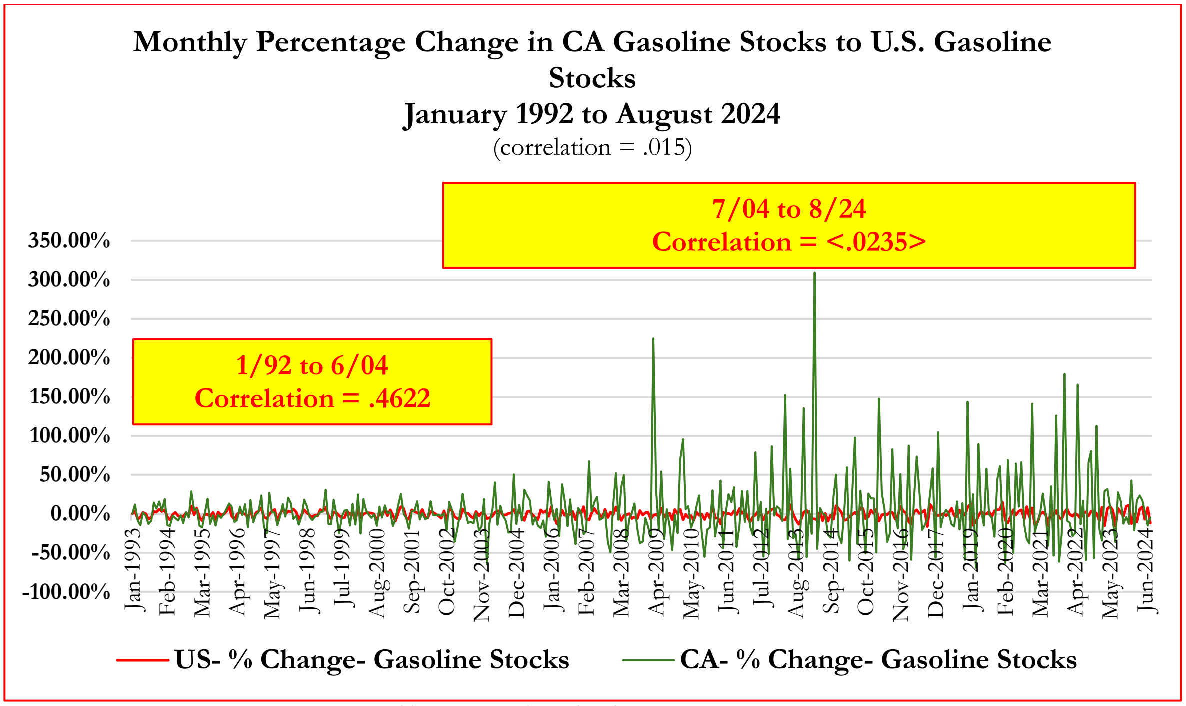
Exhibit 3.34



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a)

From 1993 to 2024, California's monthly variance of finished gasoline stocks compared to the overall U.S., measured by annual percentage change, was significantly greater and exhibited a very low correlation.

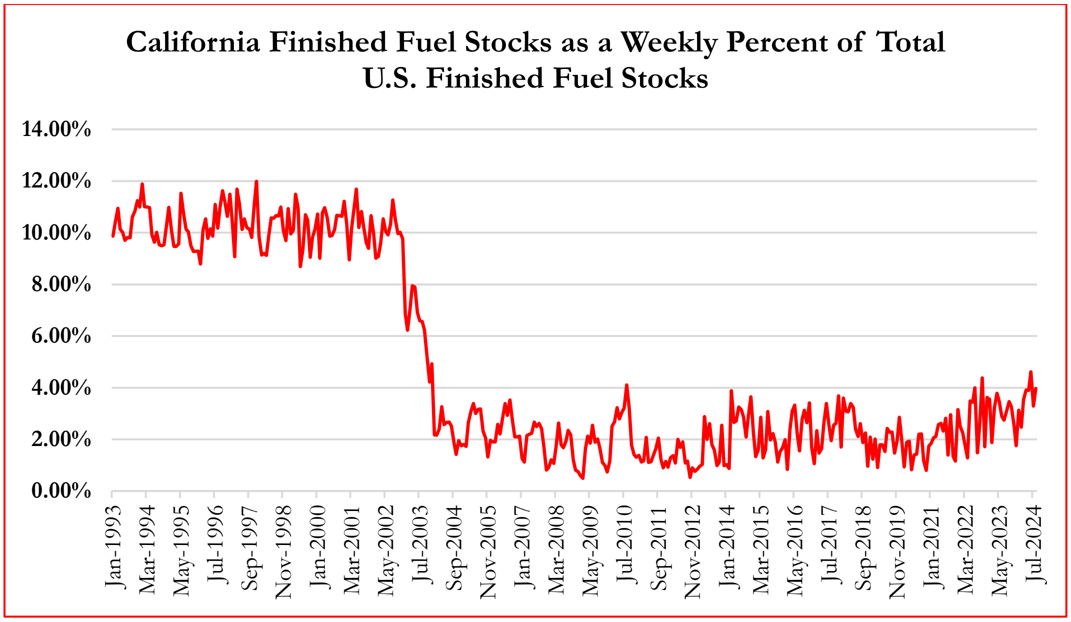
Exhibit 3.35



(Source: EIA. http://www.eia.gov/dnav/pet/pet_stoc_st_a_epm0f_str_mbbl_m.htm)

The exhibit below illustrates the weekly percentage of California bulk gasoline stocks as a percent of the total U.S. finished gasoline product stock. As a percentage of total U.S. finished fuel stocks, California has experienced a significant drop from a high of 11.99% in December 1997 to a low of .49% in February 2009. For August 2024, California bulk fuel stocks represented 3.97% of total U.S. stocks, based on EIA data.

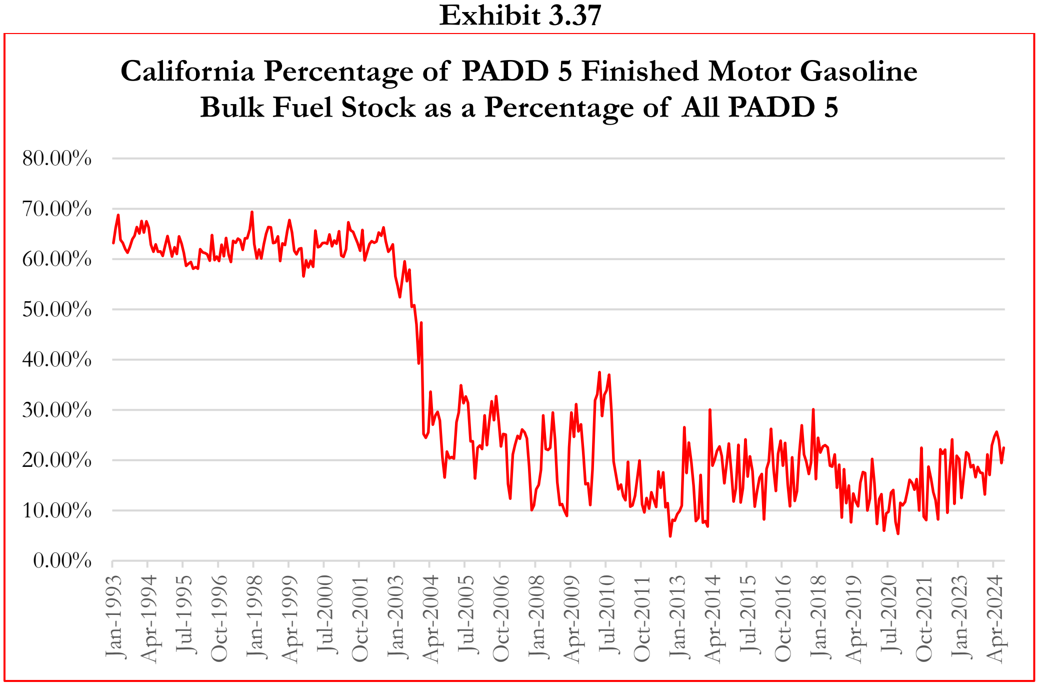
Exhibit 3.36



(Source: EIA)

A similar drop in California's percentage of total bulk fuel stocks as related to PADD 5 stocks is illustrated below.

Exhibit 3.37



(Source: http://www.eia.gov/dnav/pet/pet_stoc_st_a_epm0f_str_mbbl_m.htm)

California's variance of finished gasoline stocks compared to the overall PADD 5 and measured by annual percentage change for the 1993 to 2004 period was relatively consistent and exhibited a high

Michael A. Mische
University of Southern California
Marshall School of Business
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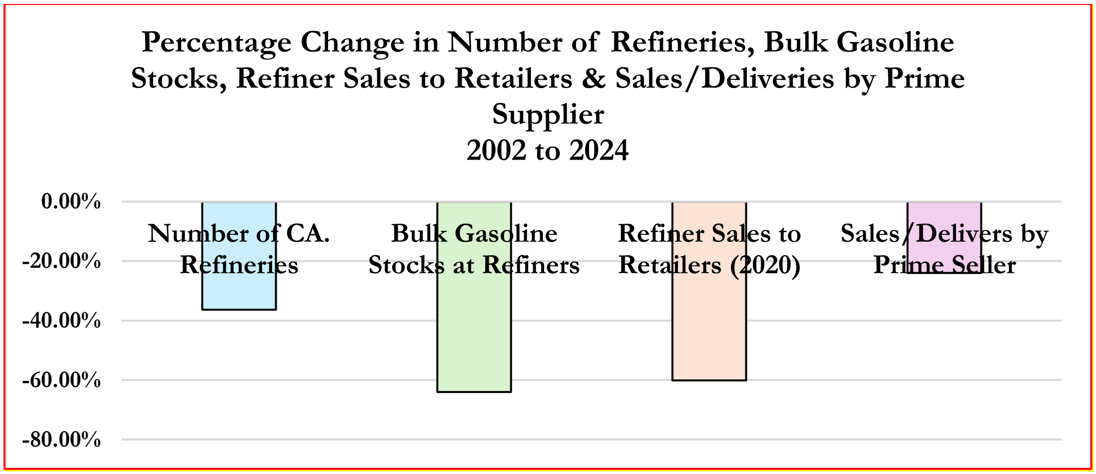
correlation. However, commencing around April 2004 and continuing through August 2024, California's variance in finished gasoline stocks to PADD 5 stocks exhibited high variance, volatility, and a low correlation. The reduction in bulk gasoline fuel stock levels can be attributed to several factors, chief among them may be the dramatic decline in the number of California-based refineries since 1992.

Exhibit 3.38



(Source: EIA- http://www.eia.gov/dnav/pet/pet_stoc_st_a_epm0f_str_mbbl_m.htm)

Additionally, commencing in 2002, there was a significant shift and increase in the price of gasoline sold in California through company outlets. Section 7.0 provides a discussion of pricing in California.

3.7 Gasoline Blends

Gasoline in California is refined, as it is across the U.S., into various blends and octane grades. Essentially, there are three dominant octane grades: regular, mid, and premium. Additionally, a "super" premium octane grade refined as "racing" fuel is also available in limited quantities. In the U.S., there are two federally required seasonal blends. The various octane grades are refined and consistent with the regulatory requirements for the seasonal blends. California maintains the federal standards the federal standards for the season but has a slightly different seasonal schedule. However, California goes several steps beyond the federally mandated standards by requiring a California special blend that is specific only to the Golden State.

3.7.1 Seasonal Blends. Refiners across the U.S. and in California are required to produce gasoline that meets regulatory mandates based on the summer or winter season. These are referred to as "seasonal blends." Under a complex set of federal and state laws, refineries are required to produce different types of seasonal gasolines at different times of the year. Refiners across the U.S. and in California are required to produce gasoline that meets regulatory mandates based on the summer or winter season. Summer blends.

- Summer blends contain about 2% less butane than winter blends and have lower Reid Vapor Pressure (RVP) emissions than winter blends. Summer blends also have about 1.7% higher energy content per gallon, which translates into more miles per gallon.

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University of Southern California
Marshall School of Business
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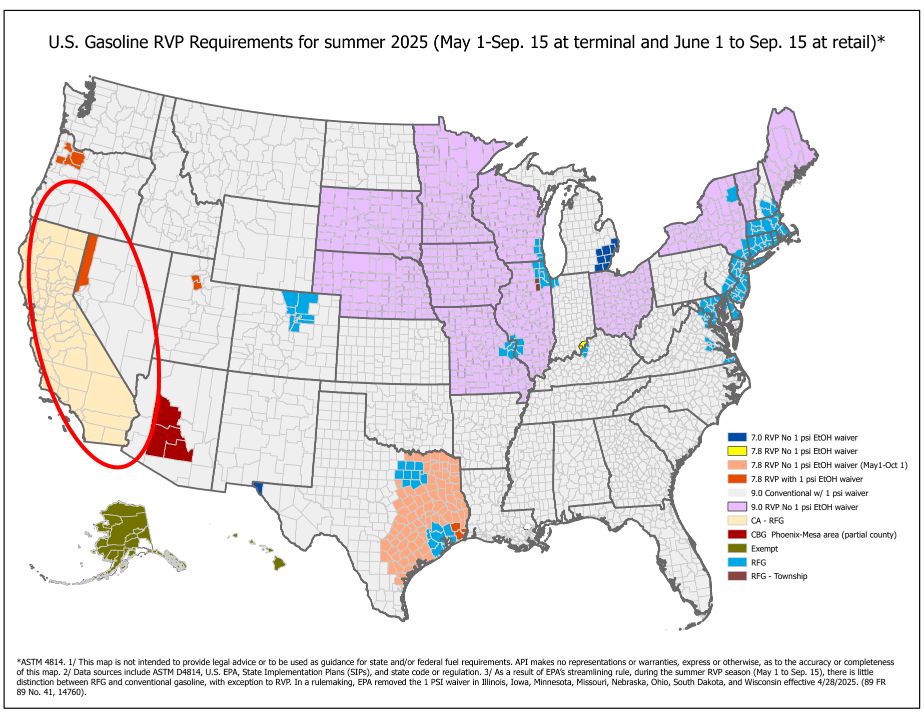
- Winter blends have higher RVP but lower energy content per gallon. Winter blends, which contain butane and have higher RVP ratings, evaporate faster in the atmosphere. In general, the higher the RVP, the faster the evaporation.

The EPA requires the use of summer blends from June 1 to September 15. In contrast, California requires the summer blend from April 1 to October 31.

Subsequent to California's fuel initiatives and Amendments to the 1990 Clean Air Act (CAA), the U.S. Federal government, through the Environmental Protection Agency (EPA), mandated seasonal Reformulated Gasoline (RFG) blends for use throughout the U.S.[11] Beginning with Phase 1 in 1989 and latter in 1991 with Phase 2, the U.S. EPA established two other categories or types of <u>seasonal</u> blends, Summer and Winter. The blends are different and require different ingredients and processes, and they are produced at different times of the year. Summer blends have lower RVP qualities. Due to various state and federal regulations associated with air quality and emissions, summer blends have 14 different specifications (types) and, as such, are more costly and complex to produce.[184] Summer blends yield less per barrel of input and requires extended production times. The price increase associated with the summer blend also occurs concurrently with an increase in demand. Historically, in the U.S., gasoline consumption is lower in the first quarter of each calendar and then climbs to peak in August. Come September, demand tends to slow and drop. In contrast, winter blends have fewer specifications, are less expensive to produce, and yield higher outputs per barrel.

Exhibit 3.39
U.S. Seasonal Blend Requirements by State- Example- Summer 2025[185]



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184 *Seasonal gas prices explained*. (n.d.). https://www.convenience.org/Topics/Fuels/Changing-Seasons-Changing-Gas-Prices
185 *U.S. gasoline requirements*. (n.d.). https://www.api.org/oil-and-natural-gas/wells-to-consumer/fuels-and-refining/fuels/us-gasoline-requirements

3.7.2 California Seasonal Blends. Due to its microclimates, California has a different seasonality calendar than most of the U.S. California's unique geography and various climates necessitate that California maintains multiple special summer blends. In California, the summer blend season runs into mid-October, which is longer than the rest of the nation. Furthermore, in California, the schedule for the mandatory shifting to summer or winter blends varies by county.[186] The summer blends sold in California's counties are designed for a specific geographical area or air basin in the state as designated by the California Air Resources Board.[13] To meet regulatory mandates, refiners start shifting from winter to summer as early as February and to the winter blend as early as mid-September.

- Seasonal blends can add as much as $.15 to the retail price per gallon of gas.[14]

3.7.3 Special Blend. California has the strictest mandates for gasoline and emissions, so its fuel is unique and more costly to produce, which, in turn, contributes to a higher retail price. The data is undisputable as multiple studies, including those of the U.S. EPA, all conclude that California's special blend has reduced smog, carcinogens, volatile organic compounds (VOC), nitrogen oxides, and other containments. [187] Nonetheless, Los Angeles continues to be ranked the highest among all U.S. major cities as having the most polluted air in 2024.[188] The tradeoff between higher retail prices associated with the unique special California gasoline blend is significantly better air quality, lower smog and soot, lower particulate emissions, and an overall improved quality of life and health.

California was the "first in the world" to introduce regulatory standards for gasoline emissions. With the California Reformulated Gasoline" (CaRFG) program, California set the most stringent standards in the U.S. for gasoline, which resulted in significant reductions in emissions from internal combustion vehicles and vast improvements in air quality.[189] Beginning in 1991 with Phase 1 mandates, California eliminated lead from gasoline and required Reid vapor pressure (RVP) systems.[190] In 1996, California implemented additional "Phase 2" mandates and later, in 2007, Phase 3 requirements, which legislated the use of specific gasoline blends to further lower emissions and air pollution. The exhibit below summarizes some key contaminants and components California has aggressively addressed to improve air quality through gasoline emissions.[10]

Smog and air pollution in California, particularly in Southern California, first appeared in the summer of 1943.[191] By the mid-1960s, air pollution, especially in the Los Angeles basin, was so severe that it was causing health issues. The smog was so thick and prevalent that it was the topic of comedic lines in both television and movies.[192] In response, California passed the first "tail-pipe" emissions standards

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186 Newsom, G., Hochschild, D., & California Energy Commission. (2020). *California Energy Commission Petroleum Watch Refinery News*. https://www.energy.ca.gov/sites/default/files/2020-09/2020-09_Petroleum_Watch_ADA.pdf
187 GAO. (2005). *GASOLINE MARKETS special gasoline blends reduce emissions and improve air quality, but complicate supply and contribute to higher prices* [Report]. https://www.gao.gov/assets/gao-05-421.pdf
188 Shafiq, S. (2025, March 12). *Report reveals 2024's most polluted cities, countries: Which US cities made the list?* USA TODAY. https://www.usatoday.com/story/news/world/2025/03/12/most-polluted-countries-cities-iqair-2024/82306911007/
189 *California Reformulated Gasoline | California Air Resources Board*. (n.d.). Ww2.Arb.ca.gov. https://ww2.arb.ca.gov/our-work/programs/fuels-enforcment-program/california-reformulated-gasoline. See also, *Gasoline | California Air Resources Board*. (2025). Ca.gov. https://ww2.arb.ca.gov/our-work/programs/gasoline/about
190 "RVP is an abbreviation for "Reid vapor pressure," which is a common measure of and generic term for gasoline volatility. "See, https://www.epa.gov/gasoline-standards/gasoline-reid-vapor-pressure.
191 California Air Resources Board. (2012). *History | California Air Resources Board*. Ca.gov. https://ww2.arb.ca.gov/about/history
192 *Jed in Politics*. (1966, November 2). Rotten Tomatoes. https://www.rottentomatoes.com/tv/the_beverly_hillbillies/s05/e08

in the U.S. In 1967, California, under then-Governor Ronald Reagan, created the California State Air Resources Board to improve California's air quality by reducing gasoline engine emissions.[193]

To reduce and eliminate Methyl Tertiary Butyl Ether (MTBE), which, at high levels, can cause adverse health effects and is a potential human carcinogen, as well as other harmful components, California enacted the strictest laws in the U.S. and the world which require that all gasoline sold contain at least 10% ethanol with the remaining 90% as petroleum.[194] [195] Currently, E10 is available for sale in California, but E15 is not sold in the state.[196] Some of the components that California law has eliminated or significantly mitigated are summarized in the exhibit below.

Exhibit 3.40

(Source: https://ww2.arb.ca.gov/our-work/programs/gasoline/about)

As a result of California's CaRFG (CARFG) requirements and other regulatory mandates, California oil refineries produce special gasoline blends that are <u>specific only to California's</u> requirements. The unique California blends require specialized refinery equipment and processes, which contribute to additional costs, increased prices, and sales taxes at the retail pump.

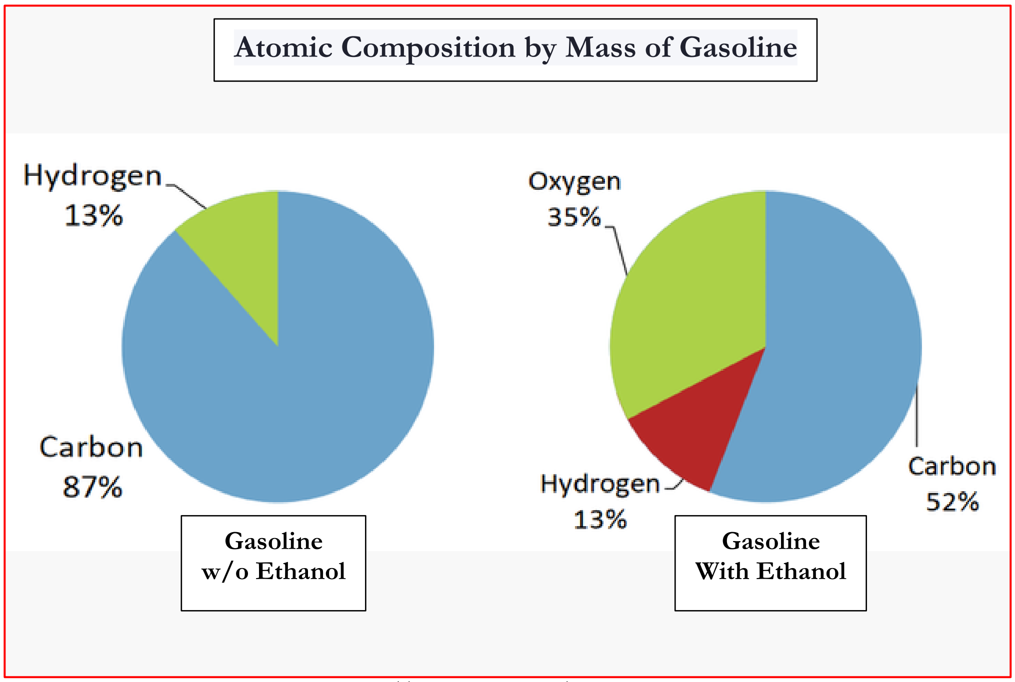
- California special blends add between $0.12 to $0.15 to the retail price of gasoline.[12]

[193] California Air Resources Board. (2012). *History | California Air Resources Board*. Ca.gov. https://ww2.arb.ca.gov/about/history
[194] *Overview | Methyl Tertiary Butyl Ether (MTBE) | US EPA*. (2025). Epa.gov. https://archive.epa.gov/mtbe/web/html/faq.html#concerns
[195] Commission, C. E. (n.d.). *California Gasoline Data, Facts, and Statistics*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-gasoline-data-facts-and-statistics
[196] Danelladebel. (2024, October 25). *Governor Newsom urges accelerated action on new gas blend to lower prices | Governor of California*. Governor of California. https://www.gov.ca.gov/2024/10/25/governor-newsom-urges-accelerated-action-on-new-gas-blend-to-lower-prices/#:~:text=What%20you%20need%20to%20know:%20Governor%20Newsom,little%20to%20no%20impact%20on%20the%20environment.&text=As%20of%202023%2C%20E15%20was%20sold%20at%20more%20than%203%2C000%20stations%20in%2031%20states.

- California's new LCFS special blend mandate is expected to add $0.47 to $0.67 a gallon of gasoline in 2025.[197]

In addition to California CaRFG regulations, there are U.S. Federal mandates. According to federal law, U.S. refiners are required to blend 15.0 billion gallons of corn-based ethanol in gasoline stocks annually.[198] The Energy Policy Act of 2005, the 2007 Energy Independence and Security Act, and later the U.S. Renewable Fuel Standard (versions 1 and 23) further require U.S. refiners to increase their use of ethanol to an average content of 10% by volume.[199] Ethanol is an alcohol derived from biomass sources, such as corn (starch), sugar cane (sugars), or cellulosic derivatives, such as wood chips. It is used in gasoline to increase oxygenation and reduce emissions.[200] Below is an exhibit developed by Professor Daniel Ciolkosz, P.E. of Pennsylvania State University, showing the differences in the atomic content between gasoline with and without ethanol.

Exhibit 3.41



(Source: https://extension.psu.edu/fuel-ethanol-hero-or-villain#:~:text=Gasoline%20is%20not%20water%20soluble,performance%20if%20not%20dealt%20with)

In gasoline, ethanol is designated with the letter "E," followed by the percentage of ethanol contained in the gasoline. Thus, E10 means that the gasoline is composed of 10% of ethanol. There are also some E15 blends that contain 15% of ethanol. According to the U.S. Dept. of Energy, ethanol can increase the octane rating of gasoline, but there is a potential tradeoff in engine

[197] Cullenward, D. (n.d.). *California's Low Carbon Fuel Standard 2*. https://kleinmanenergy.upenn.edu/wp-content/uploads/2024/10/KC-Paper-16-Californias-Low-Carbon-Fuel-Standard.pdf

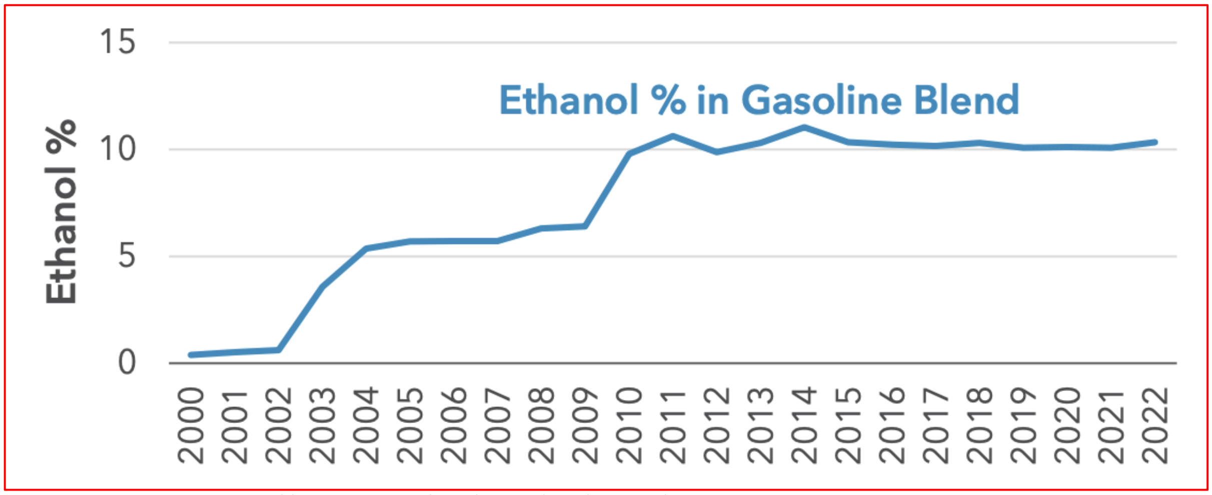
[198] See, Energy Policy Act of 2005 (PL 109–58). See also, US EPA, O. (2015, July 13). *Statutes for Renewable Fuel Standard Program*. Www.epa.gov. https://www.epa.gov/renewable-fuel-standard-program/statutes-renewable-fuel-standard-program

[199] *ENERGY INDEPENDENCE AND SECURITY ACT OF 2007*. (2005). https://www.govinfo.gov/content/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf

[200] In the U.S. about 93% of ethanol is produced from corn starch. (US Department of Energy. (2024). *Alternative Fuels Data Center: Ethanol Fuel Basics*. Afdc.energy.gov. https://afdc.energy.gov/fuels/ethanol-fuel-basics)

performance/efficiency and miles per gallon.[201] Modern engines, designed to perform using newer fuel combinations and standards, generally perform better on ethanol blends than older engines. Engine condition, maintenance, and design also influence performance. Although ethanol produces increased octane ratings, it generates up to 30% less energy per gallon of gasoline and can reduce miles per gallon by 3% or more.[202] At 30% content, ethanol fuels produce 3% less horsepower than gasoline.[203] Unlike gasoline, ethanol is water soluble and can attract and retain impurities which may impede engine performance. The use of ethanol in California is summarized in the exhibit below.

Exhibit 3.42
Ethanol Concentration in Gasoline Over Time



(Source: https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-2000_2022_ghg_inventory_trends.pdf)

In the U.S., most ethanol is produced from corn which consumes up to 40% of U.S. corn production.[204] However, a 2022 study indicates that the use of ethanol, on a net basis, may have contributed to increases in greenhouse gas emissions due to changes in agricultural production and land use.[205] According to various studies performed by researchers T. J. Lark, T. Searchinger, H. K. Gibbs, J. Fargione, J. Hill, D. Tilman, S. Polasky, and P. Hawthorne, GHG emissions from land clearing and the increased use of fertilizers and production of corn, could result and have resulted in unintentional increases in GHG emissions.[206]

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201 US Department of Energy. (2024). *Alternative Fuels Data Center: Ethanol Fuel Basics*. Afdc.energy.gov. https://afdc.energy.gov/fuels/ethanol-fuel-basics
202 *How much ethanol is in gasoline, and how does it affect fuel economy? - FAQ - U.S. Energy Information Administration (EIA)*. (2016). Eia.gov. https://www.eia.gov/tools/faqs/faq.php?id=27&t=10
203 Penn State Extension. (2014, May 8). *Fuel Ethanol: Hero or Villain?* Penn State Extension. https://extension.psu.edu/fuel-ethanol-hero-or-villain
204 Penn State Extension. (2014, May 8). *Fuel Ethanol: Hero or Villain?* Penn State Extension. https://extension.psu.edu/fuel-ethanol-hero-or-villain
205 Douglas, L. (2022, February 14). U.S. corn-based ethanol worse for the climate than gasoline, study finds. *Reuters*. https://www.reuters.com/business/environment/us-corn-based-ethanol-worse-climate-than-gasoline-study-finds-2022-02-14/
206 Hill, J. (2022). The sobering truth about corn ethanol. *Proceedings of the National Academy of Sciences*, *119*(11). https://doi.org/10.1073/pnas.2200997119. See also, T. J. Lark et al., Environmental outcomes of the US Renewable Fuel Standard. *Proc. Natl. Acad. Sci. U.S.A.*, https://doi.org/10.1073/pnas.2101084119. (2022); T. Searchinger et al., Use of U.S. croplands for biofuels increases greenhouse gases through emissions from land-use change. *Science* **319**, 1238–1240 (2008); H. K. Gibbs et al., Carbon payback times for crop-based biofuel expansion in the tropics: The effects of changing yield and technology. *Environ. Res. Lett.* **3**, 034001 (2008), and J. Fargione, J. Hill, D. Tilman, S. Polasky, P. Hawthorne, Land clearing and the biofuel carbon debt. *Science* **319**, 1235–1238 (2008).

- Lark's study indicates that models such as the Global Trade Analysis Project (GTAP), used by the California Air Resources Board, tend to underestimate the GHG emissions from crop-based GHG mitigation efforts and overestimate the environmental benefits.[207]

3.7.4 California Octanes. As a final consumer product, gasoline is produced and sold in multiple octane grades. Octane measures the fuel's stability, anti-knock, and combustion rating.[208] Octane ratings are determined using two measurement methods: research octane rating (RON) and motor octane rating (MOR). The higher the octane rating, such as 94, the higher the stability of the fuel.[209] For automobiles, there are three basic grades and specialized "racing" fuels (higher octane) sold in some locations. In California, the octane ratings are 87- regular, 89- mid range, and 91- high. Specialized racing octanes usually range from 97 to 100+. The availability of a particular octane varies by the state (and local levels. For example, 100 octane is rarely available in California but is available in other states. Colorado's regular octane is rated at 85, while 93- high octane is available in Florida.[210] As discussed in Section 2.0, around 50% of all retail gasoline sales in California are branded.

The price spread between premium and regular gasoline varies considerably. Premium branded fuels carry a higher price as compared to unbranded premium products. In California, the variance between premium and regular ranges between $0.30 to $0.50 a gallon.

3.7.5 Branded and Unbranded. The final gasoline product produced by California refineries is a standard, generic gasoline product offered for sale to distributors and wholesalers. As a generic product, it is unbranded, and standard gasoline is offered in three different octanes. All octanes (grades) must meet both federal and California minimum regulatory standards and mandates for quality, emissions, and combustion.

Once refined and produced, the generic gasoline is stored shortly by the refinery or third-party intermediaries in tank farms before delivering to a distribution point or "racks" where the distributors purchase the fuel. Delivery from the refinery to short-term shortage tanks and then onto rack points is accomplished using pipelines, tanker trucks, and, to a more limited extent, rail tankers, which run from the refinery storage tank farms to the distribution and rack points. At the rack, the distributor purchases the generic gasoline. Once the distributor purchases the fuel from the rack, they may blend it with proprietary ingredients to create a specialized **branded** blend or leave it as a generic product to be sold as an **unbranded** product.

- To create a proprietary branded blend, the distributor adds special ingredients and formulations to create branded products such as Chevron's Techron[211] or Shell's V-Power.[212]

[207] Hill, J. (2022). The sobering truth about corn ethanol. *Proceedings of the National Academy of Sciences*, *119*(11). https://doi.org/10.1073/pnas.2200997119. See also, U. Lee, H. Kwon, M. Wu, M. Wang, Retrospective analysis of the U.S. corn ethanol industry for 2005–2019: Implications for greenhouse gas emission reductions. *Biofuels Bioprod. Biorefin.* **15**, 1318–1331 (2021); J. Lewandrowski et al., The greenhouse gas benefits of corn ethanol—assessing recent evidence. *Biofuels* **11**, 361–375 (2020); and M. J. Scully, G. A. Norris, T. M. Alarcon Falconi, D. L. MacIntosh, Carbon intensity of corn ethanol in the United States: State of the science. *Environ. Res. Lett.* **16**, 043001 (2021).
[208] U.S. Energy Information Administration. (2020, November 18). *Gasoline explained - octane in depth - U.S. Energy Information Administration (EIA).* Www.eia.gov. https://www.eia.gov/energyexplained/gasoline/octane-in-depth.php
[209] Ibid.
[210] Wikipedia Contributors. (2024, March 29). *List of U.S. states by standard octane ratings*. Wikipedia; Wikimedia Foundation.
[211] *Chevron with Techron | Chevron With Techron (US).* (n.d.). https://www.chevronwithtechron.com
[212] *Shell V-Power® NiTRO+ Premium Gasoline.* (n.d.). Www.shell.us. https://www.shell.us/motorist/shell-fuels/shell-v-power-nitro-plus-premium-gasoline.html

In general, branded products contain cleaning additives that help improve engine performance and longevity. However, the overall engine performance of the additives is also influenced by the particular engine, including its purpose and manufacturer. Branded products are sold to the public through gas stations that are either privately owned, leased, or operated by the brand that flags the station. Due to the additives and their special chemistries, branded gasoline commands a price premium.

- Branded gasoline costs $.05 to $.10 more per gallon at wholesale.[213]

- Unbranded gasoline products are as named. They are unbranded. Unbranded gasoline is sold to independent retail gasoline dealers without affiliation or contractual obligation with a branded product or special blend. Typically, unbranded gasoline is sold by independent dealers and retailers and at prices that are often less than branded on a per gallon basis.

3.8 Gasoline Storage and Days Inventory

Refined gasoline has unique qualities. One of which is that gasoline is a deteriorating asset. That is, gasoline, in its final form, has a short shelf life. As many farmers and collectors of antique vehicles know, if left untreated, gasoline begins to degrade and, after about six months, can relinquish much of its quality as a fuel.[214] As a product, refined gasoline will begin to degrade and lose its qualities as quickly as thirty (30) days (depending on conditions) and continues to do so until it reaches a varnish or tar-type state, making it entirely unsuitable for sale or use.[215] Stale or varnished gasoline contains contaminants and forfeits much of its detergent and intended combustible qualities. The use of degraded gasoline can also cause considerable damage to internal combustion engines. The degradation process, combined with the volatility of its combustible and flammable qualities, makes storing gasoline for long periods difficult, costly, and potentially hazardous.

Likewise, gasoline that contains ethanol (E10 and E15 blends), such as those mandated by California and Federal regulations, also has a shelf life. Ethanol blended gasoline can begin to break down and lose its properties in as little as three (3) days, with a typical range of 3 to 39 days.[216] However, if stored properly with the correct stabilizers, gasoline can be stored for prolonged periods, but its chemistry may be changed, making it potentially inconsistent with regulatory formula requirements.[217]

In its final form, gasoline represents a finished product with all the acquisition, transportation, production, and holding costs embedded in it. Refinery petroleum inventory is stored onsite in large tanks or storage depots near refineries.[218] As with any final product, holding costs exceed raw material costs, impacting free cash flows and profitability. Due to petroleum products' costs and inherent decay properties, refiners tend to produce gasoline to match the demand as closely as possible. Consequently,

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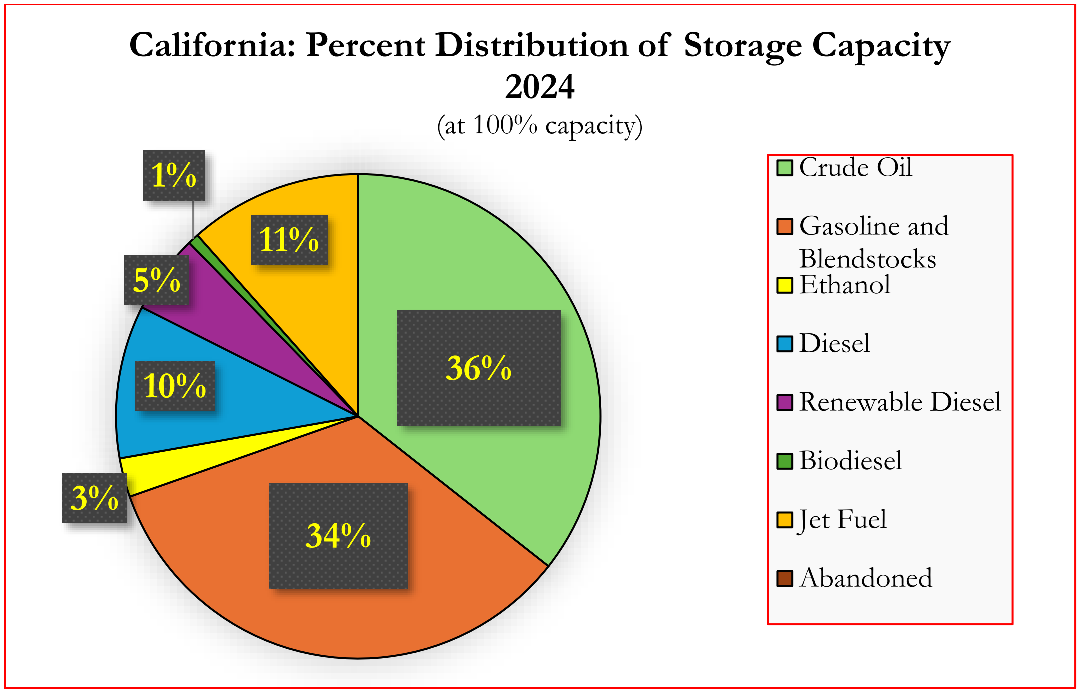
213 Gabe Wateski. (2023, July 21). *Difference Between Branded and Unbranded Fuel | Venture Fuels*. Venture Fuels. https://www.venturefuels.com/venture-fuels-content/branded-vs-unbranded-fuel/
214 *How Long Can Gas Sit in a Car Before it Goes Bad?* (n.d.). J.D. Power. https://www.jdpower.com/cars/shopping-guides/how-long-can-gas-sit-in-a-car-before-it-goes-bad
215 Moore, T. (2023, February 28). *How Long Can Fuel Really Be Stored For?* AXI International. https://axi-international.com/the-shelf-life-of-fuel-how-long-can-gasoline-and-diesel-be-stored/
216 *ContentKeeper Content Filtering*. (2024). Mass.gov. https://www.mass.gov/doc/large-volume-ethanol-spills-environmental-impacts-response-options/download
217 insideout. (2020, February 1). *Does Gasoline Go Bad?* Rislone. https://rislone.com/blog/fuel-system/does-gasoline-go-bad/
218 *Weekly Petroleum Status Report/Energy Information Administration 1*. (n.d.). https://www.eia.gov/petroleum/supply/weekly/pdf/table1.pdf

refiners tend to hold minimal inventories of finished gasoline products. In total, U.S. refiners collectively maintain around 426 million barrels of crude oil or 21.03 days' supply.[219] According to the CEC, California refiners have a maximum crude oil and gasoline and gasoline blendstocks of 13.3 and 12.7 million barrels of oil and gasoline, respectively, for 2024. This equates to approximately 558.6 and 533.4 million gallons of oil and gasoline, respectively, held as "inventory" stock. Refinery petroleum inventory is stored either onsite in large tanks or in storage depots located near refineries.[220]

Exhibit 3.43



(Source: https://www.energy.ca.gov/sites/default/files/2024-06/CEC-200-2024-010.pdf))

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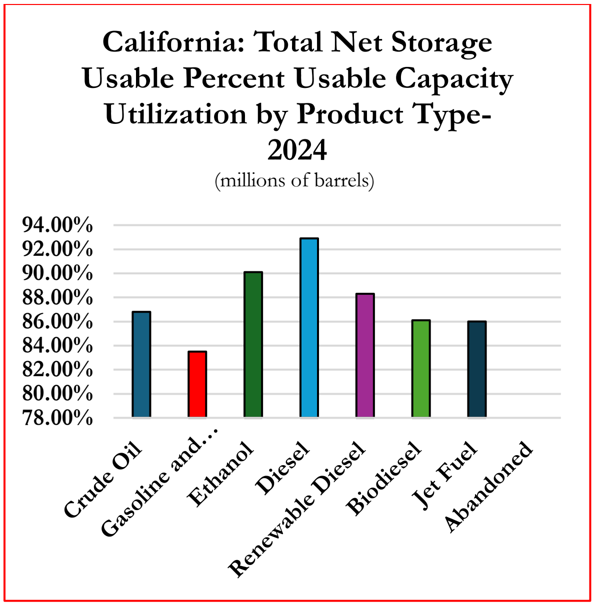
[219] *Weekly Petroleum Status Report/Energy Information Administration 1*. (n.d.). https://www.eia.gov/petroleum/supply/weekly/pdf/table1.pdf
[220] Energy Information Administration. (2025). Weekly Petroleum status report. In *Energy Information Administration*. https://www.eia.gov/petroleum/supply/weekly/pdf/table1.pdf

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

Exhibit 3.44



California: Total Net Storage Usable Percent Usable Capacity

Product	Utilization
Crude Oil	86.80%
Gasoline and Blendstocks	83.50%
Ethanol	90.10%
Diesel	92.90%
Renewable Diesel	88.30%
Biodiesel	86.10%
Jet Fuel	86.00%
Abandoned	

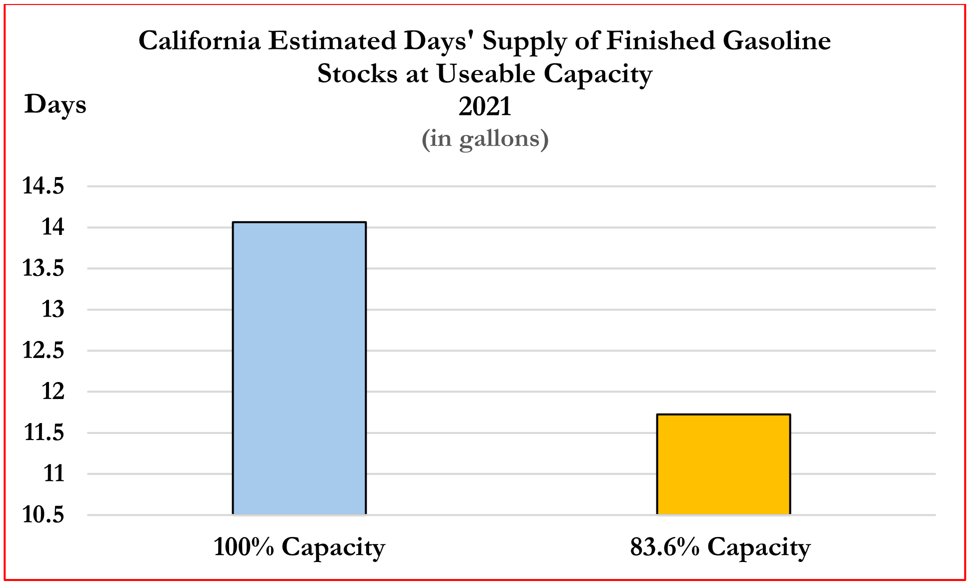
(Source: https://www.energy.ca.gov/sites/default/files/2024-06/CEC-200-2024-010.pdf)

Based on CEC capacity utilization data and the 2024 average daily consumption rate for gasoline, California's estimated days' supply of gasoline ranges from a maximum capacity of 534,427,362 gallons or 14.7 days' supply to 445,539,486 gallons or 11.74 days' supply at 83.6% capacity utilization (see, Section 2.0).[221] As a comparison, in addition to the crude oil inventories maintained by refiners, the U.S. has its Strategic Petroleum Reserve (SPR) which was established by Congress in response to the Arab Oil Embargo of 1973.[222] Under the Biden Administration, the SPR inventory declined by 38.5% from 638.08 million barrels of oil on January 29, 2021, to 391.81 million barrels as of January 31, 2025.[223] Based on the current consumption of 20.25 million barrels of oil per day, the U.S. has about 19.3 days of supply in the SPR, down from 31.5 days in January 2021.[224]

[221] According to the CEC, for 2021, California consumed 13.82 billion gallons of gasoline or 38 millions gallons of gasoline per day.
[222] *SPR Origins*. (n.d.). Energy.gov. https://www.energy.gov/ceser/spr-origins
[223] W*eekly U.S. ending stocks of crude oil in SPR (Thousand barrels).* (n.d.). https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WCSSTUS1&f=W
[224] https://www.eia.gov/tools/faqs/faq.php?id=33&t=6

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

Exhibit 3.45



(Source: CEC, Author)

Depending on conditions, location, regulations, restrictions, and contractual arrangements, retail gas stations typically replenish their inventories every 3 to 5 days.[225] The gasoline sold by a retail station is retained in underground storage tanks (UST) and represents their "inventory," which is composed of premium, mid, and regular fuel grades. Based on various sources, the capacity of the UTS generally ranges from 5,000 to 35,000 gallons. For example, the API reports that the average retail station maintains between 30,000 to 40,000[226] gallons, while the Oil and Gas Blog estimates 12,000 to 24,000 gallons.[227] The amount of gas that any station can maintain as inventory in their USTs varies considerably and is determined by factors such as the physical size of the gas station, including location, work bays, convenience store and number of pumps, lot size, set-back and depth restrictions, geology, and, most importantly, zoning regulations, and local and state laws, as well as the EPA.

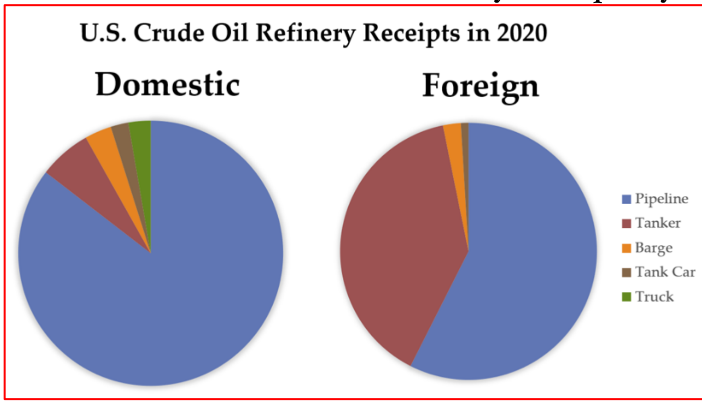
- In California, there is a $0.02 a gallon UST fee/tax on every gallon of gasoline sold.

3.9 California Oil Transportation: Pipelines, Marine Vessels, Rail & Truck

3.9.1 Crude & Gas Movement. Petroleum products, such as oil and gasoline, are moved from point to point using various transportation methods, including marine vessels, barges, pipelines, rail tankers, and truck tankers. The movement of gasoline and oil is supported by storage tanks for short-term product storage. Each method of movement has its unique qualities, mission purpose, environmental impact, convenience, risks, and costs. Below is an exhibit summarizing all U.S. refinery oil receiving by transportation mode for 2020. (Note: as U.S. domestic oil production increased, ocean imports via tankers declined. Domestically produced U.S. oil is moved via pipelines.)

[225] Various including: Sheets, C. (2022, March 15). *Why California gas prices vary: "Mystery surcharge" and more*. Los Angeles Times. https://www.latimes.com/california/story/2022-03-14/gas-prices-vary-from-place-to-place
[226] *Gas Stations*. (2024). Oilspillprevention.org. https://www.oilspillprevention.org/oil-spill-sources/gas-stations
[227] *(2025). Nipexnig.com. http://nipexnig.com/technologies/how-many-gallons-are-in-a-gas-station.html*

Exhibit 3.46
U.S. Crude Oil Refinery Receipts by Transportation Mode 2020[228]

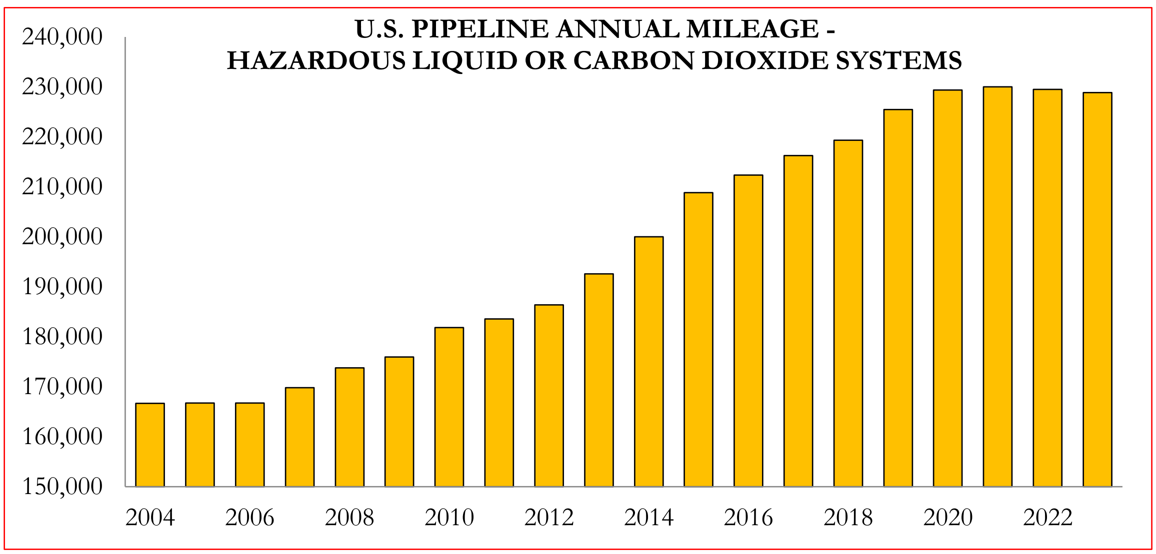


Percent of Receipts	Domestic	Foreign
Pipeline	85%	56%
Tanker	6%	39%
Barge	4%	2%
Tank Car	2%	1%
Truck	3%	0%

(Source: EIA)

The U.S. has over 3.0 million miles of pipelines, of which 684 individual lines representing 228,881 miles were used for gasoline and oil movement in 2023.[229] From 2004 to 2020, the total miles of U.S. pipelines increased 38%. However, commencing in 2021, total miles declined somewhat.

Exhibit 3.47



(Source: https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-hazardous-liquid-or-carbon-dioxide-systems

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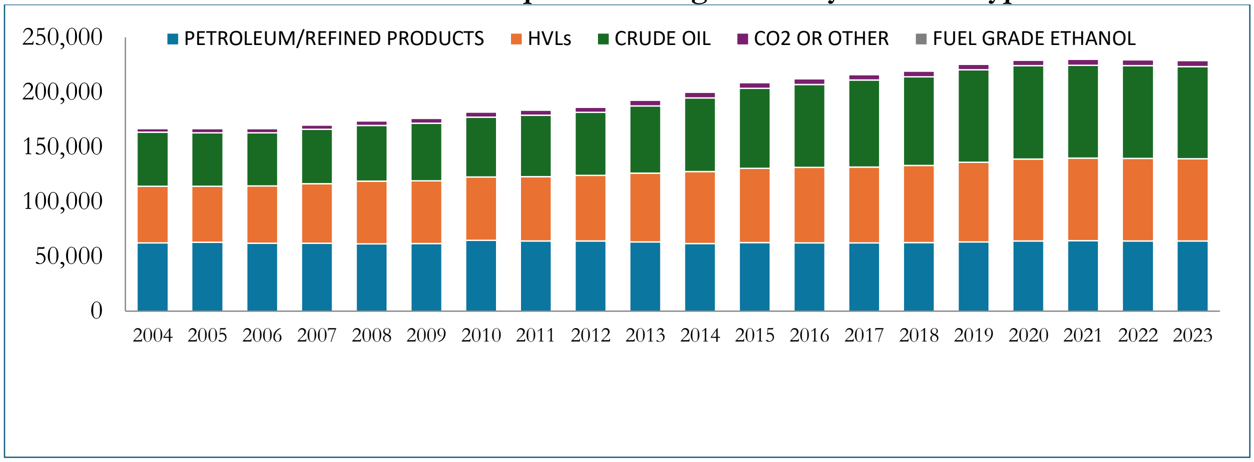
[228] *U.S. Total Refinery Receipts of Crude Oil by Method of Transportation*. (2018). Eia.gov. https://www.eia.gov/dnav/pet/pet_pnp_caprec_dcu_nus_a.htm
[229] *Annual Report Mileage for Hazardous Liquid or Carbon Dioxide Systems | PHMSA*. (n.d.). Www.phmsa.dot.gov. https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-hazardous-liquid-or-carbon-dioxide-systems

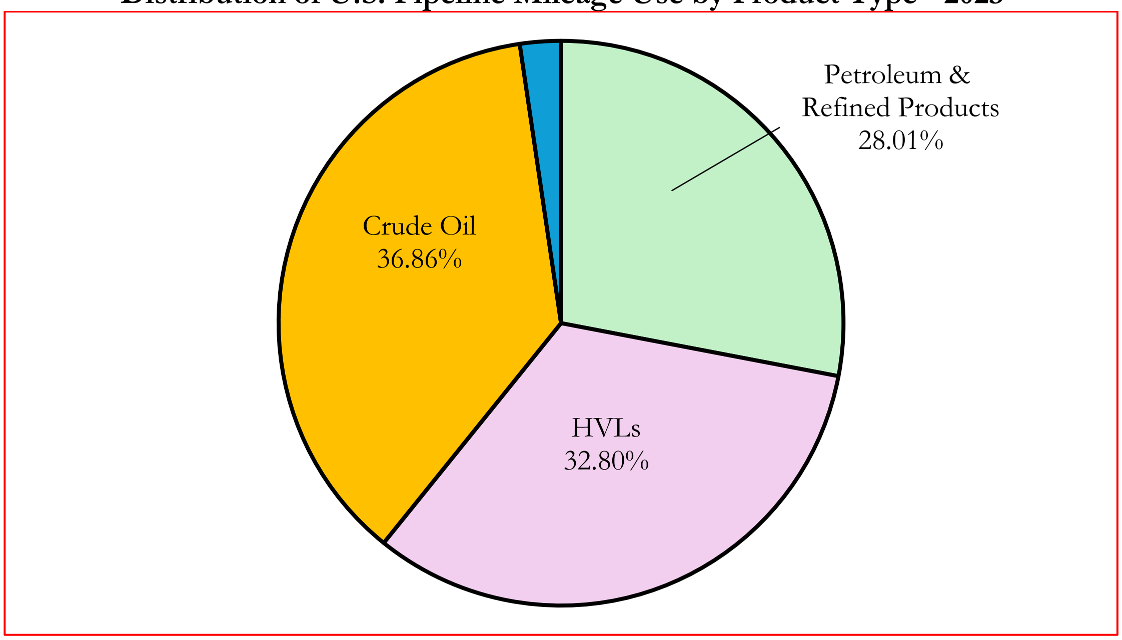
Exhibit 3.48
Distribution of U.S. Pipeline Mileage Used by Product Type



(Source: https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-hazardous-liquid-or-carbon-dioxide-systems)

As indicated in the exhibit above, the movement of crude oil and HVLs occupy the majority use of U.S. total pipeline mileage.

Exhibit 3.49
Distribution of U.S. Pipeline Mileage Use by Product Type - 2023

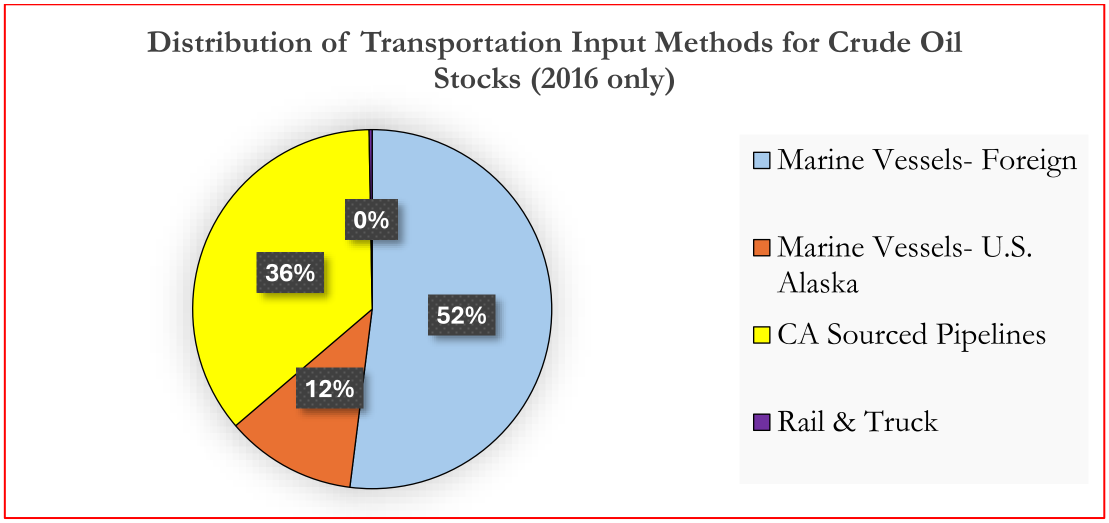


(Source: https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-hazardous-liquid-or-carbon-dioxide-systems)

Moving oil from field production to U.S. refineries through pipelines is the least expensive and safest of movement modes. According to the U.S. Department of Transportation, "It would take a constant line of tanker trucks, about 750 per day, loading up and moving out every two minutes, 24 hours a day, seven days a week, to move the volume of even a modest pipeline. The railroad equivalent of this single pipeline would be a train of 225, 28,000-gallon tank cars."[230]

California has several aspects of its petroleum transportation network that combine to make it a unique and challenging environment. California is large. Its coastline is 163,696 square miles, 840 miles long, 350 miles wide, stretching 900 miles from its southern to northern tips.[231] California's sheer size and incredibly varied terrain and climates necessitate multiple transportation methods that can move vast distances while navigating elevations from 286 below sea level to over 14,000 above sea level, as well as desert and arctic climates. Around 85% of California's approximately 39 million residents live in "coastal counties" on or near the Pacific Ocean.[232] The majority of California's gasoline states are located near major freeways and its coastal population centers. California has <u>no</u> inbound pipelines for oil or gasoline. Therefore, California is isolated and "on its own" as it does not share any inbound pipelines with other states.[233] California supplies between 80% to 88% of Nevada's gasoline needs through two outbound pipelines and 45% to 48% of Arizona's gasoline.[234] The exhibit below summarizes the primary distribution transportation methods for California's crude oil.

Exhibit 3.50



(Source: https://www.naseo.org/Data/Sites/1/schremp-1.pdf)

230 *General Pipeline FAQs | PHMSA*. (2019). Dot.gov. https://www.phmsa.dot.gov/faqs/general-pipeline-faqs
231 *California Geography Essentials | Visit California*. (2019, November 13). Www.visitcalifornia.com. https://www.visitcalifornia.com/experience/california-geography-essentials/
232 Bonta, R. (2017, July 20). *Climate Change Impacts in California*. State of California - Department of Justice - Office of the Attorney General. https://oag.ca.gov/environment/impact
233 *Project Title: SB X1-2 Implementation*. (n.d.). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf
234 *Crude Oil | The California Energy Atlas*. (2016). CA Energy Atlas. https://www.californiaenergyatlas.com/copy-of-crude-oil

3.9.2 Maritime Vessels. Over 98% of California's non-U.S. sourced imported oil is delivered to its refineries via maritime vessels.[235] For 2023, California received 61% of its crude oil stocks from foreign sources and 16% from Alaska. Oil imports from these sources are delivered to California using maritime oil tanker vessels (limited barge).[236] Maritime vessels (oil tankers) are the most cost effective and most commonly used transportation method to move massive amounts of crude oil across long distances, typically from the point of production to a marine terminal. Tankers that move oil among and between U.S. ports must comply with the Jones Act.[237]

Refineries in California are located in close proximity to the marine terminals near San Francisco and Los Angeles. California has 12 ports, and very large crude carriers (VLCCs) oil tankers generally use California's largest ports, which are the ports of Long Beach and Los Angeles, for the importation of crude oil. However, VLCC may also be able to use the Ports of Oakland, San Diego, and Hueneme under certain specific conditions.[238]

3.9.3 Pipelines. California has no inbound pipelines but has an extensive in-state (intrastate) network of pipelines for moving oil and gasoline from refineries to distribution points (racks), as well as end-users such as airports. California also has two major outbound pipelines to supply gasoline to Nevada and Arizona. California's pipeline network is composed of common carrier arteries that transport products from multiple producers and proprietary pipelines. Proprietary pipelines are owned and operated by companies such as Chevron and ExxonMobil. The sole private common carrier in California is Kinder Morgan.[239]Kinder Morgan owns, has an interest in, and operates over 79,000 miles of pipelines and 139 terminals throughout the U.S.[240] For perspective, according to the U.S. Department of Transportation, the U.S. has over 2.6 million miles of installed petroleum and petroleum-related pipelines.[241] Pipelines carry fuels to 60 distribution points in the state.

Modern pipelines are the most efficient and effective method for moving petroleum, gasoline, and natural gas. According to the U.S. Department of Transportation, the U.S. is the safest method to transport petroleum products.[242] A modern pipeline integrates advanced technologies with continuous operations to monitor safety and environmental impacts. In the U.S., pipelines and pipeline operations are highly regulated and fall under the purview of various federal, state, and local agencies, including the Pipeline and Hazardous Materials Safety Administration. In California, the California Department of Conservation's Geologic Energy Management Division (CalGEM) and the California Office of the State Fire Marshall (OSFM) oversee oil and gas pipelines.[243] As codified in California Regulations sections 1774, 1774.1, and 1774.2, California has the strictest standards for oil and gasoline pipeline construction, testing, and maintenance in the world. California Regulations 1722, 1722.9, 1773.1, and

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235 https://www.energy.ca.gov/sites/default/files/2022-07/2022-07_Petroleum_Watch_ADA.pdf

236 Commission, C. E. (n.d.). *Foreign Sources of Crude Oil Imports to California 2020*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports

237 Section 27 of the Merchant Marine Act of 1920 (P.L. 66-261). See, also: https://crsreports.congress.gov/product/pdf/R/R45725

238 *Overview of California's Ports*. (n.d.). Lao.ca.gov. https://lao.ca.gov/Publications/Report/4618

239 Schremp, G. (2016). *PADD 5 & California Transportation Fuel Overview Western Regional Emergency Fuel Coordination Meeting California Energy Commission Sacramento, CA*. https://www.naseo.org/Data/Sites/1/schremp-1.pdf

240 *Home - Kinder Morgan*. (n.d.). Www.kindermorgan.com. https://www.kindermorgan.com

241 *General Pipeline FAQs*. (n.d.). PHMSA. https://www.phmsa.dot.gov/faqs/general-pipeline-faqs

242 *General Pipeline FAQs*. (n.d.). PHMSA. https://www.phmsa.dot.gov/faqs/general-pipeline-faqs

243 California Department of Conservation. (n.d.). *Pipelines and facilities*. https://www.conservation.ca.gov/calgem/for_operators/Pages/Facilities.aspx#:~:text=Generally%2C%20CalGEM%20regulates%20all%20pipelines,used%20for%20transportation%20to%20refineries.

1775 provide for some of the most rigorous environmental protection standards in the world as related to oil and gas production.

Moving oil safely and efficiently through a pipeline requires sophisticated technologies involving collecting areas, pipes, pump stations, and temperature control. Heavy and extra heavy oils, as well as oils and pipelines in colder climates, require insulation and heating. In colder climates or when moving extra heavy crudes, as the temperature drops, oil becomes more viscous; that is, it becomes thicker and flows slower.[244] As a result of slower oil movement, pipelines will experience wax build-up on their internal surfaces, which must be cleaned periodically. A gasoline or pipeline can range from 4 to 48 inches in diameter.[245]

In addition to crude oil, the same pipelines may also be configured to move multiple fuel types, such as all grades of conventional gasoline, jet fuel and kerosene, heating oils, multiple grades of CARFG, and ultra-low sulfur diesel fuels. Moving different fuels through the same pipeline is accomplished in large batches, with extensive "clean-outs" occurring between each batch of products. As clean-outs are mandatory and essential to the proper and safe operation of the pipelines, they must be carefully scheduled and coordinated.

Construction costs for modern oil or gasoline pipelines can cost between $4.7 to over $10.4 million per mile, depending on geography, climate, distance, engineering, type of pipe, and other costs.[246] Generally, pipelines are buried 3 to 6 feet below ground surface. However, in some instances, geology, regulations, and engineering may require surface structures. For perspective, below is a summary of the estimated various construction costs for a modern oil and gas pipeline:

- "Oil & Gas Journal 2015-2016: $4.75 million/km (U.S. onshore gas),
- Oil & Gas Journal 2014-2015: $3.23 million/km (U.S. onshore gas),
- American Petroleum Institute 2017: $3.32 million/km (U.S. onshore gas, national average),
- Global Fossil Infrastructure Tracker median for 64 onshore and offshore projects: $2.34 million/km (date unspecified, worldwide)."[247]

Pipelines are the most cost-efficient and safest methods of moving gasoline and crude oil. The cost of transporting a single barrel of oil via pipelines ranges between $0.50 to $5.00 depending on distances, volumes, carriers, and other factors. Pipeline owners and/or operators establish the rate (cost) for transporting crude oil or gasoline as per regulatory guidance or requirements. Typically, producers (shippers) of crude or gasoline who use the pipeline enter into long-term contracts ranging from 10 to 20 years with the owner/operator. As the oil or gasoline travels through the pipeline, various costs, fees, tolls, royalties, and tariffs will be incurred, which the shipper incurs.

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[244] The. (2025). *The Effect of Temperature on Lubricant Viscosity | Business*. Shell.us; Business. https://www.shell.us/business/fuels-and-lubricants/lubricants-for-business/lubricants-services/industry-articles/the-effect-of-temperature-on-lubricant-viscosity.html. See also, Mathura, S. (2023, March 26). *Oil Viscosity: A Practical Guide.* Precision Lubrication. https://precisionlubrication.com/articles/oil-viscosity/

[245] https://www.onesteppower.com/post/how-is-oil-transported

[246] *Rail deliveries of oil and petroleum products up 38% in first half of 2012 - U.S. Energy Information Administration (EIA).* (n.d.). https://www.eia.gov/todayinenergy/detail.php?id=7270#:~:text=Shipping%20oil%20by%20rail%20costs,focuses%20on%20freight%20transportation%20costs.

[247] Global Energy Monitor. (2021, May 1). *Oil and Gas Pipeline Construction Costs - Global Energy Monitor*. https://www.gem.wiki/Oil_and_Gas_Pipeline_Construction_Costs

3.9.4 Rail Tankers. California received less than one percent of crude oil shipments to its refineries in 2021. California uses rail for moving propane, sulfuric acids, and butane, as opposed to finished gasoline or crude oil.[248] California has only a minimal amount (less than 1% in 2015) of inbound oil transported using rail tankers, most of which was sourced from Canada (4.27%).[249] [250] In 2024, California received no inbound crude from Canada via rail but did import 468,000 barrels from North Dakota by rail tanker.[251] In the U.S., a DOT-117 certified rail tanker can hold up to 286,000 gallons of product and must be designated with NA1993 identification.[252] [253] However, in rail transport, one of the controlling factors is the capacity of the rail track. Rail tracks are rated for speed and weight and, therefore, have restrictions. Similar restrictions are associated with tunnels, bridges, curves, incline grades, declines, and urban areas. The cost of transporting a barrel of oil via rail tanker ranges between \$10 to \$20.00.[254] [255] In California, the major rail carriers include BNSF, Union Pacific, and other operators. The CEC provides maps of the various California rail lines and rail tanker routes used in the State.[256]

Using tanker cars to transport crude oil usually requires the leasing of the rail tanker from 1 to 7 years, with lease payments paid monthly. The calculated cost to transport a barrel of oil via a rail tanker will depend on a number of factors, such as the load capacity (volumetric capacity), density of oil, ambient temperature at the time of loading, and track weight ratings and limitations. In general, rail tankers are loaded to 94% of their volumetric limits and 98% of their load capacities.[257] Other costs include terminal fees, loading and unloading costs, and rail rates.

3.9.5 Tanker Trucks. Of the estimated 166.1 million commercial and private trucks registered in the U.S., California is home to 9.6%, or 15.9 million.[258] Tanker trucks are used for the local delivery of crude oil and gasoline and, as such, have significant variability in cost. Distance from the tanker rack to the end user, typically a gas station, is a factor in transportation costs, which are reflected in the retail pump prices. Additionally, as fuel costs increase for the trucker, so do delivery costs, which, in turn, are reflected at the retail gasoline pump.

California relies extensively on tanker trucks for the shipping of finished gasoline products from refineries to distributors (racks) and onward to retail gasoline stations. In 2015, tanker trucks averaged

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[248] https://calepa.ca.gov/wp-content/uploads/sites/6/2016/10/Refinery-Documents-2015yr-Petroleum.pdf
[249] Schremp, G. & California Energy Commission. (2016). California transportation fuel overview. In *Western Regional Emergency Fuel Coordination Meeting*. https://www.naseo.org/Data/Sites/1/schremp-1.pdf
[250]Commission, C. E. (n.d.). *Foreign Sources of Crude Oil Imports to California 2020*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports
[251] California Energy Commission. (2024). *Crude Oil Imports By Rail*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california/crude
[252] *More Rail Tank Cars Meet DOT-117 Safety Standards in 2022 | Bureau of Transportation Statistics*. (2022). Bts.gov. https://www.bts.gov/newsroom/more-rail-tank-cars-meet-dot-117-safety-standards-2022
[253] *Economics of Rail versus Pipeline*. (n.d.-b). Welcome to Altex Energy. https://www.altex-energy.com/economics-of-rail-versus-pipeline/#1501828266955-2913a69d-c276
[254] *Shipping Petroleum Products*. (2023, May 30). Www.freightcenter.com. https://www.freightcenter.com/shipping/petroleum-products/
[255] *Rail deliveries of oil and petroleum products up 38% in first half of 2012 - U.S. Energy Information Administration (EIA)*. (2025). Eia.gov. https://www.eia.gov/todayinenergy/detail.php?id=7270
[256] *Department of Conservation Map Server*. (2025). Ca.gov. https://maps.conservation.ca.gov/oilgas/
[257] *Economics of Rail versus Pipeline*. (n.d.). Welcome to Altex Energy. https://www.altex-energy.com/economics-of-rail-versus-pipeline/#1501828266955-2913a69d-c276
[258] *Registered U.S. private and commercial trucks by state*. (n.d.). Statista. https://www.statista.com/statistics/191023/registered-private-and-commercial-trucks-in-the-us-by-state/

approximately 4,980 deliveries per day, representing 39.84 million gallons of gasoline.[259] In California, 94% of all trucks are fueled by either diesel (67%) or gasoline (25%).[260]

The shipping of oil and gasoline using trucks is the most expensive and least efficient mass volume transportation method based on cost per barrel or gallon. Tanker trucks come in various sizes and configurations, including high-pressurized bulk, low-pressurized bulk compressed gas, and others. Fuel tanker trucks are usually non- or low-pressure liquid bulk carriers. In contrast to the massive volumes of barrels or gallons that are carried by rail tankers and maritime vessels, tanker trucks carry between 200 to 250 barrels of oil, or 8,400 to 10,500 gallons, depending on configuration and DOT rating. In California, as well as other states, tanker trucks are heavily regulated and require special licenses to operate. The cost of transporting a barrel of oil via tanker truck is roughly double that of rail or ranges between $20 to $40.00, depending on multiple factors such as distance, tolls, terrain, and the condition and mechanics of the truck.[261] Summarized below are the estimated ranges for the cost of shipping/transporting a barrel of oil from its source to Los Angeles by method.

Exhibit 3.51

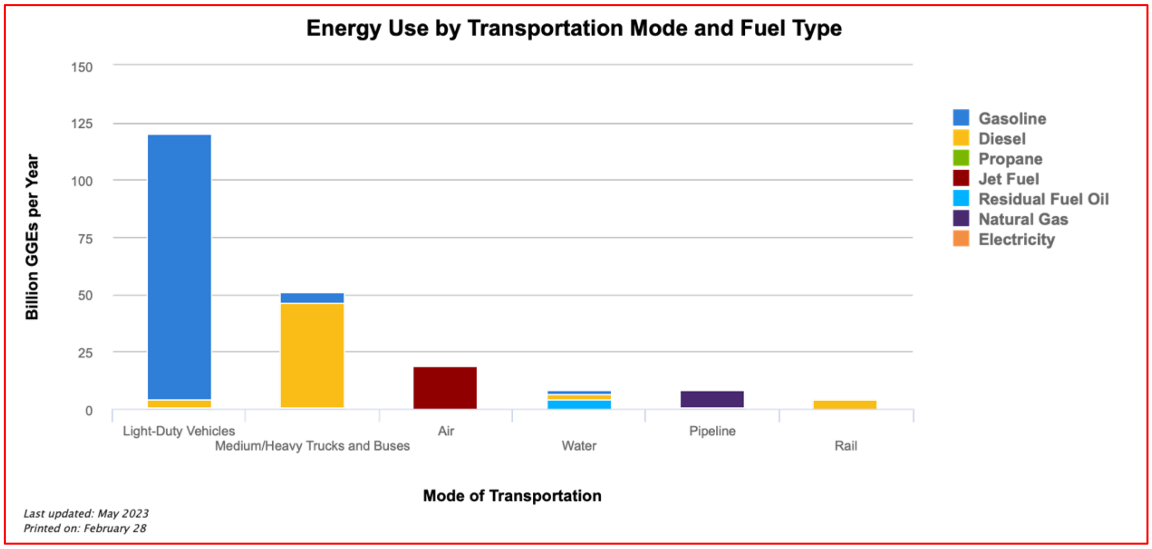
SUMMARY OF TRANSPORTATION COSTS PER BARREL OF OIL BY METHOD				
From to Los Angeles	**Pipeline**	**Tanker**	**Rail**	**Truck**
San Joaquin Valley	$0.50-$5.00			
Alaska North Slope		$5.00		
Brazil		$5.00		
Middle East		$6.00		
Canada			$10-$20	
U.S. (Gasoline)			$5-$20	$20 -$40

(Source: Source: https://www.wspa.org/wp-content/uploads/CA-Gas-Receipts-Feb-2024-v2-1.pdf & various)

Summarized in the exhibit below is the energy use (consumption) associated with modes of transportation.

[259] Crockett, & Schremp, G. (2015). *California Transportation of Petroleum Second Northern California Refinery Safety Forum*. https://calepa.ca.gov/wp-content/uploads/sites/6/2016/10/Refinery-Documents-2015yr-Petroleum.pdf
[260] California. (n.d.). *Large Entity Fleet Reporting STATEWIDE AGGREGATED DATA*. Retrieved February 23, 2025, from https://ww2.arb.ca.gov/sites/default/files/2022-02/Large_Entity_Reporting_Aggregated_Data_ADA.pdf
[261] Green, K. P. (2018). *Pipeline crunch sending crude to markets—by truck*. Fraser Institute. https://www.fraserinstitute.org/commentary/pipeline-crunch-sending-crude-markets-truck

Exhibit 3.52



(Source: DoE)

SECTION 4.0
CALIFORNIA OIL IMPORTS & FOREIGN OIL SOURCES

A STUDY OF CALIFORNIA GASOLINE PRICES
Section 4.0
Table Of Contents

4.0 CA OIL IMPORTS & FOREIGN OIL SOURCES

4.1 California Sources of Foreign Imports

No state in the U.S. imports more foreign sourced oil for its use than California. In 2023, California imported 321.153 million barrels of oil from non-U.S. sources. Since 1982, California imports of foreign oil have increased by 857%. In 2024, California imports increased slightly to 321.831 million barrels of oil, or .21%. In 2024, as U.S. imports of foreign oil hit a thirty-year low, California imports of crude came within 13% of its thirty-year high (2018).[262] California holds around 3% of U.S. oil reserves and ranks 5th in the nation in proven reserves.[263] [264] Nonetheless, California is virtually wholly dependent on foreign oil sources to meet its gasoline production demands.

For 2023, 60.7% of California's oil was imported from foreign sources, including the petrostates of Iraq (21.7%) and Saudi Arabia (15.7%). South America's Brazil and Ecuador represented the third and fourth largest sources of California import sources at 15.1% and 14.6%, respectively. Collectively, and based on CEC data, the three largest sources (Iraq, Saudi Arabia, and Brazil) represented 52.4% of all California foreign imports.[265] Middle Eastern oil from OPEC members Saudi Arabia, Iraq, and the U.A.E. collectively represented 39.25% of all California oil imports for 2023.

However, in 2024, California changed its mix of non-U.S. foreign imports. Iraq, which provided 68,406 barrels of oil composed 21.26% of its non-U.S. oil imports. Brazilian oil imports increased to 20.41%, and as production scaled in Guyana, imports from that South American country increased exports to California to 50,840 barrels or 15.80% of total 321,831 barrels of non-U.S. imported oil.[266] California has also imported oil from Russia, Angola, Oman, and other national providers.[267] Depicted below is a representation of major sources of California oil for 2024 as provided by the CEC.

[262] Roberts, K. (2024, August 19). *2024 U.S. oil imports from Middle East hit new record low*. Forbes. https://www.forbes.com/sites/kenroberts/2024/08/16/2024-us-oil-imports-from-middle-east-hit-new-record-low/. See also, EIA and CEC import data.

[263] *California State Energy Profile*. California Profile. (n.d.-a). https://www.eia.gov/state/print.php?sid=CA

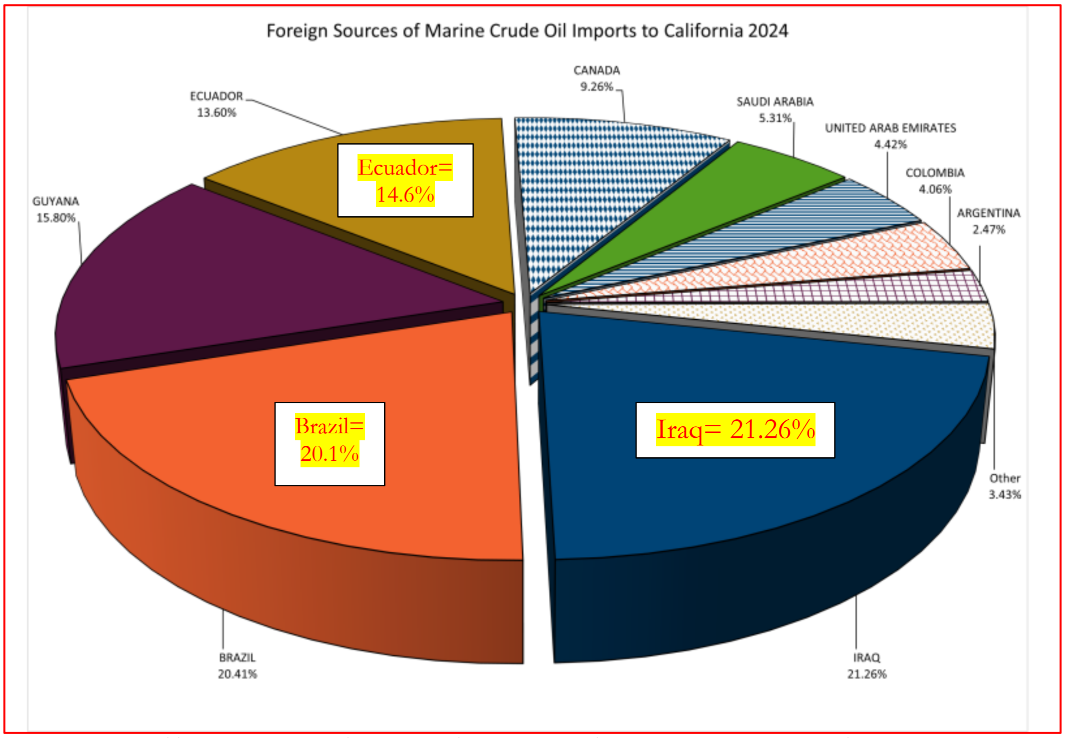
[264] Jones, J. (2024a, June 29). *States with the most oil reserves [2024]*. Construction Coverage. https://constructioncoverage.com/research/states-with-the-most-oil-reserves

[265] California Energy Commission. (n.d.-h). *Foreign sources of crude oil imports to California*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports

[266] California Energy Commission. (n.d.-d). *Foreign sources of crude oil imports to California*. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports

[267] *California 2019 crude average carbon intensity up*. (2019). Green Car Congress. https://www.greencarcongress.com/2020/06/20200616-carbci.html

Exhibit 4.1



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports)

Depicted below is a comparison of California imported oil sources for the years 2023 and 2024.

Exhibit 4.2

Comparison: Percent of Oil Imports by Source- California 2023 vs 2024		
Source	**California 2023**	**California 2024**
Iraq	21.70%	21.26%
Saudi Arabia	15.70%	5.31%
Brazil	15.10%	20.41%
Ecuador	14.60%	13.60%
Mexico	4.15%	<2%
Guyana	9.73%	15.80%
Canada	4.27%	9.26%

(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports)

Compared to all U.S. oil imports, for 2024, California has a significantly greater dependency on and a higher percentage of foreign oil from petrostate Iraq, and South America's Brazil and Ecuador than the overall U.S.

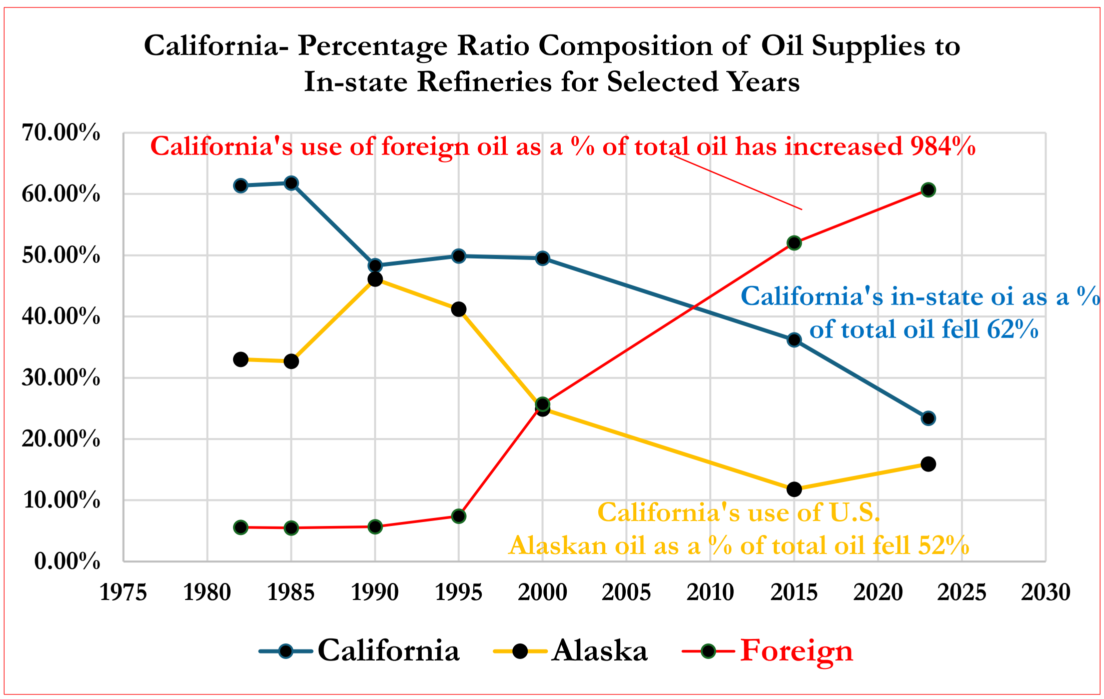
Exhibit 4.3

Comparison: Percent of Oil Imports by Source-CA. to U.S.- 2024		
Source	**California 2024**	**U.S. 2024**
Iraq	21.26%	3.43%
Brazil	20.41%	3.45%
Canada	9.26%	66.00%
Saudi Arabia	5.31%	2.82%
Colombia	2.67%	3.06%
Mexico	2.00%	7.03%
Venezuela	0.00%	4.61%

(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports and https://www.eia.gov/petroleum/imports/companylevel/)

For 2023, on a percentage composition basis, California imports 6.8 times and 2.9 times more oil from Iraq and Saudi Arabia, respectively, and 5.2 times and 7.3 times more from Brazil and Ecuador than the overall U.S. Since the mid-1990s, California's ratio of foreign sourced oil to in-state production has shifted from .92 in 1982 to 2.59 in 2023 (indicating a significantly greater reliance on foreign oil as feeder stock to California's refineries).[268] [269]

Exhibit 4.4



(Source, CEC, EIA, and Author)

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[268] *U.S. Energy Information Administration - EIA - Independent Statistics and Analysis*. (n.d.). https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_sum/html/rank_use_pet_capita.html&sid=US

[269] *U.S. Crude Oil Production by State | Bureau of Transportation Statistics*. (2024). Bts.gov. https://www.bts.gov/browse-statistical-products-and-data/freight-facts-and-figures/us-crude-oil-production-state

According to various estimates, California ranks #1 in payments to foreign sources of oil and pays more than $61.8 million per day, or $22.5 billion annually, based on Brent market prices, or $54.41 million a day, or $19.8 billion annually, based on WTI market prices, to foreign countries such as Iraq, U.A.E., and Saudi Arabia and others for its oil imports.[270] California's oil imports from various petrostates, such as Iraq and Saudi Arabia, as well as various other Middle Eastern sources have both intended and unintended economic consequences and directly and indirectly support the sourcing countries' economies, governing policies and structures, political agendas, and societal initiatives. Summarized in the exhibit below are some of pertinent social, political, and human freedom rankings for various sources such as Transparency International and Global Finance of California crude oil imports.[271] The U.S. is provided for a comparative perspective.

Exhibit 4.5

Comparison: Selected Rankings for Social, Economic & Corruption for California Oil Imports (2023/2024)					
	Iraq	**Saudia Arabia**	**Brazil**	**Ecuador**	**United States**
Percent of California Total Imports	21.70%	15.70%	15.10%	14.60%	NA
Corruption Perception Ranking	154	53	104	115	24
Human Freedom Ranking	156	157	70	72	17
Media/Press Freedom Ranking	169	166	82	110	55
Democracy Ranking	128	150	51	85	29
Economic Freedom Ranking/Score	Not Ranked	61.9	53.2	55	70.1
Poorest County Ranking	71	173	107	79	182
Government Integrity	18.3	43.9	36.9	34.9	76.4

(Source: Various. See footnote below.)

Iraq, which is California's largest provider of foreign in 2023, is ranked 27th out of 179 as a "Fragile/Failed State Index" by the Fund for Peace. For perspective, North Korea, Rwanda, and Venezuela rank "better." The U.S. is ranked 141st.[272]

[270] Based on WTI and Brent crude prices as of 3/14/25, and CA. imports are reported by CEC. See also, Ed, C. (2018, October 9). *California ranks #1 in sending dollars abroad for Energy*. https://www.cfact.org/2018/10/09/california-ranks-1-in-sending-dollars-abroad-for-energy/ . See also, *FACTS - Californians for energy independence*. (2023, July 31). Californians for Energy Independence. https://www.energyindependenceca.com/facts/#:~:text=California%20now%20imports%2075%25%20of,use%2C%20mostly%20from%20foreign%20countries.&text=California%20spends%20$25%20Billion%20dollars,to%20meet%20our%20energy%20needs.

[271] Sources include Transparency International. (2024, September 12). *2023 Corruption Perceptions Index: Explore the results*. Transparency.org. https://www.transparency.org/en/cpi/2023; Vásquez, I., Mcmahon, F., Murphy, R., & Schneider, G. (2023). *HUMAN FREEDOM INDEX 2023 A Global Measurement of Personal, Civil, and Economic Freedom*. https://www.cato.org/sites/cato.org/files/2023-12/human-freedom-index-2023-full-revised.pdf; *Age of conflict*. (n.d.). https://pages.eiu.com/rs/753-RIQ-438/images/Democracy-Index-2023-Final-report.pdf?version=0; Ventura, L. (2024, October 20). *Poorest Countries in the world 2024*. Global Finance Magazine. https://gfmag.com/data/economic-data/poorest-country-in-the-world/;*Human rights index*. (2024, March 7). Our World in Data. https://ourworldindata.org/grapher/human-rights-index-vdem?tab=chart&country=BRA~ECU~IRQ~SAU~USA; and The Heritage Foundation. (n.d.). *Index of Economic Freedom: All Country Scores | The Heritage Foundation*. Index of Economic Freedom | the Heritage Foundation. https://www.heritage.org/index/pages/all-country-scores.

[272] Energyskeptic. (n.d.). *Peak everything, overshoot, & collapse - preservation of knowlege*. Peak Everything, Overshoot, & Collapse - Preservation of Knowlege. https://energyskeptic.com/

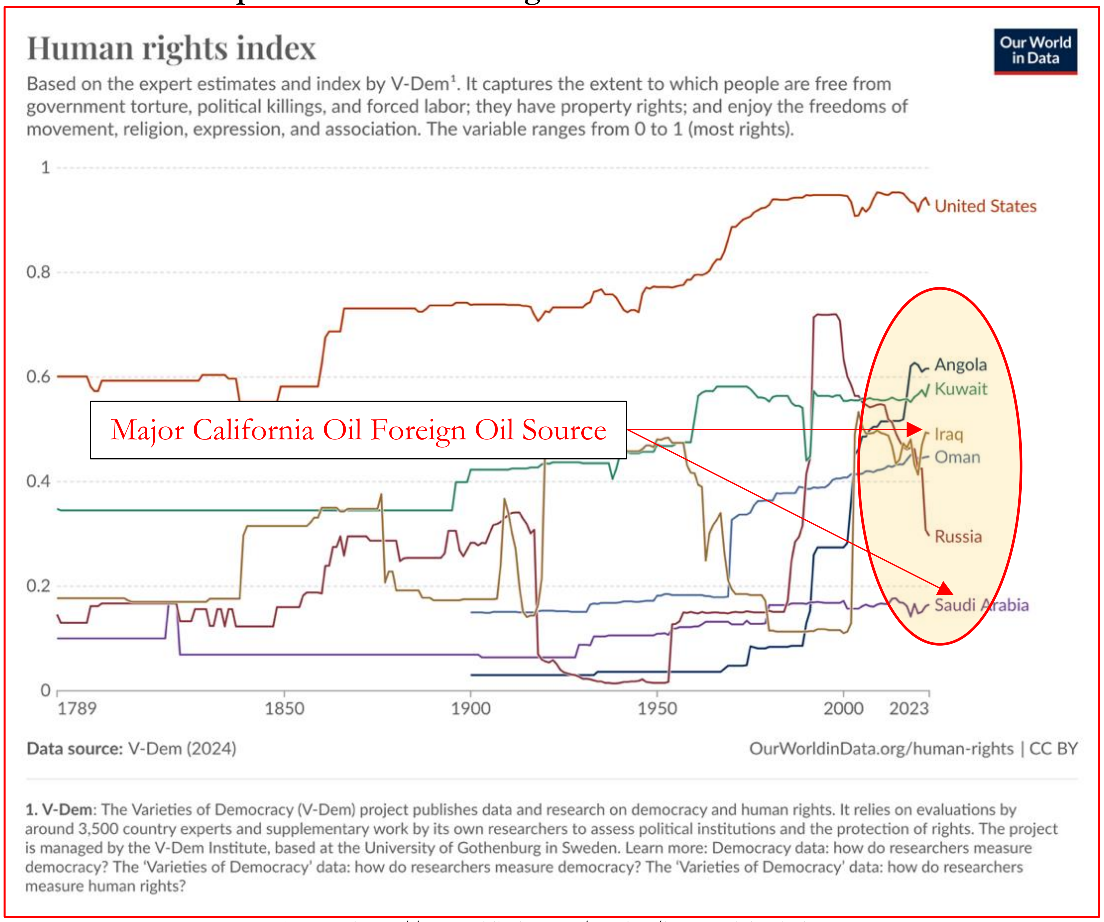
Exhibit 4.6

FRAGILE STATES INDEX RANKING Selected CA Sources of Foreign Imports	
California Oil Source	**Overall Ranking Out of 179**
Iraq	27
Brazil	71
Ecuador	87
Saudi Arabia	100
U.S.A.	141
Note: Lower number = more unfavorable.	

(Source: https://fragilestatesindex.org/excel/)

As summarized in the chart below, California's sources of foreign oil rank considerably lower in terms of human rights compared to domestically available sources from the U.S., including California.

Exhibit 4.7
Comparison of Human Rights for California Oil Sources



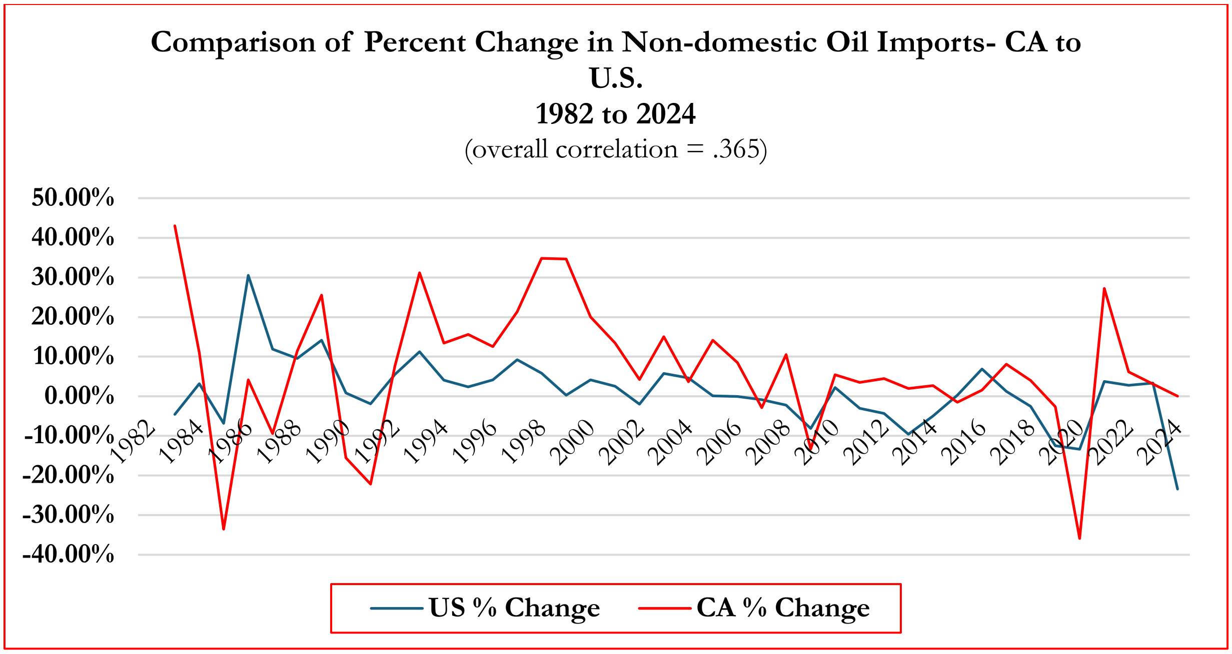
(Source: https://ourworldindata.org/grapher/human-rights-index vdem?tab=chart&country=OMN~USA~IRQ~KWT~SAU~RUS~AGO)

4.2 California Compared to U.S. Oil Imports

Although both California and the overall U.S. grew substantially over forty years, California's dependency on foreign sourced oil grew faster and moved contradictorily to that of the overall U.S. Consequently, on an annual percentage change basis, California has a low correlation (.365) for oil imports as compared to the overall U.S. oil imports. From 1982 to 2017, California exhibited wide disparities in oil imports between itself and the overall U.S. However, in 2017, California began to present smaller deviations in the annual percentage change in non-domestic oil imports to that of the overall U.S.

As California's in-state oil field production declined, the Golden State turned to foreign petrostates such as Iraq, Saudi Arabia, and the U.A.E., as well as South American sources such as Brazil, Guyana, and former OPEC member Ecuador, to produce gasoline, diesel, and jet fuels, and other petroleum derivative products.[273] [274] As California is highly dependent on foreign oil, it is also highly vulnerable to geopolitical events, natural and force majeure events, and a host of other activities that can cause supply disruptions and spot and long-term contract pricing variations in world oil markets.

Exhibit 4.8



(Sources: https://afdc.energy.gov/data/10324. CA CEC, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRIMUS1&f=M)

Since 1982, California's reliance on foreign oil imports has increased by 858%, or 20 times greater than that of the overall U.S. importing of foreign oil.[275]

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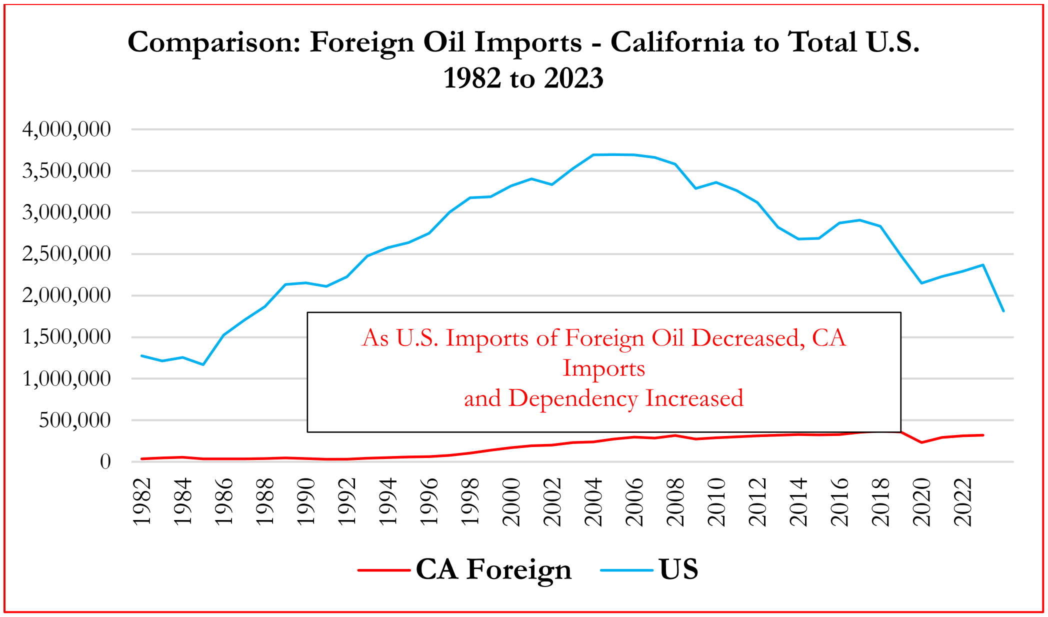
[273] Fox News. (2015, December 21). *Shale oil deposit a possible boon to struggling California, but state wary, enviros opposed.* https://www.foxnews.com/politics/shale-oil-deposit-a-possible-boon-to-struggling-california-but-state-wary-enviros-opposed

[274] Jones, J. (2024, March). *States With the Most Oil Reserves [2024] - Construction Coverage.* Construction Coverage. https://constructioncoverage.com/research/states-with-the-most-oil-reserves

[275] *Alternative Fuels Data Center: Maps and Data - U.S. Production, Consumption, and Trade of Petroleum Products.* (n.d.). Afdc.energy.gov. https://afdc.energy.gov/data/10324

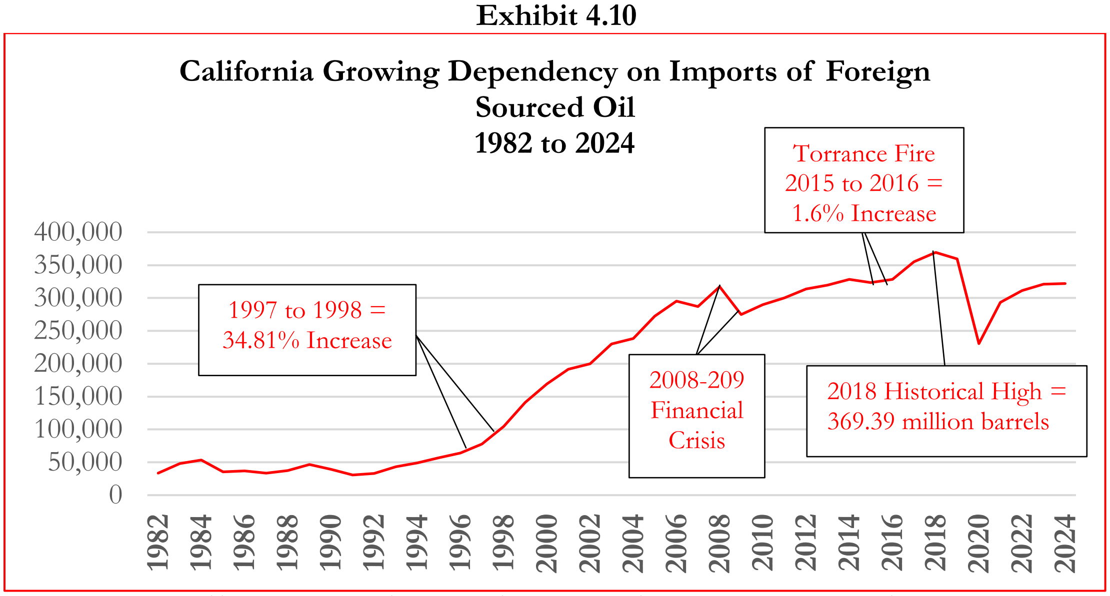
Exhibit 4.9



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRIMUS1&f=M)

In 1982, California produced 61% of its oil needs, imported 33% from Alaska, and imported only 5.6% from foreign sources. By 2023, and based on CEC data, the composition of California in-state oil stocks reversed to 23.4% in-state sourced, Alaskan oil imports declined to 16%, and foreign sourced moved to 60.7%. The exhibit below illustrates California's growing dependency on non-U.S. foreign oil sources. Since 1982, California's dependency on foreign oil has grown by 859%.

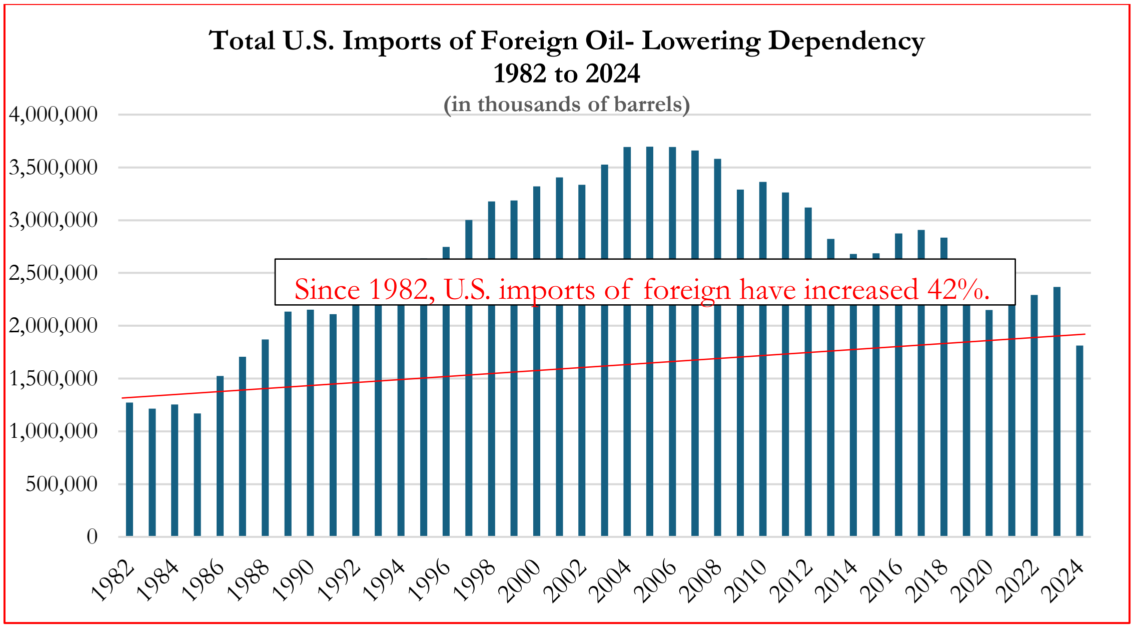
Exhibit 4.10



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california)

In contrast, while California's in-state production declined, and its dependency on foreign oil increased, U.S. imports and dependency on foreign sourced oil decreased, and domestic U.S. oil production increased.

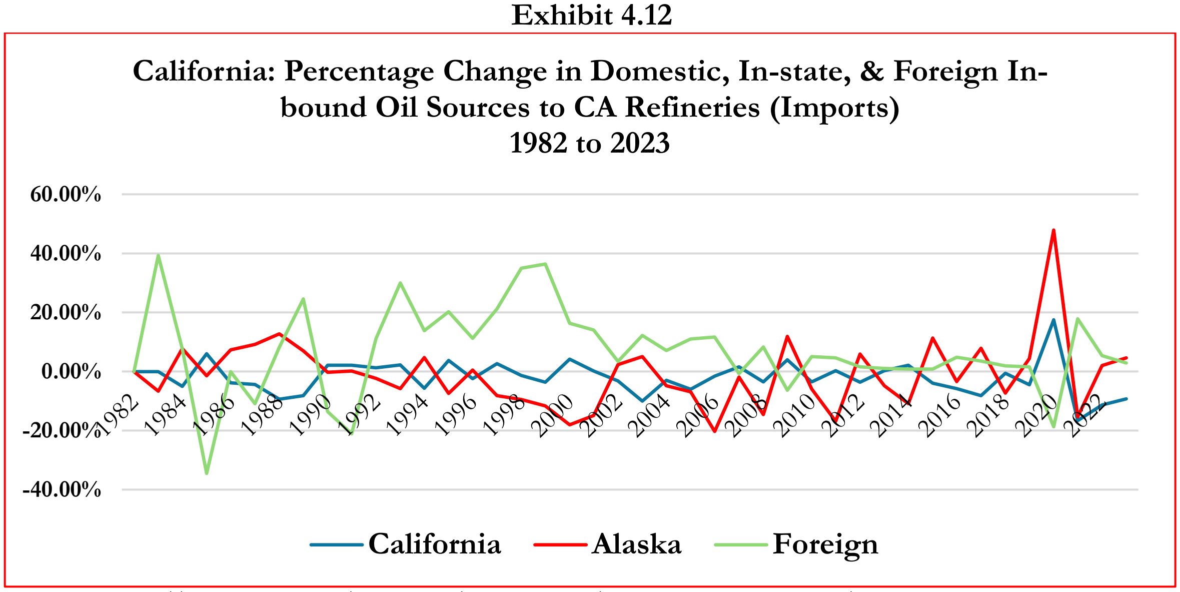
Exhibit 4.11



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRIMUS1&f=M)

The composition of California's inbound oil stocks by source, as measured by annual percentage change, is depicted below. Note the declines in Alaskan oil imports and the increase in foreign stock dependency. The 2020 spike is attributed to Covid-19.

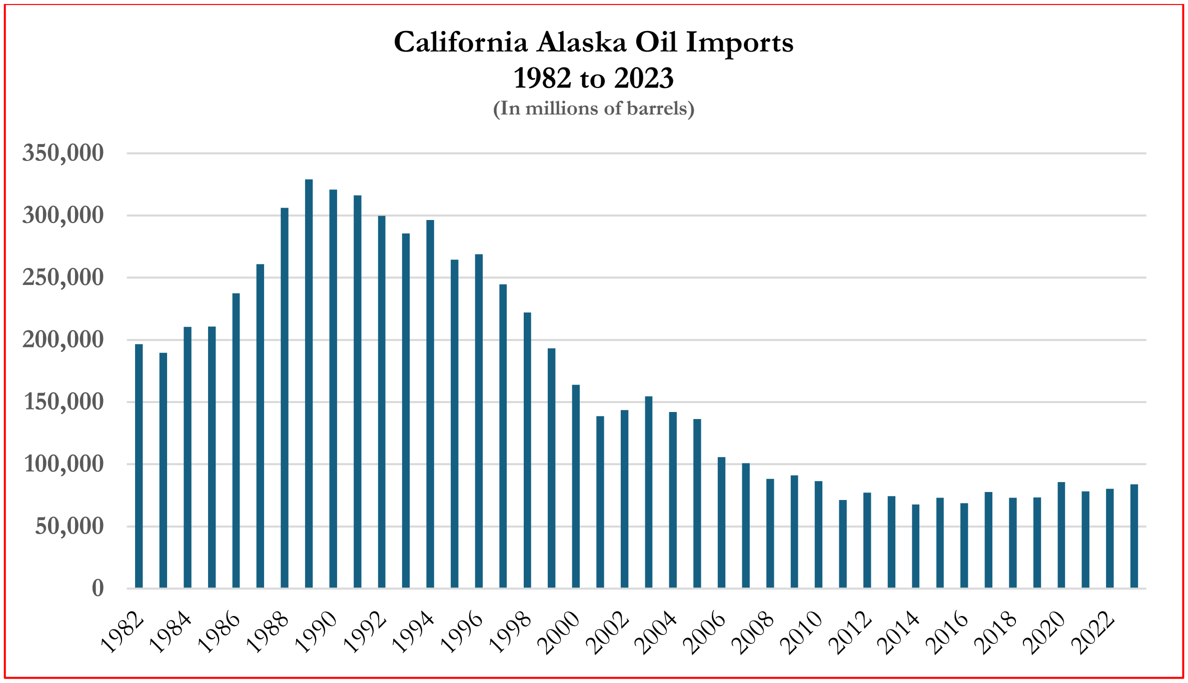
Exhibit 4.12



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california)

Commencing in the mid-1990s, as California's imports of domestically produced oil from Alaska and in-state oil production began a long-term decline, its need for foreign produced oil began to accelerate. While imports of non-U.S. domestically sourced oil from OPEC and other states increased by 857%, California imports of U.S. domestically produced oil from Alaska plummeted by 57.32%.[276]

Exhibit 4.13

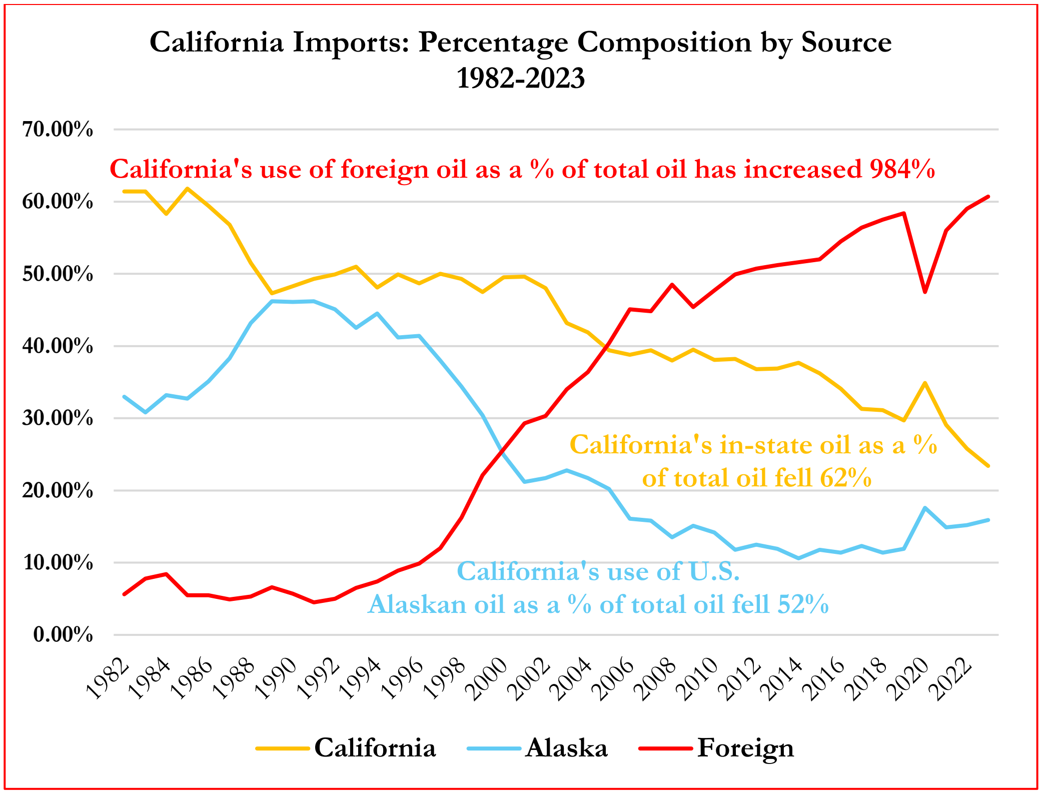


(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california)

The chart below depicts the percentage composition of California oil stocks for the 1982 to 2023 period. As indicated, California oil imports' composition changed significantly between 1982 and 2023. Specifically, there is a decline in the importing of U.S. Alaskan sourced oil, a drop in in-state production, and a dramatic increase in the use of foreign sourced oil.

[276] Alaska North Slope oil field production declined but accounted for 15% of California's oil in 2021. Today, the Alaskan Pipeline operates at 20-25% of its original capacity due to lower field production. However, both field production and pipeline capacity utilization are expected to increase in 2025. See, https://www.californiaenergyatlas.com/crude-oil

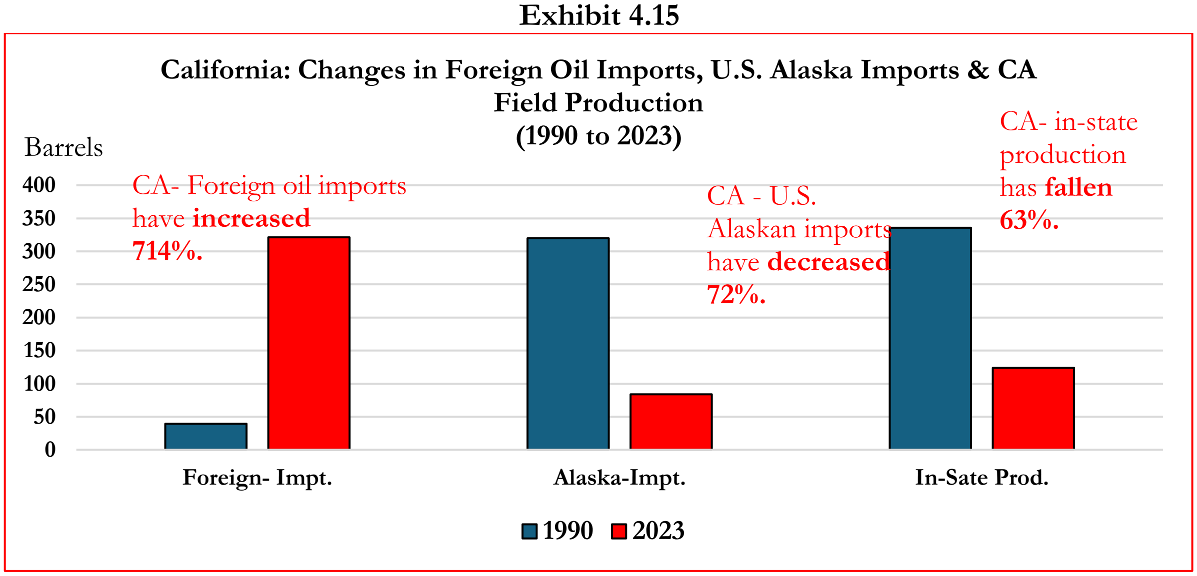
Exhibit 4.14



(Source:https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california)

While imports from foreign sources increased, domestically sourced 'imports' from other U.S. petroleum producing states, Alaska and California's in-state production have declined.

Exhibit 4.15



(Source: CEC)

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

4.3 Greenhouse Gas Emissions- Imports

4.3.1 Production Emissions. Measuring and comparing greenhouse emissions is a complex process in the petroleum industry, and methods and reporting standards vary. The U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DoE), California Air Resources Board (CARB), and International Standards Organization (ISO), for example, all have various standards and measurement methods. The ISO standards for measuring complete "well to tank," or what is more formally termed the Life Cycle Assessment (LCA) Sections 14040 and 14044, provide a standardized method for evaluating environmental impacts.[277]

Extracting and shipping oil creates multiple levels of greenhouse gas (GHG) emissions. As crude petroleum has unique chemistries, "no two barrels of oil are alike." Oil sourced in Texas can and will differ from oil produced in California. Even oil derived from Texas will have unique and specific differences. West Texas oil has a different chemistry from East Texas oil. Oil found in Alaska's North Slope has a chemical profile distinct from that found off the Gulf Coast of the U.S. Accordingly, where the oil is sourced, how it is sourced, how it is refined and stored, and how it is transported will create unique carbon footprints and GHG emissions.

GHG emissions are gases that are released into the atmosphere. Higher atmospheric temperatures are created as a result of gases that absorb longer wavelength radiation.[278] GHG emissions include a number of different components: HFC- hydrofluorocarbons, N_2O- nitrous oxide, CO_2 – carbon dioxide, CH_4 - methane, PFCs- perfluorocarbons, H_2O- in the form of water vapor, and SF_6- sulfur hexafluoride.[279] The most abundant of these components are carbon dioxide and methane, which compose between 80% to 90% and 5% to 10%, respectively, of human related (anthropogenic) GHG. Although it is a less abundant contributor to GHG, methane is far more potent than carbon dioxide as it is far more effective at trapping heat (about 80 times more than carbon dioxide). However, carbon dioxide has a much longer lifespan in the atmosphere, lasting for hundreds of years.[280]

At each stage of the "well to tank" oil production, refinement, and distribution process, GHG is created and emitted. Recent research has placed increasing emphasis on understanding the entire carbon and environmental footprint created by the complete well to tank life cycle.

Generally, crude oil production GHG emissions are measured in CO_2 equivalents per barrel of oil, or kgCO_2 eq./barrel (kilograms of carbon dioxide equivalent per barrel).[281] The carbon intensity of producing and consuming combustible transportation fuels is measured as CO_2e/MJ (megajoule of energy). In oil production, as well as in the production of liquefied natural gas, most methane GHG emissions are generated through a process known as "venting and flaring, and leaks."

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277 International Organization for Standardization. (2014, August 12). *ISO 14044:2006*. ISO. https://www.iso.org/standard/38498.html and International Organization for Standardization. (2006, August 12). *ISO 14040:2006*. ISO. https://www.iso.org/standard/37456.html.

278 *Greenhouse Gas Emission - an overview | ScienceDirect Topics*. (n.d.). Www.sciencedirect.com. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/greenhouse-gas-emission

279 *Greenhouse Gas Emission - an overview | ScienceDirect Topics*. (n.d.). Www.sciencedirect.com. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/greenhouse-gas-emission

280 *The Natural Gas Industry Has a Methane Problem*. (2019, June 7). Nrdc.org. https://www.nrdc.org/stories/natural-gas-industry-has-methane-problem

281 EPA. (2022, June 23). *Greenhouse Gases Equivalencies Calculator - Calculations and References | US EPA*. US EPA. https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references. See also, Netherlands, S. (2024). *CO2 equivalents*. Statistics Netherlands. https://www.cbs.nl/en-gb/news/2019/37/greenhouse-gas-emissions-down/co2-equivalents#:~:text=One20kg20of20CO2

- Flaring is the process of releasing gases directly into the atmosphere and/or igniting released gases to combust in the atmosphere at the point of production or refinement.

- Venting results from the intentional release of gases associated with pneumatic equipment, pipelines, tanks, etc., associated with the production and movement of petroleum products. Venting can also occur from fugitive emissions or leaks in pipelines, valves, pumps, vessels, and equipment throughout the production infrastructure.

- Methane leaks from storage tanks, pipelines, and collectors at terminals.[282]

The U.S. and California, as well as the U.S. petroleum industry and operators, have the world's most stringent production, health & safety, operational, and environmental standards for petroleum production and movement. Other crude sources, including OPEC members such as Iraq and Venezuela, do not have as stringent safety and environmental protection and enforcement standards, nor do Ecuador and Columbia. Consequently, the GHG created at production and refinery points tends to be greater in countries with lower standards.

According to a 2013 study performed by H.M. El-Houjeiri, A.R. Brandt, and J.E. Duffy, as cited by the CARB, [283] crude oil field production emissions of carbon dioxide average between 3 to 30 g CO_2/MJ. The range of emissions is contingent on processing methods and practices, rates of production, and flaring rates at a particular point of production. In California, the CARB assessment concluded that the range for California oil field production was 1.5 to 47 g CO_2/MJ.[284]

According to a McKinsey study, GHG emissions intensity for heavy oil such as that imported by California refiners ranges from 30 to 120 of CO_2 e/barrel per barrel. In general, and for example purposes only, California foreign oil sources averaging 70 kg of CO_2 e/barrel do not compare as favorably to domestically produced oil from the U.S. Permian Basin, which ranges from 20 to 40 and averages 20 kilograms of CO_2 e/barrel.[285] Below is a summary prepared by the management consulting firm McKinsey & Co., incorporative of other sources, of the estimated greenhouse gas emission intensity by various oil-producing areas, including the U.S. Gulf of Mexico. (Note: grades of oil sweet to extra heavy vary considerably.)

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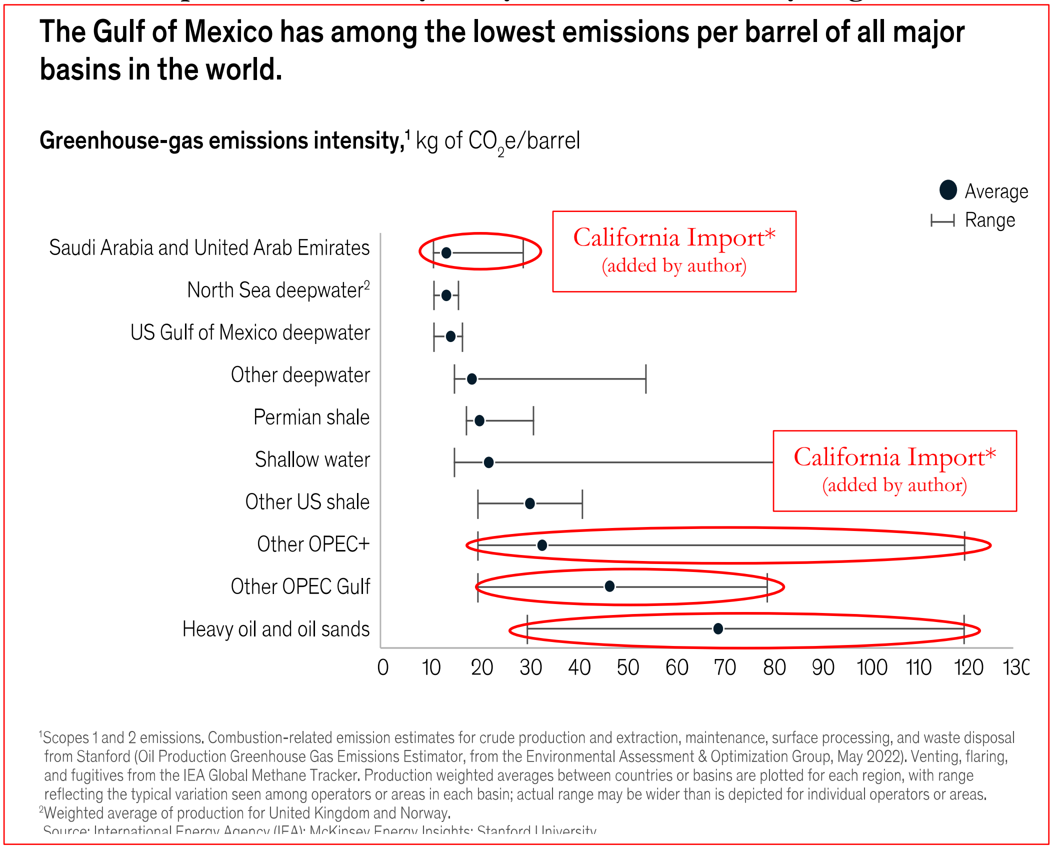
[282] Mandel, J., & Zou, J. J. (2019, May 30). *Leaks threaten safety — and success — of America's top natural gas exporter*. Center for Public Integrity. https://publicintegrity.org/environment/leaks-threaten-safety-and-success-of-americas-top-natural-gas-exporter/

[283] El-Houjeiri, H.M., Brandt, A.R., Duffy, J.E., 2013. Open-Source LCA Tool for Estimating Greenhouse Gas Emissions from Crude Oil Production Using Field Characteristics. Environ. Sci. Technol. 47, 5998–6006. El-Houjeiri, H.M., Brandt, A.R., Duffy, J.E., 2013. Open-Source LCA Tool for Estimating Greenhouse Gas Emissions from Crude Oil Production Using Field Characteristics. Environ. Sci. Technol. 47, 5998–6006.

[284] CARB (2019). California Air Resources Board. Calculation of 2019 Crude Average Carbon Intensity Value. https://www.greencarcongress.com/2020/06/20200616- carbci.html

[285] Brown, J., Luciano Di Fiori, Smith, M., & Kassia Yanosek. (2022, September 21). *How the Gulf of Mexico can further the energy transition*. McKinsey & Company; McKinsey & Company. https://www.mckinsey.com/industries/oil-and-gas/our-insights/how-the-gulf-of-mexico-can-further-the-energy-transition

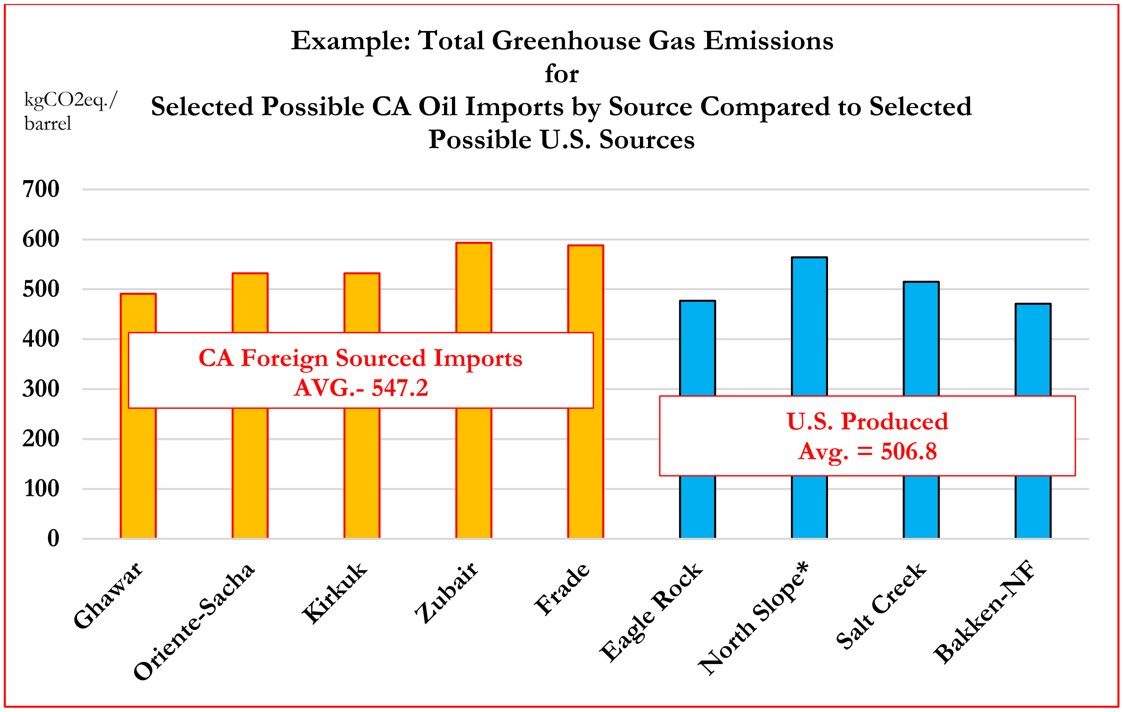
Exhibit 4.16
Comparison: McKinsey Study- GHG Emissions by Regions



(Source: McKinsey & Co.)

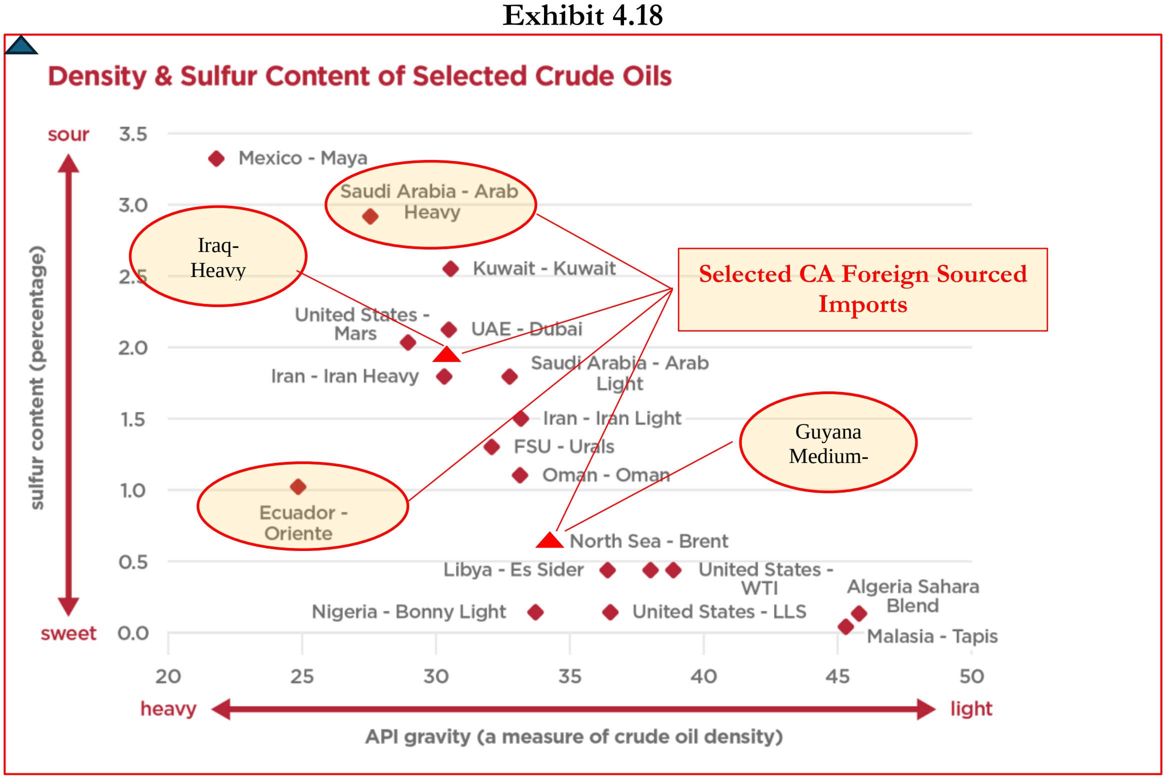
California imports oil from various wells in Saudia Arabia, Iraq, the U.A.E., Brazil, Ecuador, and several other sources. Oil field production GHG emissions vary considerably by source and production methods. Below is an example of the typical GHG emissions by oil fields from foreign sources compared to U.S. sources. (Note, provided for example purposes only. The actual GHG emissions for California's oil sources will vary.)

Exhibit 4.17



(Note: Provided for comparative purposes only and not inclusive of all sources. There are many variations in GHG emissions based on the exact source of oil and upstream production methods. Source: http://oci.carnegieendowment.org/#compare/iraq-kirkuk/iraq-zubair.)

Exhibit 4.18



(Source: https://www.mdd.com/forensic-accounting-articles/introduction-to-the-oil-gas-value-chain/)

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

Below is a summary based on the Carnegie Endowment for International Peace Oil-Climate Index of the total GHG emissions associated with various California heavy crude oil foreign sources as compared to selected U.S. light crude oil sources.[286] Significantly, since California refineries were and are currently configured for the refinement of California in-state sourced heavy crude oils, they currently use foreign sourced heavy crudes for refinement into gasoline and other products. The use of light crudes would require retooling and significant capital investment and given the mandates to eliminate both gasoline and diesel fueled vehicles, there is no incentive to invest on behalf of the refiners in light crude refinement. Nonetheless, the comparison is interesting since the U.S. is a major producer of light, and California has an abundance of heavy crudes in proven reserves.

[286] *Assessing global oils — Carnegie Endowment for International Peace*. (n.d.). Assessing Global Oils — Carnegie Endowment for International Peace. http://oci.carnegieendowment.org/#compare/iraq-kirkuk/iraq-zubair

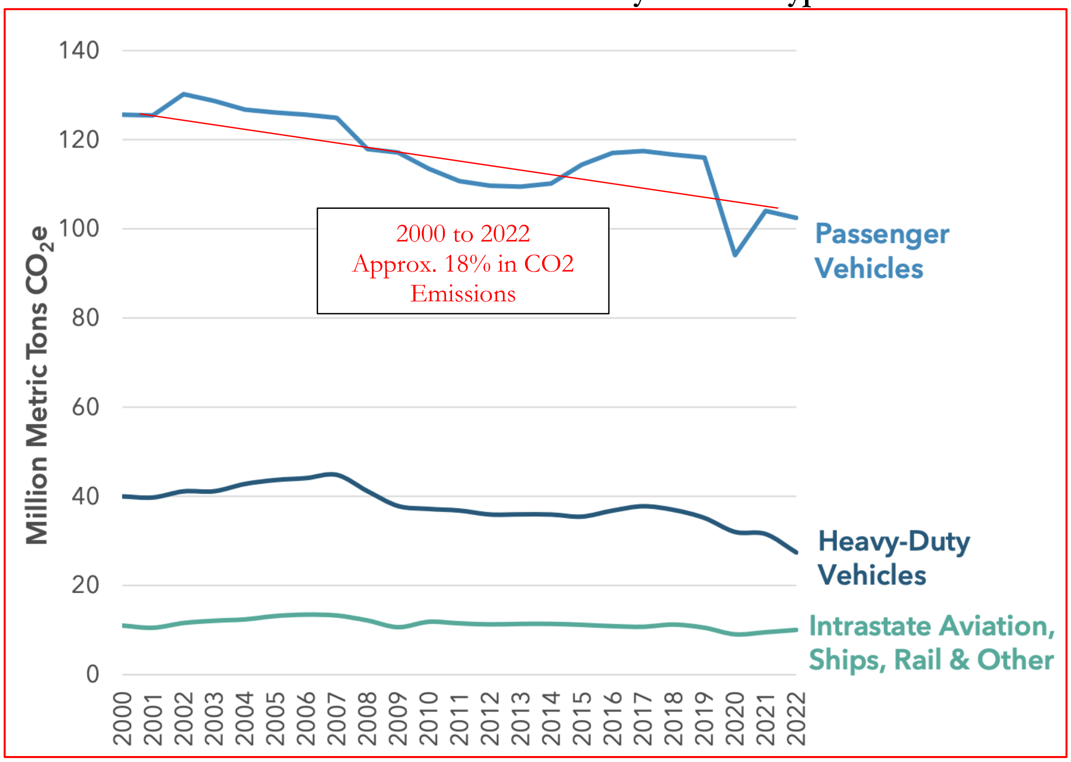
Exhibit 4.19
Comparison: Estimated Greenhouse Gas Emissions by Oil Source

GREENHOUSE GAS EMISSIONS-COMPARISON: SELECTED CALIFORNIA CRUDE OIL IMPORTS TO U.S. SOURCES									
COUNTRY OF ORIGIN	**CA. TOP FOREIGN SOURCES**					**UNTIED STATES**			
	Saudi Arabia	**Ecuador**	**Iraq**	**Iraq**	**Brazil**	**Texas**	**Alaska**	**Wyoming**	**U.S.**
Region	Ghawar	Oriente-Sacha	Kirkuk	Zubair	Frade	Eagle Rock	North Slope*	Salt Creek	Bakken-NF
Total GHG Emissions	491	532	532	593	588	477	564	515	471
GHG From Upstream Production	34	60	71	130	34	41	102	68	24
GHG From Transportation to Customers	11	11	11	11	11	10	11	11	10
API Gravity Weighting	33	29	39	30	20	41	31-32.1	37	38
Sulfur Content %	1.63%	0.95%	1.97%	2.66%	0.80%	0.31%	0.85-.98%	0.30%	0.07%
Classification	Light	Medium	Light	Deep	Heavy	Light	Medium	Light	Light
Sulfur Content Classification	Sour	Sour	Sour	Sour	Sour	Sweet	Sour	Sweet	Sweet
Percentage of Total GHG Due to Production	6.92%	11.28%	13.35%	21.92%	5.78%	8.60%	18.09%	13.20%	5.10%

Provide for comparative purposes only. There are many variations in GHG emissions based on the exact source of oil and upstream production methods. Source: http://oci.carnegieendowment.org/#compare/iraq-kirkuk/iraq- zubair.)

GHG and CO_2 emissions at the wellhead and refinery are important measurements but are incomplete. The totality of GHG emissions, or what is generally referred to as "well to wheel" emissions, which include transportation, must also be considered. Because California has limited in-state oil production and no in-bound pipelines from oil-producing states of any significance, the Golden State must import over 321,153,000 barrels of crude oil for gasoline production using maritime ocean tankers of various sizes which contribute to GHG emissions.[287]

Exhibit 4.20
Greenhouse Gas Emissions by Vehicle Type



(Source: https://ww2.arb.ca.gov/sites/default/files/2024-09/nc-2000_2022_ghg_inventory_trends.pdf)

4.3.2 Maritime Tanker Movement & GHG & Routes. According to CEC data, over 98% of California's non-U.S. sourced imported oil is delivered to its refineries via maritime vessels.[288] Since California imports over 50% of its oil from Middle Eastern sources, the GHG emissions generated in transit to California maritime terminals are higher due to the distance, time, and speed required to transport the oil stock.

Over 12 billion barrels of crude oil are moved using maritime tankers.[289] Ocean tankers produce GHG and CO_2 emissions and, based on an International Transport Forum (ITF) study, account for 3% of

[287] Various including CEC, EIA and others.
[288] Commission, C. E. (n.d.). *Foreign Sources of Crude Oil Imports to California 2020*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/foreign-sources-crude-oil-imports
[289] ETC Energy Transitions Commission (2018), Reaching zero carbon emissions from shipping. https://www.ieta.org/resources/COP24/Misc%20Media%20Files/Dec7/SE16%20(3).pdf

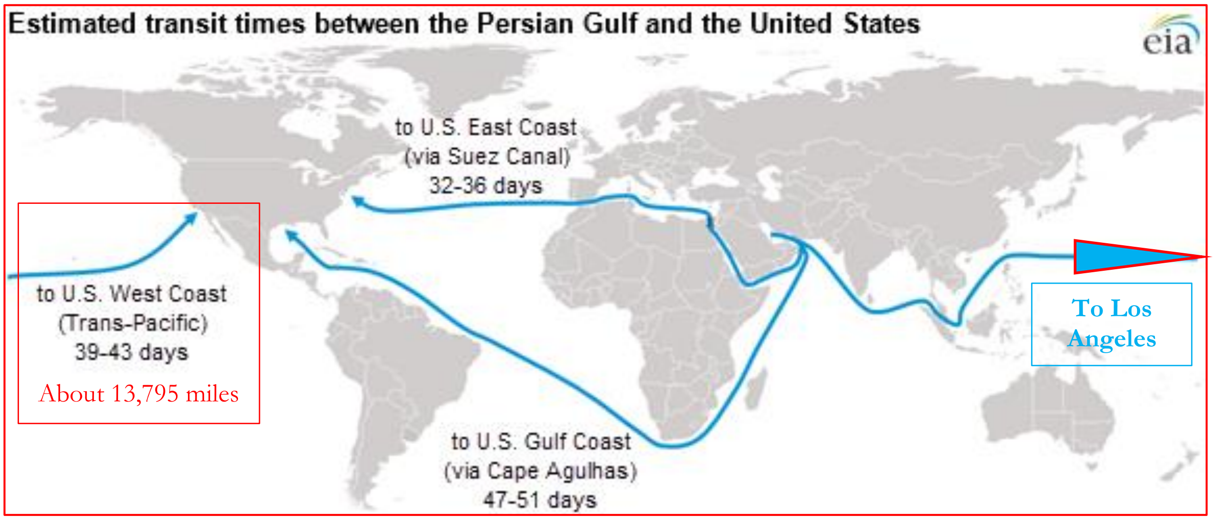
global emissions.[290] According to a 2015 study, oil tankers produced 114 million tons of CO_2, which accounted for 13% of all maritime CO_2 emissions.[291] Many factors, such as the age of the tanker, the propulsion technology of the tanker, load capacity, percent utilization of load capacity, speed of travel, as well as distance and trading lanes used, are just a few factors that impact total GHG emissions as related to oil production, transportation, and gasoline production. Other factors, including weather, geopolitical events, and destination port, can increase GHG emissions. The longer that the tanker is "anchor hoteling" and waiting for a berth and (idling) for lading and unlading its cargo, the greater the level of GHG emissions created.

Ocean tanker vessels come in various sizes and off-load at maritime terminals located in northern and southern California. Maritime transportation of foreign petroleum costs a barrel of oil and travel time to delivery and contributes to greenhouse emissions. However, due to economies of scale, ocean vessel transportation is one of the least costly and most efficient methods of moving vast amounts of petroleum. On average, it can cost between $30,000 to $70,000 a day to operate a very large crude carrier (VLCC) tanker, depending on fuel costs, port congestion, the size and age of the vessel, and the time of year.[292] Since Oil tankers burn diesel and heavy oil fuels, they produce greenhouse gas emissions.[293] In general, older oil tankers tend to be less efficient than newer ones, emitting more greenhouse gases than the newer VLCC tankers.

The distance and transit routes (trade lanes) a tanker uses to move from a source terminal, such as in Saudia Arabia or Iraq, to California has an enormous impact on emissions. Other factors include ocean tanker load factor, the percentage of tanker capacity utilization for its crude cargo, speed, routes, weather, etc. According to the EIA, the typical transit time for a VLCC class oil tanker to travel from Jeddah, Saudi Arabia, to Los Angeles is about 42-43 days (6 weeks).[294] Transit times from the U.S. Gulf Coast refineries to Los Angeles are about 11-13 days.

[290] Greene, S., Jia, H., & Rubio-Domingo, G. (2020). Well-to-tank carbon emissions from crude oil maritime transportation. *Transportation Research Part D: Transport and Environment*, *88*, 102587. https://doi.org/10.1016/j.trd.2020.102587
[291] Olmer, N., Comer, B., Roy, B., Mao, X. and Rutherford, D. Greenhouse Gas Emissions from Global Shipping, 2013-2015. (2017), https://theicct.org/publications/GHG-emissions-global-shipping-2013-2015
[292] VLCC oil tankers have a capacity to carry up to 2.0 million barrels of oil. See, Gunvor Group. (2024, January 22). *Very large crude carrier - Gunvor Group*. https://gunvorgroup.com/glossary/very-large-crude-carrier/#:~:text=A%20Very%20Large%20Crude%20Carrier,extraction%20locations%20to%20refineries%20worldwide.
[293]
[294] *U.S. crude oil imports from Saudi Arabia and Iraq recently increased, but may decline soon - U.S. Energy Information Administration (EIA).* (n.d.). https://www.eia.gov/todayinenergy/detail.php?id=30092#:~:text=Although%20crude%20oil%20exports%20from,the%20southern%20tip%20of%20Africa.

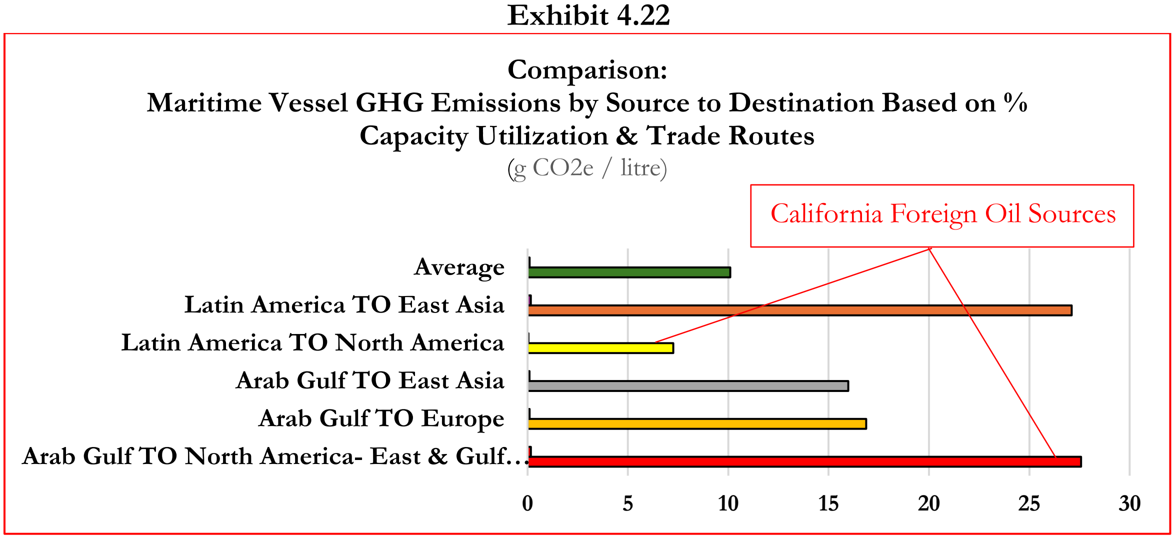
Exhibit 4.21



(Source:https://www.eia.gov/todayinenergy/detail.php?id=30092#:~:text=Although%20crude%20oil%20exports%20from,the%20southern%20tip%20of%20Africa)

Oil tankers, such as those used to transport crude oil to California, generate over 114 million tons of CO_2 annually.[295] Approximately 109 million metric tons of greenhouse gas emissions were associated with maritime oil vessel transportation in 2018.[296] Total greenhouse gas emissions related to transportation average around 11-12 kg CO_2 eq/barrel, according to Carnegie Endowment OCI data.[297]

Exhibit 4.22



(Source: https://theicct.org/publications/GHG-emissions-global-shipping-2013-2015)

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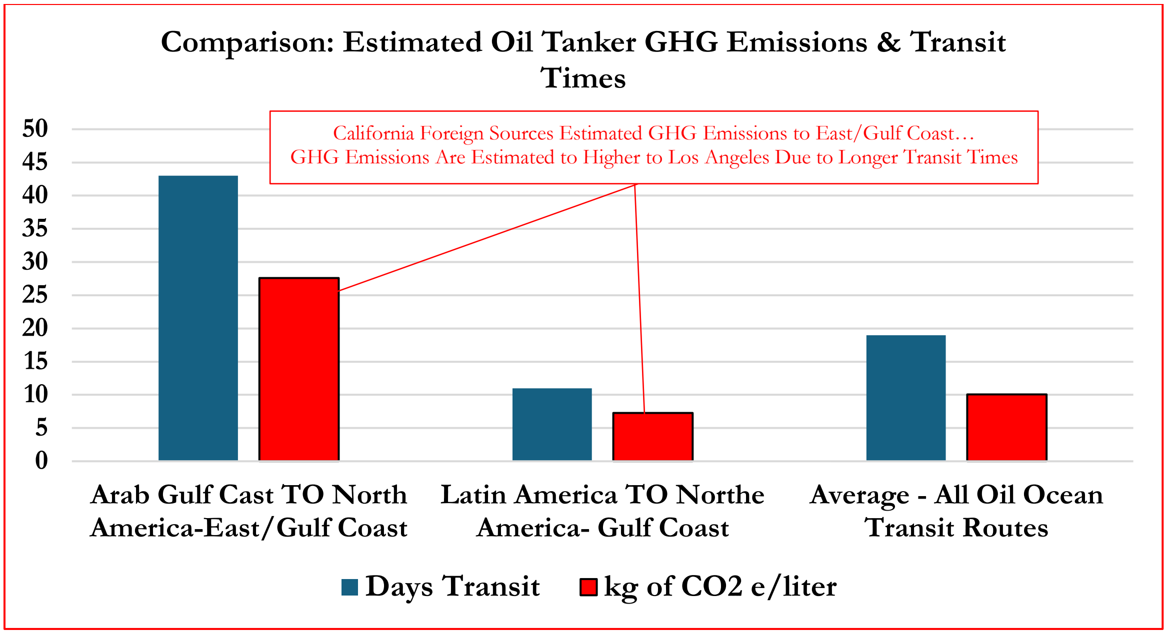
295 Olmer, N., Comer, B., Roy, B., Mao, X. and Rutherford, D. Greenhouse Gas Emissions from Global Shipping, 2013-2015. (2017), https://theicct.org/publications/GHG-emissions-global-shipping-2013-2015

296 Ankathi, S., Lu, Z., Zaimes, G. G., Hawkins, T., Gan, Y., & Wang, M. (2022). Greenhouse gas emissions from the global transportation of crude oil: Current status and mitigation potential. *Journal of Industrial Ecology*, *26*(6), 2045–2056. https://doi.org/10.1111/jiec.13262

297 *Assessing Global Oils — Carnegie Endowment for International Peace*. (n.d.). Assessing Global Oils — Carnegie Endowment for International Peace. https://oci.carnegieendowment.org/#total-emissions

Most of California's crude oil imports in 2023 came from Iraq, Saudi Arabia, and Brazil. Although transit times and distances vary for oil imports from these sources, they all contribute to GHG emissions when measured as "well to tank."

Exhibit 4.23



(Source: https://theicct.org/publications/GHG-emissions-global-shipping-2013-2015)

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

SECTION 5.0
REFINERY OPERATIONS & MARGINS

A STUDY OF CALIFORNIA GASOLINE PRICES
Section 5.0
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5.0 REFINERY OPERATIONS

5.1 Introduction

The first oil finery was established in Pittsburgh, Pennsylvania, in 1850. In 1855, a refiner in Connecticut produced gasoline. In 1862, John D. Rockefeller committed to building his first refinery, and by 1880, Rockefeller had created the Standard Oil Company, which produced petroleum products, predominantly kerosene, to a relatively consistent quality standard.[298]

Refineries are essential to the production of gasoline, jet fuels, heating oils, and bulk distillates, such as diesel fuels for trucks, railroad locomotives, maritime vessels, and agricultural machinery. Refineries are extraordinarily complex, and there are many different types of refineries with different production capacities and processes that produce specialized products. Some refineries are highly diverse and can produce a variety of products, and others are limited to only a few products. Irrespective of specialization, refineries are necessary to process crude petroleum molecules to produce fuels, plastics, concrete, asphalts, fertilizers, and many other products. Some of the more common of the 6,000 by-products of petroleum production include everyday items such as perfume, floor coverings, soap, paints, caulking, golf balls, drinking cups, blush, eyeliner, dialysis machines, medical gloves, birth control pills, insulin, and vitamins.[299] [300]

Oil refineries are highly sophisticated and are classified and rated on a standard scale known as The Nelson Complexity Index (NCI).[301] The NCI indicates the levels of operational and technical sophistication of a specific refinery and its operations. The NCI rates refinery capacity and sophistication on a scale of 1 to 20, with 20 being the most complex. Refineries with high NCI ratings are more sophisticated and capital intensive and are, therefore, inherently more complex and expensive to operate. However, high NCI-rated refineries generally have higher gross profit margins than less complex and lower NCI-rated refineries, assuming higher utilization rates.[302]

California has some of the most complex, sophisticated, and highest NCI-rated refineries in the U.S. and the world. For example, PBF's Torrance refinery, with 166,000 barrels per day throughput, and its Martinez refinery, at 157,000 barrels a day capacity, have NCI ratings of 13.8 and 16.1, respectively.[303] Chevron's El Segundo coking refinery has an NCI rating of 12.62 and 9.62 in its Northern California Richmond cracking complex.[304] [305] The Phillips 66 refinery that is slated to close by year-end 2025 has an NCI rating of 14.1.[306] By comparison, Marathon Petroleum, which operates

[298] *The refining and petrochemical industries: 170 years of innovation*. (n.d.). Www.afpm.org. https://www.afpm.org/newsroom/blog/refining-and-petrochemical-industries-170-years-innovation
[299] Paul. (2023, March 18). *List of 365 Products Made from Oil / Petroleum*. Bad Ass Work Gear. https://badassworkgear.com/list-of-products-made-from-oil-petroleum/
[300] Bruzek, A. (2020, November 25). *Making the Pill from Yams to Fish*. Living on Earth; World Media Foundation. https://www.loe.org/shows/segments.html?programID=20-P13-00048&segmentID=4
[301] *Refining Report Complexity index indicates refinery capability, value*. (1996, March 18). Ogj.com; Oil & Gas Journal. https://www.ogj.com/home/article/17234421/refining-report-complexity-index-indicates-refinery-capability-value
[302] Hafner, M., & Luciani, G. (2022). *The Palgrave handbook of international energy economics*. Chapter 3, Jean-Pierre Favennec. Palgrave Macmillan.
[303] *Refineries – PBF Energy*. (n.d.). https://www.pbfenergy.com/refineries/
[304] kgi-admin. (2021, October 27). *Refinery profile: El Segundo coking refinery, US*. Offshore Technology. https://www.offshore-technology.com/marketdata/el-segundo-refinery-coking-the-us/?cf-view
[305] kgi-admin. (2021, October 27). *Refinery profile: Richmond cracking refinery, US*. Offshore Technology. https://www.offshore-technology.com/data-insights/richmond-refinery-cracking-the-us/
[306] *Petroleum refineries vary by level of complexity - Today in Energy - U.S. Energy Information Administration (EIA)*. (n.d.). Www.eia.gov. https://www.eia.gov/todayinenergy/detail.php?id=8330

the largest refinery in California, has its most sophisticated and highest NCI-rated refinery in Galveston, Texas, which is rated at 15.3, and the Jurong Island I refinery in Singapore has an NCI rating of 5.8.[307] [308] Overall, and based on the available data, the average for U.S. refineries is 9.5, while European refineries have a lower average of approximately 6.5.[309]

Exhibit 5.1[310]

NCI RATINGS & CAPACITIES OF SELECTED CALIFORNIA REFINERIES		
California Refinery	**Capacity (barrels per day)**	**NCI Rating**
GCEH-Benicia	145,000	16.1
Marathon - LA	365,000	12.07
Phillips 66- LA (slated for closure)	139,000	14.3
PBF- Martinez	156,400	16.1
PBF- Torrance	160,000	13.8
Valero- Wilmington	85,000	15.9
CA. Total (selected refineries only)	175,067	
CA. NCI Average		**14.43**
U.S. NCI Average		**9.5**
EU NCI Average		**6.5**

(Source: see footnote below)

Operationally, refineries share three basic processes: **1-** Separation, **2-** Conversion, and **3-** Treatment.

- 1- Separation involves the atmospheric distillation of crude oil into various fractions or components (fracking).
- 2- Conversion involves the "cracking" of the various components into various product type streams.
- 3- Treatment creates the final petroleum product, such as gasoline. Treatment involves blending separated products with various additives to derive a gasoline product and grade compliant with federal and State mandates.

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[307] *What is the Nelson Complexity Index? Oil 101 Podcast*. (2021, September 28). EKT Interactive. https://ektinteractive.com/podcast/oil-101-podcast/oil-101-nelson-complexity-index/
[308] sarikabandari. (2023, May 4). *Top ten active oil refineries in Asia*. Offshore Technology. https://www.offshore-technology.com/data-insights/top-ten-active-oil-refineries-asia/?cf-view
[309] Maples, R. E. (2006). *Petroleum refinery process economics*. Pennwell Corp.
[310] *List of oil refineries*. (2020, April 24). Wikipedia. https://en.wikipedia.org/wiki/List_of_oil_refineries

Refineries are capital intensive operational assets that require an extensive and sophisticated supporting infrastructure, highly trained workers, constant maintenance, and technical and innovative upgrades. Under the most favorable conditions, an oil refinery will cost between $5.0 to $15.0 billion (or about $46 per person in the U.S.) and years to build. In California, it is essentially impossible to build a new refinery or to significantly expand an existing refinery due to zoning, permitting, regulatory, and environmental restrictions, as well as the prevailing political policies and sentiment.[311] California's Advanced Clean Cars Acts I and II mandate the elimination of internal combustion engine (ICE) cars and light truck and SUV sales by 2035. Consequently, there is no incentive for a refiner to expand or incur significant investments in refinery operations, for new gas station retailers to enter the market, or for current refiners to even stay in the California market space.[312]

5.2 Basic Refinery Economics

Refinery economics are as complex as the engineering of a refinery and its related operations. Refineries are extraordinarily expensive to maintain and operate, which contributes to the challenges of operating a refinery profitably. Refineries operate on crude oil, which is the primary input for the creation of other products, such as gasoline. The key operating characteristics of an oil refinery reflect traditional economic theory. Oil refineries operate best when:

(1) there is a stable and certain stream in inbound oil stocks from which to make products,
(2) they operate within a capacity utilization range of 88% to 94% and achieve and sustain economies of scale in production,
(3) their operating equipment is well-maintained pursuant to a planned maintenance schedule,
(4) they are operated with a highly skilled and trained labor force,
(5) they are producing relatively homogeneous products, and
(6) they utilize advanced production methods and innovations.

Refineries are most efficient and productive when they achieve economies of scale and when the costs of production are optimized. Economies of scale vary based on a number of factors, of which engineering, capacity, labor competency, and quality of raw material inputs, processes, and products produced are central. Typically, the larger the refinery volume and the higher its capacity utilization rate, the more efficient and profitable the refinery will be, ceteris paribus. Stated differently, the cost of refining a barrel of crude decreases as more crude is refined. The more crude oil that is refined creates a larger numerator from which to allocate and spread both variable and fixed costs, thereby lowering cost per unit and improving both operating (gross) and net margins. Typically, the complexity of the refining methods and technologies is associated with higher production costs. Conversely, complex refineries also generate higher margins than less complex ones since complex refineries are adaptable and efficient at cracking and the conversion of heavier crudes into high value products, such as gasoline.

The type of oil stocks that a refinery uses to produce gasoline and other fuels largely determines the manufacturing methods and technologies that it uses to produce the fuels. In general, the costs of

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311 *The Cost of Building a Refinery in 2021*. (2021, November 5). Tiger General. https://www.tigergeneral.com/the-cost-of-building-a-refinery-in-2021/
312 California Air Resources Board. (2024). *Cars and Light-Trucks Are Going Zero - Frequently Asked Questions | California Air Resources Board.* Ww2.Arb.ca.gov. https://ww2.arb.ca.gov/resources/documents/cars-and-light-trucks-are-going-zero-frequently-asked-questions

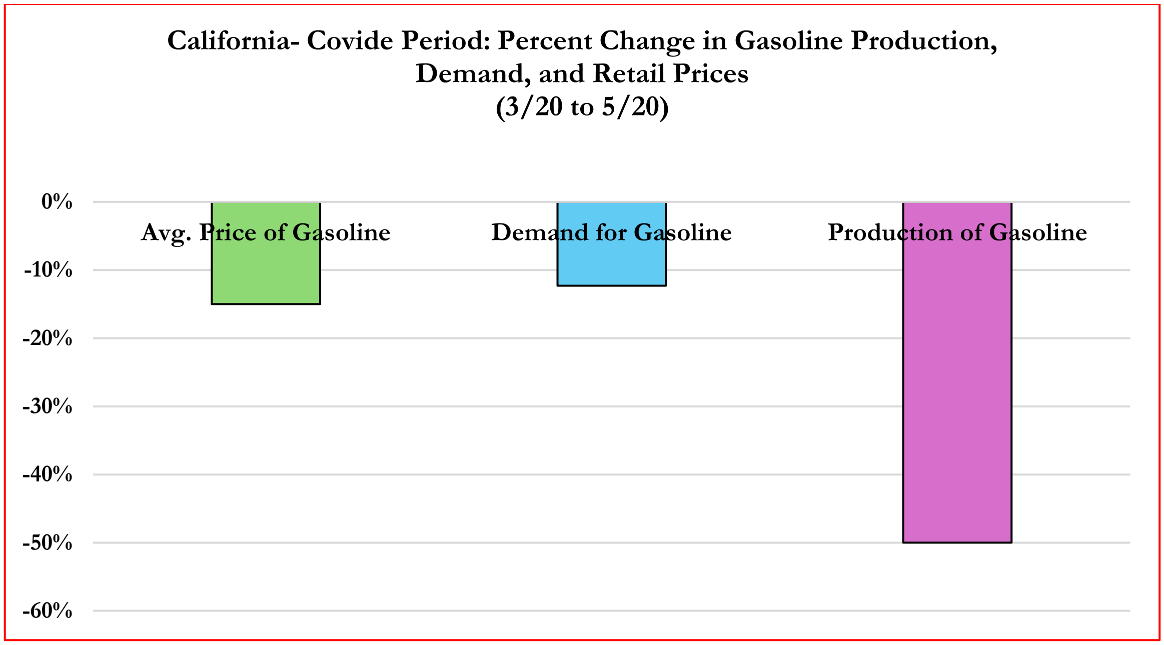
processing crude oils are influenced by not only production methods but the quality of the crude oil itself. Refineries, such as those in California, are configured to process light heavy to extra heavy crude oils from California and foreign sources (see Section 3.0). To process lighter sweet crudes would require a massive investment in equipment and changes to manufacturing processing flows. Thus, in California, with a legislative mandate looming to end internal combustion vehicles and high structural and embedded costs, it is not practical or economically prudent to apply funds for California refiners to engage in switching to different, lighter crude oil stocks.

Refiners are completely reliant on a consistent and steady supply of crude oil stock to produce gasoline, jet fuel, and derivative products. Refineries are designed for throughput, and to help maintain economies of scale, refiners hold a certain amount of crude oil as raw material inventory. The crude oil is inventoried (stored) in large tanks. Relative to PADD 5, where California's refineries are located, of the total 426.0 million barrels of crude oil stock held in U.S. inventory by refiners, 47.3 million or 11.1% are located in PADD 5. As described in Section 3.0, California refineries hold between 11.74 to 14.7 days of finished gasoline inventories and around 13.3 million barrels of oil as inventory stock.

To achieve profitability, refiners must refine at high volumes of throughput, which creates economies of scale. Refinery throughput (production) is measured in barrels or gallons a day and as a percentage of the refinery's maximum capacity utilization. Like any other business, refiners are highly sensitive to changes in the price of raw materials, which, in this case, are global crude oil prices. This is particularly the issue with California refineries, which are heavily dependent on foreign sourced oil, especially oil from the Middle East. Refiners are also obviously sensitive to end-user demands, which, although they have certainty, also fluctuate and can be highly elastic to external stimuli, such as government mandated shutdowns, as was the case throughout 2020 and into 2022. During the COVID-19 pandemic, when governments such as California implemented mass restrictions and mandatory shutdowns of businesses, schools, and retail establishments, the demand for gasoline fell from 32.4 million gallons a day in March 2020 to 28.6 million barrels a day in May 2020, or roughly 12.3%.[313] Correspondingly, from March 2020 to May 2020, California gasoline production fell by 50%, and the average retail selling price for all formulations fell 15% from $3.262 to $2.771 per gallon.[314]

[313] *California Total Gasoline Retail Sales by Refiners (Thousand Gallons per Day)*. (2014). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=A103650061&f=M
[314] *California All Grades All Formulations Retail Gasoline Prices (Dollars per Gallon)*. (2010). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_sca_dpg&f=m

Exhibit 5.2



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_SCA_DPG&f=M)

Many factors influence refinery operations and, ultimately, refiner profitability. Some of the most severe situations, such as weather, accidents, equipment malfunctions, and war, can cause unplanned production outages or reductions of significant duration, which, in turn, influence the supply of fuels and end-user prices. The chart below summarizes just a few of the many exposures and risks that influence refinery production.

Exhibit 5.3

REFINERY PRODUCTION- SOME INFLUENCING FACTORS		
Influence on Production	**Predictable**	**Non-predictable**
Product Demand	✓	
Refinery- Planned Maintenance	✓	
Refinery- Unplanned Maintenance		✓
Force Majeure		✓
Weather		✓
Political Events- War		✓
Shipping Lane Disruption		✓
Seasonal Blend Change	✓	
CA Special Blend	✓	
Processing & Equipment Malfunctions	✓	✓
Accidents		✓
Regulatory Requirements	✓	
Labor Disputes		✓
Marine Terminal Disruptions		✓

(Source: Author)

Michael A. Mische
University of Southern California
Marshall School of Business

Due to their technical configurations, processes, and refinement capacities, refinery economics and operations are highly sensitive to changes in the price of crude oil, the source of crude oil, and the quality of crude oils used to refine crude petroleum into gasoline. Refineries in California specialize in complex processes. To meet demand, and with no inbound pipelines, California refineries are almost entirely dependent on foreign crude oil and maritime transportation for consistent crude stocks. Any disruptions to foreign sources or in the inbound transportation of crude oil will disrupt refinery operations and could stimulate an increase in retail prices. Such was the situation in the 1970s with the Arab Oil Embargo of the U.S. Any disruptions, whether planned, unplanned, unforeseen, foreseen, or by force majeure, etc., affect both oil and gasoline supply and demand. When a refinery shuts down or is forced to shut down due to some event, supply is stressed throughout the distribution and supply chain model, and retail prices usually spike in the short term. When capacity and supply are restored, prices moderate.

In California, as well as in other states, refineries must schedule production switchovers to comply with EPA mandates. In California, refiners must also produce California's special CaRFG (reformulated) gasoline grades and blends as mandated by California law. California, as discussed in Section 3.0, requires a special blend of gasoline, which is unique to the Golden State and not required in other states. Thus, California is an isolated market and highly vulnerable to supply dynamics.

Refinery economics requires that refineries constantly plan and strive to achieve a sense of equilibrium between the amount of crude oil stock inputs (supply) and the amount of gasoline output needed to satisfy the consumer market (demand). Because of their high-capacity utilization, high capital costs, product shelf life, and regulatory costs, refiners have a minimal surplus inventory of finished products. For example, according to EIA data for 2024, the world production of petroleum was estimated at 102.5 million barrels a day, and world consumption was 102.77 million barrels a day…virtually equilibrium.[315] As discussed in Section 3.0, gasoline is an unstable liquid in that, once refined, it is vulnerable to oxidation, heat, humidity, moisture, and other contaminants. In final product form, finished gasoline has a diminishing shelf-life because it degrades over time.

5.3 Business Operating Environment Costs

California is one of the costliest states in the U.S. in which to operate a business. According to CNBC, California ranks 23rd in the U.S. as a "Top Business State," is ranked 45th for cost of doing business, and holds the 47th rank for business friendliness in the U.S.[316] For site selection and locating a business, while Texas ranks as #1, California is ranked #15.[317] Furthermore, in 2018, 68% of major highways and roads in California were ranked by the National Transportation Research Group as poor or mediocre, resulting in an additional $843.00 annually in individual vehicle operating costs.[318] Below is an exhibit summarizing some of the common ranking factors for business environments as related to the Golden State.

[315] https://www.eia.gov/outlooks/steo/tables/pdf/3atab.pdf
[316] Danelladebel. (2024, June 28). *Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuel in California's Fight Against Climate Change | Governor of California*. Governor of California. https://www.gov.ca.gov/2020/09/23/governor-newsom-announces-california-will-phase-out-gasoline-powered-cars-drastically-reduce-demand-for-fossil-fuel-in-californias-fight-against-climate-change/
[317] Monaghan, D. (2024, November). *2024 Business Climate Rankings: Growth Mindset*. Site Selection Magazine. https://siteselection.com/2024-business-climate-rankings/
[318] TRIP. (2018). *California transportation by the numbers*. https://tripnet.org/wp-content/uploads/2018/08/CA_Transportation_by_the_Numbers_TRIP_Report_Aug_2018.pdf

Exhibit 5.4[319]

Business Operating Environment Factor	2023 to 2025 CA. Ranking Out of 50
Cost of Living	**50**
Best State to Do Business In	**50**
Commercial Insurance Rates	**50**
State Financial Liability & Unfunded Liabilities	**50**
Retail Gasoline Prices	**49**
College Readiness	**49**
Unemployment Rate	**49**
Favorable Tax Climate	**48**
Workers Compensation Rates ($100/PR)	**47**
Most Likihood of Business Insurance Lawsuits	**46**
Cost of Doing Business	**45**
Education: K to 12	**37**
Economy	**32**
Overall Business Friendliness & Climate	**23**
(Scale: 1 = Best or First, 50 = Worst or Last)	

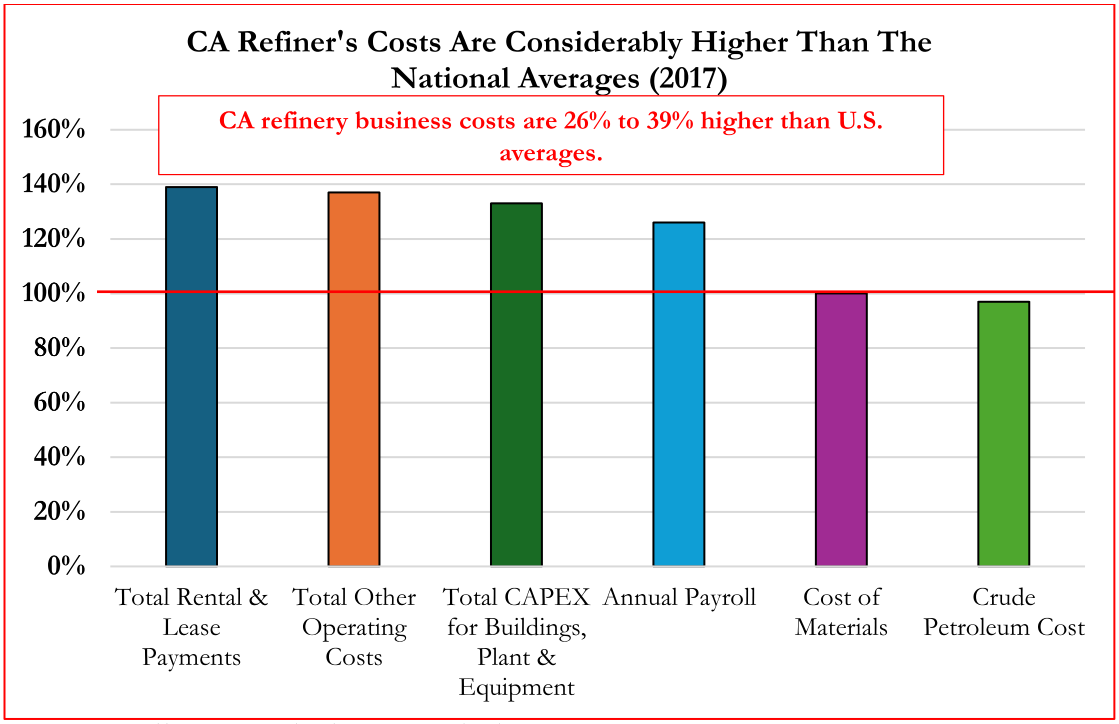
(Source: Multiple, See footnote below)

Not surprisingly, the high cost of doing business in California carries over to refinery operations and costs. According to the October 2024 CEC and CDTFA Joint Agency Report, California refinery costs are considerably higher than the averages for the U.S.[320] Specifically, the Joint Agency Report concluded that California refinery operating costs range between 26% to 37% higher than the U.S. average for refineries. Summarized in the exhibit below are the findings from the CEC and CDTFA Joint Agency Report.

[319] Various including, but not limited to: staff, CNBC. com. (2024, July 11). *23. California*. CNBC. https://www.cnbc.com/2024/07/11/top-states-for-business-california.html; *California*. (2025, February 12). ChiefExecutive.net. https://chiefexecutive.net/best-worst-states-business/California/;Reason Foundation. (2024, December 19). *State debt: California, Illinois, New York, New Jersey and Texas each have over $200 billion in total liabilities*. Reason Foundation. https://reason.org/transparency-project/debt-trends-state-local/state/#;Hallo, S. (2024). *States with the highest workers' comp rates*. Propertycasualty360.com; Property Casualty 360. https://www.propertycasualty360.com/2024/06/03/states-with-the-highest-workers-comp-rates/?slreturn=2025020300429;Meenasian, S. (2025, January 21). *Which States Top the Charts for business Insurance Lawsuits? A Look at the Numbers*. USA Business Insurance Services, Inc. https://www.businessinsuranceusa.com/news/insurance/states-highest-business-insurance-lawsuits/;U.S. Bureau of Labor Statistics. (2024). *Unemployment Rates for States*. Bls.gov. https://www.bls.gov/web/laus/laumstrk.htm; https://www.usnews.com/news/best-states/rankings/education/prek-12.

[320] CDTFA_CEC joint report 2024 review of the gasoline in ... (n.d.-b). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf

Exhibit 5.4.1

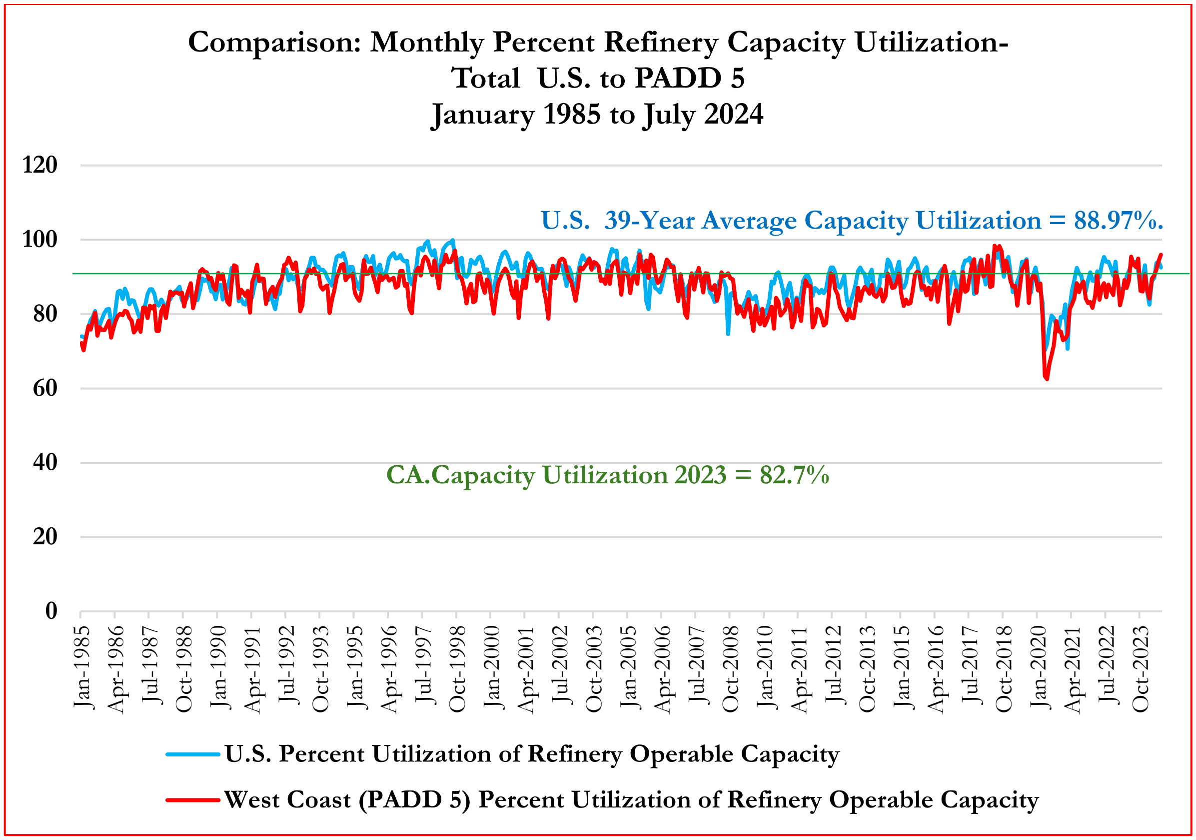


(Source: https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

5.4 Refinery Capacity Utilization

Refining capacity utilization is a key component and metric in operational efficiencies and economies of scale. Below is a chart summarizing the monthly percent of capacity utilization of all U.S. oil refineries compared to PADD 5 refineries from 1985 to 2024. As indicated, the correlation between the overall U.S. and PADD 5 is relatively strong, with a correlation coefficient of .773.

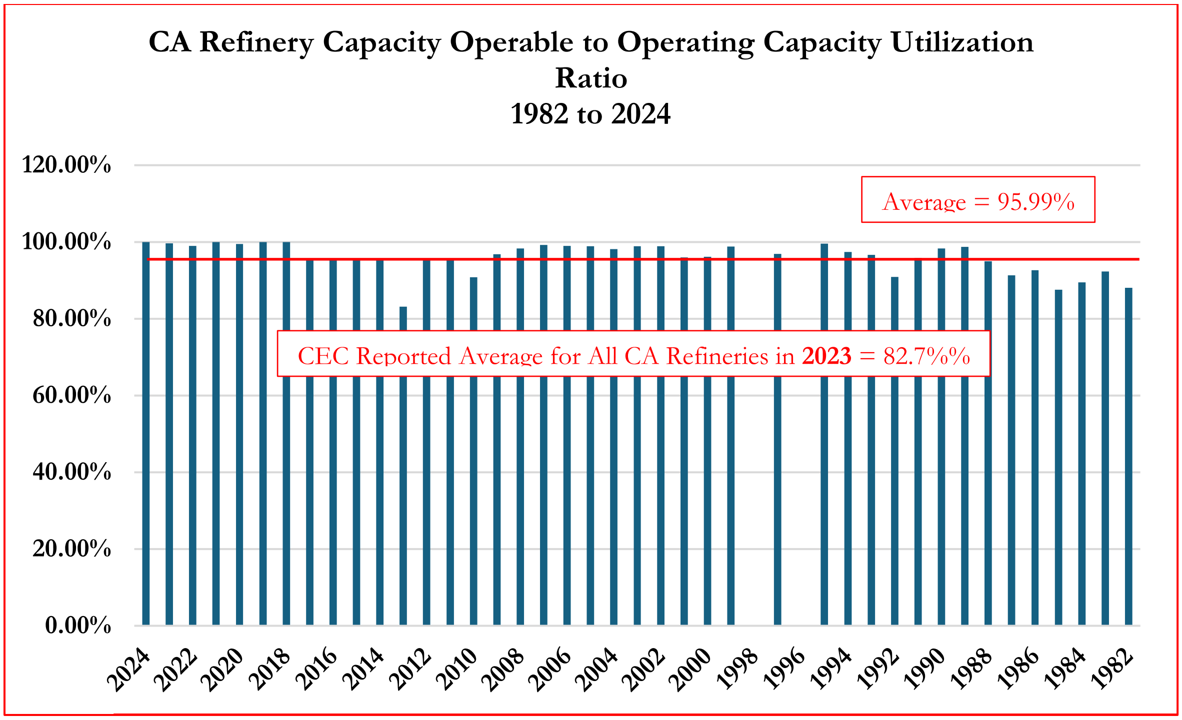
Exhibit 5.5



(Source: EIA)

Refineries adjust their capacity utilization rates based on several factors, foremost the estimated demand for products. When demand is high, refiners increase capacity utilization; when it is low, they adjust utilization downward. Thus, refiners constantly try to achieve a sense of equilibrium between production (supply) and demand (consumption).

Exhibit 5.6



(Source: CEC and EIA)

To maintain operational capacity, produce various octanes, and adhere to the regulatory requirements of specialized and seasonal blends and grades, refineries must switch or transition from one blend and one season to another. The switchovers typically involve a shutdown or slowdown in production and a reduction in capacity utilization and output. The switchovers not only impact refinery operations but also oil and gasoline transportation. Gasoline pipelines, which move finished products from refiners to distribution points, must be evacuated and cleaned so as not to mix seasonal blends and conventional gasoline with reformulated special blended gasoline. When planned switchovers and shutdowns occur, retail prices usually experience a "seasonal" increase due to inventory levels and the general uncertainties surrounding refinery reopening and resumption of full production. In general, refinery operations are stopped, suspended, or interrupted based on three primary reasons:

- **Scheduled Technical or "Turnaround" Shutdowns.** As operational assets, refineries schedule (plan) periodic shutdowns for inspection, testing, maintenance, re-certifications, repairs, upgrades, and the installation of new technologies. Scheduled shutdowns are known in advance and are usually public knowledge. California refineries, as well as those in other countries and states, practice scheduled shutdowns.
  - In the U.S., major technical or "Turnaround" shutdowns are performed about every four years for refineries in January and February (the first calendar quarter) when the demand for gasoline is usually at its lowest. Historically, the demand for gasoline has been the lowest during the first week of February and is highest in August through mid-September.
  - Based on a four-year schedule, about 25% (one in four) of refineries undergo turnaround or scheduled (planned) shutdowns about once every four years.

- **Scheduled Switching (Transition) Shutdowns.** Because refineries make a number of different products and gasoline grades, they schedule periods of time in which they can switch their operational profiles over to the planned product. Switchovers can take as little as a few days or run several weeks. In the U.S., as well as California, refineries schedule “switchovers” or transition shutdowns to produce seasonal blends.
  - o California refineries have several periods of required switchovers due to the mandatory seasonal blends.[5]
  - o Generally, a switchover to seasonal blends causes short-term retail price increases.
  - o California gasoline pipelines are also affected by seasonal switches as they must also be cleaned and purged as a precondition to switching out blends.
  - o Below is an exhibit summarizing key refinery shutdown and changeover periods.

Exhibit 5.7

Event	Timing		Regulatory Required	Comments
Scheduled/Planned	January	February	Partial	Low Demand- Turnaround
US- Summer Blend Switch	March	April	Yes	EPA- Transition Season; price increases common
Terminal/Retail Purge	May	June	Yes	Can result in lower short term inventories & price spikes
Driving Season- Summer	March	August	No	Generally higher demand & higher prices
US- Winter Blend	September	February	Yes	Can result in lower short term inventories & price spikes
Driving Season- Winter	September	February	No	Generally lower demand & lower prices
CA- Summer Blend	April	October	Yes	Generally higher demand & higher prices
CA- Winter Blend	November	Marach	Yes	Generally lower demand & lower prices

(Sources: AAA, and https://www.convenience.org/Topics/Fuels/Changing-Seasons-Changing-Gas-Prices)

- **Unplanned Shutdowns.** Unplanned shutdowns occur due to mechanical or equipment failures, malfunctions, and/or safety needs, as well as refinery mishaps and acts of nature and force majeure. Unplanned shutdowns include non-controllable events such as weather-related, natural events (e.g., earthquakes), and mechanical/technical (e.g., breakdowns, equipment failures, etc.) that can disrupt production and supply chains. Likewise, labor and transportation disruptions, wars and terrorism, and other geopolitical events can force unscheduled shutdowns or production rollbacks, which, in turn, influence increases in retail prices. Some examples:
  - o In 2020, a major fire occurred in Marathon’s Carson refinery, resulting in flaring and atmospheric contamination.[321]
  - o In 2015, the Exxon Mobil Torrance Refinery sustained an explosion, shutting down production.[322]
  - o In 2015, a ruptured oil pipeline emptied 140,000 gallons of crude oil into the Pacific Ocean offshore of Santa Barbara (Refugio), disrupting refinery supplies and causing considerable environmental damage.[323]

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321 *Communities for a Better Environment 6325 Pacific.* (n.d.). Retrieved March 6, 2025, from https://www.cbecal.org/wp-content/uploads/2020/02/CBE-2020-Factsheet-MarathonTesoro-explosion-Refinery-Fires.pdf
322 *ExxonMobil Torrance Refinery Explosion | CSB.* (n.d.). Www.csb.gov. https://www.csb.gov/exxonmobil-torrance-refinery-explosion-/
323 *Following Santa Barbara Oil Spill, New Analysis, Video Reveal Devastating Toll of California Pipelines*. (2015). Biologicaldiversity.org. https://www.biologicaldiversity.org/news/press_releases/2015/california-pipelines-05-22-2015.html

- In 2012, Chevron's Richmond Refinery, which began operating in 1902, experienced a pipe explosion that shut down production for almost a year.[324]

As indicated in Section 3.0, refiners in the U.S. are required by the EPA to produce various octanes in **seasonal** blends. In California, refiners are required to produce **both** seasonal and California **special** blends, which make California gasoline unique. The production of both blends requires special tooling (equipment) and processes that yield a final product that is compliant with the regulatory mandates. The costs of producing a compliant product are considerably higher.

5.5 Refinery Margins

5.5.1 Crude Costs and Margins.

Oil refinery gross and net margins are some of the most volatile of all industries. As crude oil is a commodity, refinery profits are highly correlated with global oil prices. Crude oil represents 45% to 60% of the price of gasoline and has a direct influence on retail prices at the pump.[325]In California, crude oil has historically represented 48.25% of the price of gasoline.

As crude oil is a commodity, oil refinery margins follow the basic laws of supply, demand, and prices. When crude oil prices are high, refineries benefit, and their margins expand. Conversely, when crude oil prices are low, refinery margins contract. Therefore, refinery profits and margins can be high or low at any point in time. Refineries, like any business, can operate with profits or losses, depending on costs and efficiencies, but unlike many other businesses, they are at risk with respect to crude oil prices. Special seasonal blends yield different profit margins, as well. Winter blends are more expensive to refine and also have higher margins than summer blends. Strong macroeconomics are also correlated to higher crack spreads and margins. In addition to the impact of crude oil prices are the operating behaviors of a refinery and the products that they make, which influence profitability.)

5.5.2 California Refinery Margins. Across multiple industries, the CSI Market ranks oil refineries 93rd in net profitability, 103rd in gross profits, 88th for return on assets, and 91st for return on equity.[326] Based on CSI Market data, the gross profit margin for oil refineries averaged 4.256% and .338% for net margins for five quarters from Q4-2023 to Q4-2024.[327] For perspective, an NYU Stern study found that across all industries, the gross profit and net profit margins were 36.56% and 8.54%, respectively.[328] On a comparative basis, oil refinery net profits are among the lowest among various industries and rank low, along with grocery stores.

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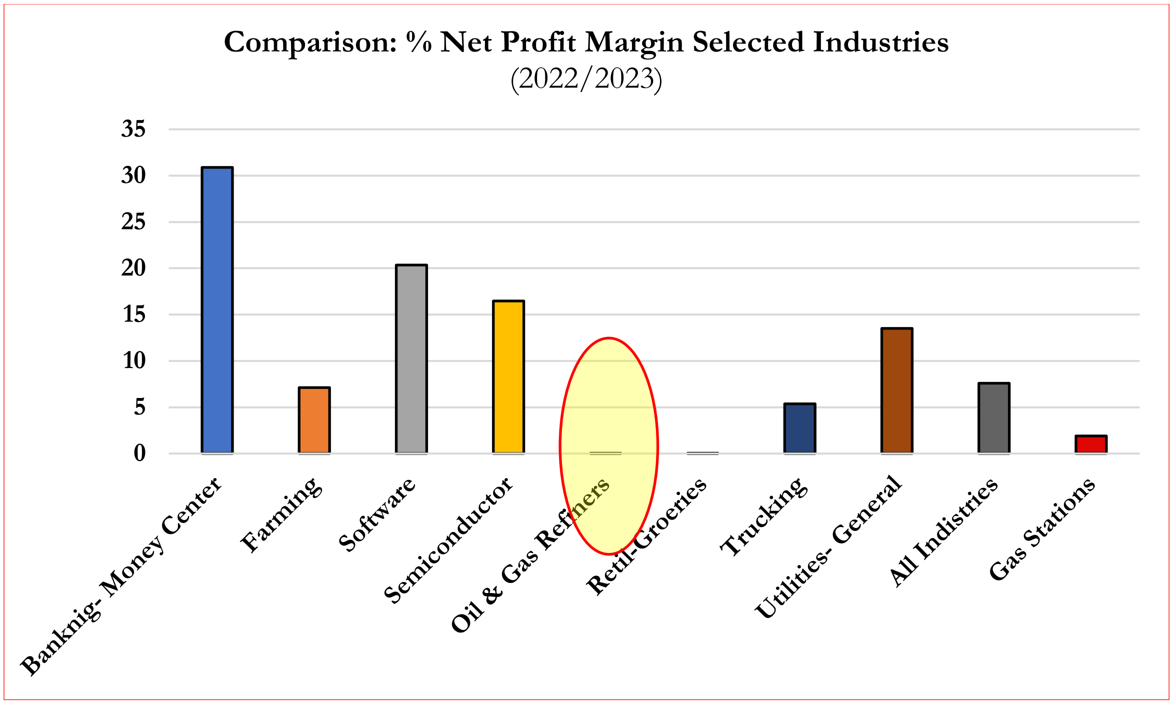
[324] *"Kristin J. Bender and Daniel M. Jimenez, "Massive fire at Chevron refinery in Richmond fully contained; shelter in place lifted", Contra Costa Times (August 6, 2012)"*
[325] EIA. Also, *Gas Prices Explained – US Oil & Gas Association*. (2024, August 8). Usoga.org. https://usoga.org/gas-prices-explained/.
[326] *Oil Refineries Industry Profitability by quarter, Gross, Operating and Net Margin from 1 Q 2022*. (n.d.). Csimarket.com. https://csimarket.com/Industry/industry_Profitability_Ratios.php?ind=606
[327] *Oil Refineries Industry Profitability by quarter, Gross, Operating and Net Margin from 1 Q 2022*. (n.d.). Csimarket.com. https://csimarket.com/Industry/industry_Profitability_Ratios.php?ind=606
[328] Damodaran, A. (2024, January 5). *Useful Data Sets*. Nyu.edu. https://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html

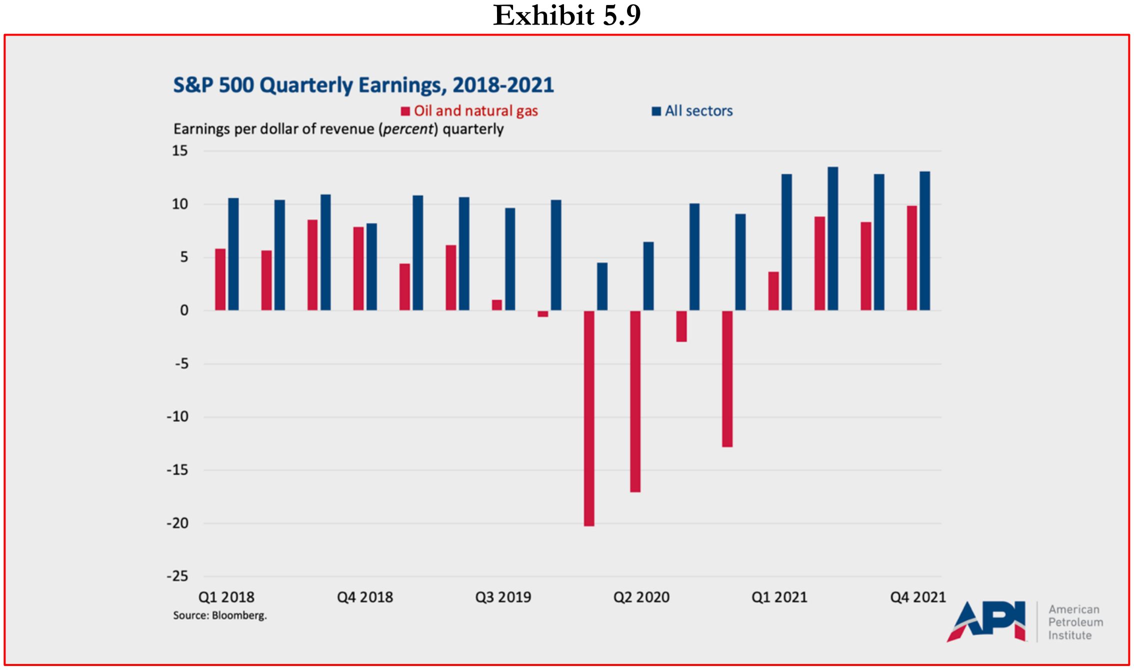
Exhibit 5.8



(Source: https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/margin.html and https://csimarket.com/Industry/industry_Profitability_Ratios.php?ind=606)

As indicated in the exhibit below, refinery earnings and margins fluctuate daily, weekly, quarterly, and annually.

Exhibit 5.9



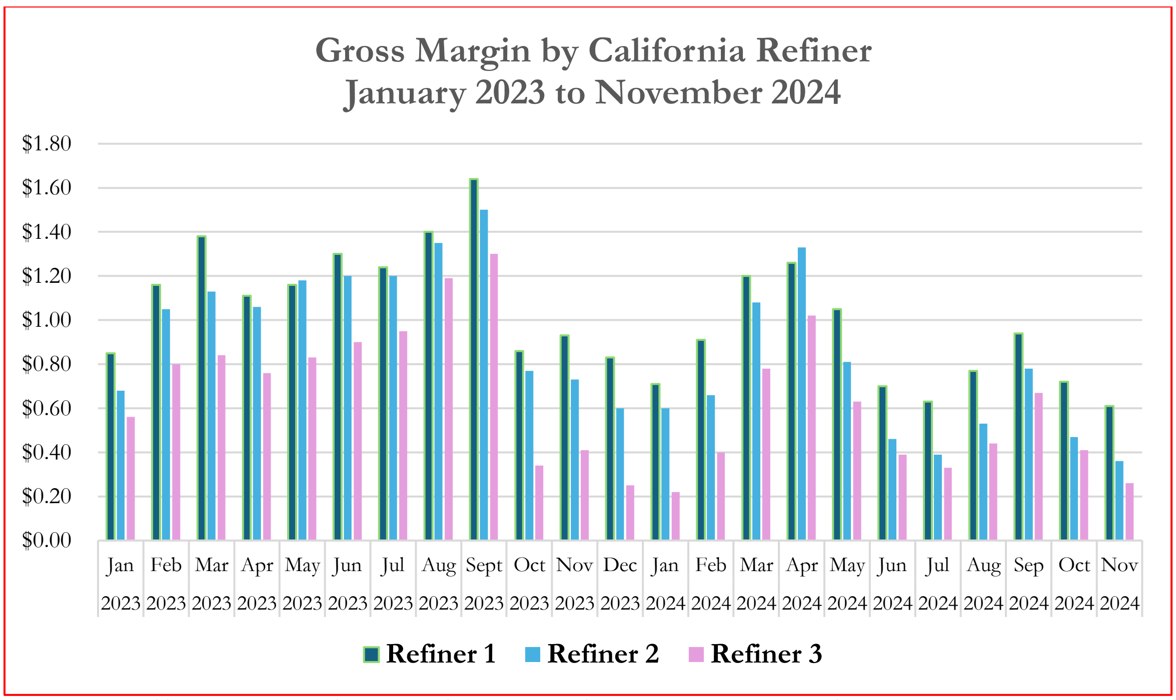
(Source: API)

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

Based on its internal analysis, the CEC estimated that refinery gross profits ranged between $1.00 and $2.31 a gallon for the 2002 to 2022 period. However, that was gross profit margins only and not net profits. To derive gross profits, the CEC uses the wholesale price of gasoline minus the cost of crude oil. Such representation is accurate but not necessarily completely accurate. It is common for refineries to include in the calculation of gross profits the cost of crude oil stock plus regulatory costs. A more thorough measure is net profit margin and dollars since net profits generate free cash flows after all costs are considered. Net profits include all operational costs, which, in 2023, averaged around $1.00 a gallon. For perspective, California taxes, fees, and regulatory mandates total around $1.42 a gallon. Taken as a whole, for the 2023 to 2024 period, California refiners averaged around $0.09 a gallon. 2022 was also reflective of Biden's economic policies and a period of high inflation, with gasoline prices hitting a historical high in June 2022 and inflation peaking at 9.1%. From December 2019 to December 2023, overall percentage change in retail gasoline prices in the U.S. increased by 21%, while the percentage change in California gasoline prices increased by 34%.

As indicated below, the gross margins for three California refiners, as reported by the CEC for a 23-month period, fluctuated from a high of $1.64 a gallon in September 2023 to a low of $0.22 a gallon in January 2024. For all three refineries, the average gross profit per gallon was $0.84.

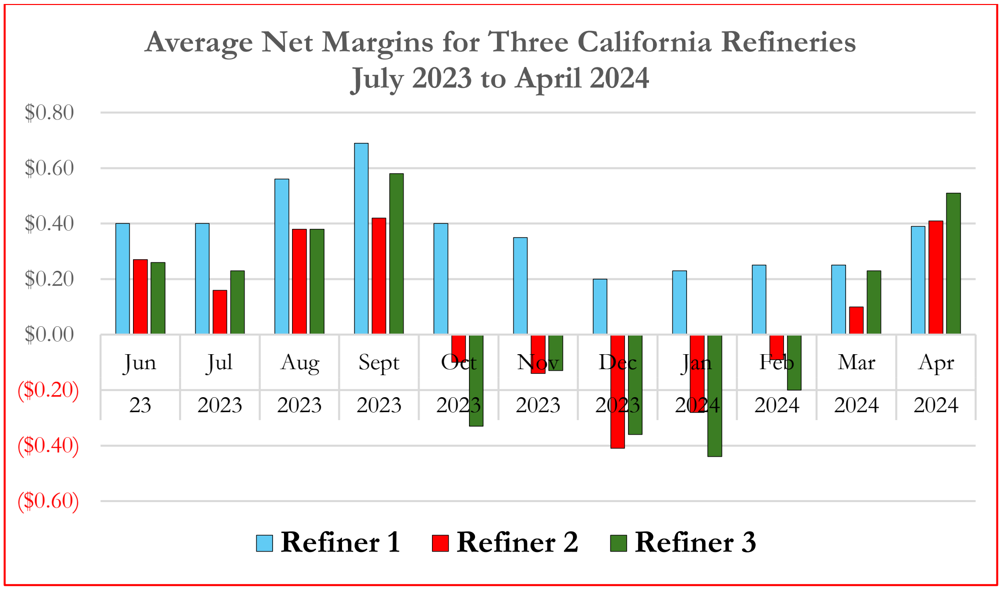
Exhibit 5.10



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/california-oil-refinery-cost-disclosure)

Summarized below is the average net margin for three California refiners for an 11-month period. Of the 11 months, five months, or 45.5%, indicated negative profitability.

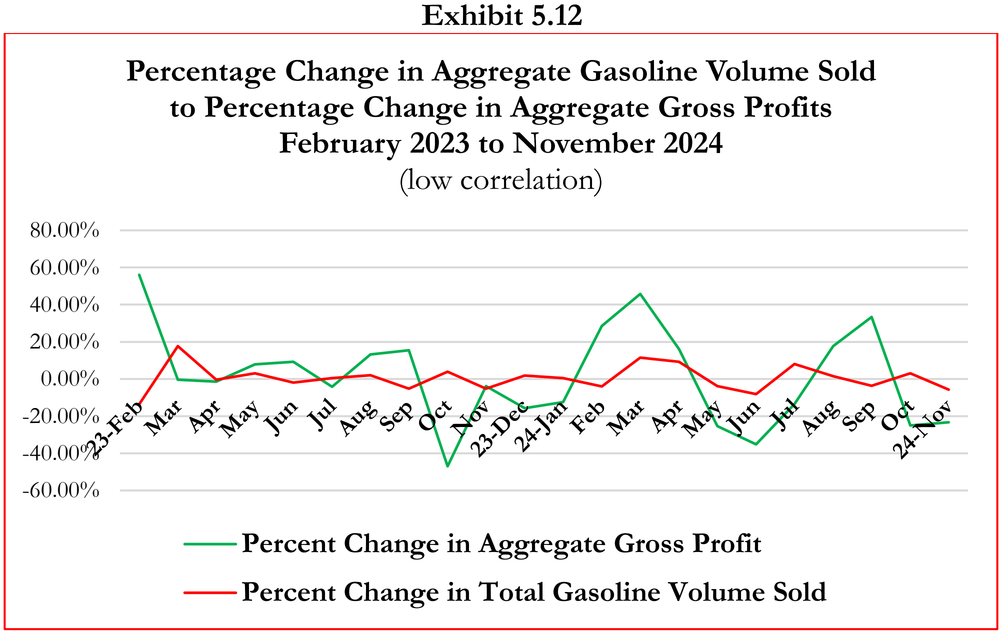
Exhibit 5.11



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/california-oil-refinery-cost-disclosure)

Summarized in the exhibit below is the percentage of gasoline volume sold in California and aggregate gross profits for a 22-month period commencing February 2023 and ending November 24, 2024. As indicated, gasoline sales fluctuated, as measured by percentage change, ranging from 17.89% to -13.60% with an average variance of .50%. Conversely, the average fluctuation in aggregate gross profits for the same period ranged from 58.06% to -48.98%, with an average variance of 1.62%.

Exhibit 5.12



(Source: https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/california-oil-refinery-cost-disclosure)

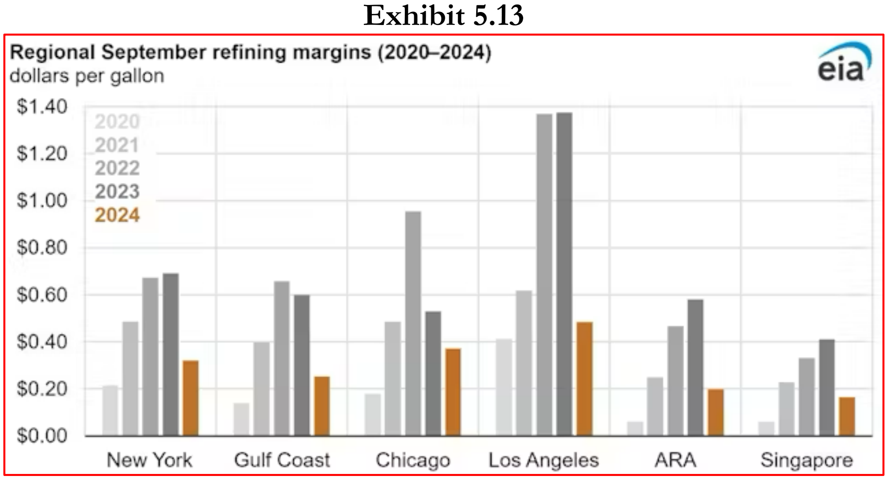
On a five-year basis, comparing the various refining margins for six U.S. regions, the refining margins, as measured in dollars, show extreme variability. As indicated in the exhibit below, refiner margins rebounded and increased from mid-2020, the end of Covid, through 2023. The margins reflect not only operating efficiencies and the price of crude oil but also the speed at which various regions recovered from government mandated Covid lockdowns. California was the first state to issue 'shelter in place" lockdowns, which began on March 19 and ran through to August 28, 2020, or 162 days. California's lockdown was the second longest, and New Mexico was the longest in the U.S.[329] For perspective, Florida's lockdown period was 31 days, spanning the April 2 to May 2, 2020, period.[330]

When the lockdowns were lifted, demand recovered and snapped back. In California, which had comparatively protracted lockdowns, as demand for gasoline recovered, refiner margins substantially increased, in part due to the rate of recovery and a reduction in refinery capacity due to closures or conversions. In simple economic terms, refiner margins increased as demand accelerated at faster rates than supply due to reductions in supply attributed to refinery closures and/or conversions.[331] As demand stabilized in late 2023 and slowed throughout 2024, and the global price of crude oil modulated, refiner margins began to fall. Contributing to the decline in refinery margins was the drop in distillate fuels used in manufacturing. During the Biden years, U.S. industrial manufacturing increased less than one percent from 102.02% in 2019 to 102.90% in 2023.[332]

Additional factors that contributed to higher crack spreads and, thereby, higher refiner margins and profits and retail gasoline prices during the 2020 to 2023 period were high U.S. inflation, lower global refinery capacity, and the Russian invasion of Ukraine.

Since peaking in 2023, refiner margins across the U.S., including California, are falling. As indicated, the refinery margins, as measured in dollars per barrel in California, fell further and faster than any other part of the U.S. from 2023 to 2024.

Exhibit 5.13

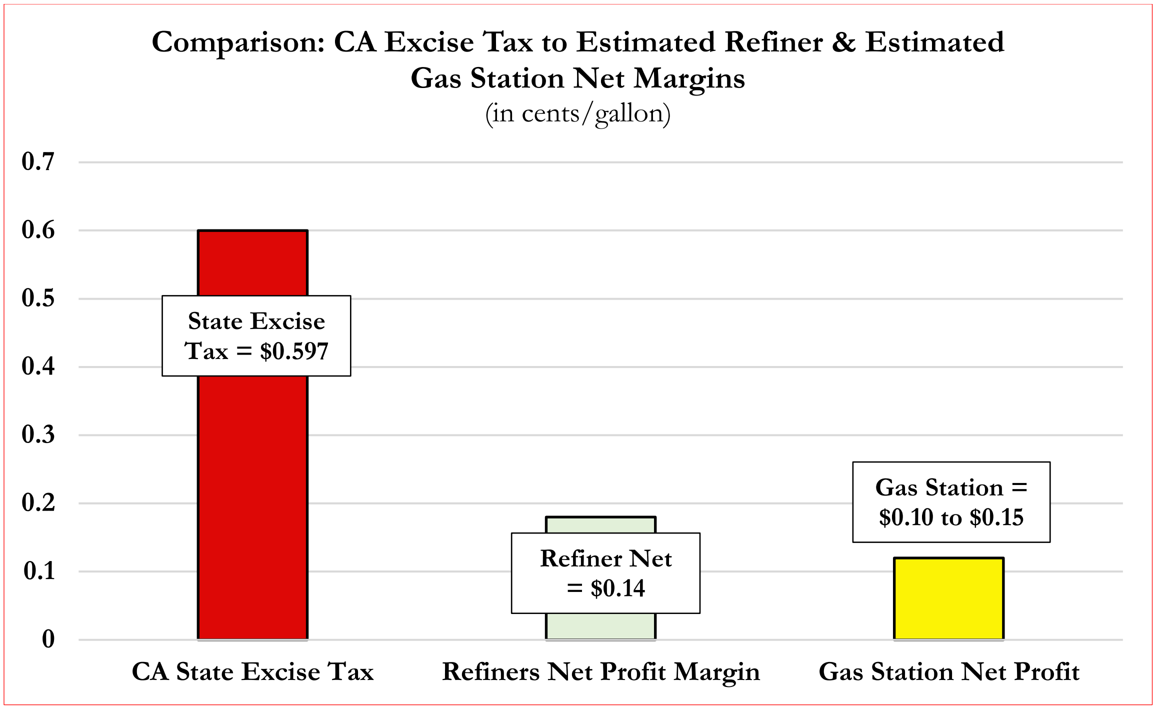


(Source: https://www.eia.gov/todayinenergy/detail.php?id=63447#)

[329] https://ballotpedia.org/States_that_issued_lockdown_and_stay-at-home_orders_in_response_to_the_coronavirus_(COVID-19)_pandemic,_2020
[330] https://ballotpedia.org/States_that_issued_lockdown_and_stay-at-home_orders_in_response_to_the_coronavirus_(COVID-19)_pandemic,_2020
[331] *Global refinery margins fall to multiyear seasonal lows in September - U.S. Energy Information Administration (EIA).* (2025). Eia.gov. https://www.eia.gov/todayinenergy/detail.php?id=63447#
[332] FRED. (2019). *Industrial Production Index*. Stlouisfed.org. https://fred.stlouisfed.org/series/INDPRO

In California, on a comparative basis, the State generates over 3 times as much in excise taxes per gallon of gasoline sold than the average refinery makes at around $0.08 to $0.18 in net profits, subject to crude oil prices and seasonality, and over 5 times as much as the retail gasoline station operator makes in net profits from the sale of gasoline to the public.

Exhibit 5.14



(Source: Compiled by Author)

5.5.3 Crack Spreads. A common measure of refinery efficiency and profitability is the crack spread. Crack spreads have long been used in the oil industry as a measure of profitability. Crack spreads represent the "profit" in both dollars and percentages, between the cost of crude oil inputs and the selling price of the resulting products, such as gasoline, aviation fuels, and distillates, from the refining of crude oil. There are three basic methods for calculating the crack spread. Each method has a preferred application as related to a refinery and the products that it produces. Two of the predominant measures for crack spreads are the 3-2-1 and 5-3-2 calculations.

- 3-2-1. The 3-2-1 crack spread is the most commonly used for multiple products. The EIA defines the crack spread as "an indicator of refining margins, the short-term profit margin for oil refineries, which generally produce about 2 barrels of gasoline for every 1 barrel of distillate fuel oil. To estimate the refinery crack spreads, regional crude oil benchmarks were used (Brent for New York, Los Angeles, and ARA; Light Louisiana Sweet for the U.S. Gulf Coast; West Texas Intermediate for Chicago; and Dubai for Singapore). ARA=Amsterdam-Rotterdam-

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
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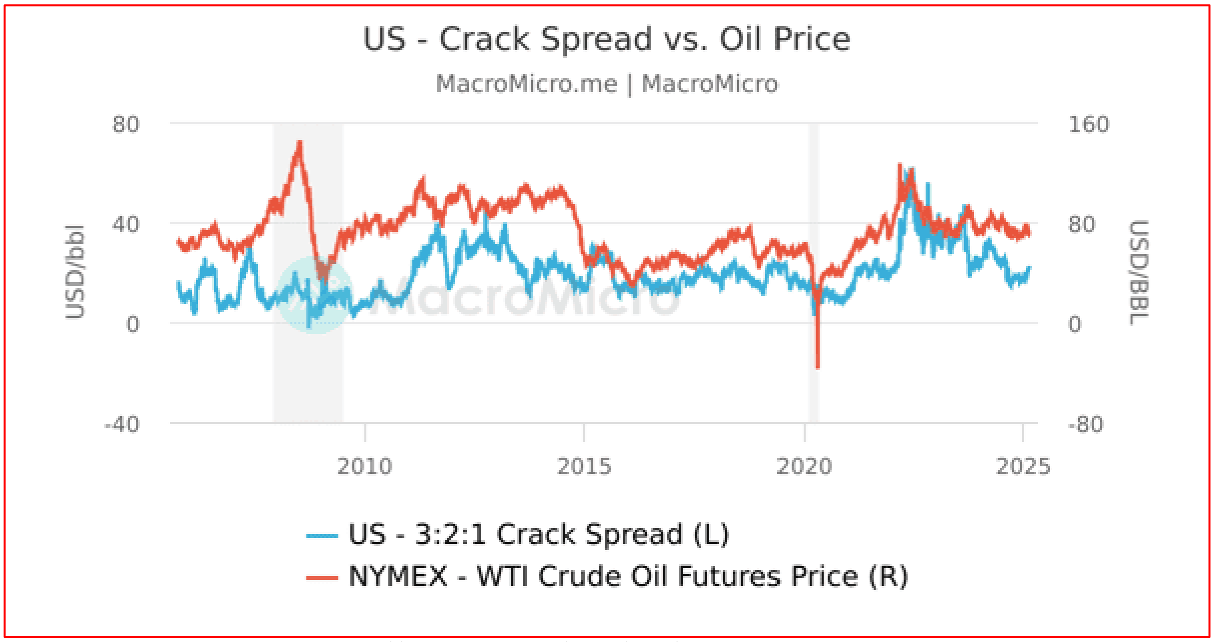
Antwerp."[333] The crack spread is a calculation that is determined by subtracting 3 barrels of oil from the price of 1 barrel of distillate plus 2 barrels of gasoline and is expressed as:

Crack Spread = (2 barrels of gasoline + 1 barrel of distillate) – 3 barrels of oil

- 5-3-2. The 5-3-2 crack spread is also a measure of refinery profitability and efficiency. The 5-3-2 method is generally used by a refiner when there are lower yields of retail gasoline relative to other products, such as jet fuel and distillates. The calculation involves 5 barrels of oil to produce 3 barrels of gasoline and 2 barrels of distillates, such as heating oil.

Understandably, since crude is the primary input to the refinery, the resulting crack spread is highly correlated to the crude price of oil.

Exhibit 5.15



(Source: https://en.macromicro.me/charts/4376/crude-oil-cracking-spread-vs-wti)

As indicated in the exhibit below, a number of other factors also have a significant influence on the crack spread.

[333] *Global refinery margins fall to multiyear seasonal lows in September - U.S. Energy Information Administration (EIA).* (2025). Eia.gov. https://www.eia.gov/todayinenergy/detail.php?id=63447#

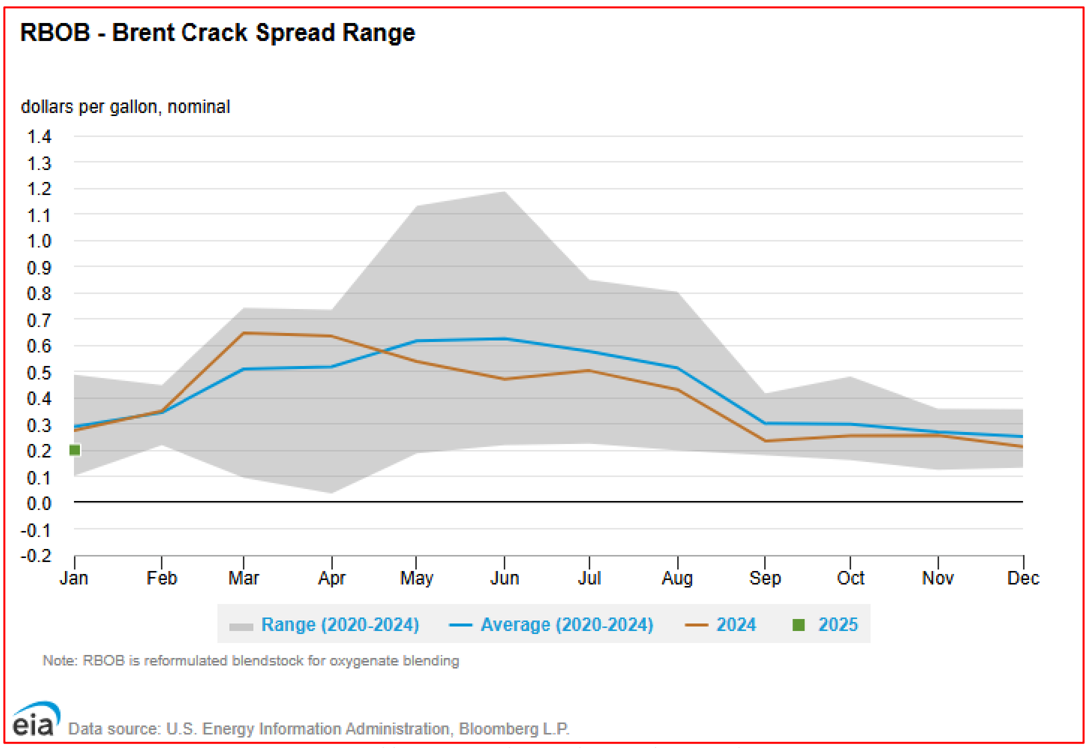
Exhibit 5.16

FACTORS INFLUENCING CRACK SPREADS	
FACTOR	**IMPACT ON CRACK SPREAD**
Crude Prices	Higher crude prices are associated with higher crack spreads.
Seasonality	California has a longer summer season which is associated with higher crack spreads.
Refinery Capacity Utilization	Refineries operate best when they achieve economies of scale and operate at higher capacity utilization levels. Higher utilization levels, such as those of California refineries, typically generate higher crack spreads.
Geographical Location of Refinery	Refineries that are concentrated near high population areas, such as those in Southern and Northern California.
Refinery Nelson Rating & Complex	Advanced refineries, such as those with hydrocrackers, deep conversion units, and fluid catalytic cracking and higher rated NCI typically generate higher crack spreads. California refineries, on average, have higher NCI ratings than the U.S. and Europe.
Quality of Crude Grades Imports	Refineries, such as those of California, process heavy crudes. Refineries that process heavier crudes typically have higher crack spreads due to their ability to produce a wider range of products.
Demand	Demand for gasoline and distillates influence crack spreads. In California, the demand for gasoline is second only to Texas in volume consumed. California also produces more aviation fuel per barrel of oil than the U.S.. Both the demand for gasoline and aviation fuels positively influence and increase crack spreads of California refineries.

(Source: Various and Author)

Crack spreads are reflective of demand, supply, product mix, and seasonality. During the summer months, demand for gasoline is higher than in winter, and crack spreads tend to be higher. Likewise, when manufacturing and commercial transportation are robust, crack spreads reflect that activity.

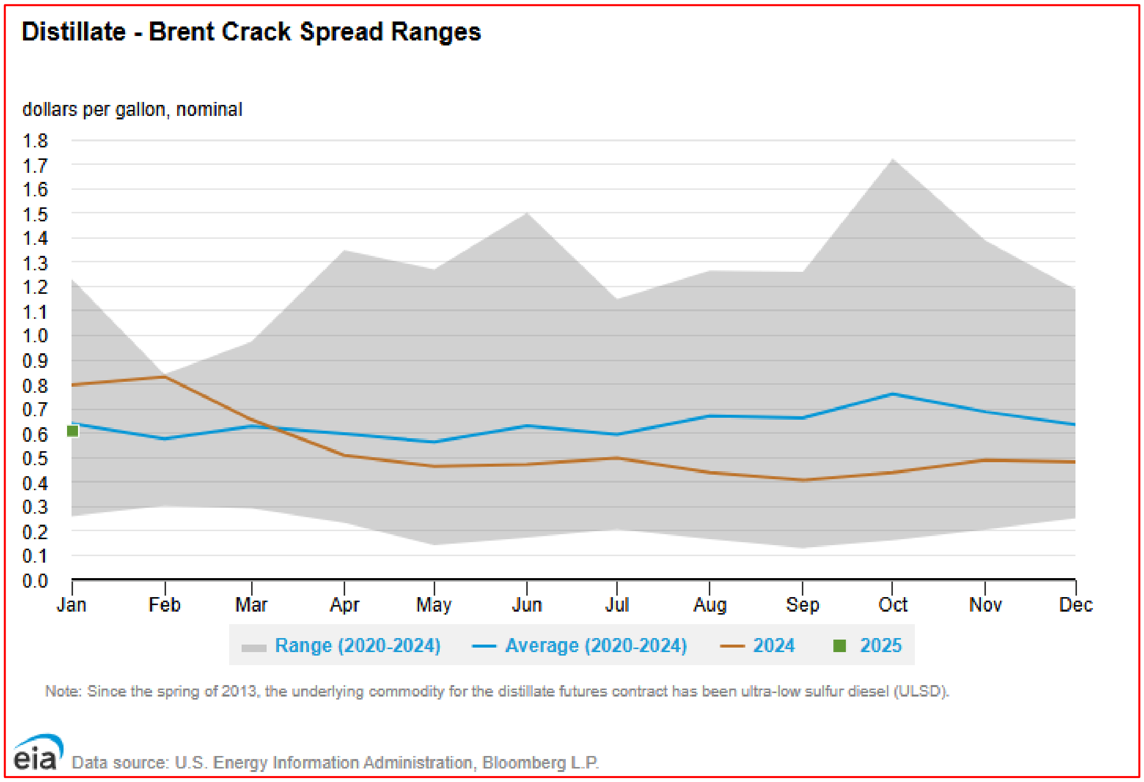
Exhibit 5.17



(Source: https://www.eia.gov/finance/markets/products/prices.php)

During winter, driving time is lower, and the demand for gasoline is lower, but the demand for heating fuels increases.

Exhibit 5.18



(Source: https://www.eia.gov/finance/markets/products/prices.php)

In general, historically, crack spreads, as presented in dollars, ranged between:

- $10 to $25 a barrel for the 2014 to 2020 period.
- $5 to $20 a barrel per-2008.
- $20 to $30 a barrel for the 2009 to 2014 period.
- $40 to $63 a barrel for the 2021 to 2022 period.[334]
- OPIS data indicates that crack spreads increased 159.1% between Q3- 2019 from around $22 a barrel to $57 a barrel in Q3- 2022.[335]
- According to OPIS, crack spreads were around $57 a barrel in Q3-2022, and crack spreads fell by 61% to approximately $23 a barrel in Q3-2024.[336]

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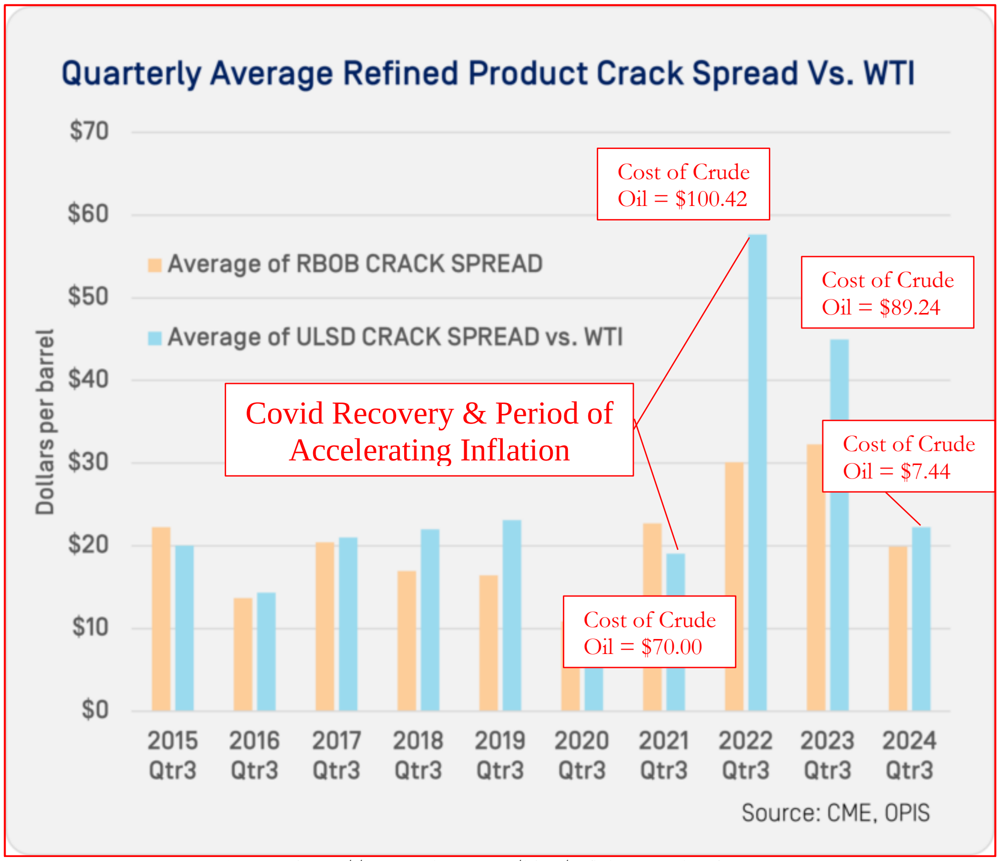
334 Apthorp, A., & Apthorp, A. (2022, July 20). *What Is It Wednesday – 3:2:1 Crack Spread - Mansfield Energy*. Mansfield Energy. https://mansfield.energy/2022/07/20/what-is-it-wednesday-321-crack-spread/

335 cmoore. (2024, October 16). *Refining Margins Face Third-Quarter Struggles - OPIS, A Dow Jones Company*. OPIS, a Dow Jones Company. https://www.opisnet.com/blog/refining-margins-face-q3-struggles/

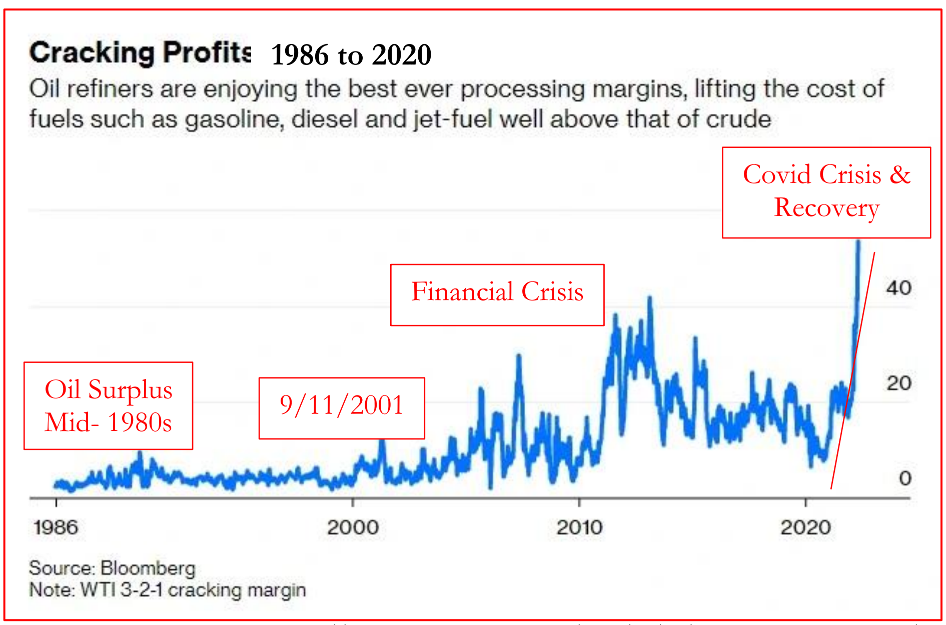
336 cmoore. (2024, October 16). *Refining Margins Face Third-Quarter Struggles - OPIS, A Dow Jones Company*. OPIS, a Dow Jones Company. https://www.opisnet.com/blog/refining-margins-face-q3-struggles/

Exhibit 5.19



(Source: https://www.opisnet.com/blog/refining-margins-face-q3-struggles/#:~:text=After%20the%20outsized%20refining%20margins,than%20that%20five%2Dyear%20average)

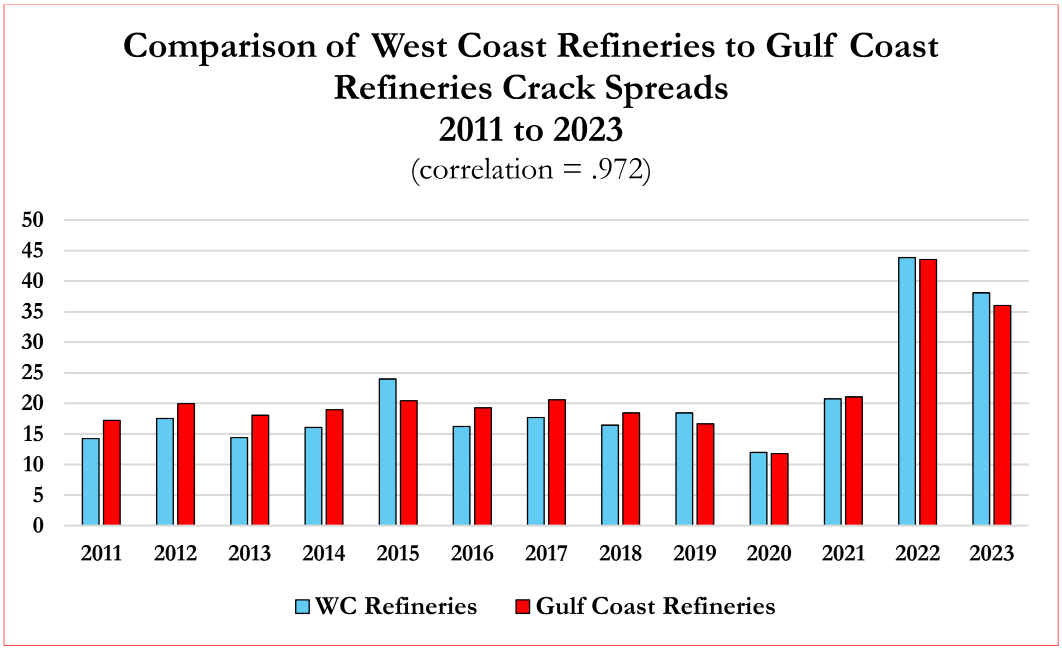
Exhibit 5.20



(Source: Bloomberg as cited in https://global-macro-monitor.com/2022/05/26/the-smoking-crack-spread/)

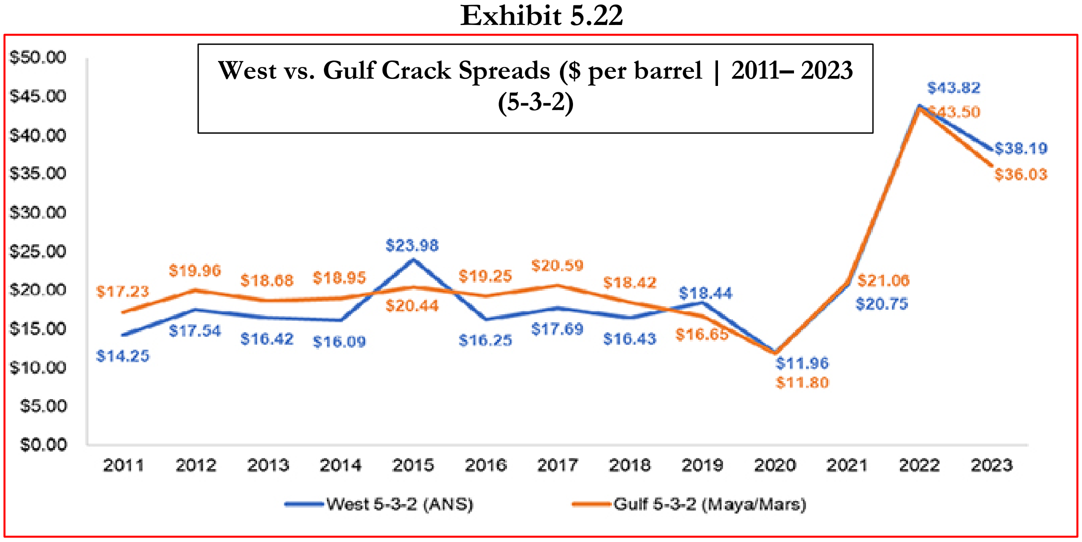
5.5.4 California Crack Spreads. Both Governor Newsom and members of the California Legislature have asserted that California oil refineries have engaged in price gouging, excessive pricing, and/or profiteering. However, analysis of oil refinery data obtained under SB 1322 and SBX1-2 indicates otherwise. Analysis of West Coast refineries to Gulf Coast refineries indicates a very high correlation between the two and no significant anomalies between the two for the 2011 to 2023 period. If there were significant margin anomalies associated with pricing and profiteering, the crack spreads would most likely show lower correlations and considerable variations would exist.

Exhibit 5.21



(Source: https://www.chevron.com/newsroom/2024/q2/california-regulations-could-cut-supply-raise-gasoline-prices-says-chevron-exec)

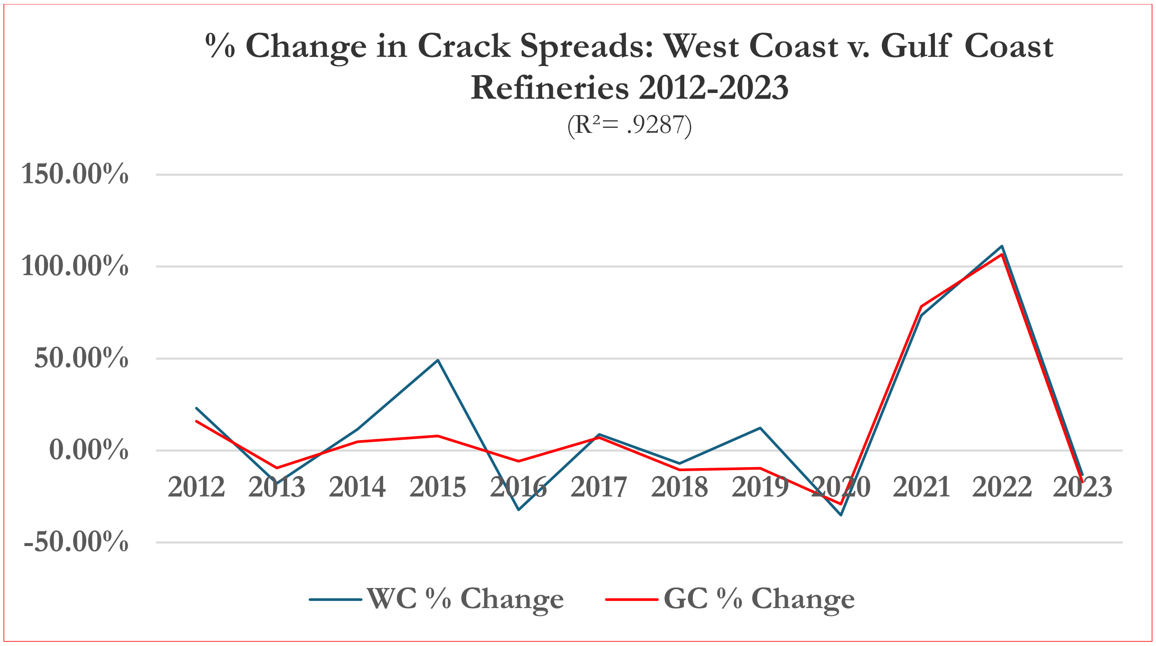
Exhibit 5.22



(Source: https://www.chevron.com/newsroom/2024/q2/california-regulations-could-cut-supply-raise-gasoline-prices-says-chevron-exec)

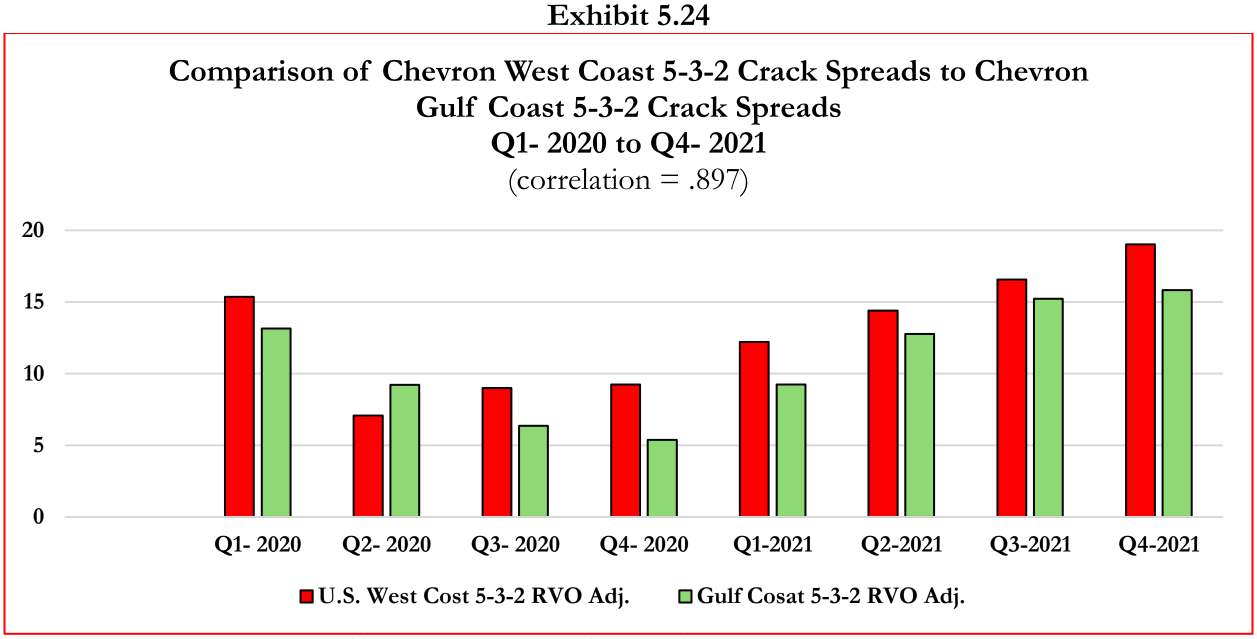
On an annual percentage basis, the crack spreads between West Coast refineries and Gulf Coast refineries also present a high correlation of .928 and no anomalies.

Exhibit 5.23



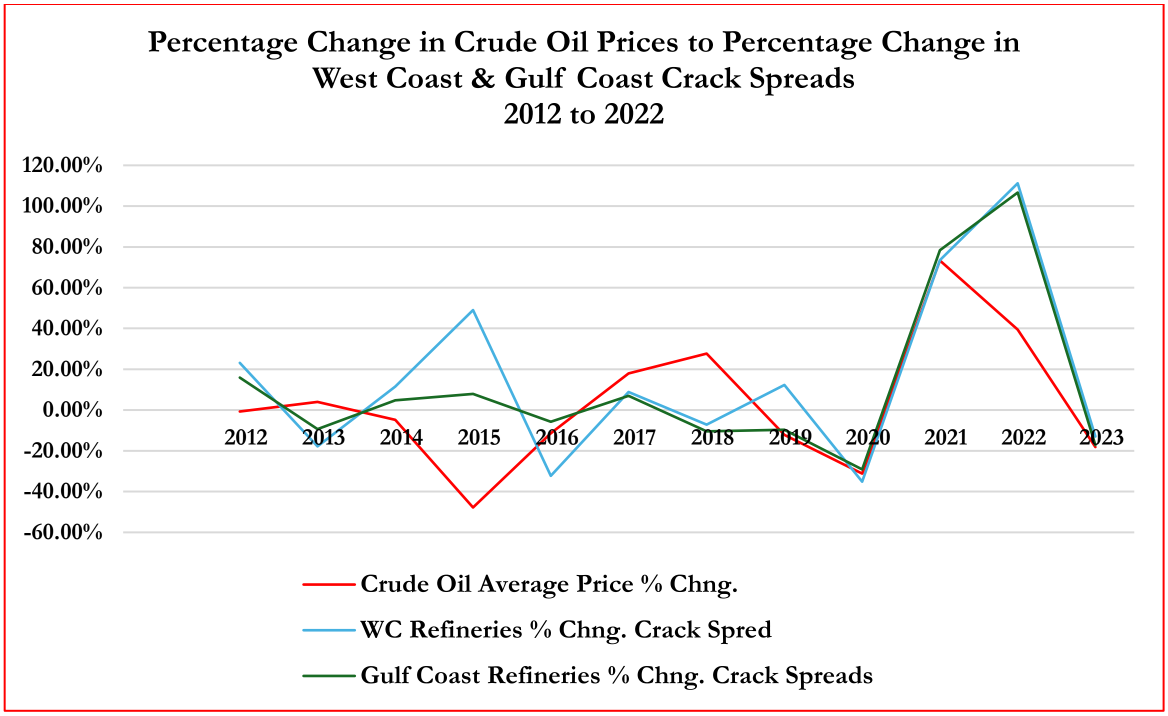
(Source: EIA and Chevron)

Exhibit 5.24



(Source: https://chevroncorp.gcs-web.com/static-files/d106fac8-6e19-406b-b359-c724558bc77e)

Exhibit 5.25



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RWTC&f=M and https://chevroncorp.gcs-web.com/static-files/d106fac8-6e19-406b-b359-c724558bc77e

One of the cost factors effecting crack spreads is the price of crude that the refiner pays. On the west coast, and particularly in California, refiners tend to pay a slightly higher for 'first purchase' crude oil than the rest of the U.S. due to low in-state production, and the need to import oil from distant sources such as the Middle East. The higher acquisition cost generally does not directly affect the crack spread but it will be reflected in the overall price of gasoline. However, crack spreads alone are very useful, they are incomplete with respect to refinery profits. A higher crack spread may not necessarily indicate higher net profits. Ironically, California's cap and trade program, which requires refiners to incur considerable compliance costs in the purchase of carbon credits, are reflected in the crack spreads. Consequently, as a result of inclusion of cap-and-trade costs, profits may not improve but the crack spread will widen.[337]

[337] *California law and refinery closure reflect ongoing challenges for the state's fuel market - U.S. Energy Information Administration (EIA).* (n.d.). https://www.eia.gov/todayinenergy/detail.php?id=63944

SECTION 6.0
CALIFORNIA GASOLINE PRICING

A STUDY OF CALIFORNIA GASOLINE PRICES
Section 6.0
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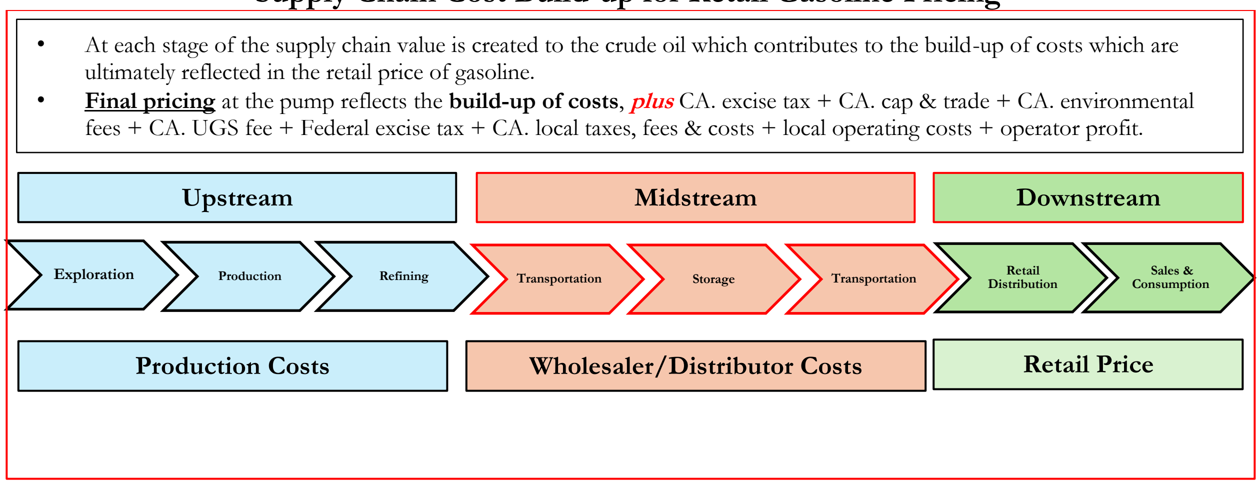
6.0 CALIFORNIA GASOLINE PRICING

6.1 Introduction

The final retail pump price is reflective and is a product of many costs that are incurred and built up throughout the petroleum to gasoline supply chain. The price for gasoline that the station pays is based on the wholesale contract for the purchase of gas that supplies the gas station. The retail pump price that the consumer pays is a function of the cost build-up created by the combination of upstream, midstream, and downstream activities associated with the supply, production, refinement, transportation, and distribution of petroleum to arrive at a final pump price. At each point in the supply chain, costs are incurred and accumulated to arrive at the final consumer price.

Exhibit 6.1
Supply Chain Cost Build-up for Retail Gasoline Pricing



In addition to the wholesale price, the final local gas pump prices that the consumer pays are a function of many other variables that comprise the "cost build-up." Since the majority of gas stations in California and the U.S. are independently owned and operated by individuals and small businesses, gas stations are generally free to set their own prices. A gas station is a business and, as such, must generate profits in order to sustain itself and remain in business. Local prices, which are set by the owner/operator (dealer) of the station, vary considerably by state, county, city, and specific physical location. Here are some of the major components of the cost build-up for retail pricing of gasoline: level of competition, location, age of station, traffic volumes, size of gas storage and number of underground tanks, ease of ingress and egress, just to note a few.

Some of the other factors that inform operating costs and, in turn, influence final retail pump prices include:

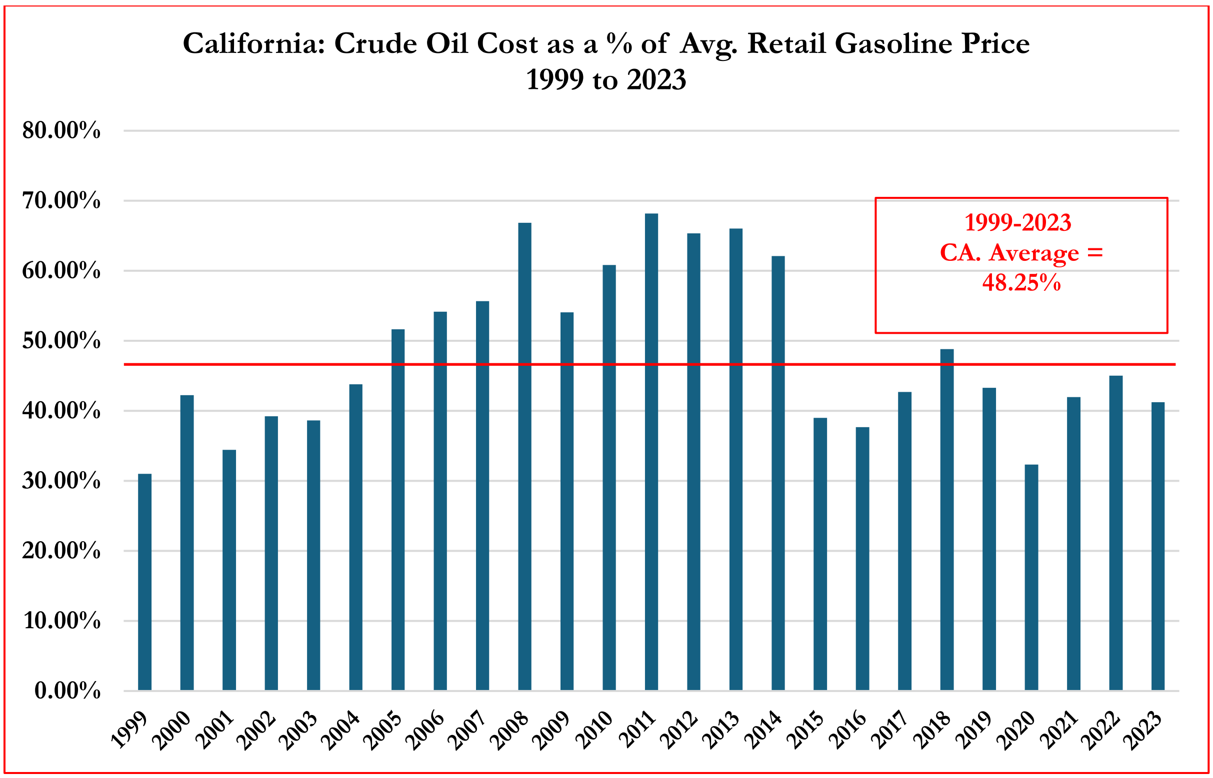
Exhibit 6.1-1

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

6.2 Oil & Gasoline Spot Prices. Final retail prices, which are reflective of the refiner's taxes, fees, and costs, plus the "build-up" of costs throughout the supply chain to the local gas station operator cost. The local operator then sets their retail selling prices based on local demand and volumes, operating costs including local taxes and fees, local pricing, individual sentiment as to future gasoline supplies and costs, and competitive influences, just to list a few.

The majority of raw material costs are in the production of gasoline, and the largest single component of wholesale gasoline prices is in crude oil, which in California have historically averaged 48.25%.

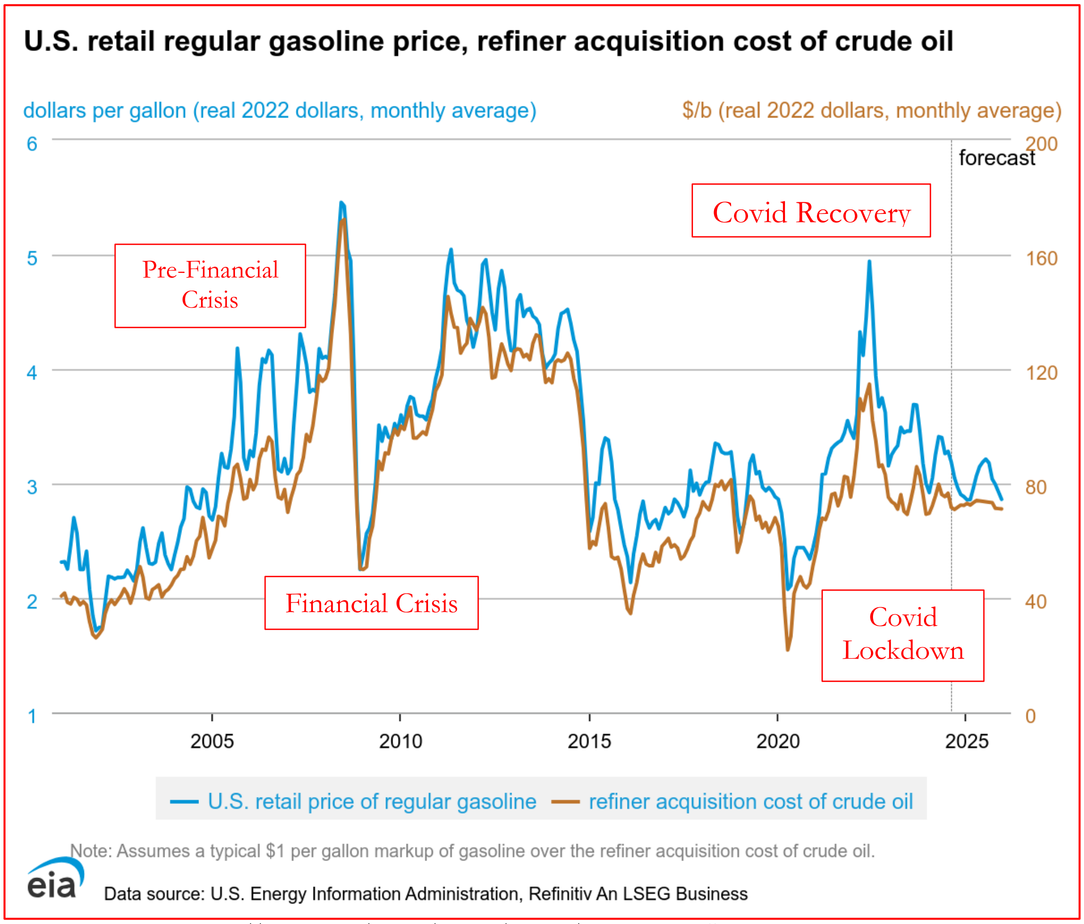
Exhibit 6.2



(Source: EIA and CEC)

For the 30-year period, oil spot prices to average U.S. reformulated gasoline prices indicate a high correlation of .9539, with minimal deviations with exception of extraordinary events.

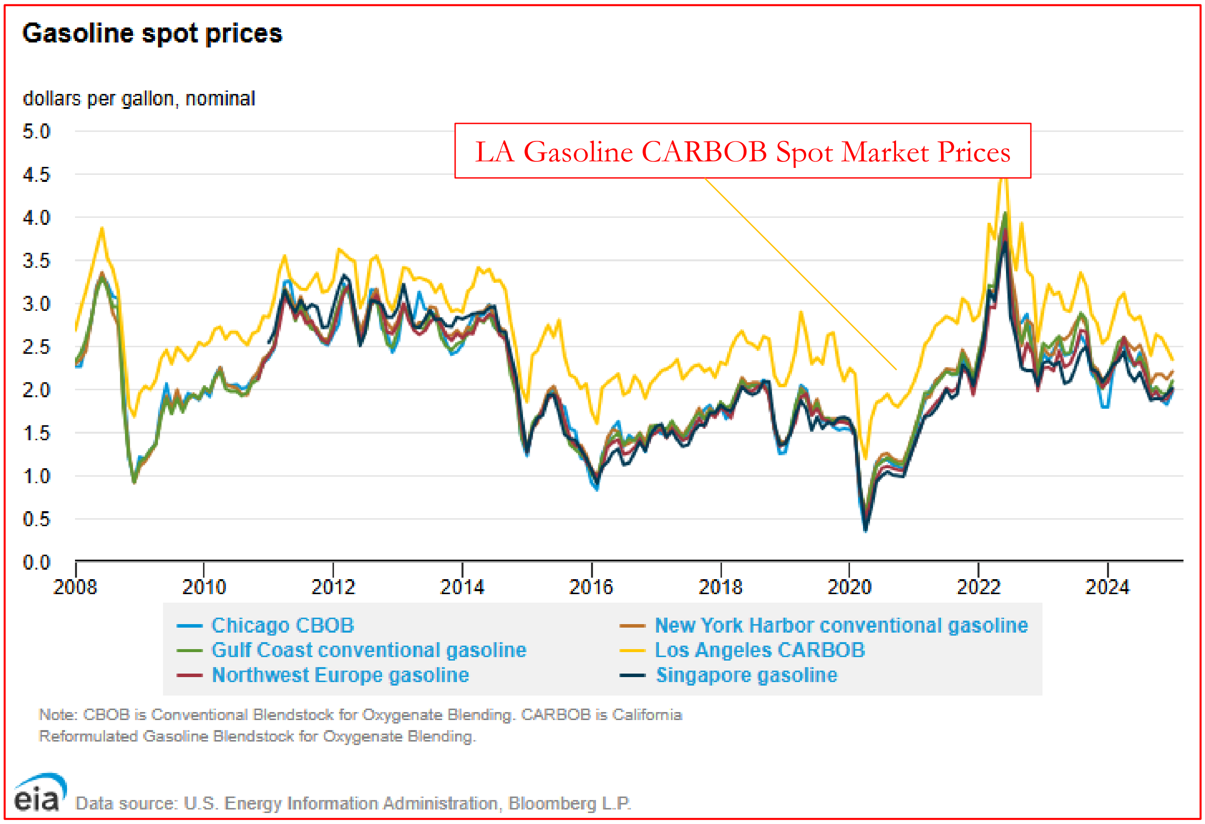
Exhibit 6.3



(Source:https://www.eia.gov/finance/markets/crudeoil/spot_prices.php#:~:text=Crude%20oil%20is%20traded%20in,that%20are%20lower%20in%20quality)

The spot price for gasoline across various U.S. markets, including Los Angeles, tends to move collectively and in a relatively consistent manner and this is true for California. Overall, for the January 1, 1995, to January 20, 2025, period, the 30-year correlation is indicated to be .9539.

Exhibit 6.4



(Sources: EIA and Bloomberg)

California spot and retail gasoline prices partially reflect the layering of regulatory costs, fees, and taxes, onto already high operating costs, and greater than average CPI. The total of all California regulatorily mandated taxes, fees and costs as of March 10, 2025, is calculated to be $$1.458 per gallon, plus federal excise tax of $0.18 a gallon for a grand total of $1.638 a gallon. California taxes, costs and fees represent 89% of total regulatory costs superimposed on the consumer. Based on a layering of costs, the higher cost of California CARBOB over others such as Gulf Coast, and NY Harbor conventional is expected. When combined with demand swings, and especially tightening supplies, prices will, understandably, profile a greater and sometimes widening gap between California CARBOB and other markets.

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

Exhibit 6.5[338]

(Source: CEC, EIA, https://www.congress.gov/crs-product/R48314 & Author)

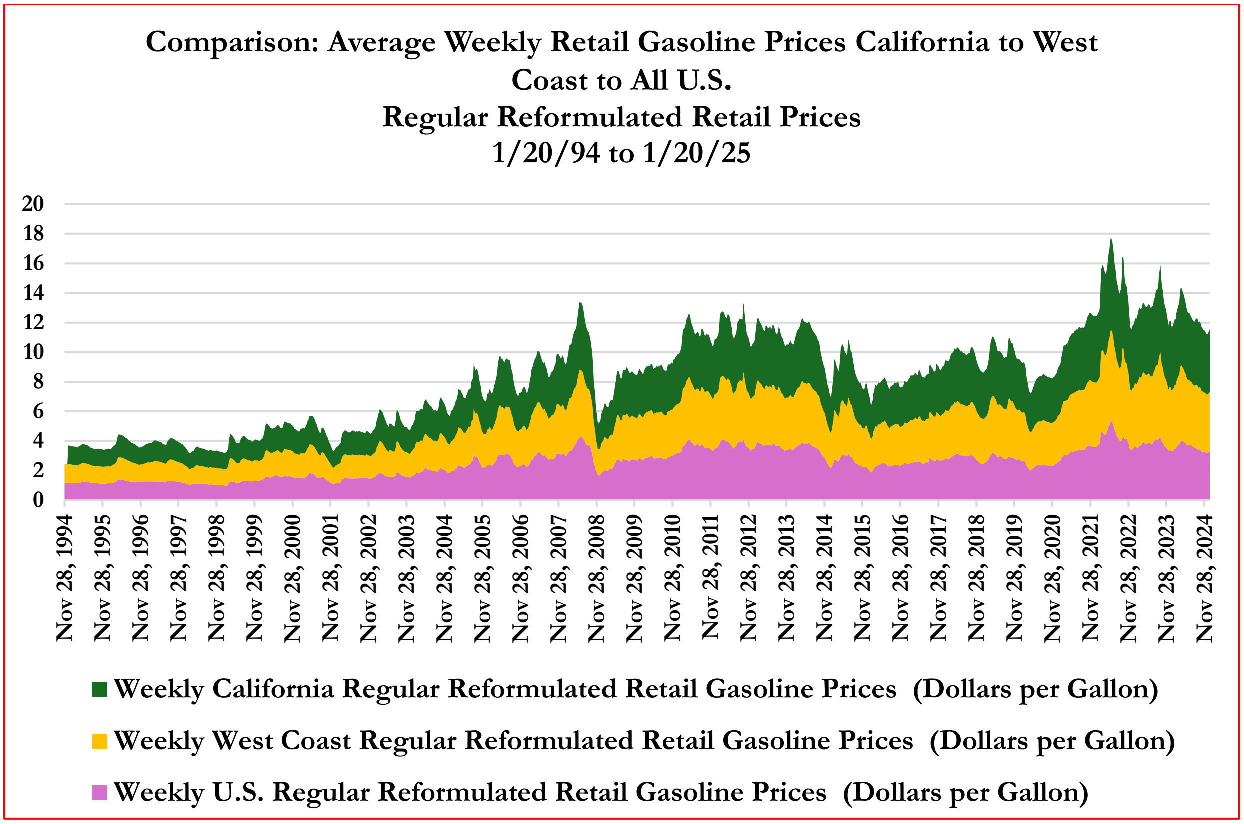
6.2 California Gasoline Prices

California gasoline prices behave, with some exceptions, in a manner consistent with overall U.S. market. For the January 2, 1995, to January 20, 2025, period, the correlation between oil spot prices to the California retail price for reformulated gasoline was high indicating .8660. and a correlation of .8750 between oil spot prices and California average weekly prices for reformulated gasoline. Furthermore, although California gasoline is more expensive, the correlation between U.S. average weekly gasoline prices for reformulated regular and California reformulated regular prices for the January 1, 1995, to January 20, 2025, period is indicated at .9768.

The exhibit below summarizes the weekly average dollar differences in California retail gasoline as compared to the West Coast and all of the U.S. For the 1994 to 2025 period, Californians have paid, on average, 13.01% per gallon of gasoline in the Golden State as compared to the overall average for the U.S.

[338] *The California Cap-and-Trade Program: Overview and Considerations for Congress*. (2025). Congress.gov. https://www.congress.gov/crs-product/R48314, Cornett, S. (2023, October 24). *California's Cap-and-Trade Program: Frequently Asked Questions*. Lao.ca.gov. https://lao.ca.gov/Publications/Report/4811, *California's Climate Programs – Facts per Gallon*. (2023). Factspergallon.com. https://factspergallon.com/californias-climate-programs/, https://www.wspa.org/wp-content/uploads/CA-Gas-Receipts-Feb-2024-v2-1.pdf

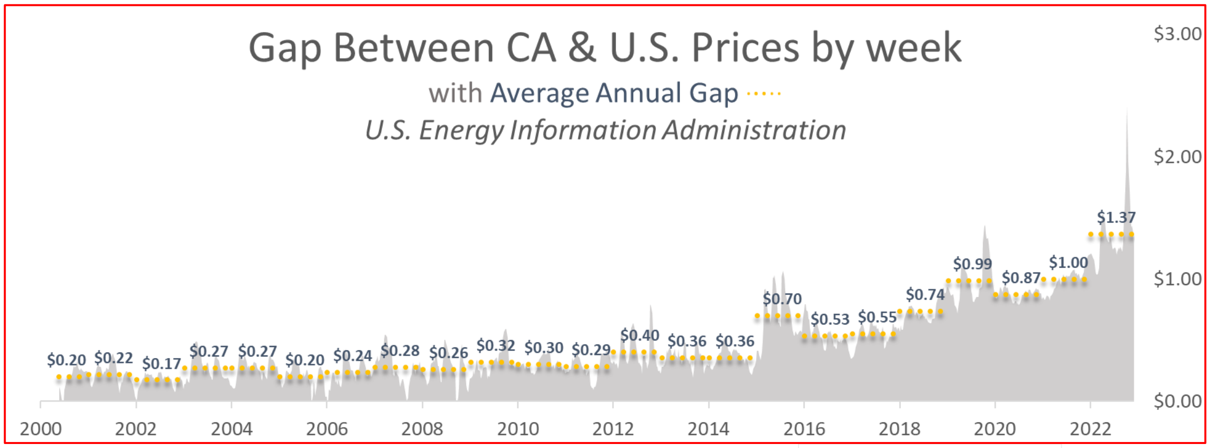
Exhibit 6.6



(Source: EIA)

For the January 2, 1994, to January 20, 2025, period, the average price differential for regular reformulated gasoline between the overall U.S. and California averaged $0.355 a gallon. Between January 2, 1994. Since 2015, when California's Cap and Trade programs took full effect, the number of refineries fell, and a major fire broke out in one of the Los Angeles area refineries, the gap between average U.S. gasoline prices and gasoline prices in the Golden State has widen. From 2000 to 2025, the price differential between California average weekly regular reformulated gasoline prices and the U.S. average for reformulated regular gasoline pre-cap and trade averaged 7.84%. Post full implementation of the cap-and-trade program in 2015, the price differential between California and the U.S. based on weekly gasoline prices for regular reformulated fuel expanded to 23.56% by March 2025.

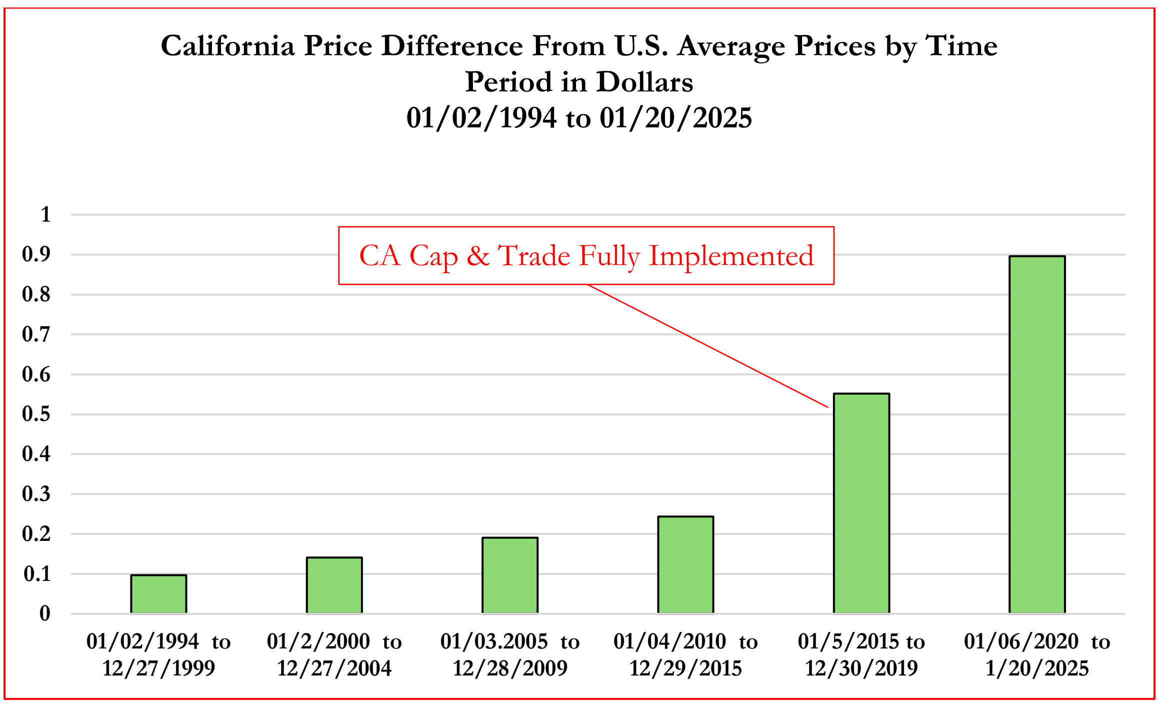
Exhibit 6.7



(Source: EIA and California Research Bureau. (2022). Gas prices in California. In *Gas Prices in California: History & Policy*. https://www.library.ca.gov/wp-content/uploads/crb-reports/CRB_Gas_Prices_in_California.pdf)

Illustrated in the exhibit below is the absolute dollar difference in the average retail price of regular reformulated gasoline between California and the U.S. for selected time periods.

Exhibit 6.8

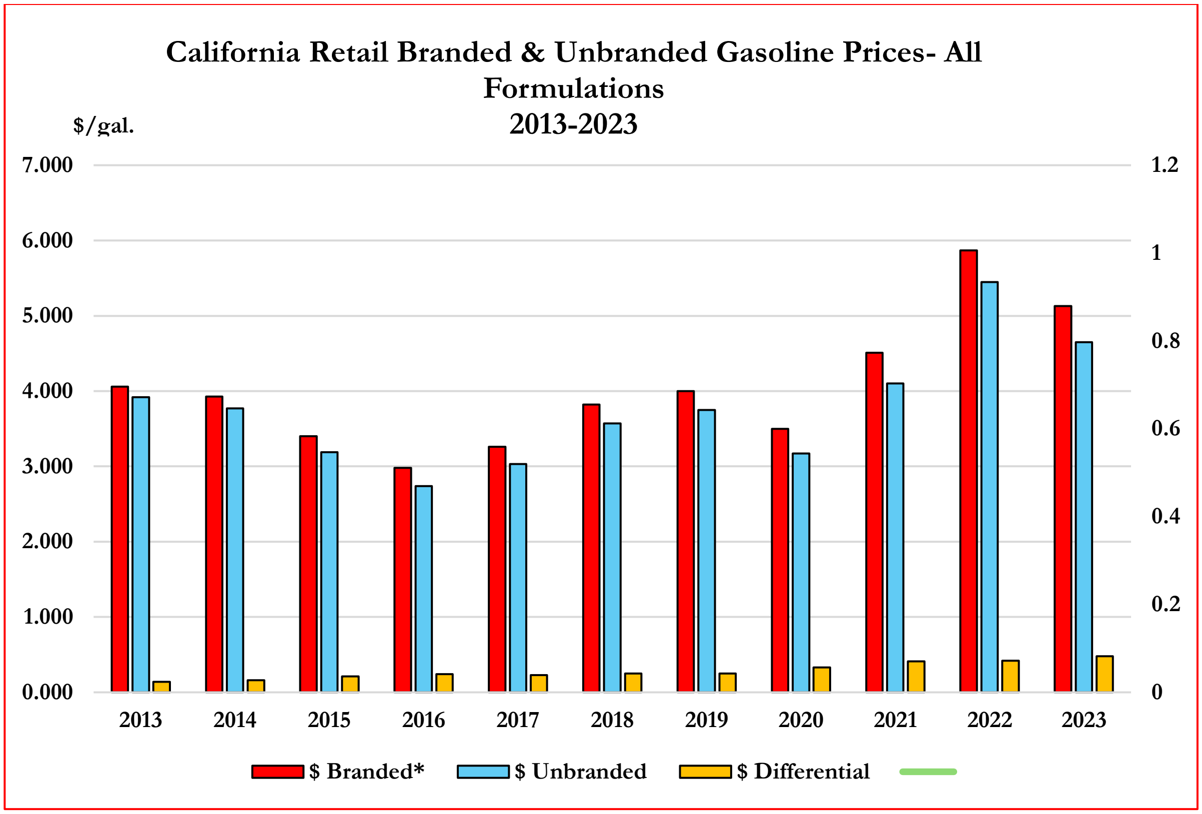


(Source: EIA & Author)

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

As illustrated in the exhibit below, the price of regular gasoline in California on January 2, 1995, was $1.264 a gallon.[339] Adjusting for inflation, the equivalent price of gasoline on March 8, 2025, would be $2.72 a gallon or 115% more. Correspondingly, for the same period, California State Revenue from the sale of gasoline increased 324%. For the same period, the California State Excise Tax on gasoline sales increased 233%, while the price of gasoline increased 274%.

Exhibit 6.9



(Source: https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

339 *U.S. Regular Reformulated Retail Gasoline Prices (Dollars per Gallon)*. (2020). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epmrr_pte_nus_dpg&f=a

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
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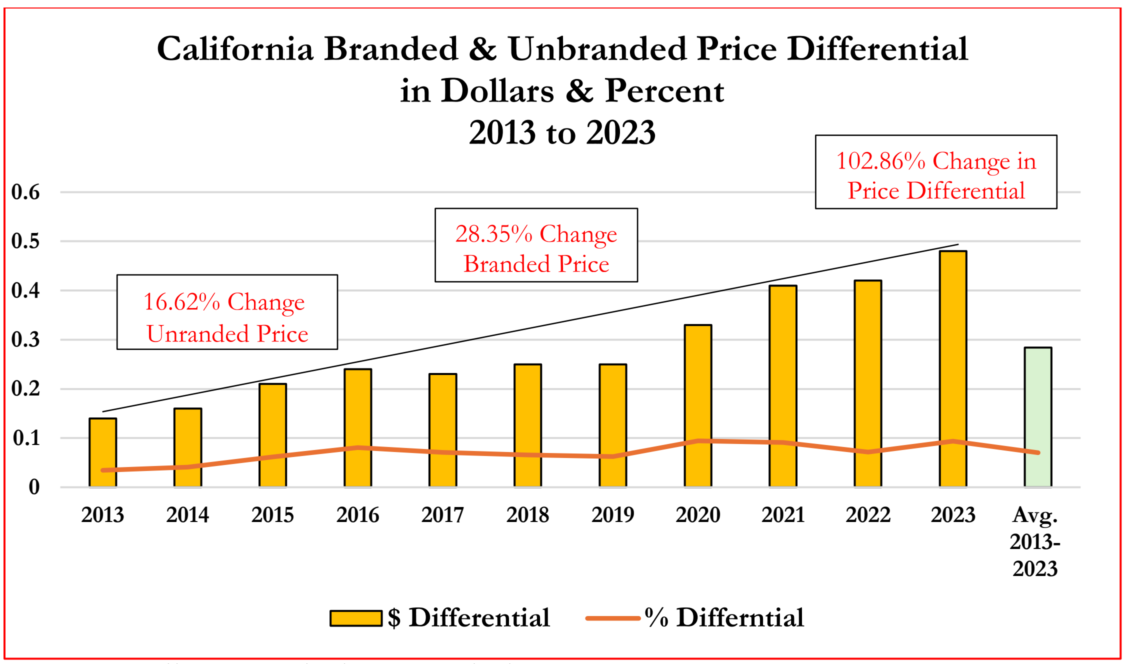
Exhibit 6.10

Price Differential CA Gasoine All Formulations 2013 to 2023				
Year	Branded	Unbranded	$ Differential	% Differntial
2013	4.06	3.92	0.14	3.45%
2014	3.93	3.77	0.16	4.07%
2015	3.4	3.19	0.21	6.18%
2016	2.98	2.74	0.24	8.05%
2017	3.26	3.03	0.23	7.06%
2018	3.82	3.57	0.25	6.54%
2019	4	3.75	0.25	6.25%
2020	3.5	3.17	0.33	9.43%
2021	4.51	4.1	0.41	9.09%
2022	5.87	5.45	0.42	7.16%
2023	5.13	4.65	0.48	9.36%
Avg. 2013- 2023	4.042	3.758	0.284	7.026%
% Chg. 2013-2023	26.35%	18.62%		1.415 x

(Source: https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

Based on CEC data, for the 2013 to 2023 period, the average price of branded gasoline in California was $4.042, as compared to the average price of unbranded at $3.758 a gallon. For the same period, the price of branded gasoline increased 26.35%, as compared to the price of unbranded, which increased by 18.64%. The absolute price differential from 2013 to 2023, grew from $0.14 to $0.48, a gallon or 102.86%.

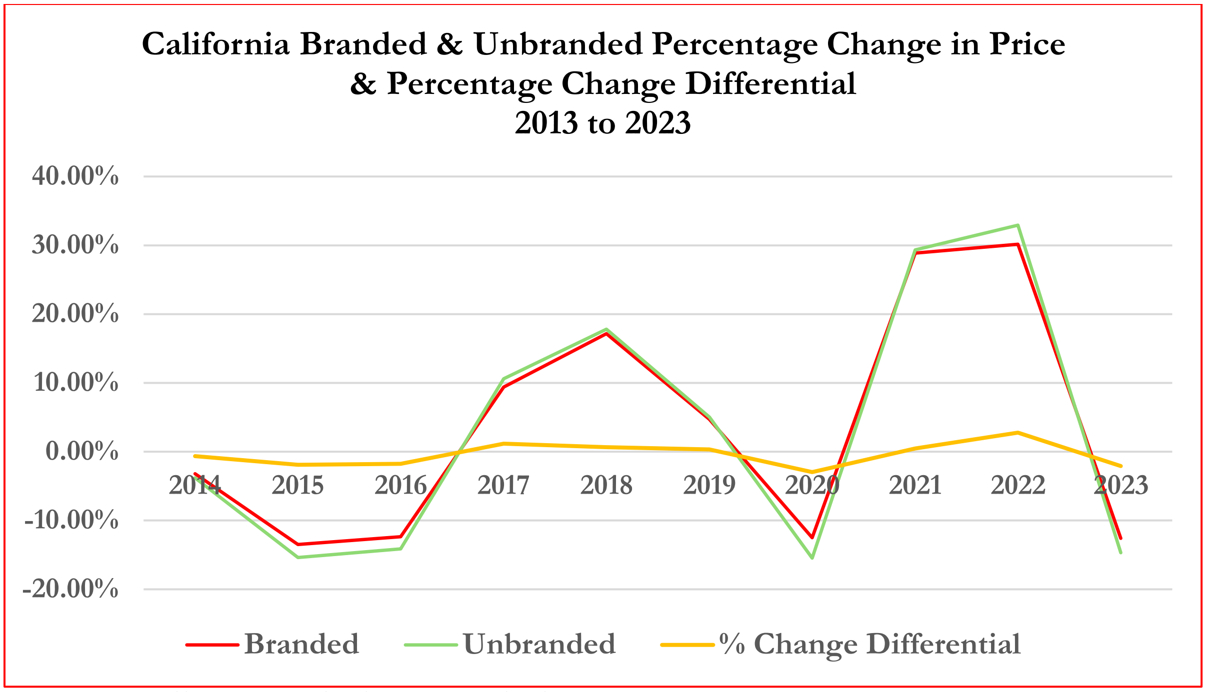
Exhibit 6.11



(Source: https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

Not surprisingly, the percentage in branded and unbranded gasoline prices move consistently and indicate a correlation of .999. Individually, branded gasoline prices present a slightly greater variance than unbranded, however, unbranded prices tended to demonstrate higher peak and lower trough variances than branded for the 2014 to 2023 period.

Exhibit 6.12



(Source: https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf)

California has a higher percentage of premium gasoline sales than the rest of the U.S. In California, 17.8% of all gasoline retail sales in 2020 were premium octane, compared to 11.6%, according to the EIA.[340] [341] Consumers' preference for premium fuels, as expressed by California's higher percentage of premium gasoline sales compared to the overall U.S., contributes to higher retail pump prices and margins. For the 2010 to 2020 period, retail gasoline sales volume of regular octane in California as a percentage of all gasoline octanes volumes sold have remained relatively stable, growing only by 1.5%; meanwhile, premium octane sales as a percentage of all gasoline sales have grown 53.45%.

In California, as in common throughout markets in the U.S., it is not unique to see considerable variances in retail prices for the same brand and grade of gasoline. Even in areas where only a few miles or blocks separate stations, prices may vary by considerable amounts.[342] For example, on 9/25 and 9/25, prices for a random sample varied by as much as 10% for Chevron's regular blend and 5%

[340] CALIFORNIA ENERGY COMMISSION. (2021). *CALIFORNIA ENERGY COMMISSION PETROLEUM WATCH 2021*. https://www.energy.ca.gov/sites/default/files/2021-11/2021-10_Petroleum_Watch.pdf

[341] Mitchell, R. (2022, June 2). Paying extra for premium gas? You should probably stop - Los Angeles Times. *Los Angeles Times*. https://www.latimes.com/business/story/2022-06-01/midgrade-premium-regular-gasoline-damage-money#:~:text=Midgrade%20makes%20up%20a%20tiny,pump%20provides%20fatter%20profit%20margins

[342] Sheets, C. (2022, March 15). Why California gas prices vary: 'Mystery surcharge' and more - Los Angeles Times. *Los Angeles Times*. https://www.latimes.com/california/story/2022-03-14/gas-prices-vary-from-place-to-place

for Shell. Retail pump prices for unbranded gasoline are usually lower and have greater variability than the example below.

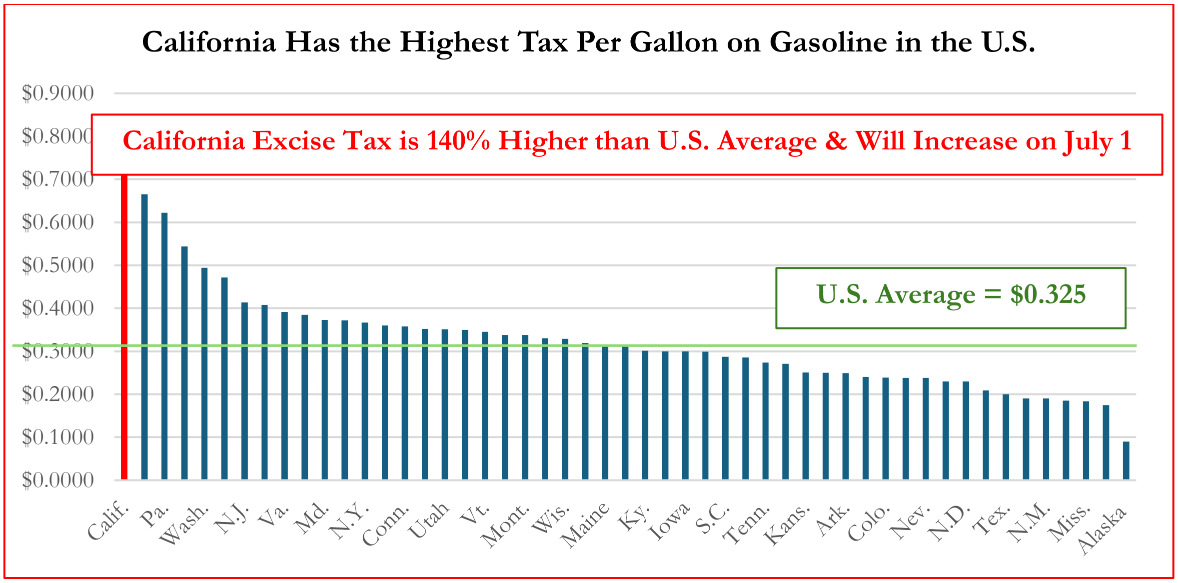
Exhibit 6.13

(Source: Direct Observation)

6.3 California Gasoline Taxes, Fees and Costs

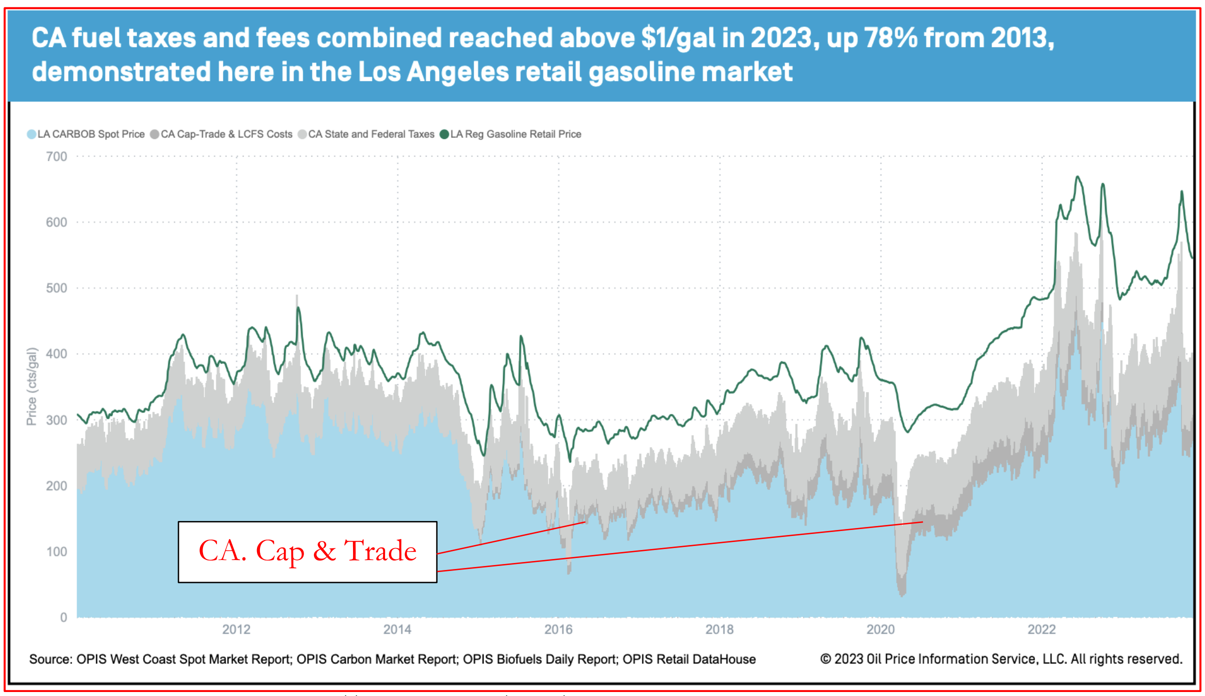
Retail gasoline prices are a function of the interactions among many variables and components. Factors such as supply, demand, seasonality, taxes, fees, costs, refinery operations, and individual gas station (outlet) owners/operators. In the Golden State, regulatory fees, taxes, and costs are second only to the cost of the crude oil needed to produce gasoline.

Exhibit 6.14



(Source: https://taxfoundation.org/data/all/state/state-gas-tax-rates-2023/)

Exhibit 6.15



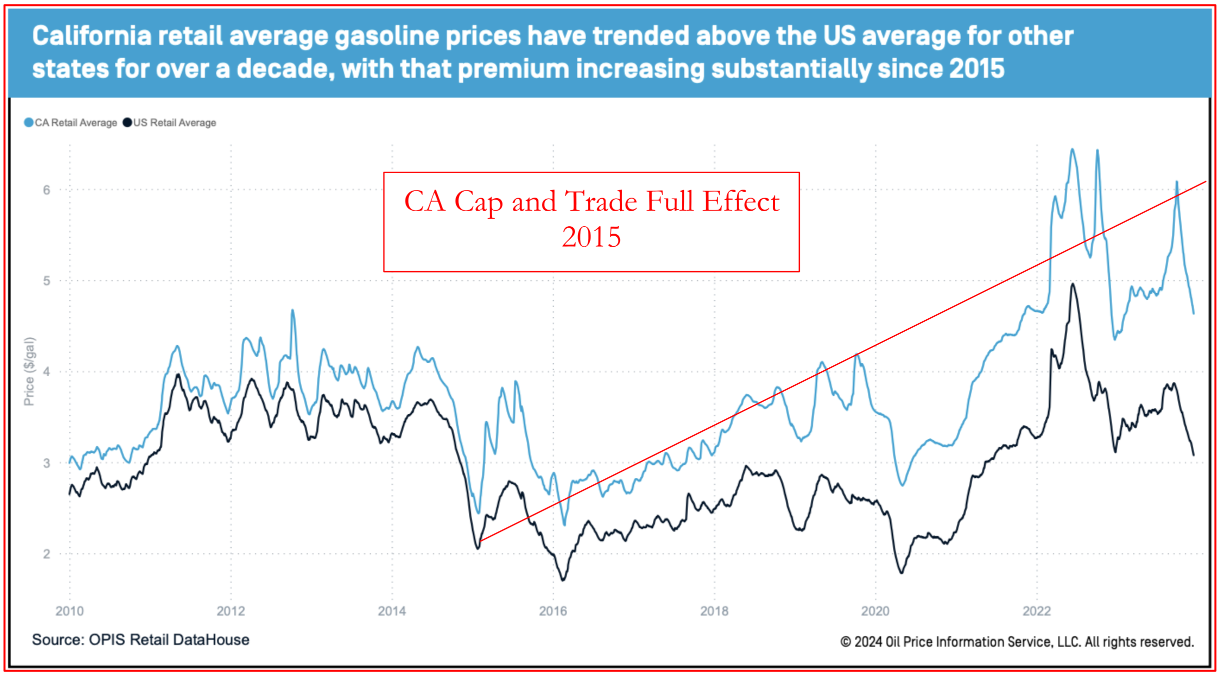
(Source: https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf)

Analysis of OPIS data highlights a growing disparity between West Coast crude oil prices, gasoline spot prices, and fuel costs at both the wholesale and retail levels since 2015—<u>the year when wholesale fuel sellers were required to adhere to cap-and-trade policies</u>.[343]

[343] *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

For the 2003 to 2025 period, California's gas tax has also increased by 231.1%. It was $0.18 cents per gallon in 2003, $0.39.5 per gallon in 2013, and has now risen to $0.596 per gallon, according to figures from the California Department of Tax and Fee Administration (CDTFA).[344] Indexed to the CCPI, the California excise tax is scheduled to automatically change on July 1 of each year and is estimated to increase from $0.613 to $0.625 per gallon in 2025, depending on California's Consumer Price Index.[345] As of December 11, 2023, taxes and regulatory fees added $1.386 per gallon to the price of gasoline in the state.[346] This research estimates all taxes, regulatory costs, and fees have risen faster than the annual inflation by 9.52% to $1.518 a gallon as of March 2025. The largest components of the increase are California's cap and trade costs, which are passed on to the consumer, and the LCFS premium.[347]

Exhibit 6.16



(Source: https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf)

6.3.1 Excise Tax. The state excise tax on gasoline, which is indexed to the California Consumer Price Index, is legislatively engineered to change on July 1 of every year. Since California has, dating back to 1955, an inflation rate in excess of that of the overall U.S., the excise tax on gasoline sales is virtually guaranteed to increase each year.

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344 *Tax Rates — Special Taxes and Fees*. (2022). Ca.gov. https://www.cdtfa.ca.gov/taxes-and-fees/special-taxes-and-fees-tax-rates/

345 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

346 Commission, C. E. (n.d.). *Estimated Gasoline Price Breakdown and Margins*. California Energy Commission. https://www.energy.ca.gov/estimated-gasoline-price-breakdown-and-margins

347 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
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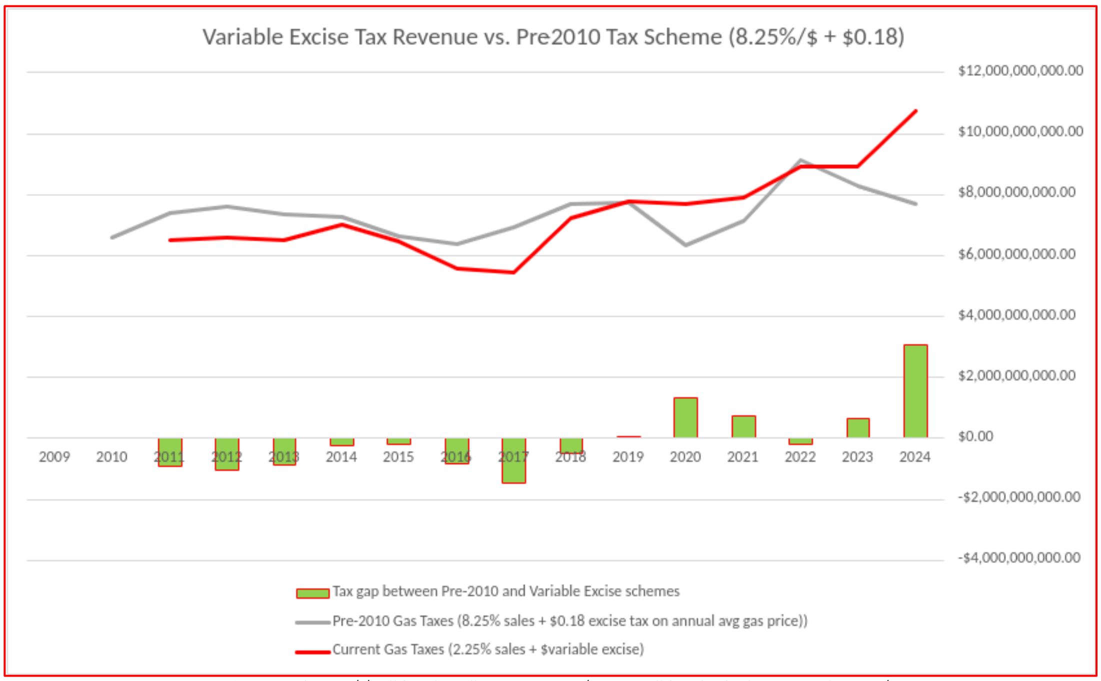
California's state excise tax, which was supposed to eliminate state sales taxes in 2010, has grown from around $0.07 a gallon in 1971 to almost $0.60 a gallon in 2025. California changed in 2010 to variable excise tax (indexed) with the objective of raising more revenue and equalizing taxes for both the state and local governments. Although the Legislature "assured voters that the scheme would be equalized to the pre-2010 sales tax method," the net effect between the pre-2010 tax and post-2010 tax indicates significant divergence, as illustrated in the exhibit below by the California Policy Center. As indicated in the exhibit below, the switch to the variable excise tax has increased gasoline revenues to the State by almost $2.0 billion or $0.147, a gallon based on 13.6 billion gallons of gasoline consumed in 2023.[348] [349]

Exhibit 6.17



(Source: https://californiapolicycenter.org/2024-california-fuel-taxes-a-doosey/)

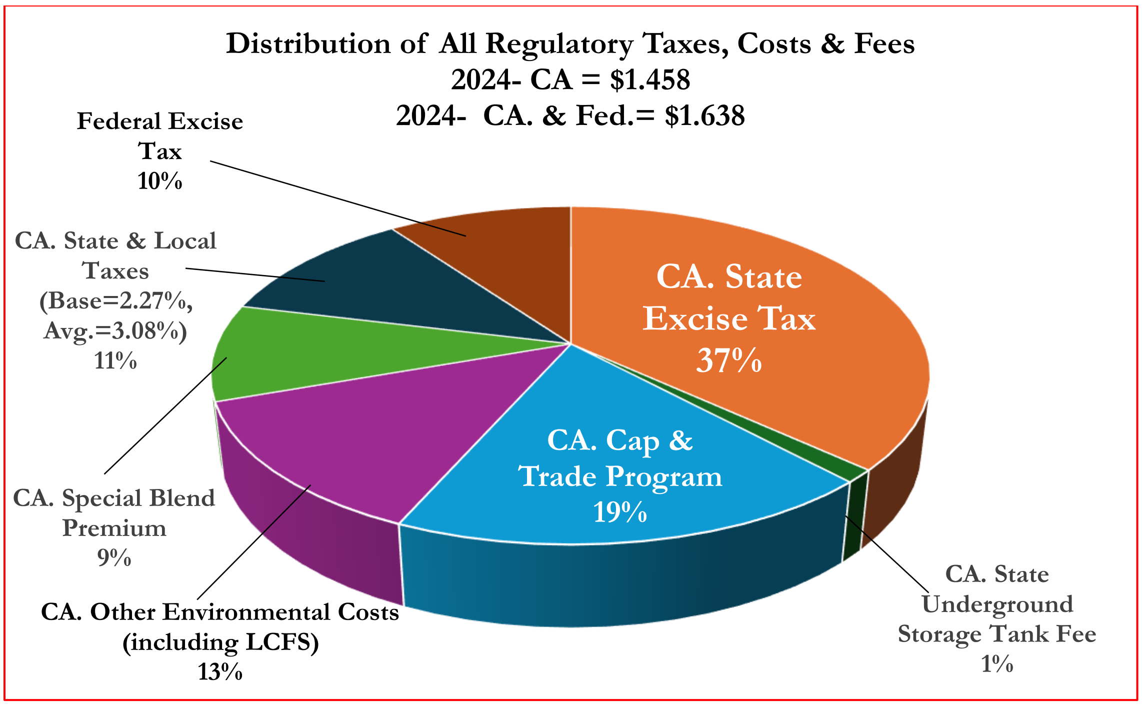
6.3.2 California Cap and Trade & Environmental Costs. California's cap and trade program adds $0.30 to $0.33, to the price o a gallon to gas. Additionally, California's other environment initiatives add another $0.21 to consumer prices at the gas pump. California mandates that refiners comply with the State's Cap and Trade program. The program requires that refiners bid on allowances for emissions and the state's unique LCFS. The cap-and-trade cost is anticipated to significantly increase in 2025. Twenty-five percent (25%) of California's cap and trade regulatory fees generated by gasoline sales are statutorily allocated to California's High Speed Rail project (CHSR).[350] Originally scheduled for completion in 2020 at a cost of $33 billion, the CHSR is years behind schedule and billions of dollars over budget. Current estimates place the completion of the high-speed rail project

[348] *2024 California Fuel taxes… A DOOSEY | California Policy Center*. (2025, January 15). California Policy Center |. https://californiapolicycenter.org/2024-california-fuel-taxes-a-doosey/
[349] Commission, C. E. (n.d.). *California Gasoline Data, Facts, and Statistics*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/california-gasoline-data-facts-and-statistics
[350] *Cap and Trade Funding*. (2021, May 19). Metropolitan Transportation Commission. https://mtc.ca.gov/funding/state-funding/cap-and-trade-funding

between 2030 and 2035, with a projected cost of $106 billion, or three times its original estimate.[351] As noted by the California Legislative Analyst's Office (LAO) in a November 2023 report, "To our knowledge, no studies have produced a reliable estimate of the emission reduction achieved by the cap-and-trade program so far."[352]

Two of largest revenue generators for the Golden State are its excise tax, which is the highest in the U.S., and its environmental program fees, which represent 42% and 36% of revenues, respectively. Of the environmental program fees generated, California's cap and trade mandate is 24%, while other environmental programs are 12%.

Exhibit 6.18[353]



(Source: Compiled from various sources, see footnote below)

The expenses tied to both cap-and-trade and the Low Carbon Fuel Standard (LCFS) directly influence and increase gasoline prices for consumers. Over time, the costs associated with complying with these regulations have risen and tend to cumulate. Data from the OPIS Carbon Market Report indicates that compliance costs for CARB reformulated gasoline (RFG) at the wholesale level in California increased by 200%, from about $0.10 per gallon in 2015 to over $0.30 per gallon by the end of 2023.[354] The recently established LCFS standard in late 2024 by the CARB, which was delayed pending further

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[351] *U.S. Transportation Secretary Duffy Announces Review of California High-Speed Rail Project | US Department of Transportation*. (2025). Transportation.gov. https://www.transportation.gov/briefing-room/us-transportation-secretary-duffy-announces-review-california-high-speed-rail-project

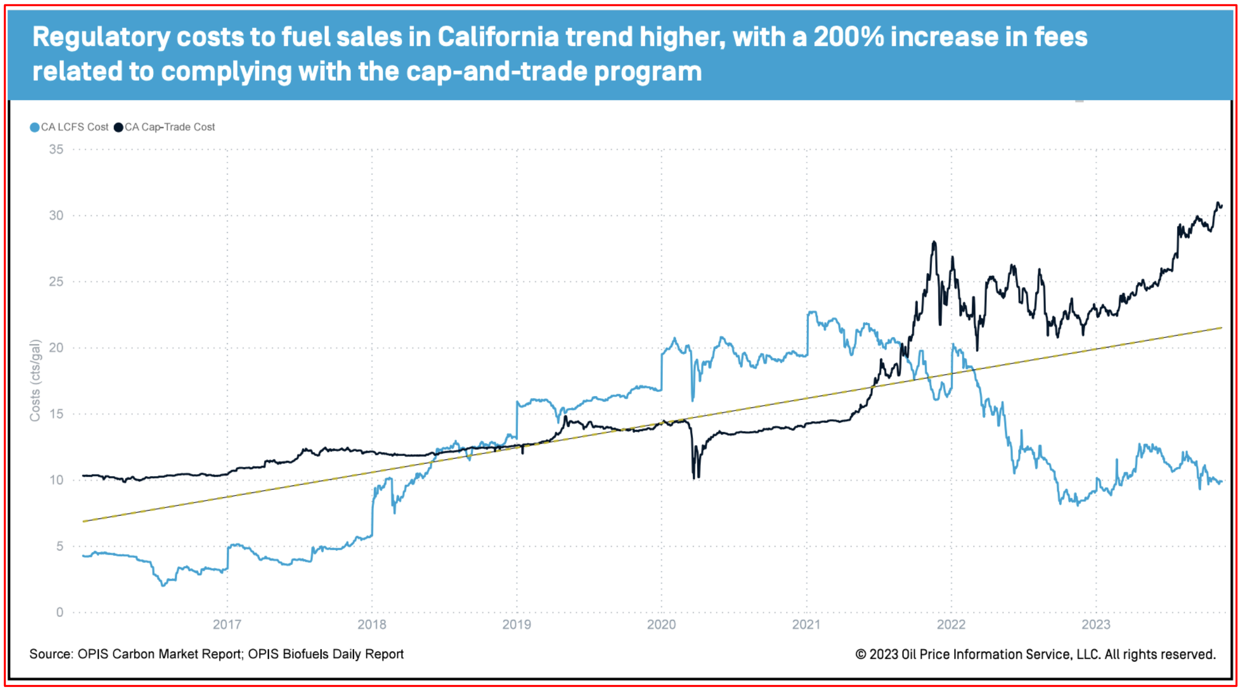
[352] *California's Cap-and-Trade program: Frequently asked questions*. (2023, October 24). https://lao.ca.gov/Publications/Report/4811#:~:text=As%20noted%20above%2C%20cap-and,their%20income%20towards%20transportation%20costs.

[353] *The California Cap-and-Trade Program: Overview and Considerations for Congress*. (2025). Congress.gov. https://www.congress.gov/crs-product/R48314

[354] *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

disclosure and transparency regarding the cost to the consumer, was estimated by the CARB to add another $0.47 a gallon by year-end 2025.[355]

Exhibit 6.19



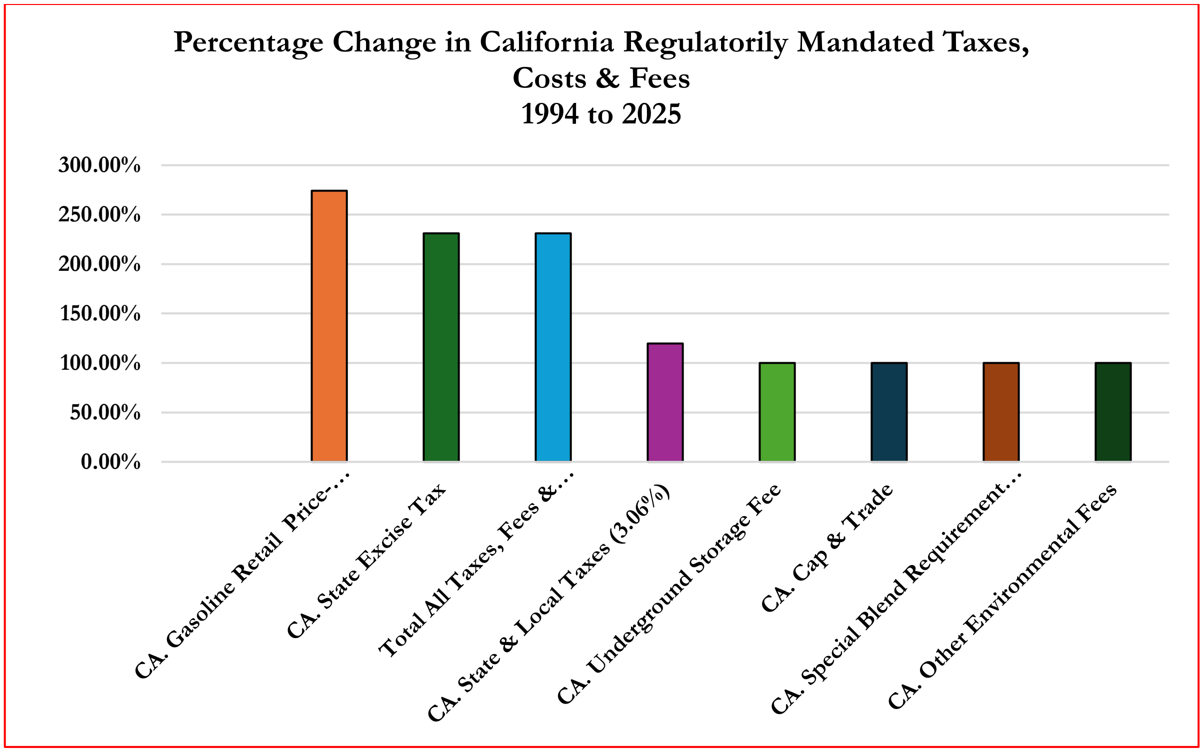
(Source: https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf)

6.3.3 Local Sales Tax. In addition to the highest state excise tax in the nation, California also imposes a 2.25% base sales tax for local districts. However, an analysis of cities located in California's 58 counties indicates that, on average, the effective tax rate at the local level on gasoline sales is 3.06% (non-weighted for sales and city size).[356] While the retail price of gasoline has increased by 274% since 1994, the state excise tax and local sales tax have increased by 231.1%, and 119.7%, respectively. The three significant cost burdens that have been added through regulations since 1994, are the California cap and trade program, the special blend, and other environmental costs.

[355] IER. (2025, March 4). *California's Plan to Tighten Its Fuel Standard Hits a Setback*. IER. https://www.instituteforenergyresearch.org/regulation/californias-plan-to-tighten-its-fuel-standard-hits-a-setback/?amp=1

[356] County, A. (n.d.). *District Taxes, Rates, and Effective Dates DISTRICT SALES AND USE TAX RATES Tax Area District Name and Acronym Rate Effective Date End Date Newark (City) City of Newark Transactions and Use Tax (NEGT)*. Retrieved March 10, 2025, from https://www.cdtfa.ca.gov/formspubs/cdtfa105.pdf

Exhibit 6.20



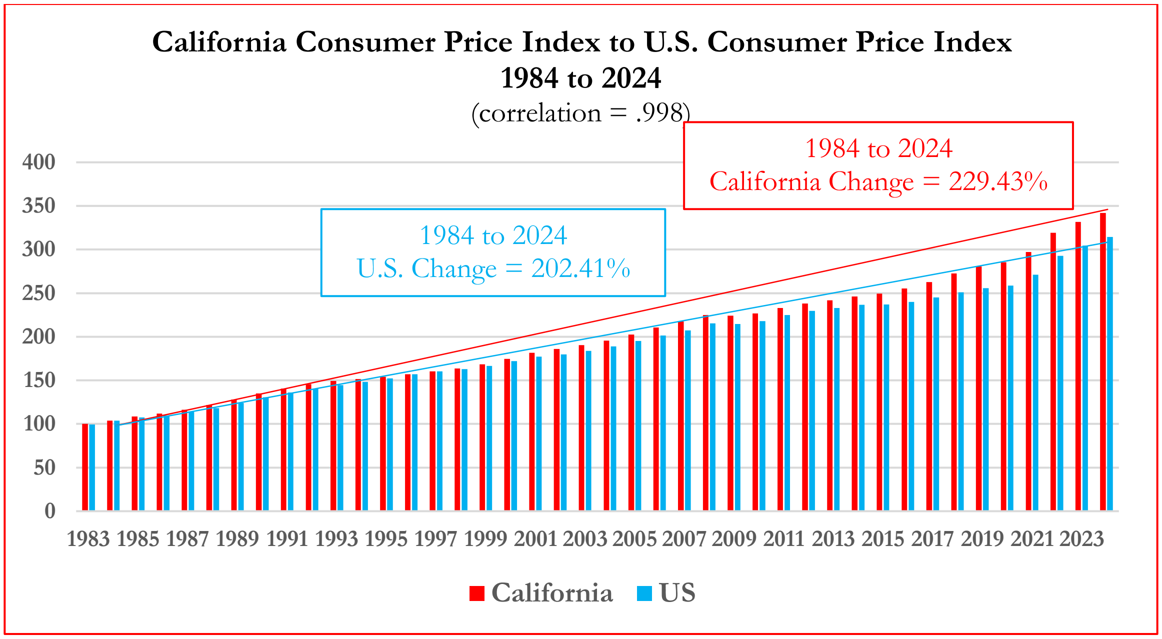
(Source: Compilation)

6.4 California Consumer Price Inflation & Gasoline Prices

Inflation is a common phenomenon in any economy. Since 1985, California's rate of inflation, as measured by the California Consumer Price Index, has increased faster than that of the overall U.S. For the 1984 to 2024 time period, California's CCPI increased by 229.43%, while the overall U.S. Consumer Price Index (CPI) increased by 202.41%. California's CPI, which is the basis for the California state excise tax on gasoline, is 1.13 times higher than that of the overall U.S. Not surprisingly, at .998, California's CPI is highly correlated to the overall U.S. CPI.

Michael A. Mische
University of Southern California
Marshall School of Business
Business of Energy Transition Initiative
March 16, 2025

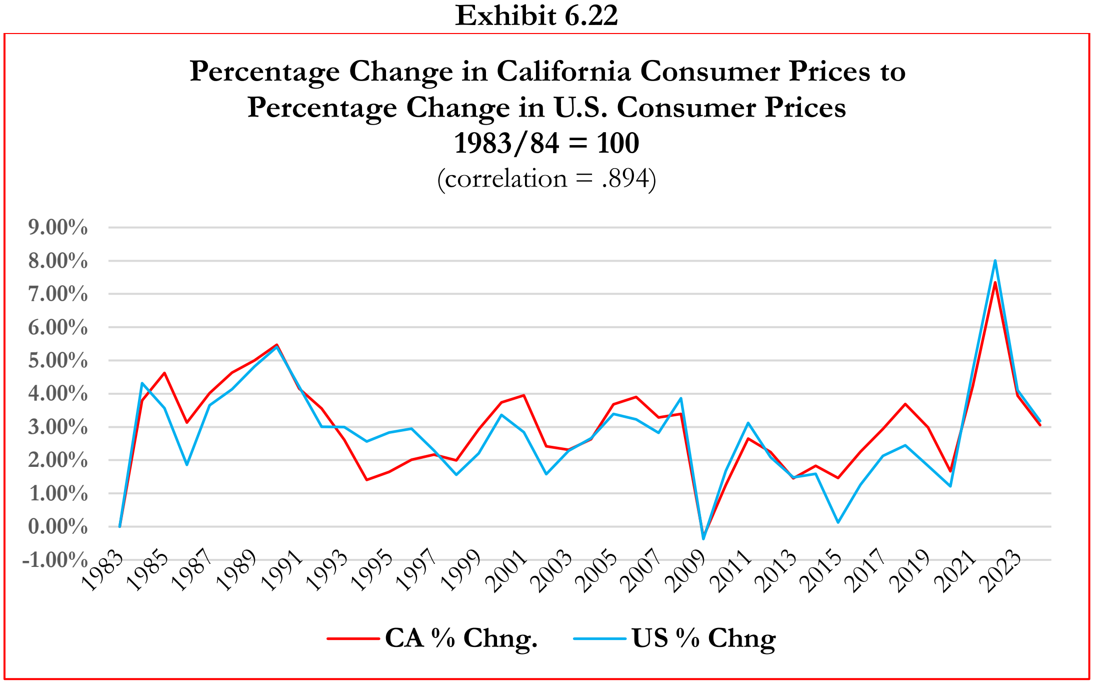
Exhibit 6.21



(Sources: https://www.dir.ca.gov/oprl/cpi/entireccpi.pdf and https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1913-)

For the 1984 to 2024 period, California's CPI is highly correlated with that of the overall U.S. CPI (.894).

Exhibit 6.22



(Sources: https://www.dir.ca.gov/oprl/cpi/entireccpi.pdf and https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1913-

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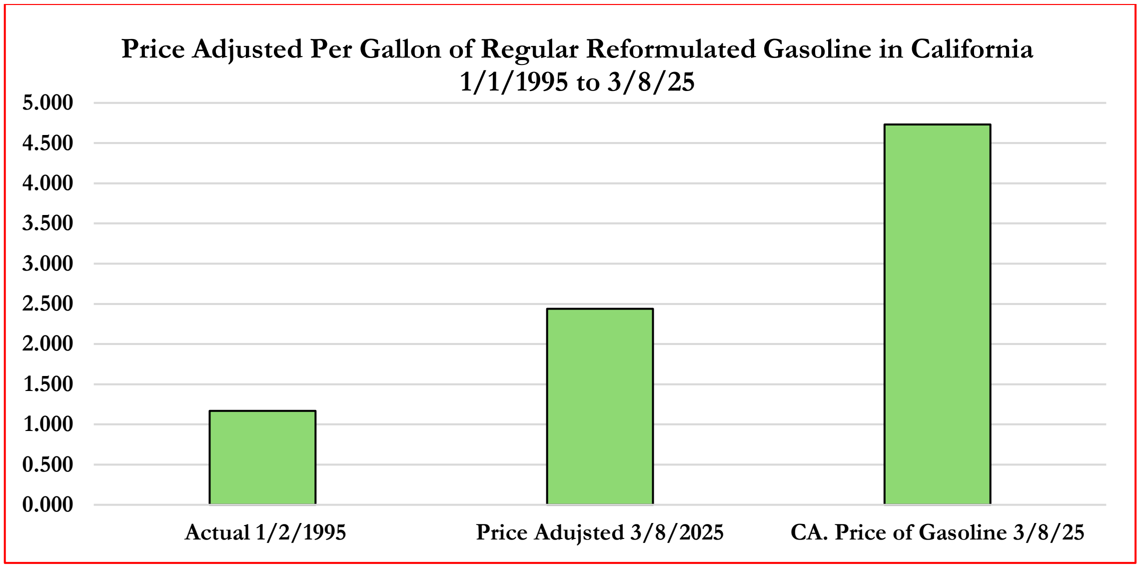
March 16, 2025

Adjusting for general and California specific inflation, the 1994 price of California reformulated regular gasoline would be $3.051, today. Adding the 2024, total regulatory cost of $1.638, to the inflation adjusted price, brings the price adjusted cost to $4.734, which is within one percent of the actual price.

Exhibit 6.23



(Source: EIA & Author)

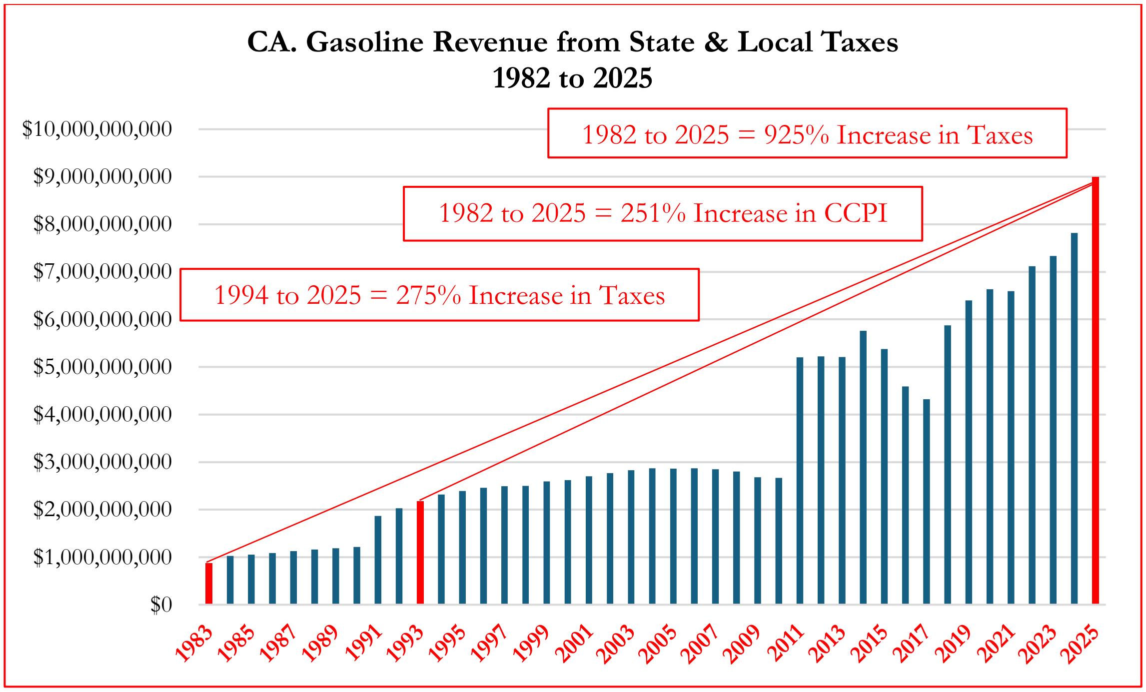
6.5 California Revenue from the Sale of Gasoline

Gasoline sales are BIG business for the Golden State, which will generate between $9.5 and $10.0 billion in income from gasoline taxes and fees to the State for its 2024/2025 fiscal year. The majority of California's gasoline revenues are allocated to the support of highways, local streets and roads, and multimodal programs.[357]

Since 1983, California's gasoline sales revenues have increased by 925%. For the 1994 to 2025 period, California revenues from gasoline sales have increased 275%. Correspondingly, the average retail price for regular gasoline increased by 274% for the same period. For the 1982 to 2025 period, increases in California taxes outpaced the CCPI by 3.8 times or 957% to 251%.

[357] *Assessing California's Climate Policies—Implications for State Transportation Funding and Programs*. (2023, December 13). Ca.gov. https://lao.ca.gov/Publications/Report/4821

Exhibit 6.24



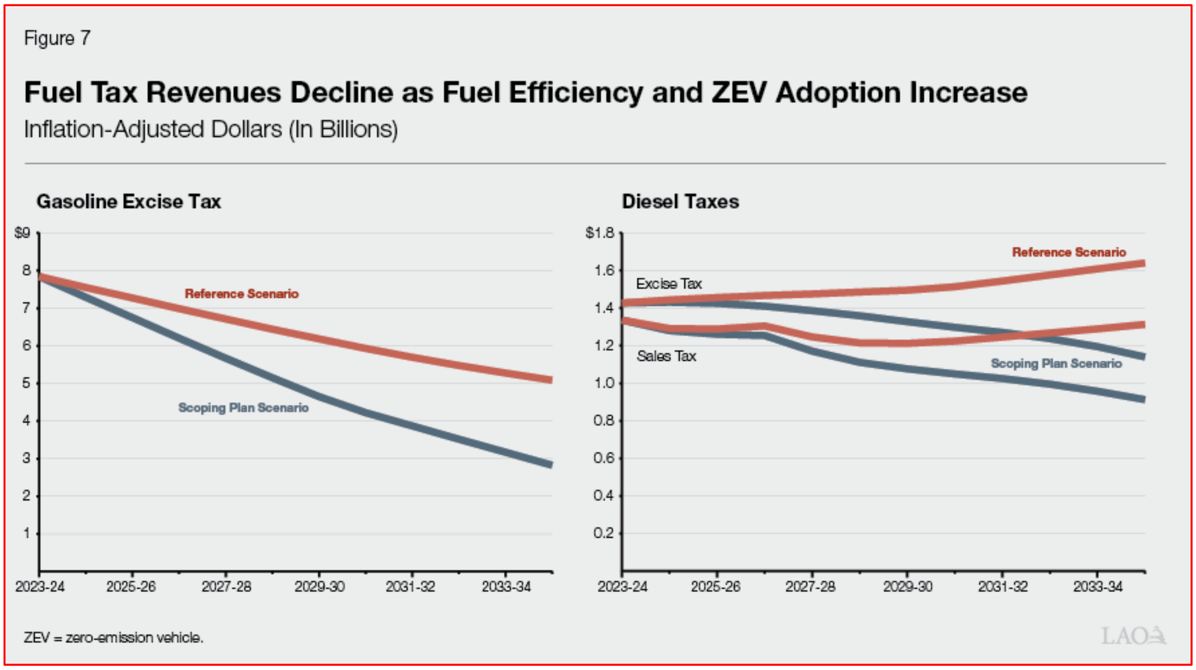
(Source: https://www.cdtfa.ca.gov/DataPortal/charts.htm?url=FuelGasJetStats)

California's Legislative Analyst's Office (LAO) predicts that as a consequence of California's zero emissions policies and the 2035 mandates to eliminate the selling of new internal combustion engine cars, revenues for the Golden State may fall by at least $5.0 billion over a ten-year period.[358] As of this time, it is unclear how California will compensate for the pending loss of gasoline sale revenues. As provided in the LAO report, California may have to increase taxes on gasoline and or increase motor vehicle registration fees to compensate for the shortfall associated with its zero emissions vehicle mandates.[359]

[358] *Assessing California's Climate Policies—Implications for State Transportation Funding and Programs*. (2023, December 13). Ca.gov. https://lao.ca.gov/Publications/Report/4821

[359] *Assessing California's Climate Policies—Implications for State Transportation Funding and Programs*. (2023, December 13). Ca.gov. https://lao.ca.gov/Publications/Report/4821

Exhibit 6.25



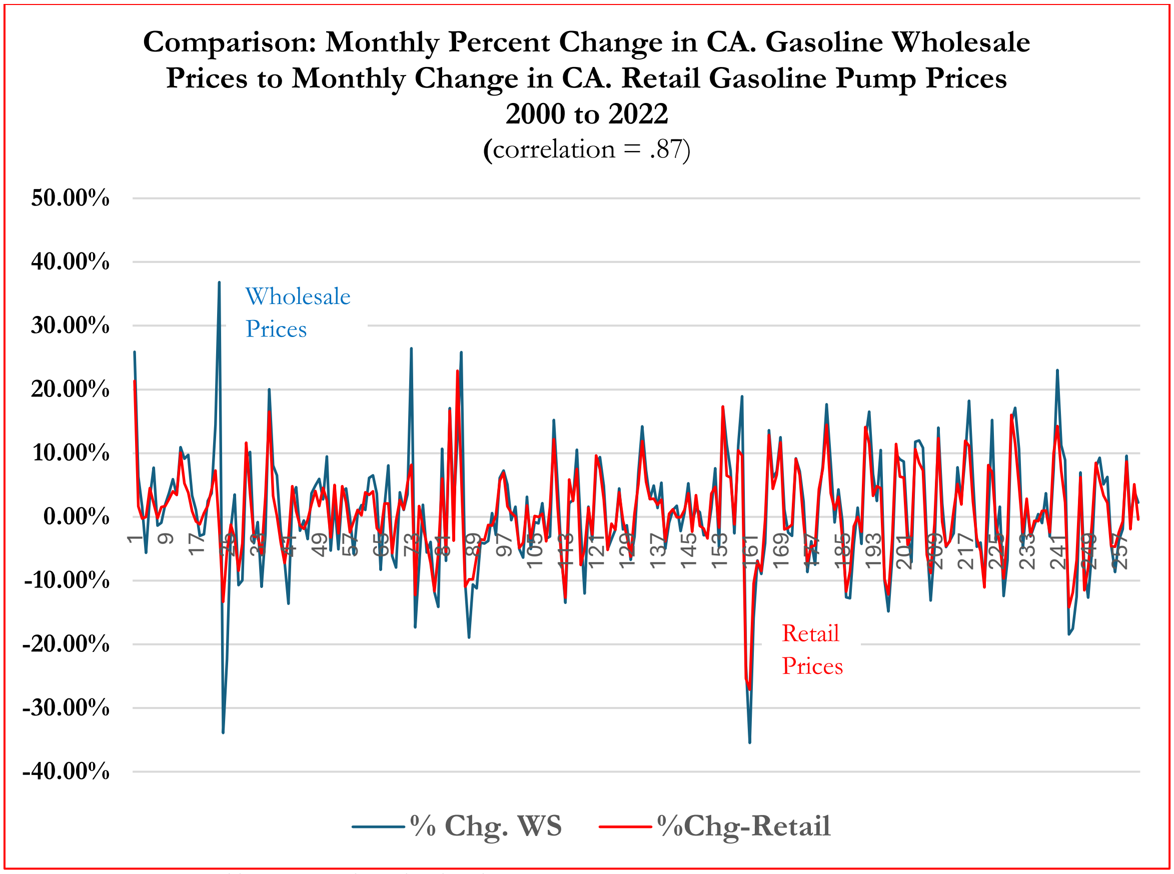
(Source: https://lao.ca.gov/Publications/Report/4821)

6.6 Analysis of California Gasoline Price Movements

The cost of crude oil to the refiner and the wholesale price (rack price) at which the refiner sells the refined gasoline to the distributor represent two of the most significant components of the retail price.[360] In California, changes in wholesale gasoline prices are correlated to changes in retail gasoline pump prices. For the 2000 to 2022 period, the monthly percent change in wholesale and retail prices averaged .94% and .89%, respectively, and have a correlation coefficient of .87.

[360] Rack Price or Rate Defined. "The rack price includes the cost of the gas itself, as well as transportation, overhead, and profit costs. The price can vary from terminal to terminal and depends on the cost of crude oil and related refining costs. The rack price also depends upon the distance between the fuel retailer and wholesaler terminal. A gas station located far from a terminal is going to pay a higher fuel rack price than one located just down the street." See, https://kendrickoil.com/what-is-a-fuel-rack-price/

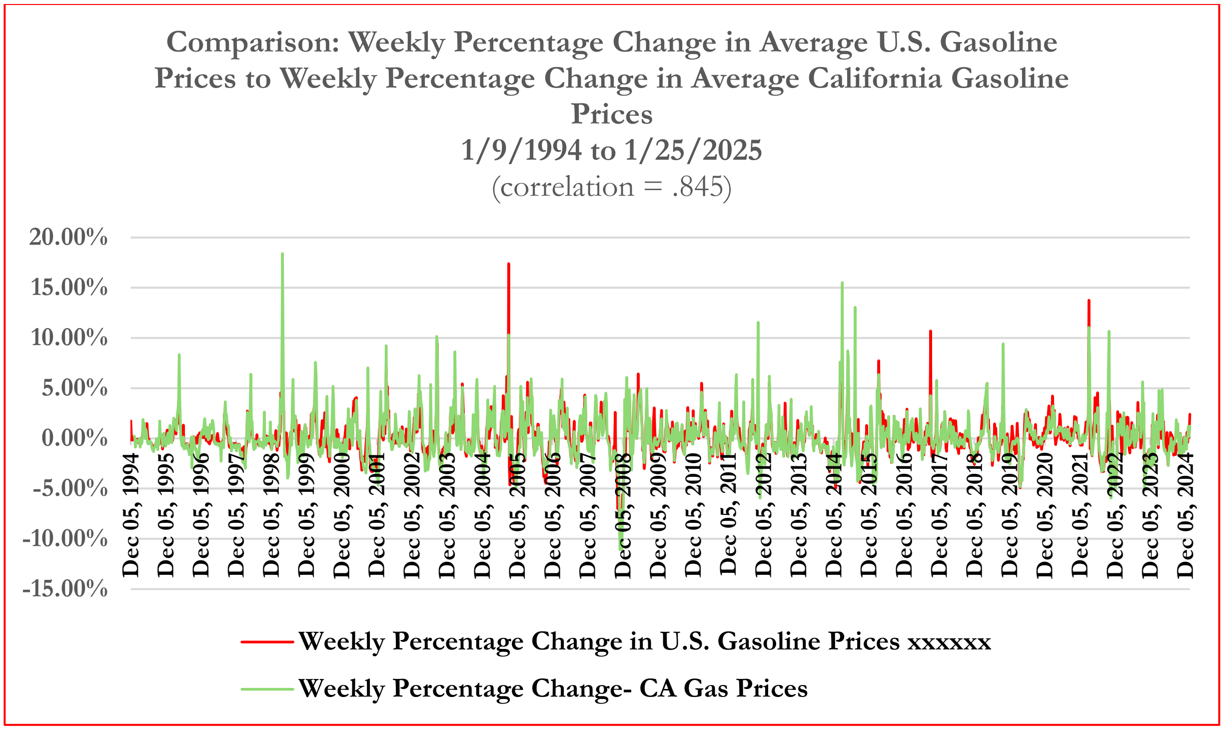
Exhibit 6.26



(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMA_EPMP_PWG_SCA_DPG&f=M)

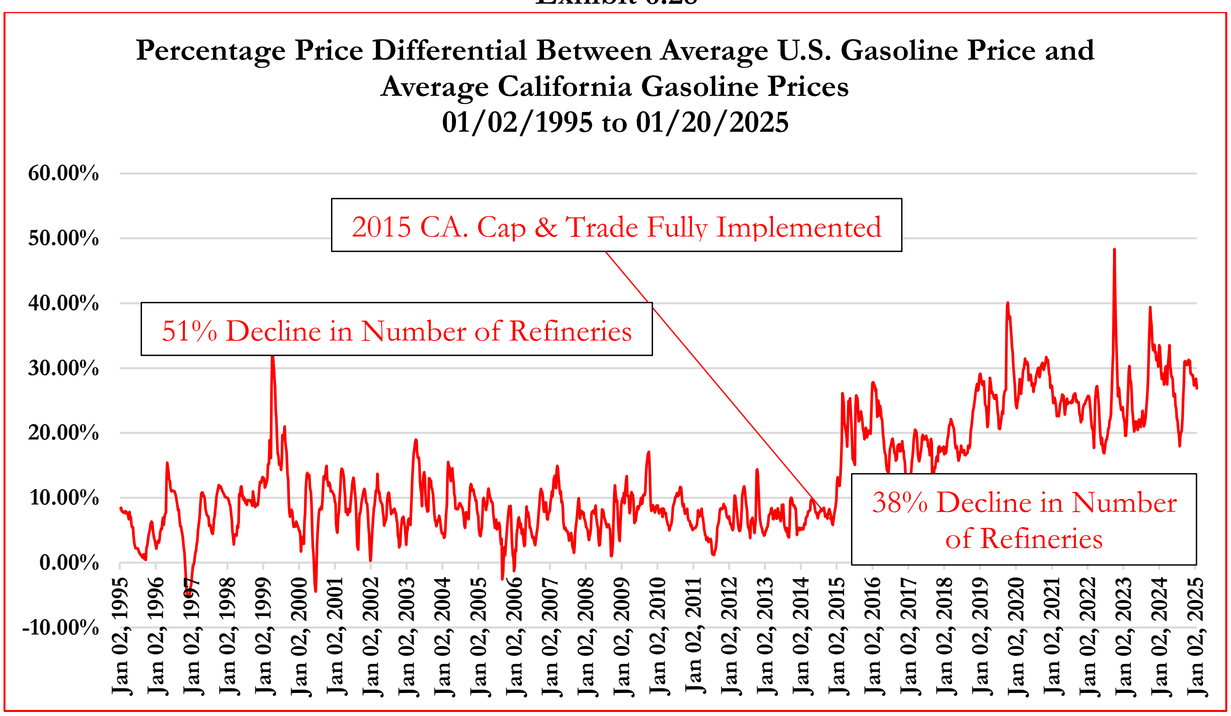
The weekly percentage in California average gasoline prices are also have a relatively high correlation with the weekly change in the average price of gasoline in the U.S.

Exhibit 6.27



(Source: EIA)

Exhibit 6.28



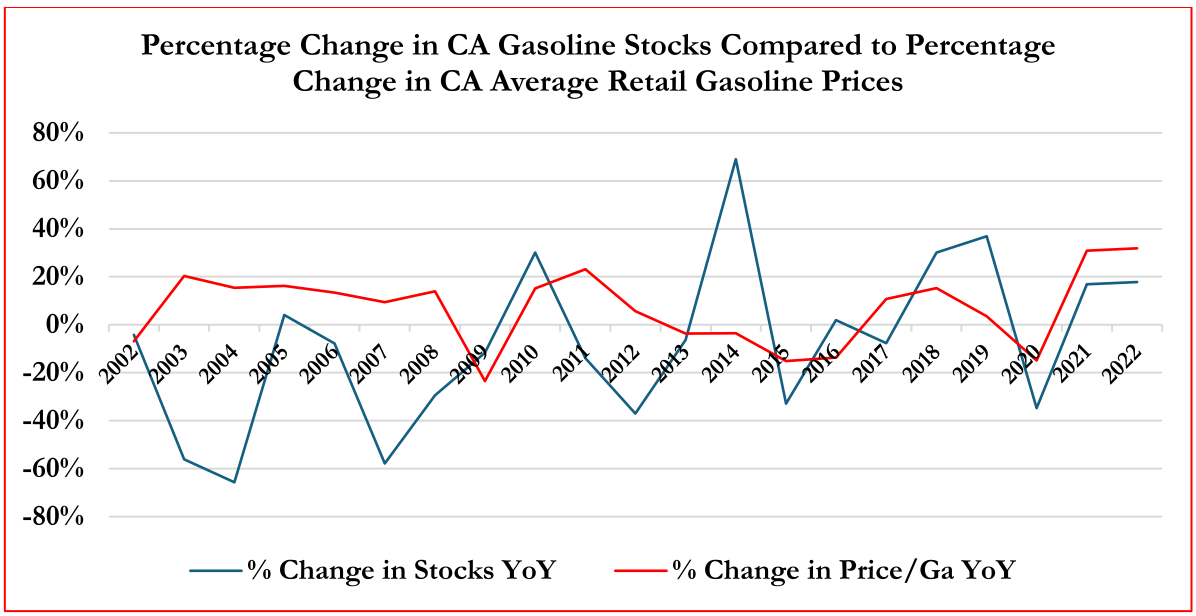
(Source: EIA)

In 2010, gasoline prices in California were approximately $0.31 per gallon higher than the national average outside the state, representing an 11% price gap. By 2022, this difference had widened significantly, with California drivers paying $1.55 per gallon more, or roughly 39% above the rest of the U.S. In 2023, the price gap remained elevated, with California's retail gasoline prices averaging $1.46 per gallon higher, translating to a 41% premium compared to other states.[361]

In spring 2022, gasoline prices in California experienced a sharp increase in retail gasoline prices to $5.91 per gallon on March 29, according to OPIS retail pricing data. This surge was largely driven by supply constraints, including maintenance work and unexpected disruptions at refineries, and the continued recovery in demand post-Covid lockdowns. Notably, PBF's Torrance refinery struggled to restart its fluid catalytic cracking unit, a key component in gasoline production, while Valero Energy's Wilmington refinery was undergoing scheduled (planned) maintenance.[362]

Adding to the supply stress, gasoline inventories had plummeted to 24.675 million barrels by the end of September 2022, the lowest level in a decade and well below the 30-million-barrel benchmark considered a stable supply See Section 3.0).[363] At the same time, gasoline imports into the West Coast were slow to react to the Covid-rebound and dwindled to just 1,000 barrels per day, worsening the shortage.[364]

Exhibit 6.29



(Source: CEC and EIA)

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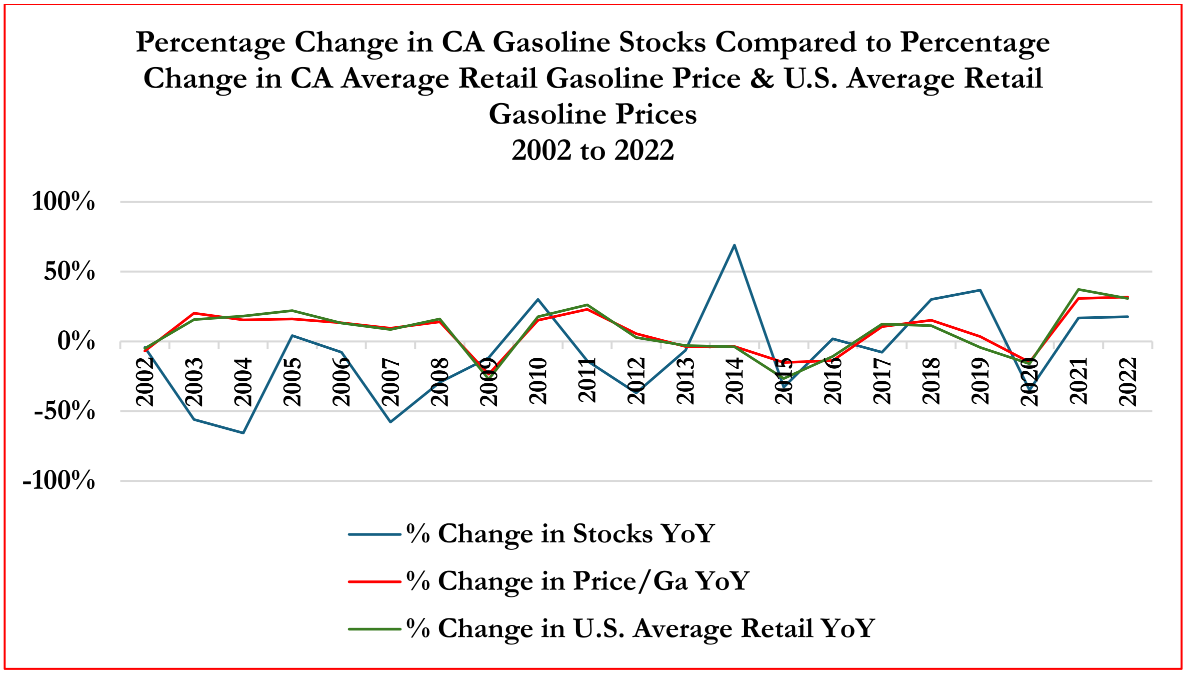
361 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

362 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

363 *Weekly West Coast (PADD 5) Ending Stocks of Total Gasoline (Thousand Barrels)*. (2015). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WGTSTP51&f=W

364 *Weekly West Coast (PADD 5) Imports of Total Gasoline (Thousand Barrels per Day)*. (2015). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=WGTIM_R50-Z00_2&f=W

Exhibit 6.30



(Source: CEC and EIA)

Operational issues at refineries also played a role in driving prices higher. In 2015, a fire in the Torrence refinery disrupted gasoline production while the extra costs of the California cap and trade program became fully effective. On February 18, 2015, ExxonMobil's Torrance, California refinery sustained a catastrophic malfunction resulting in an explosion equal to a 1.7 tremor.[365] The explosion resulted in the refinery being shut down for over a year and being sold to PBF, reopening in May 2016.[366] The February explosion occurred in a month when demand is lower, and refiners are performing planned maintenance and reduced production. During the week of February 16, 2015, the explosion the average retail price for all formulations for California was $2.847. Following the explosion, the average retail price of gasoline jumped 5.38%, for the week of February 23, 2015, and then by 13.24% the week of March 2, 2015. The average price of gasoline spiked a second time during the week of July 13, 2015, during the prime driving season, by 11.55%, from the prior week, on a percentage change basis.

From the week of February 23, 2015, to the week of October 5, 2015, the average weekly retail price of all formulations of gasoline in California ranged between $3.009 to $3.954, a gallon on July 20, 2015, the peak of the summer driving season. The week of October 12, 2016, the average price of all formulations of gasoline in the Golden State fell below $3.00 a gallon and remained below that level until February 20, 2017. On a percentage change basis, for the week of February 27, 2017, the price of gasoline increased by 2% to 3.014 a gallon from the previous week's average of $2.955 a gallon, and remined above $3.00, a gallon, with the exception of the weeks of July 24 and July 17, 2017, when the prices dropped to $2.995 and $2.988, respectively. Correspondingly, while gasoline prices declined, on

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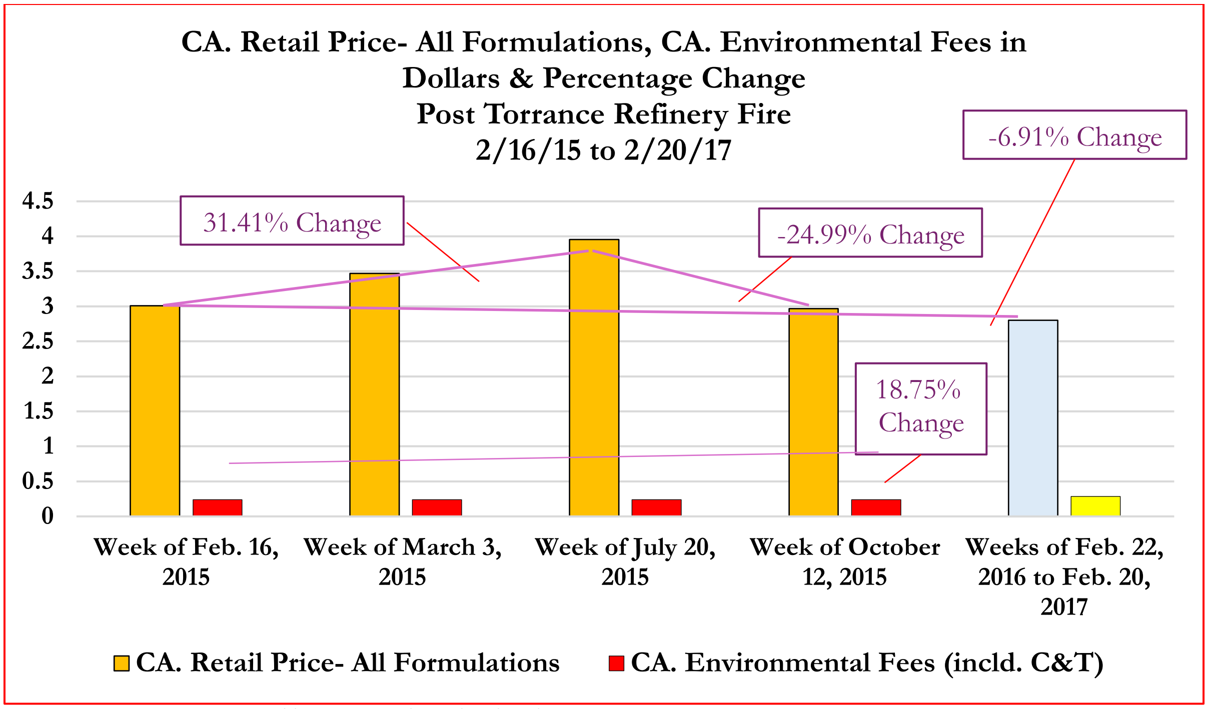
365 Zou, J. J. (2017, February 10). *The ExxonMobil near-disaster you probably haven't heard of*. Center for Public Integrity. https://publicintegrity.org/environment/the-exxonmobil-near-disaster-you-probably-havent-heard-of/

366 Staff Report. (2016, May 10). *ExxonMobil Restarts Torrance Refinery One Year After Explosion*. NBC Los Angeles; NBC Southern California. https://www.nbclosangeles.com/news/local/planned-restart-torrance-refinery-expected-tuesday/2004869/

a percentage change basis by average of 6.91%, California environmental fees increased by 18.75%, for the February 16, 2015, to February 20, 2017, period.

Exhibit 6.31[367]

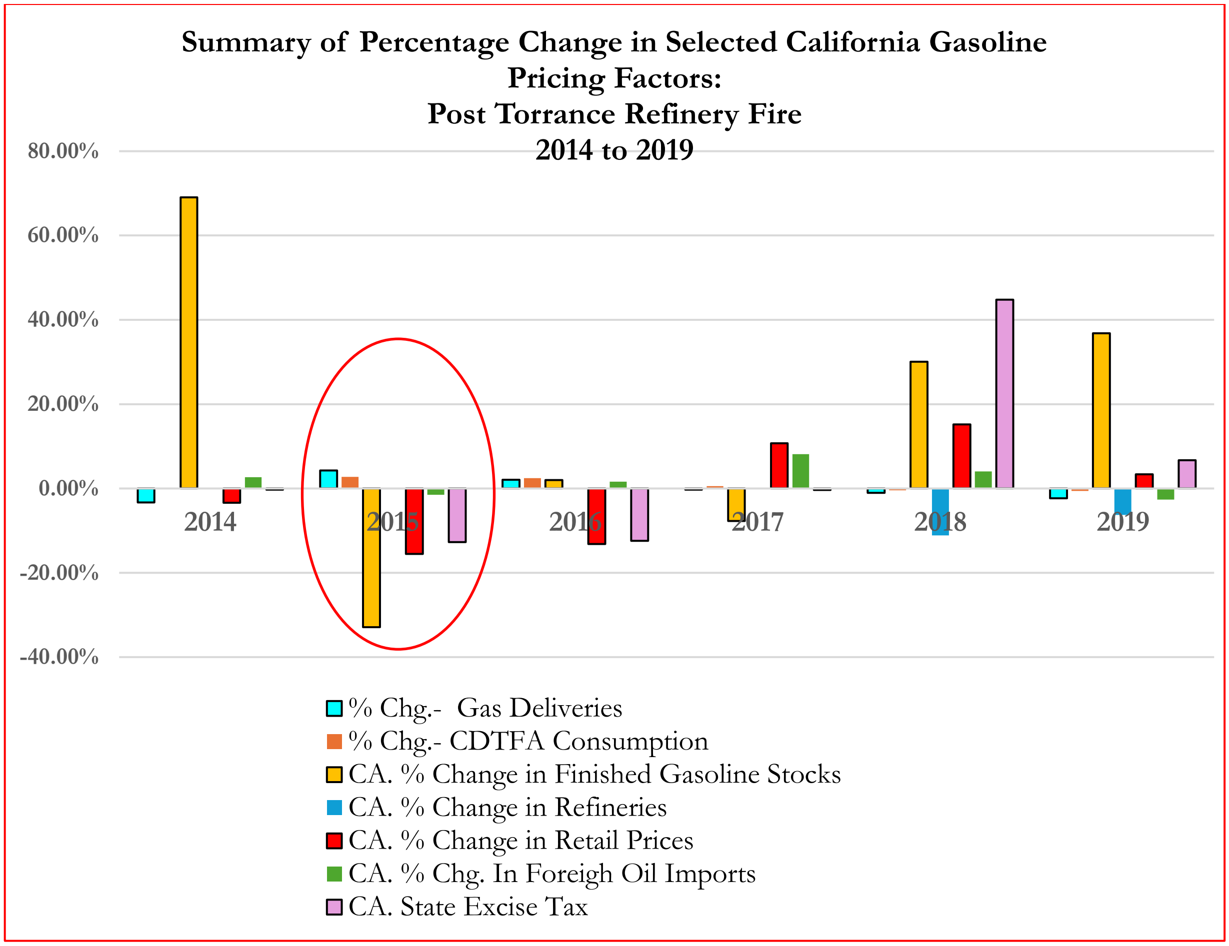


(Source: https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_sca_dpg&f=w)

On a percentage change basis, while gasoline consumption and gasoline deliveries to retail outlets declined slightly, average retail gasoline prices increase, as did the state excise tax, oil imports, and California environmental costs on a per gallon basis.

[367] *Weekly California All Grades All Formulations Retail Gasoline Prices (Dollars per Gallon)*. (n.d.). Www.eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_SCA_DPG&f=W

Exhibit 6.32[368]



In September 2022, three major California refineries were undergoing scheduled maintenance, while an additional facility may have faced an unplanned power outage, though the company did not confirm the disruption. These refinery challenges further constrained fuel production, contributing to the state's price volatility and increased pricing.[369]

From 2000 to 2025, the price differential between California average weekly regular reformulated gasoline prices and the U.S. average for reformulated regular gasoline pre-cap and trade averaged

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[368] *Sales Tax Rates for Fuels*. (2025). Ca.gov. https://www.cdtfa.ca.gov/taxes-and-fees/sales-tax-rates-for-fuels.htm#motor.Commission, C. E. (n.d. a). *Annual Oil Supply Sources To California Refineries*. California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/annual-oil-supply-sources-california; *California Total Gasoline All Sales/Deliveries by Prime Supplier (Thousand Gallons per Day)*. (2020). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=c100050061&f=a; *Fuel Taxes Division Statistics & Reports – 2010*. (2025). Ca.gov. https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts10.htm; *California Finished Motor Gasoline Stocks at Refineries, Bulk Terminals, and Natural Gas Plants (Thousand Barrels)*. (2020). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a *California All Grades All Formulations Retail Gasoline Prices (Dollars per Gallon)*. (2010b). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_sca_dpg&f=m; *California Finished Motor Gasoline Stocks at Refineries, Bulk Terminals, and Natural Gas Plants (Thousand Barrels)*. (2020b). Eia.gov. https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mgfsxca1&f=a

[369] *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

7.84%. Post full implementation of the cap-and-trade program in 2015, the price differential between California and the U.S. based on weekly gasoline prices for regular reformulated fuel expanded to 23.56% by March 2025.

In September 2023, retail gasoline prices in California climbed to $6.083 per gallon. The factors behind this price increase mirrored those from autumn 2022, including low fuel inventories, limited imports, and below-average refinery output.[370] In response to the price surge, the California Air Resources Board (CARB), under Governor Newsom's direction, approved an early switch to winter-blend gasoline on September 28 to help lower costs.[371] Winter-grade gasoline is less expensive to refine than its summer counterpart due to the inclusion of lower-cost fuel formulation components.

At the wholesale level, Los Angeles CARBOB spot prices peaked at $4.3866 per gallon on September 26, with a significant $1.87 per gallon cash differential over the NYMEX RBOB contract, according to OPIS data. However, just a day later, the price had dipped to $4.0501 per gallon, and by September 29, after the RVP transition, it had plunged to $2.9895 per gallon.[372]

Despite claims of gas station owner-operator price gouging, retail gasoline prices tend to be less volatile than wholesale and spot prices due to supply contract structures and station-level inventory management.[373] An OPIS analysis of gasoline price trends in Los Angeles and San Francisco following California's RVP waivers in 2022 and 2023 revealed that while spot and rack prices dropped sharply, retail price declines were more gradual and took longer to be reflected at the pump. Gas station operators generally operate with a 7 to 14 supply of gasoline and with 14-to-30-day purchase contracts from wholesalers and will also react to local competition pricing. In the absence of oil shocks, such as in the 1970s, local prices tend to move slower than either spot or rack wholesale.[374] As California has one of the highest costs of living and one of the highest costs of doing business, it only stands to reason that California gas station operators moderate their reactions to changes in spot and wholesale prices.

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370 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

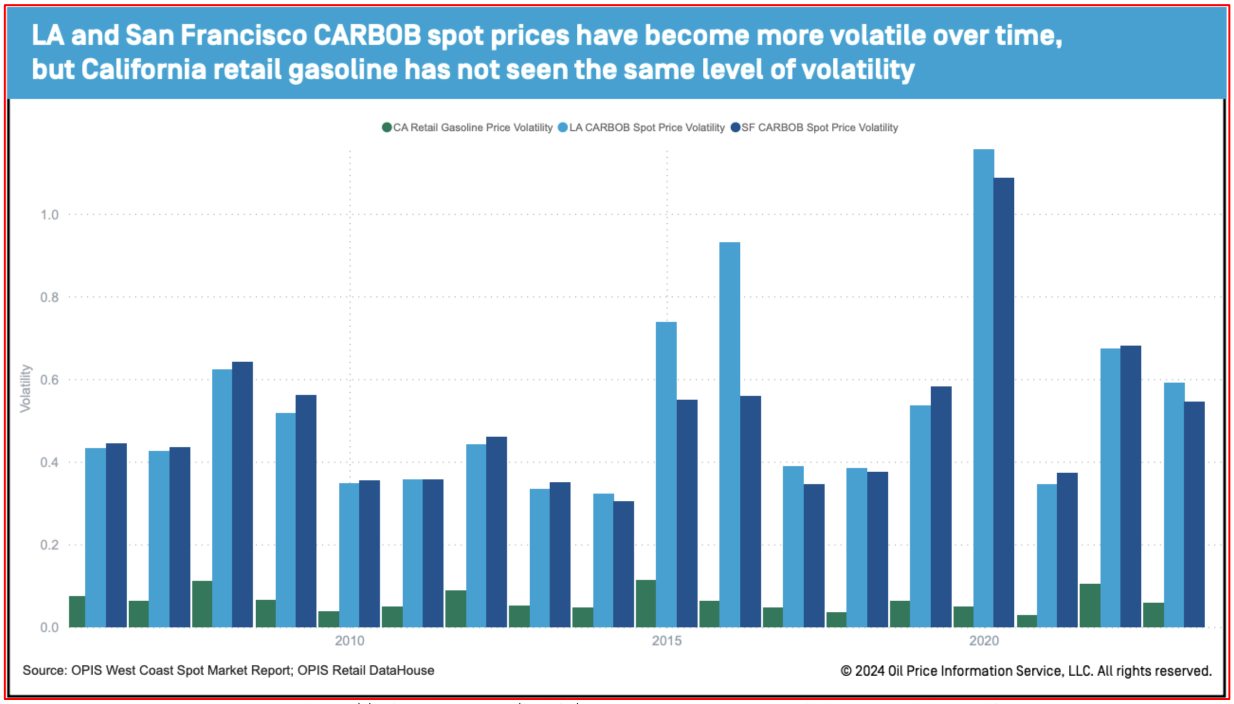
371 https://ww2.arb.ca.gov/sites/default/files/2023-09/RVP_Advisory_2023.pdf

372 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

373 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

374 *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

Exhibit 6.33



(Source: https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf)

Although gasoline price spikes in 2022 and 2023 may give the impression of increased volatility, a deeper analysis of the data presents a more nuanced picture.

- According to OPIS data, California's retail gasoline price volatility between 2006 and 2014 averaged 21.23%, while from 2015 to 2023, it measured 20.53%.[375]

- In contrast, spot market volatility has increased significantly. Between 2006 and 2014, Los Angeles CARBOB spot prices had a volatility rate of 129.9%, but from 2015 to 2023, that figure jumped to 206.4%.[376] Similarly, San Francisco CARBOB spot price volatility rose from 134% in the 2006–2014 period to 181.5% from 2015 to 2023.[377]

The evidence of a stable retail market is further supported by analyzing the week-to-week price movements of California gasoline compared to the U.S. from November 1994 to Jan 2025. Out of the 1567 weeks, the differential widened for 765 weeks and narrowed for 802 weeks. Additionally, the average duration of the differential widening was 2.86 weeks, and the average duration of narrowing was 2.99 weeks.[378] This analysis supports the conclusion that price declines take longer to be reflected at the pump; however, on average, this disparity is very small. This is also evidence against the proposed predatory asymmetric pass-through causality in the 2024 CEC and CDFTA Joint Agency

[375] CA retail regular gasoline price data through November 15, 2023

[376] *California's Gasoline Market: How the State's Unique Structure Impacts Pricing at the Pump*. (n.d.). Retrieved March 11, 2025, from https://info.opisnet.com/hubfs/OPIS-West%20Coast-Spotlight%20Analysis-1.pdf

[377] Los Angeles CARBOB spot price data and San Francisco CARBOB spot price data through December 29, 2023

[378] Analysis conducted by author

report.[379] Additionally, there were 51 weeks where the differential had a Z-score above 2 and only 6 weeks with a Z-score below -2. In these weeks, the California to U.S. price differential reaches well above 40%. This relationship of California having a disproportionately high number of outlier weeks holds true for many relationships, including West Coast Reformulated gasoline to California Reformulated differential (45 outliers with a Z-score above 2 and 9 outliers with a Z-score below -2) and California to WTI spot oil differential (40 outliers with a Z-score above 2, and 9 outliers with a Z-score below -2).[380] This data reveals the fact that California's supply chain is fundamentally vulnerable to price changes, leaving the consumer to pay higher prices for longer periods of time.

The 2024 Joint Agency Study also comments on refinery margins. However, this information is clouded in uncertainty given that the report focuses largely on gross margins and the fact that the CEC states that they "cannot estimate profit margins based on average retail prices and observed wholesale market prices. This is because detailed data on refining and distribution costs, costs paid by approximately 10,000 retail locations, hundreds of wholesale marketers, jobbers, and distributors, is not available."[381] Nonetheless, the joint agency report suggests that gross gasoline refining margins have increased significantly since 2022, implying perhaps that the refineries are engaging in unfair pricing strategies to exploit the consumer. However, the report also states that refining costs and profits in 2022 average 16% of the selling price of gasoline, of which 14% of the selling price of gasoline is normally associated with refining costs.[382] This implies that CEC calculates the profit margin to be just 2%, which is less than a grocery store, and providing strong evidence of fair pricing practices and lack of any malicious price manipulations or profiteering.

For the 2020 to 2024, September refining margins, as well as refiner's net profits per gallon of gasoline produced, have declined significantly across all major U.S. markets since recovering from the Covid restrictions and lockdowns and 2024 highs. The 3:2:1 crack spread also declined in the same period. California refinery margins dropped by around 85% from approximately $1.38, a gallon in September 2023 to $0.20, in September 2024.[383] Furthermore, in November 2023, refinery costs and profits decreased to 10.95% of the price of gasoline.[384] California refineries are not immune from global and U.S. macroeconomic behavior. From January 2023 to November 2024, period retail gasoline sales in California increased by 11.49% , from $4.368 to $4.925 a gallon, while refiner's gross profit margins dropped by 26.%.

[379] *Project Title: SB X1-2 Implementation.* (n.d.). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf
[380] Analysis conducted by author
[381] Commission, C. E. (n.d.). *Estimated Gasoline Price Breakdown and Margins*. California Energy Commission. https://www.energy.ca.gov/estimated-gasoline-price-breakdown-and-margins
[382] *Project Title: SB X1-2 Implementation.* (n.d.). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf
[383] *Global refinery margins fall to multiyear seasonal lows in September - U.S. Energy Information Administration (EIA).* (2025). Eia.gov. https://www.eia.gov/todayinenergy/detail.php?id=63447#
[384] *Project Title: SB X1-2 Implementation.* (n.d.). https://seuc.senate.ca.gov/sites/seuc.senate.ca.gov/files/cdtfa_cec_joint_report_2024_review_of_the_gasoline_in_california_and_relate.pdf

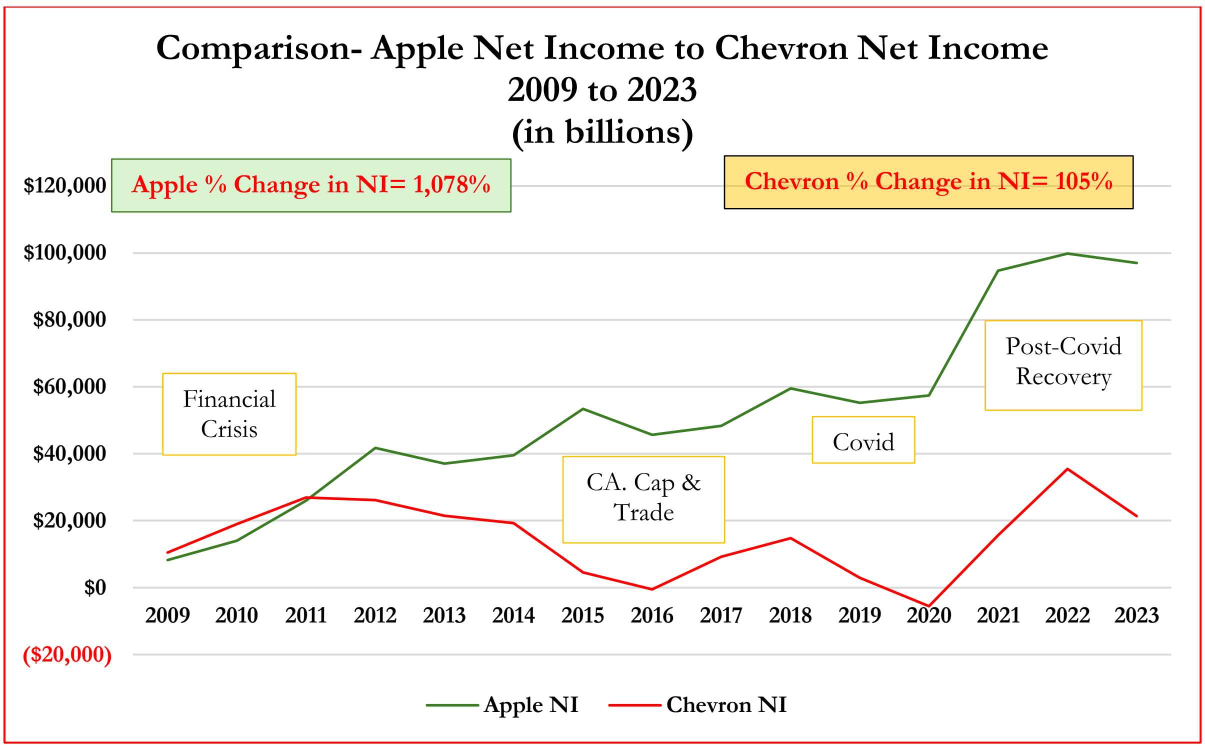
Exhibit 6.34[385]

California Gasoline Prices, Gallons Sold & Refiner Gross Margins (1/23 to 11/24)			
Indicator	**Jan. 2023**	**Nov. 2024**	**Percent Change**
CA. Avg. Retail Price of Gasoline*	4.368	4.935	12.98%
CA. Gasoline Sold **	904,596,000	960,190,000	6.15%
CA. Aggregate Gross Profits**	597,033,360	441,687,400	-26.02%
* EIA data for all formulations; ** CEC data			

Based on data provided to the CEC under SB 1322,[386] CEC analysis of recent 9 months of California refinery data, in-state net profits per gallon for refineries were negative.

For perspective, the below exhibit contrasts the percentage in net profits for California's two most highly valued companies, Chevron and Apple, both of which were headquarter in California in 2025, for the 2009 to 2023 timeframe.

Exhibit 6.35



(Source: https://www.macrotrends.net/stocks/charts/CVX/chevron/net-income#:~:text=Chevron%20annual%20net%20income%20for,a%20381.89%25%20decline%20from%202020, and https://www.macrotrends.net/stocks/charts/AAPL/apple/net-income#:~:text=Apple%20annual%20net%20income%20for,a%2064.92%25%20increase%20from%202020)

[385] https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/california-oil-refinery-cost-disclosure, and https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMM_EPM0_PTE_SCA_DPG&f=M

[386] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB1322

Attachment 3

Takeaways by Bloomberg AI

- California's largest inland oil pipeline is in danger of closing within months without state approval for a rate increase and other measures.
- The pipeline's operator, Crimson Midstream LLC, is losing money and facing "severe financial distress" due to a decline in regional oil production and a shift to rival pipelines.
- A shutdown of the pipeline would likely force Bay Area refiners to resort to more imports of ocean-borne crude and could shift some crude supplies to highways aboard tanker trucks.

California's largest inland oil pipeline is in danger of closing within months without state approval for a rate increase and other measures, a shutdown that would choke off some crude supplies to at least two San Francisco-area refiners.

Crimson Midstream LLC's San Pablo Bay Pipeline that hauls oil from the Bakersfield area to Northern California refiners is losing $2 million a month, creating "severe financial distress" for the company, Robert Waldron, CEO of Crimson's parent CorEngery Infrastructure Trust, wrote in a letter to Governor Gavin Newsom's office this week.

The pipeline's fortunes have waned amid a "sudden and unexpected shift" of regional oil production to rival pipelines serving Los Angeles-area fuel makers, Waldron wrote. Crude pipelines are designed to pump certain quantities of oil and when volumes fall below the minimum ranges, the costs of operating them can soar.

The Western States Petroleum Association has been warning California lawmakers since last year that dwindling Central Valley oil production risked shuttering pipelines such as the San Pablo Bay conduit. Valero Energy Corp.'s Benicia refinery and PBF Energy Inc.'s Martinez plant, which account for roughly one-fifth of the state's fuel-making capacity, are dependent on Central Valley crude for some of their supplies.

Any interruption in San Pablo Bay Pipeline shipments would likely force Bay Area refiners to resort to more imports of ocean-borne crude, Waldron warned. Crimson is seeking a 37% increase in the fees it can charge to crude shippers, a temporary $3.75-a-barrel tariff hike, and other measures.

California Crude Output Has Been Sliding for Decades

Source: EIA

“Unfortunately, Crimson is now facing severe financial distress,” Waldron wrote. “Without near-term relief, Crimson will likely be forced to shut down the SPB Pipeline this fall.”

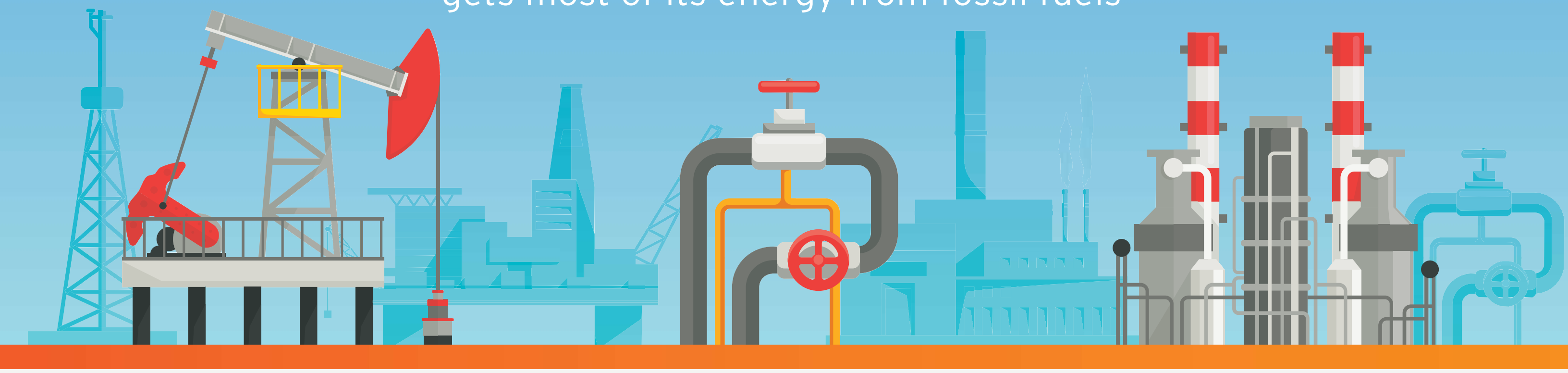
California crude output has fallen by more than 70% in the past four decades as fields first tapped in the early 20th century began to run dry, competition increased from lower-cost sources, and some of the nation’s strictest environmental rules piled on costs. Newsom is seeking to make it easier for inland drillers to obtain permits and boost oil output, while further restricting offshore crude production.

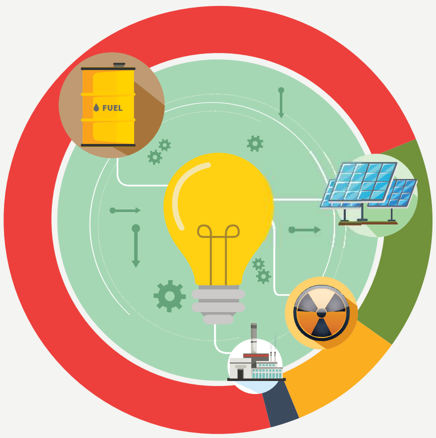
The San Pablo Bay Pipeline is the larger of two conduits carrying crude to Northern California. The pipeline’s minimum, daily operating capacity is around 60,000 to 65,000 barrels, according to consultant Turner, Mason & Co. Waldron noted that a shutdown risks shifting 15,000 barrels of daily crude supplies to highways aboard tanker trucks, suggesting the pipe already is running significantly below capacity.

Attachment 4

WHERE CALIFORNIA GETS ITS ENERGY

California is the world's 5th-largest economy and gets most of its energy from fossil fuels





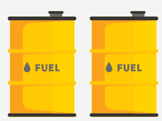
73% Fossil Fuel

16% Renewables

9% Other

2% Nuclear

U.S. Energy Information Administration



California Oil Production

463,000 BBL /day

California Oil Usage

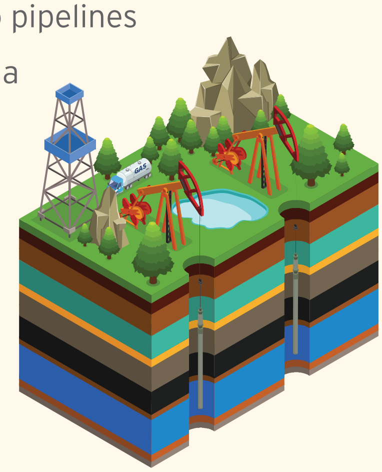
1,800,000 BBL /day

California Energy Commission

California uses almost **4x** more oil than it produces and accounts for 55% of net energy imports for the entire United States

CALIFORNIA, THE "ENERGY ISLAND"

There are currently no pipelines to bring oil to California from any other part of the United States. California must rely on imported oil to make up the difference



CALIFORNIA'S

TOP 5

FOREIGN OIL SOURCES (2019)

- *Saudi Arabia* **87,601,000 BBL**
- *Ecuador* **62,370,000 BBL**
- *Iraq* **58,730,000 BBL**
- *Colombia* **32,814,000 BBL**
- *Nigeria* **19,528,000 BBL**

California Energy Commission

WHY IT MATTERS

LESS ACCOUNTABILITY

Oil exporting countries do not adhere to California's safety, labor, human rights, and environmental standards

ENVIRONMENT HEALTH INDEX

U.S.	82.8
COLOMBIA	51.6
ECUADOR	50.2
SAUDI ARABIA	47.5
IRAQ	39.5
NIGERIA	31

Yale University

GLOBAL FREEDOM SCORES

U.S.	85
ECUADOR	67
COLOMBIA	65
NIGERIA	45
IRAQ	29
SAUDI ARABIA	7

Freedom House

HIGHER COSTS

Imported foreign oil costs Californians over

$25 BILLION

a year and is less reliable and less sustainable

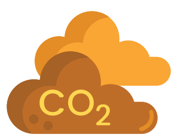
Capitol Matrix Consulting

NEGATIVE ENVIRONMENTAL IMPACT

THE LARGEST OIL TANKERS BURN NEARLY **4 TONS** OF FUEL EVERY DAY THEY ARE ANCHORED

International Council on Clean Transportation

EACH SHIP EMITS **11+ TONS** OF CARBON DIOXIDE PER DAY



International Council on Clean Transportation

A FOREIGN OIL TANKER TRAVELS AN ESTIMATED **8,865 MILES** AND AVERAGES **0.004 MILES PER GALLON** TO CALIFORNIA'S PORTS

Energy & Infrastructure of PTS Advance

OIL TANKERS ACCOUNT FOR **13%** OF WORLD MARINE CO2 EMISSIONS

International Council on Clean Transportation

KERNEDC
ECONOMIC DEVELOPMENT CORPORATION

Attachment 5

Energy Transition Squeeze: The Phillips 66 Los Angeles Refinery Closure

Megan Boutwell | Nov 20, 2024

As part of our consulting practice, Stillwater pays close attention the regulatory and market forces driving changes in the transportation energy transition and how these [1] changes impact fuel supply and demand. The recent announcement from Phillips 66 that they'll be ceasing refining operations at the Los Angeles refinery complex at the end of 2025 is not surprising given the regulatory and market pressures California refiners are facing. In this article, we take a look at the compounding pressures on California refineries and provide analysis on the impact of the Phillips 66 LA refinery closure on near-term supply in Southern California.

California refiners feeling the squeeze from regulatory and market pressures

California refiners face unique and compounding pressures, making continued operations a challenge. These range from overall gasoline and diesel demand destruction to declining California crude oil production, to the California Air Resources Board (CARB) expanded "At-Berth" regulation, and a new state law establishing a maximum gross gasoline margin.

Petroleum Product Demand Destruction: One of the key factors contributing to petroleum product demand destruction in California is the success of the low carbon fuel standard (LCFS) to incentivize the transition of the petroleum diesel pool to renewable diesel (RD) and biodiesel (BD). The most recent CARB data for the LCFS program shows RD and BD together made up 75% of the California diesel pool in the second quarter of 2024. This has contributed to length in the California petroleum diesel market, requiring excess production to be exported.

While gasoline has been difficult to replace with lower carbon alternatives, other factors including enhanced fuel efficiency for internal combustion engine vehicles (ICEVs), the adoption of zero emission vehicles (ZEVs), and remote work have led to a 10% drop in **California gasoline demand** since 2015.

California Crude Oil Production Decline: California crude oil production has been declining at an average rate of 2% per year since the 1980s. Starting in 2019, California restricted in-state crude oil production, leading to a **24% decline** in volume between 2019 and 2023. The production decline appears to be accelerating this year, as the first six months of 2024 showed production 12% lower than the first six months of 2023. The state's efforts to curb crude oil production have continued into 2024. **Governor Newsom** directed regulators to end the issuance of new permits for fracking by January 2024. The governor has also requested CARB analyze pathways to phase out oil extraction across the state by no later than 2045.

As local crude production delivered by pipeline has decreased, refiners have had to increase imports of waterborne alternatives to maintain fuel production. In 2023 the largest contributors of **foreign sources of crude oil** to the state included Iraq, Saudi Arabia, and Brazil. Most California refineries were engineered originally to process California crude oil. While refineries have adjusted to run alternate crudes, the quality does not match that of local production and results in decreased refinery utilization and efficiency. Bottom line: Importing waterborne crudes increases supply risk, lowers fuel production, and increases costs.

At-Berth Regulation: CARB's At-Berth regulation, authorized by the U.S. Environmental Protection Agency (EPA), requires that each vessel visiting a regulated California port or marine terminal must use a CARB Approved Emission Control Strategy (CAECS) to control emissions for the duration of each visit, unless the visit qualifies for an exception. Starting in 2023, the At-Berth regulation applied to container, reefer, and cruise vessels for visits to all regulated terminals. The regulation expands starting in 2025 to include roll-on-roll-off vessel visits to all regulated terminals and tanker vessels for visits to terminals at the Ports of Los Angeles and Long Beach. In 2027, the regulation will apply to tanker vessel visits to all regulated terminals. Stakeholders, including refiners, are concerned about the barriers to compliance which include significant infrastructure upgrades like shore power installations and retrofitting existing vessels to be shore power compatible. This creates challenges for foreign flag vessels that do not invest in retrofitting to meet the new regulation and decreases the supply of vessels that are available to charter. A smaller fleet of At-Berth compliant vessels available to charter will impact refiners' ability to export petroleum diesel and import crude oil and refined products, adding cost.

Maximum Gross Gasoline Refining Margin Regulation: In March 2023, the state legislature adopted **SBx 1-2, the California Gas Price Gouging and Transparency Law**, which authorizes the establishment of a maximum gross gasoline refining margin and the imposition of a financial penalty for refiner profits above the maximum margin. The regulation expands the reporting obligations related to maintenance and business of California refineries to the California Energy Commission (CEC). The law created the Division of Petroleum Market Oversight (DPMO) within the CEC to analyze the data provided by all participants in the state's petroleum industry. It authorizes the CEC to regulate the timing of refinery turnarounds and other maintenance activities in certain instances to mitigate supply shortages and price spikes.

In the case of Phillips 66, their West Coast Realized Margins are already tight and shrinking. According to their **most recent quarterly report,** West Coast Realized margins[1] for the first three quarters of 2024 was $9.34 per barrel. This is a significant loss as compared to the first three quarters of 2023 at $21.40 per barrel. While these margins sound like a lot, in fact P66's

3Q2024 net income was negative (showing a loss of $6.64 per barrel) because of high expenses.

What is the impact on product supply and demand?

To understand California product supply and demand balances, it's helpful to zoom out for a look at the U.S. West Coast (USWC) transportation fuel production and distribution landscape. The map below was developed for the **2015 EIA PADD 5** study. While production facilities and product flows have remained largely the same, many of the refineries shown on the map have changed hands over the nearly 10 years since this report was published. As well, Marathon and Phillips 66 have converted their Bay Area refineries to renewable fuel production. The table to the right of the figure lists the most up to date USWC refining companies, locations, and refinery capacity.

The P66 Los Angeles refinery (number 4 in the group of facilities identified on the map near Los Angeles) consists of two facilities which are five miles apart in Carson and Wilmington and are linked by pipeline. The refinery complex production capacity is 139 thousand barrels per day (kbd), producing about 70 kbd of gasoline and 40 kbd of diesel, along with other refined products. P66's LA refinery supplies refined products to customers in California, Nevada, and Arizona by pipeline and truck.

Current gasoline production capacity in Southern California is about 541 kbd, while diesel production is 138 kbd. P66's LA refinery closure takes about 13% of gasoline and 29% of diesel production out of the Southern California market. This leaves the market balanced for diesel but short for gasoline in the near term, requiring foreign imports. A short gasoline market, reliant on imports, will lead to an increase in retail gasoline price because of the cost to transport imported gasoline from supply sources in Korea, India, or the UK.

The transportation energy transition requires a forward-looking view of supply and demand balances

The transportation energy transition is going to get bumpy. Regulatory and market conditions are likely to squeeze other West Coast refiners out of the market before enough EVs can be adopted to further reduce demand. This will result in gasoline demand exceeding supply, which will raise prices due to increases in the volume of long-haul imports required.

Stillwater has developed a West Coast Supply and Demand Outlook, available to consulting clients, which offers a clear view of the impact of these forces on the market. **Contact us** to learn more.

We see things others miss.

From understanding policy shifts to emerging technology, we'll help you navigate the challenges in the transportation fuels market.

“Margin” refers to the difference between the price of the refined products a refinery sells and the cost of the crude oil it buys. This is different from “profit” which is the actual monetary gain after all expenses are deducted from the margin.

Attachment 6

June 27, 2025

Dear Governor Newsom,

Thank you for the opportunity to respond to your April 21, 2025, letter soliciting recommendations from our office on changes to state policy to ensure adequate transportation fuels supply during this pivotal time in our state's clean energy transition. In the months since receiving your letter, your energy team has engaged with the Petroleum Strategy Task Force, continued deep research into global petroleum market trends, convened roundtables and discussions with diverse stakeholders representing varied interests, and utilized new data afforded to us by legislation enacted over the last several years to better understand the petroleum industry.

This letter offers our strategies and recommendations to address your request for actions to ensure that Californians have access to safe, affordable, and reliable transportation fuels and that petroleum refiners continue to see value in serving the California market, even as in-state demand for petroleum-based fuels declines over the coming decades. These recommendations reflect the complexity of the issue, input from a multitude of stakeholders, and a faithful synthesis of robust data and discussions. We believe that these actions are necessary as the State considers its next steps to further our clean energy transition.

We look forward to working with members of the Legislature, fellow state agencies, industry, and stakeholders to implement these strategies. Together, we will evolve California's strategy to successfully phase out petroleum-based fuels by 2045 while protecting communities, workers, and consumers, and foster market conditions that support the industry's ability to operate safely, reliably, and successfully to meet demand through the transition.

Executive Summary

California's petroleum market is evolving rapidly, as California's pioneering climate and air quality policies, which are critical to protecting our communities' health, have accelerated the adoption of highly fuel-efficient conventional vehicles and zero emission vehicles (ZEVs), leading to a decline in demand for petroleum-based fuels. The decreasing demand for petroleum-based fuels underscores California's success in its transition to a sustainable, clean energy future. But the decreasing demand, economic factors, and volatility of the international petroleum market also introduces uncertainty to the petroleum industry, which impacts consumers, the workforce, and fenceline communities. That uncertainty has only been compounded this year by actions of the current federal administration, which have both added more shocks to the global petroleum market and sought to undermine California's transition away from reliance on petroleum-based fuels.

In California, recent years have been marked by higher gasoline retail prices, in-state petroleum refinery conversions and exits, and a growing reliance on fuel imports to meet consumer demand. These impacts are not isolated to California and are also being felt nationally and globally. To address dramatic gasoline retail price spikes, you partnered with the Legislature in 2023 and 2024 to provide the CEC with new industry and market transparency tools to better understand the causes behind gasoline price spikes and to develop strategies to protect consumers during the transition to clean, alternative fuels.

Current analysis indicates a continued decline in gasoline demand; a credible risk of rapid near-term conversions or exits of existing refineries, which is consistent with global refinery industry consolidation; impacts to other critical infrastructure across the upstream, midstream and downstream segments; and safety and reliability challenges associated with disinvestment along the petroleum value chain.

The success of California's decarbonization strategies are transforming the state's transportation sector from its early transition phase into its pivotal and challenging "mid transition" phase.[1] In this phase, demand for the

[1] Grubert and Hastings-Simon (2022). *Designing the mid-transition: A review of medium-term*
challenges for coordinated decarbonization in the United States. WIREs Climate Change. https://doi.org/10.1002/wcc.768

incumbent petroleum-based fuel system, while declining, remains substantial, as the clean, alternative fuel system continues to scale. In this phase, investor confidence in the incumbent system is expected to falter due to long-term uncertainty about the trajectory and pace at which these two systems evolve.

During this mid-transition phase, the State must simultaneously continue supporting the rapid expansion of new clean, alternative fuels while actively managing a gradual responsible phase-down of the incumbent systems that millions of Californians will continue to depend upon for years to come. Successfully managing this transition and continuing the State's long-standing leadership in addressing climate, air quality, health, and environmental issues will require coordinated actions and strategic alignment of state, regional, and local jurisdictions.

As a result of all of these factors, immediate State actions are necessary to stabilize the near-term vulnerabilities of the entire transportation system and implement a comprehensive strategy to support a successful transition. Given sufficient time, the petroleum market is likely to find a new equilibrium following the disruption of a refinery closure, but in the near term, an abrupt loss of refining capacity and the increased need for imported fuel to compensate is likely to create new risks for stable fuel prices and supply. Keeping in-state and imported fuel competitive will be an important balancing act moving forward, because if the cost of refining fuel in state exceeds the cost of importing fuel, it could further accelerate additional petroleum refinery exits.

Collaboratively, we must harmonize regulations and processes to maximize market-driven solutions and continue to advance State policy goals. By doing so, the State can ensure safe and reliable operations through an orderly, managed transition of the petroleum sector that safeguards California consumers, workers, communities, and the environment.

Since receiving your April 21, 2025 letter, my office has continued its engagement with the cross-agency Petroleum Strategy Task Force, other relevant state and local regulators, industry, and impacted stakeholders and communities. Drawing from this engagement and lessons learned from energy transition challenges in other sectors nationally and internationally, we have identified both risks to fuel supply and opportunities to support a managed transition in the transportation sector. Our office recommends the pursuit of three concurrent strategies:

1. Stabilize fuel supply through imports of refined fuels and maintaining in-state refining capacity.
    a. Support necessary import of refined fuel products (such as California-specific gasoline) by addressing regulatory and permitting issues that limit import capacity.
    b. Retain in-state petroleum refining capacity where possible to maintain resilience of the transportation fuels system.
2. Provide sufficient confidence to industry to invest in maintaining reliable and safe infrastructure operations to meet demand.
    a. Stabilize in-state crude oil production and distribution to bolster supply for California refineries and support the petroleum fuels system.
    b. Implement near-term statutory and regulatory changes that improve investment confidence while advancing state policy goals.
    c. Strengthen coordination across state, regional, and local authorities, communities, and stakeholders to inform policy implementation.
3. Develop and execute a holistic transportation fuels transition strategy.
    a. Implement a suite of policies and programs to ensure environmental, public health, labor, economic, and consumer protections for a successfully managed transportation fuels transition.

The recommendations laid out in this letter reflect the complexity of the issue, input from a multitude of stakeholders, and a faithful synthesis of robust data and discussions. We believe that these actions are necessary as the State considers its next steps in the clean energy transition.

Introduction and Background:

Over the past two decades, California has embarked on a transformative effort to decarbonize its economy. Through pioneering climate and air quality policies, the state has:

- Catalyzed the development of clean energy technologies,
- Fostered new clean energy industries employing tens of thousands of Californians,
- Decreased annual gasoline demand by more than 2 billion gallons (13.4%) in 8 years,
- Replaced more than 2 billion gallons of fossil diesel with renewable diesel, resulting in nearly 72% of diesel needs met by renewable diesel,
- Increased zero emission vehicle (ZEV) adoption from an annual rate of 7.8 percent new vehicle sales in 2020 to over 25 percent in 2024, and
- Made significant progress in improving air quality for communities across the state, including reducing over 77,500 tons of NOx since 2016, and
- As a result of the Low Carbon Fuel Standard (LCFS), the variety of transportation fuels and consumer choices have increased including rapid deployment of renewable diesel and zero emission infrastructure and will reduce fuel costs for Californians per mile by 42% translating to savings of over $20 billion in cost savings by 2045.

At every inflection point—whether driven by market changes, climate and public health imperatives, national and global policy shifts, or technological breakthroughs—California has enacted forward-looking policies, regulations, and processes to continue advancing its decarbonization goals while prioritizing affordability, safety, and reliability.

Now, as the transportation sector enters a new phase in its transition, marked by rapid changes in the petroleum fuels system, California needs to once again continue to evolve its strategy to ensure success. If a lack of proactive management during this phase of the transition leads to rising energy prices and less reliable fuel supplies, that instability could erode support for continued decarbonization. We must take the necessary steps to chart a path for an orderly and safe transition away from legacy petroleum-based systems that maintains system reliability, protects communities, workers, and consumers, and continues to advance the state's decarbonization trajectory.

Shifts in Petroleum Fuel Supply: A Global Issue and Californian Opportunity

California's petroleum value chain is complex and must be considered holistically in managing the transportation fuels transition (Figure 1). It supplies gasoline, diesel, jet fuel and other petroleum derivatives, and consists of interdependent activities and infrastructure that include:

- Upstream activities related to production of crude oil,
- Mid-stream activities related to gathering, storing, processing, and transporting petroleum products, and
- Downstream activities related to refining and distribution, marketing and sale of refined products.

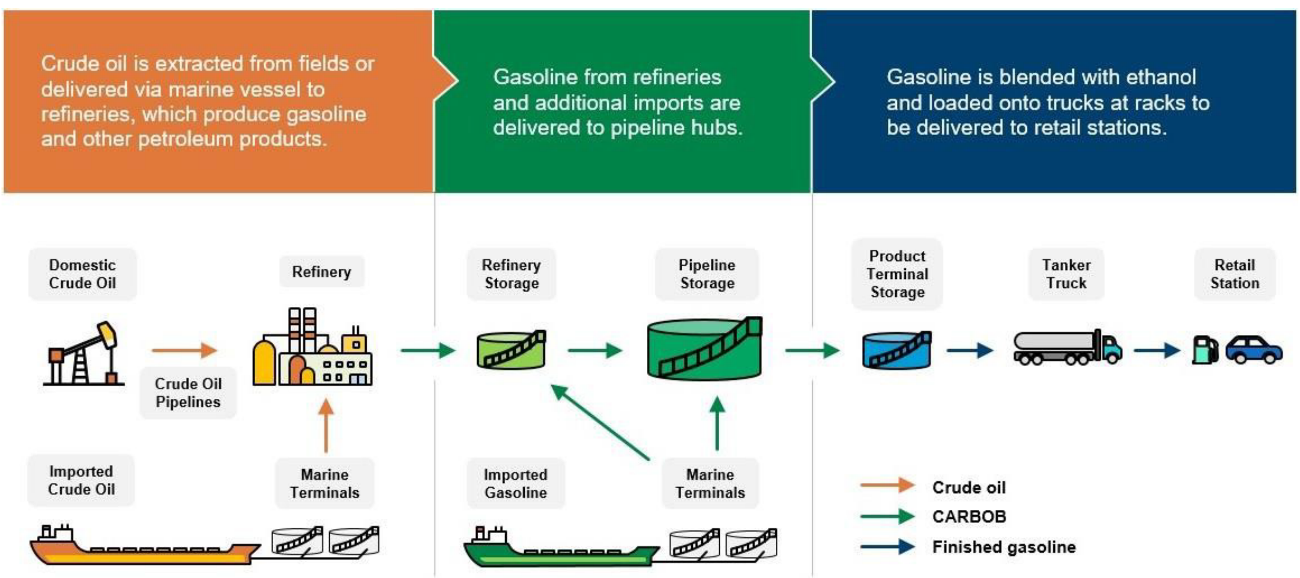


Figure 1. The petroleum value chain is complex and interdependent, and policies should consider the system holistically. Investments across the value chain are necessary for a managed decline.

California currently imports over 75% of its crude oil to meet the demand of in-state petroleum refineries and about 10-20% of its gasoline from out-of-state and foreign sources, depending on refinery maintenance activities. Gasoline imports statewide could increase to 25-35% of demand by the summer of 2026, and up to 50% in the northern California region after the announced anticipated refinery closures, bringing risk of supply disruptions and price volatility. The interdependent elements of the petroleum-based system therefore cross state and national boundaries and contain critical vulnerabilities tied to changes in local, state, federal, and international policies, markets, and events.

A wide range of factors affecting the petroleum value chain are accelerating the decline and consolidation of the refining industry in many U.S. states, as well as developed economies across the globe. One in five refineries globally risk shutdown by 2030[2]. Across the nation, petroleum refiners face the conjoined challenges of rising operating costs, softening demand for some refined products, and competition from newer, more efficient mega-refineries in other countries. Geopolitical events and changing federal and foreign government policies are also impacting industry decisions. Further, many national petroleum refineries, including some in California, are well over 100 years old and require substantial financial investments to maintain safe and reliable operations. In recent years, these factors have driven the closure of petroleum refineries in places as diverse as Australia, the United Kingdom, and multiple states, including some that have been perceived as especially profitable settings, like Texas.

As a result of such factors and as California's policies continue to drive down demand for petroleum-based fuels, California's in-state petroleum refining capacity has been declining faster than its demand for refined petroleum products and has been supported by increase in imports of refined products. Future trends are uncertain: recent federal actions and policies, including undercutting California's clean air standards and its impact on ZEV adoption combined with global conflicts (currently, about 30% of crude supply to California's refineries comes from the Middle East), are creating further uncertainty in both in-state demand for refined gasoline and global petroleum markets. To prevent a further exacerbated imbalance of supply and demand from harming Californians—whether through disrupted fuel supply, insufficient facility maintenance, or ongoing pollution threatening public health—and to maintain resilience in the

[2] Wood Mackenzie (2025). *Global 2035 refinery closure threat update: Which assets are most at risk of closure?. https://www.woodmac.com/news/opinion/global-refinery-closure-outlook-2035/*

system in light of ongoing uncertainty, the State must actively manage the decline of its legacy petroleum-based systems while maintaining affordable, reliable, safe, and equitable access to transportation fuels statewide.

Proactively Navigating the Challenges of the Mid-Transition

California is entering a pivotal and challenging phase of decarbonization described in scholarly work as the "mid-transition," in which the demand for the incumbent petroleum-based system, while declining, remains substantial, and the clean alternative fuels, continue to scale up[3] (Figure 2). Over the past five years:

- Two Californian refineries, Marathon Martinez and Phillips 66 Rodeo, have converted to producing renewable fuels —transitions that support the State's shift to cleaner, less carbon-intensive fuels, but that have also reduced gasoline refining capacity in the state.
- Phillips 66 has announced its intent to close its Wilmington refinery in the fourth quarter of 2025. Phillips 66 has committed to working with California to maintain or increase levels of supply to meet consumer needs, including through imports[4].
- Valero has announced its intent to idle, restructure, or cease refining operations at its Benicia refinery by the end of April 2026.

[3] Grubert and Hastings-Simon (2022). *Designing the mid-transition: A review of medium-term challenges for coordinated decarbonization in the United States*. WIREs Climate Change. https://doi.org/10.1002/wcc.768
[4] https://investor.phillips66.com/financial-information/news-releases/news-release-details/2024/Phillips-66-provides-notice-of-its-plan-to-cease-operations-at-Los-Angeles-area-refinery/default.aspx

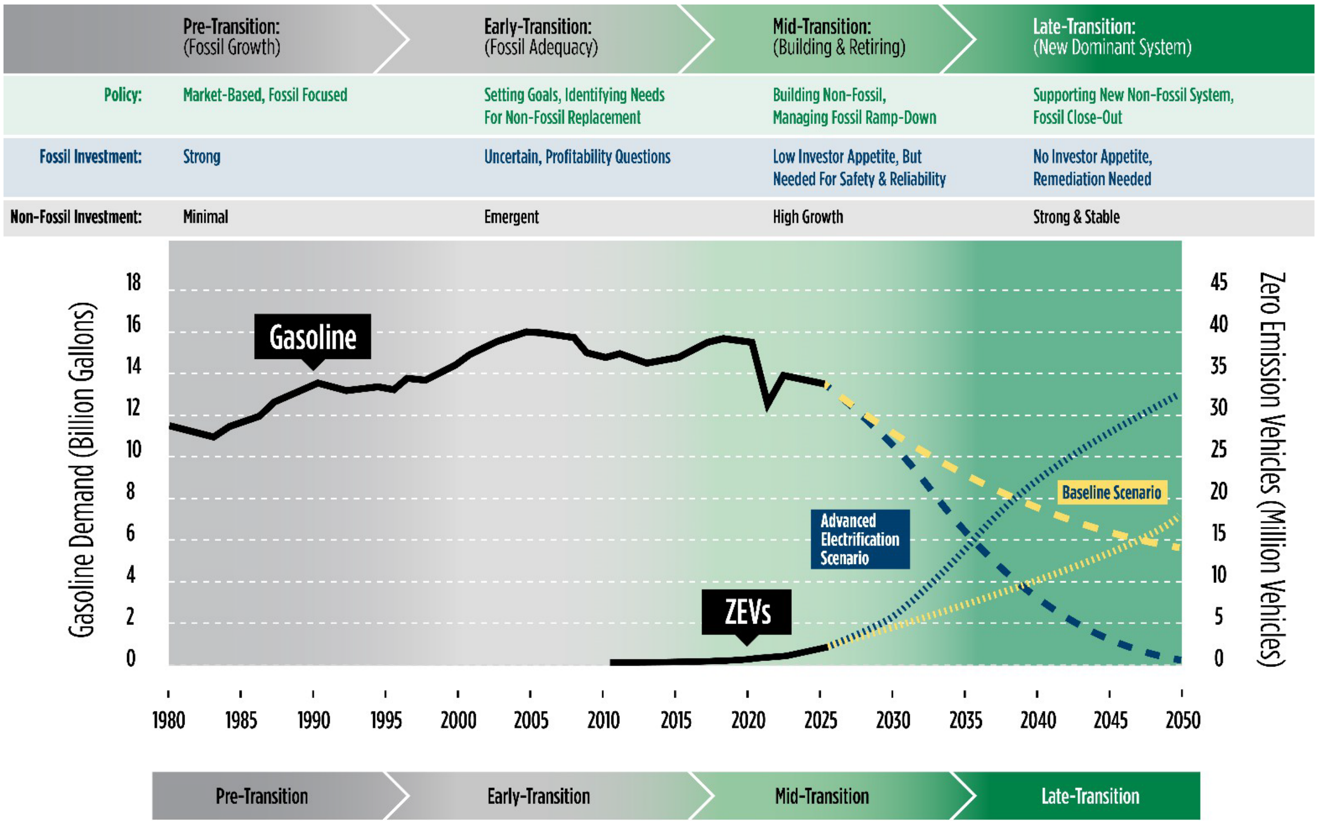


Figure 2. California has entered the mid-transition, a critical phase in which the State must not only support the growth of new clean energy systems but also manage the phase-out of their fossil-fueled predecessors. The CEC's 2024 Integrated Energy Policy Report (IEPR) includes two scenarios for gasoline demand and ZEV adoption: a baseline scenario and a higher transportation-electrification scenario.

To ensure energy reliability and economic stability, sustained investments in both legacy and emerging infrastructures are essential during the mid-transition to support the totality of market needs. Sudden and unmanaged exits of critical legacy energy infrastructure can have significant negative impacts on energy security, local governments, worker safety, consumer prices, public health, environmental protection, and the communities that depend on jobs and revenue from those industries.

To protect consumers, frontline communities, workers, the economy, and the environment, California's policies must simultaneously achieve two objectives:

1. Accelerate deployment of renewable and low-carbon technologies to sustain decarbonization momentum.
2. Establish clear mechanisms and incentives to keep legacy petroleum-based assets safe, reliable, and affordable until the new clean energy system can fully replace them.

Current analysis suggests that under today's market and regulatory conditions, California faces the prospect of continued reduction in in-state petroleum refining capacity that outpaces demand decline for petroleum-based fuels and closures of other critical parts of the state's petroleum-based fuel value chain. Without a clear, state-led transition pathway, these sudden exits create a very real risk of severe price spikes, supply constraints, and long-term liabilities at sites. The industry is likely to become more heavily concentrated with fewer but more powerful incumbent firms. Given sufficient time, the petroleum market is likely to find a new equilibrium following the disruption of a refinery closure, but in the near term, an abrupt loss of refining capacity and the increased need for imported fuel to compensate is likely to increase price volatility. Keeping in-state and imported fuel competitive will be an important balancing act moving forward, because if the state's regulatory paradigms lead to the cost of refining fuel in state exceeding the cost of importing fuel, it could further accelerate additional refinery exits.

By contrast, proactive state policy can not only prevent these potential severe risks, but also achieve a just, least-cost transition to clean energy, while securing major benefits for fenceline communities, consumers, petroleum industry workers, and the environment. It will be increasingly important to foster a competitive market open to all. Adjusting conditions that help steer the market in ways that align decline in California's petroleum-based fuel production with in-state and regional demand can also make California's energy systems more resilient in an increasingly unstable national and international context.

These market adjustments must also align with California's trailblazing climate policies. The State's longstanding commitment to protecting air quality, public health, and the environment, as well as recent actions to enhance consumer protections against gasoline retail price spikes, provide a strong foundation on which California can solve the interlocking challenges of the mid-transition. By learning the lessons of past industrial transitions and of refinery closures around the country and the world, California can once again chart a groundbreaking policy path—this time, for the safe, effective, and necessary transition away from petroleum-based fuels.

In designing policies to manage the decline of California's petroleum fuel system, policymakers face a set of interlocking issues that must be addressed together to support a successful transition:

Reliability and Affordability of Supply: California faces an unusually tight set of constraints on its access to supplies of crude oil and refined petroleum products. Geography and the state's long energy history both largely limit the state to in-state production and marine imports. To combat air pollution and meet federally required air quality standards, California has also long used a specialized gasoline blend that is produced by a limited number of refineries worldwide. Domestic demand for this gasoline already outstrips in-state refineries' cumulative capacity. Under these supply constraints, even a single refinery outage can lead to gasoline price increases.

Increasing marine imports of gasoline to replace lost supply especially in the near term can be costly, slow, and constrained by bottlenecks in import infrastructure. Imports also introduce new vulnerabilities into the fuel supply by making the State more exposed to impacts of geopolitical events, external markets, and regulatory changes in other jurisdictions. Nonetheless, California is likely to become more dependent on imports of refined fuels if the decrease in in-state refining capacity continues to outpace declining demand and proactive planning is needed.

Safety and Reliability of Infrastructure: Petroleum refineries are high-hazard infrastructure that require regular investment in maintenance to protect workers and communities from accidents. Without policy intervention, declining capital inflows could lead to deferred maintenance and heightened dangers. Petroleum refinery accidents can pose grave health risks to workers and residents in the vicinity, and unplanned events impact fuel supply and retail prices, as well as impose unanticipated costs on petroleum refiners, potentially leading to sudden or accelerated closures. For example, Pennsylvania's PES Refinery closed suddenly in 2019 after a major explosion caused by a corroded 50-year-old pipe. Releases and spills can permanently damage entire ecosystems, with acute and chronic public health, ecological, and economic consequences, including potentially many hundreds of millions of dollars in remediation per site and long-term withdrawal of land from other beneficial uses. It is imperative that refinery operators make necessary investments in refinery maintenance on a timely basis throughout the transition.

Employment Security: Recent petroleum refinery conversions and exits have revealed challenges for displaced workers in finding comparable employment. Workers across the petroleum value chain, including crude oil extraction, similarly face continued job losses and difficult hiring conditions in a declining field. These workers' skills will remain critical for maintaining safe and reliable fuel supplies throughout the duration of the energy transition. Moreover, existing skilled refinery craftsmen are leaving the state to seek similar work in other markets, reducing the experience level of the California petroleum refinery workforce. To retain these workers and their skills, state policy should help ensure that work remains safe and that job transitions are meaningfully supported.

Community Impacts: Petroleum refineries and other elements of the petroleum-based fuel system play significant roles in local economies but also impact the health and safety of fenceline communities. Many examples show that industrial decline can damage community safety, health, and the environment. Because fenceline communities are often dependent on their industrial facilities' tax payments, payrolls, and value chains, a single industrial closure can hollow out the local economy in ways that are very difficult to absorb. Proactive planning and resources will be necessary to prepare communities for a future without petroleum industry, including refineries, and to ensure that fossil fuel-related legacies do not cause new harm.

Smooth Transition for Successful Decarbonization: The many risks posed by an unmanaged clean energy transition also threaten California's continued climate progress. If energy prices rise and fuel supplies become less reliable during the mid-transition, support for continued decarbonization may erode. By contrast, creating clear, transparent, long-term plans for the phase-out of petroleum infrastructure can give the public confidence in the trajectory of state climate policy and create space for industry, state and local governments, and community groups to find least-cost, least-harm solutions to tackling the clean energy transition.

Strategies and Recommendations

Many impacted stakeholders, including representatives from industry, labor, environmental and environmental justice organizations, and state and local agencies continue to engage with the CEC in productively discussing the interlocking challenges of the clean energy transition. While not all groups align in their preferred strategies to address these challenges, there has been shared recognition of different constituencies' priorities and common goals. A holistic solutions framework developed from this consultation guides this response.

The cross-agency Petroleum Strategy Task Force has additionally provided valuable insight and recommendations for addressing these complex and cross-jurisdictional issues. Building off these engagements, lessons learned from transition challenges in petroleum and other sectors nationally and internationally, and previous work including the CEC's Transportation Fuels Assessment, the CEC has identified needs and opportunities to support affordable, reliable, equitable, and safe fuel supply through a managed transportation fuels transition that pursues three concurrent strategies:

1. Stabilize fuel supply through imports of refined fuels and maintaining in-state refining capacity.
2. Provide sufficient confidence to invest in maintaining reliable and safe infrastructure operations to meet demand.
3. Develop and execute a holistic transportation fuels transition strategy.

Solving the challenge of transportation fuel transition will require state policymakers to pursue solutions that achieve these three objectives together, including near-term stabilization actions as well as long-term holistic transition solutions, and that advance the state's commitment to its overarching priorities.

Strategy 1: Maintain capacity to stabilize fuel supply

TOPLINE: The CEC thinks it is prudent to immediately stabilize in-state supply by working to retain in-state refining capacity while demand persists, and by supporting sufficient imports, storage, and delivery of refined products.

PROBLEM: In-state petroleum refining capacity is declining faster than gasoline demand and the abrupt exit of a refinery has numerous consequences to consumers, workers, and communities. Northern

California is already experiencing a net regional shortage in refining capacity and is particularly vulnerable if the State fails to maintain existing Northern California refinery operations in the near term and upgrade the import infrastructure capabilities at Bay Area ports. Due to previously enacted legislation, the state receives a one-year notice prior to petroleum refinery operational changes that helps the State plan for the decline in refining capacity. To support system resilience as in-state refining capacity declines, the State needs to receive sufficient and timely volumes of marine-imported fuel.

1a: Supporting Imports of Refined Products

Background:

Crude oil, gasoline, jet fuel, and other petroleum products are imported into California via marine oil terminals, primarily at the Ports of Long Beach and Los Angeles and in the San Francisco Bay region that includes San Pablo Bay and Carquinez Strait. Gasoline refining capacity in California is already insufficient to meet demand, with the shortfall increasing during refinery maintenance events. The shortfall must be made up through marine imports of refined product. To keep fuel supply and prices stable, the import process must be efficient and surge capacity must be preserved. Investments in third-party marine oil terminals, facilities where oil and petroleum products are stored, are key to incrementally increasing import capacity; these terminals are not associated with one individual refiner and can be utilized by multiple market participants, which in turn increase market competition and protects consumers. Greater import capacity will be necessary to maintain resilience in the system as refining capacity in California continues to fall.

Permitting delays and investment uncertainty can be barriers to repairing, optimizing and increasing import, storage, and delivery capacity – in some instances, permit delays can obstruct project completion by months or years. While the rate at which import reliance will increase is uncertain, State action is needed in the short term to make sure California has an adequate supply of fuel to reliably and affordably serve demand. Projects that increase import capacity, without permitting delays, can take anywhere from three to 24 months, with most projects such as dock improvements or pipeline modifications taking between 12 and 18 months. Specific challenges and opportunities to increase capacity and efficiency vary by location and facilities.

Recommendations:

- Support confidence for the private sector to invest in import, storage, and delivery infrastructure through sector-wide regulatory coordination (see Strategy 2).
- Address regulatory and permitting issues to import capacity and efficiency, especially in regions with major refining capacity loss.
- Establish an interagency workgroup that includes the CEC, the State Lands Commission, relevant Air Districts, local governments, and ports to develop a plan to improve coordination, establish clear lines of communication to prioritize critical energy infrastructure projects, enhance early public engagement, and identify efficiencies and reduce redundancies in permitting.
- Explore ways to increase the throughput capacity of third-party terminals to receive and distribute gasoline and jet fuel.

1b: Prudent Retention of In-state Refining Capacity

Retaining in-state refining capacity while demand for refined fuel persists supports the resilience of the transportation fuels system in California. It can also maintain employment and local revenue while giving workers and communities time to plan for the future.

The CEC is engaging with market players to explore strategies to retain operations at existing refineries.

Strategy 2: Provide sufficient confidence to industry to invest in maintaining reliable and safe operations to meet continued demand

TOPLINE: System-wide needs must be addressed in the near term to protect consumers and fenceline communities and ensure needed investments are made to safely meet demand while achieving climate goals and public health protective standards.

PROBLEM: Increasing petroleum business uncertainty in California is leading to reduced industry confidence to invest in the state as they continually seek other, higher-return opportunities. This has prompted company decisions to discontinue operations in California, especially when faced with significant investment decisions (e.g. refinery turnarounds) and uncertain future returns on those investments. Disinvestment in fossil infrastructure with closure on the horizon poses risk to safety and reliability. Due to the interdependencies of the petroleum value chain (up-, mid-, and downstream), disruptions can have widespread consequences to the entire system (Figure 1). Additional closures and operational challenges elsewhere in the value chain (e.g. viability of crude oil pipelines with low throughput volumes) are likely in the near term and inevitable in the long term.

Industry participants have identified several intersecting regulatory and administrative issues in maintaining system-wide stability: crude oil extraction and delivery, CEC's regulatory tools, At-Berth regulations, Cap-and-Trade, and issues related to other regional, state and local authorities. CEC continues to engage with a wide range of impacted stakeholders and communities to discuss these issues and possible solutions. While not all groups are unified in their preferred approach to these challenges, there has been general recognition of the benefit of a holistic approach and strategically aligning state and local regulation of the petroleum system to support the achievement of state goals and priorities.

In consultation with industry, labor, fenceline communities, and the cross-agency Petroleum Strategy Task Force, the CEC has identified a suite of measures to bolster confidence in the California market and ensure reliable and safe operations during the transportation sector's mid-transition. These measures are organized into two tiers:

• Tier 1 – Immediate Actions: Options for near-term adoption via administrative directives or statutory modifications.
• Tier 2 – Further Exploration: Options requiring additional analysis, stakeholder consultation, and impact assessment before implementation.

Tier 1: Issues to Prioritize for Immediate Action

1. Stabilizing In-State Crude Oil Production and Distribution.

Background:

Crude oil production in California in recent years has dropped far faster than demand from in-state refineries, largely because of California Environmental Quality Act (CEQA) litigation that stalled crude oil production permitting in Kern County. That decline in in-state crude oil production has forced a shift toward increased foreign and Alaskan crude oil imports. This rapid decline in crude production introduces several challenges that include:

- *Refinery Adaptation Challenges and Cost Pressures:* Many California refineries were engineered for the specific qualities of local crude oil. Several refineries are not logistically well set up to receive waterborne imported crude. Without retrofit investment, they incur higher processing costs and reduced efficiency when processing imported crude.
- *Pipeline Throughput Decline and Infrastructure Risk:* California has a network of pipelines, primarily from Kern County, that deliver crude oil to in-state refineries. Reduced in-state crude production has driven several crude pipelines to shut down due to low throughput. Several remaining crude oil pipelines now run intermittently due to low volumes, inflating crude transportation costs.
- *Exposure to Geopolitical Risks:* Relying heavily on imported crude oil ties California's energy security to volatile foreign-policy dynamics and geopolitical tensions.
- *Economic and Fiscal Impacts:* The contraction in domestic crude oil production erodes high-wage jobs and shrinks local tax bases, placing additional strain on oil-dependent communities and public services.

Recognizing the interdependence between in-state crude oil production and related critical infrastructure across the petroleum value chain, we think it is prudent to stabilize in-state crude production to support resilience in the petroleum system.

Recommendation:

As part of a managed transition strategy, we recommend that the State take action to achieve targeted stabilization of crude oil production in California to supply in-state refineries while ensuring that production is consistent with critical health and environmental protections. Specifically, limited production that is needed to achieve targeted stabilization should be prioritized in existing established, and densely developed oilfields, and outside of Health Protection Zones (HPZs) surrounding homes, schools, and other sensitive receptors where new permitting is prohibited by law; and production should not include methods that are prohibited by important environmental protection laws, such as California's ban on new offshore oil and gas leases and California's ban on well stimulation treatments.

The Legislature may wish to consider, for example, statutory changes to declare the Kern County Zoning Ordinance Second Supplemental Environmental Impact Report (SCH20130879) in compliance with CEQA and conclusive for purposes of its use by responsible agencies to allow the County's ministerial approval of oil and gas wells with the mandatory mitigation measures identified in the ordinance. This change would allow for a more appropriate amount of extraction in Kern County's well-established oil fields. While clarifying that oil extraction on those already-disturbed lands, away from neighborhoods, is permissible, the Legislature may also wish to expand the current limitations on new offshore oil and gas development and codify the ban on well stimulation treatments in statute.

Additional legislative or administrative actions could include a targeted regulatory framework that ties crude production and permitting more directly to demand over the transition period. The objective would be to facilitate more timely, predictable, and legally durable permitting for crude oil production outside of HPZs in established, densely developed oilfields coupled with a requirement to permanently seal at least two wells for each new well drilled – one located in that same oilfield and the other located in an HPZ. This would facilitate a managed production decline that aligns with and adapts to declining demand throughout the transition to create more certainty, maintain critical infrastructure investment, and protect consumers, workers, and fenceline communities.

2. Regulatory Tools.

Background:

Several intersecting regulatory authorities supporting the achievement of the State's climate, public health, and consumer protection priorities impact the petroleum industry. Strategic implementation of the State's suite of regulatory tools can support the necessary investment confidence to retain safe and reliable industry operations and achieve policy goals.

To protect California consumers from extraordinary spikes in retail gasoline prices, such as those during 2022 and 2023, you called for two special sessions of the Legislature in 2023 and 2024 resulting in the passage of SB X1-2 (Skinner, Chapter 1, Statutes of 2023 First Extraordinary Session) and AB X2-1 (Hart, Chapter 1, Statutes of 2024 Second Extraordinary Session). These efforts collectively:

- Expanded the CEC's data collection authority that significantly increased transparency into various aspects of the petroleum market and helped identify the key factors that contribute to fuel price volatility;
- Created a new independent market oversight division, the Division of Petroleum Market Oversight (DPMO), responsible for oversight, investigations, economic analysis, and policy recommendations regarding the transportation fuels market;
- Required development of two planning efforts 1) an assessment of California's transportation fuels market with potential strategies to address price spikes, and 2) a Transportation Fuels Transition Plan with CARB; and
- Provided CEC with new regulatory authorities to mitigate retail gasoline price spikes and protect consumers: establishing a maximum gross gasoline refinery margin (GGRM) and penalty, setting minimum inventory requirements for refiners, and establishing resupply requirements for planned refinery maintenance events.

The Legislature required that CEC engage in careful consideration of the impacts to consumers and the petroleum sector from implementing the new regulatory authorities. The CEC has exercised caution by focusing on gathering the necessary information to develop a holistic view of the petroleum value chain and establishing the best ways to protect consumers during this transition.

To protect the public health of local communities near ports, CARB adopted its at-berth regulation in 2007 to address emission reductions from ocean-going vessels when they are docked at California ports. The regulations were most recently amended in 2020 and as of January 2025, crude oil and petroleum product tankers at the Port of Los Angeles and the Port of Long Beach are subject to the regulation.

The majority of tanker industry partners are complying with the regulation through one of two approved pathways: (a) the Innovative Concepts, an alternative compliance approach that applies the emissions reductions from approved projects towards vessel visits, or (b) the Remediation Fund, used as an interim solution until their chosen primary control technologies—such as shore power or barge-based capture systems—are installed. One barge-based system for tankers has received CARB approval, with additional systems under review. Small terminals may comply under the low-use exception or by using the Remediation Fund in combination with barge-based systems or shore power as approvals are finalized. While systems are undergoing approval, capture and control companies can offer research exceptions to vessel and terminal operators for participating in testing. Tankers will be subject to the regulation at all ports as of January 2027.

AB 32 (Nuñez, 2006) enables CARB to implement programs that are globally recognized as cost-effective tools for reducing carbon pollution and for generating billions in proceeds to support investment in innovative and pollution-reducing projects. One of these tools is the Cap-and-Trade program, which was officially launched in 2012 and carefully balances the steady decline of greenhouse gas emissions, provides utility ratepayer benefits through the climate credit, and provides industry credits to mitigate for leakage. Petroleum market participants are regulated entities under the Cap-and-Trade program.

Recommendation:

The CEC believes that its available refinery regulatory tools should be implemented holistically and prudently to maximize consumer benefit and avoid unintended consequences. The CEC's analyses have demonstrated a relationship between California's volume of gasoline inventory ("days of supply") and retail prices, whereby low inventory volumes are associated with higher retail prices. The CEC sees value in continuing to assess, in collaboration with the industry, how the resupply and minimum inventory strategies could be implemented to promote market liquidity during refinery outages and stabilize prices.

The CEC has determined that additional analytical work is necessary to establish a maximum GGRM and to impose a penalty for exceeding it that would protect California consumers as intended.

In order to prioritize CEC's development and implementation of the resupply and/or minimum inventory regulatory tools, we recommend that the CEC adopt a pause for a reasonable length of time on implementing a maximum GGRM and penalty.

We recognize that there are challenges in technological compliance specifically for tanker vessels and that the regulation can add unanticipated cost and operational burden. We recommend that you request that CARB meet with each refiner and terminal covered by the at-berth regulation and discuss current status and barriers to implementation of all technical tools intended to achieve emissions reductions from tankers at berth to assess the timelines for deployment of those emissions reductions.

We recommend that the Air Resources Board continue to work on the regulatory process for continued implementation of the Cap- and-Trade program, including progress towards required targets, cost containment strategies and minimizing leakage.

Tier 2: Issues for Further Exploration

3. Local and Regional Authority.

Background:

Petroleum infrastructure is subject to various local and regional regulations and often requires permits from a variety of local agencies.

In California, the local air districts have primary authority to regulate all non-mobile pollution sources of air pollution, including stationary sources. This means that local air districts are responsible for adopting regulations to reduce emissions from stationary sources, such as refineries, and for permitting of these sources. All districts with refineries have adopted, implemented, and are enforcing regulations to reduce emissions from the refineries. The regulations reflect the air quality issues in each area and aim to address criteria pollutant emissions in order to comply with the federally enforceable State Implementation Plan, and toxic emissions that impact local communities. The district permits generally require facilities to be in compliance with all applicable regulations, depending on the district and the facility type.

Industry has asserted that the stringency, inconsistency, and compliance costs of air quality requirements placed on refineries, along with extended permitting timelines at air districts and other local and regional agencies, pose uncertainty and risk to their longer-term planning. Industry also has asserted that the potential for new local taxation, fees, and regulatory initiatives causes significant investor uncertainty.

Recommendation:

As noted above, we recommend the formation of an interagency working group to address immediate coordination challenges. In addition, we recognize the importance of working with the Legislature and local stakeholders to address concerns. We think the Administration should consider partnering with the Legislature to advance solutions to strategically align regulations and permitting processes across all levels of government that could best support achievement of State policy goals.

Strategy 3: Holistic Transition Strategy

TOPLINE: Near- and medium-term actions must be part of a holistic transition strategy that is built on shared understanding, collaboration, and development of policies across state agencies and stakeholders. A managed transition is critical for protecting Californians and will depend on coordination and collective action.

PROBLEM: Transitioning California's transportation fuel system away from petroleum-based fuels is providing substantial benefits to consumers, workers, communities, and the environment, but an unmanaged transition poses significant and acute risks to safety, health, environment, economy, and affordability.

While concurrently addressing the previous objectives, the State should implement policies and plans to support a successful transition, which could include:

- Identify and pursue necessary transition funding to support climate, health, community, and worker priorities.
- Protect workers and communities such as through robust process safety management regulations at refineries, which has the added benefit of increasing reliability of the facilities.
- Support and protect California's authority to set emission standards and achieve climate goals.
- Further California's ability to diversify and evolve its transportation sector to comply with federal and state air quality standards and meet climate goals, such as by continuing to expand the availability and reduce the cost of ZEVs.
- Identify challenges, opportunities, and strategies for the future of land affected by the transition (e.g. remediation, marketability, and

value), such as Asset Retirement Obligations and standards for refinery remediation and decommissioning plans.

- Evaluate whether new approaches to California's fuel specifications could continue to protect public health and meet federally required air quality standards while making the State more resilient to disruptions during its fossil fuel transition.
- Continue to evaluate additional options presented in the Transportation Fuels Assessment, e.g. product reserve and production enhancement strategies such as E15 or Reid Vapor Pressure (RVP) modification.
- Explore further pathways to increase resilience in the system, such as improving connectivity between Northern and Southern California fuel markets, e.g. through increased marine oil terminal capacity or repurposing of existing fossil fuel transportation infrastructure.
- Develop strategies that can support a managed phase-out especially during the late transition phase of the transportation sector, such as state management or ownership of assets.

Conclusion

The problems laid out in this letter are complex but solvable. California has entered a critical but challenging phase in its transition to a decarbonized transportation sector, which is made more challenging by California's unique petroleum market, global changes in the refining sector and across the petroleum value chain, and new disruptions at the federal level. The strategies and recommendations laid out here represent our careful, comprehensive, collaborative assessment of the petroleum market and the future of the clean energy transition.

Thanks to your leadership and commitment and the expertise of agencies, stakeholders, and communities, California is rising to the challenge. Equipped with new data made available by forward-thinking policies led by you and the Legislature in the past two years, we have a much clearer understanding of the causes of gasoline price spikes and the strategies needed to protect consumers and communities in the future. We are working closely with a broad range of partners to continue to evolve the State's approach so that we may successfully 1) accelerate momentum to decarbonize California's economy, and 2) ensure that petroleum firms can continue to supply petroleum-based fuels while the clean, alternative fuels continue to scale.

We are thankful for the opportunity to share this analysis with you, the Legislature, our partners, and the public. We look forward to collaborating with the Legislature, state and local agencies, industry partners, and impacted stakeholders to ensure a reliable, affordable, and safe clean energy future for all Californians.

Sincerely,

G. S. Gangadhar

Siva Gunda
Vice Chair
California Energy Commission