SUPPORTING DOCUMENTS

The documents attached hereto are submitted for reference to the California Air Resources Board as relevant materials to the Environmental Justice Comments on the Proposed 15-Day Changes submitted by CBE et al. on May 4, 2026.

ENERGY INSTITUTE AT HAAS

ENERGY INSTITUTE BLOG

A Stress Test for California Carbon Pricing

Threading the needle between climate ambition and industry opposition

California is trying to finalize a major redesign of its carbon market. The timing is not great. Gasoline prices are pushing $6 a gallon. Two refineries have now closed. And the federal government has shifted from subsidizing clean energy investment to openly undermining state-level climate action.

(https://energyathaas.wordpress.com/wp-content/uploads/2026/04/screenshot-2026-04-26-at-8.22.47-pm.png)

The Valero refinery in Benicia closed earlier this month. **Source.** (https://www.siliconvalley.com/2025/04/28/bay-area-oil-refinery-benicia-build-property-home-jobs-energy-economy/)

Into this fraught territory steps the California Air Resources Board (CARB), the agency tasked with translating a **sweeping legislative** (https://lao.ca.gov/Publications/Report/5097) mandate into workable regulations. The legislature has asked for a program that can reduce greenhouse gas emissions, prioritize affordability, maximize cost effectiveness, mitigate emissions leakage, avoid adverse impacts on industrial competitiveness, and demonstrate a climate policy success to the rest of the world. That's a lot to ask of one policy instrument. There will be tradeoffs.

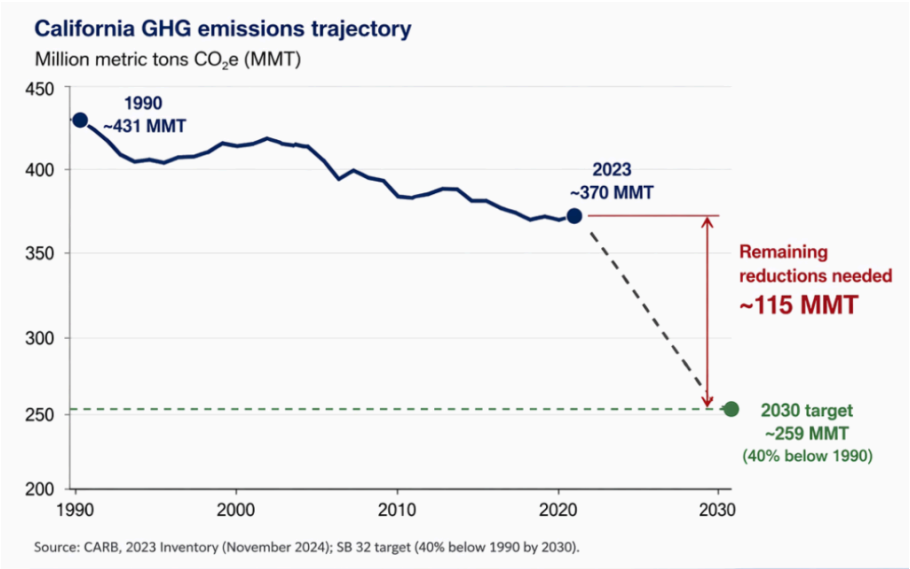
High gasoline prices have handed refiners unusual political leverage—and they are using it. **Chevron,** (https://www.chevron.com/newsroom/2026/q1/californias-economy-faces-threats-with-new-energy-policy-changes) PBF, and **Marathon** (https://kmph.com/resources/pdf/4c26c4da-a1e2-4e51-bb87-546cad58188b-MPCProposedCapandInvestAmendmentsConcerns_3.09.26.pdf) have all warned that CARB's January proposal would hasten refinery closures, destroy jobs, and inevitably **"drive in-state refining capacity to zero."** (https://www.argusmedia.com/en/news-and-insights/latest-market-news/2798020-calif.-refiners-warn-emission-rules-risk-closures)

After months of pressure, CARB has put forward a Plan B that includes a multi-billion-dollar hand-out for industry. Is that level of compensation warranted? That's a political call that I don't know how to referee. I want to focus on the economics:

how might these concessions impact the carbon market, and how can we limit the collateral damage.

How did we get here?

In January, CARB released its **initial Cap-and-Invest proposal.** (https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2026/cap_invest/nc_isor.pdf) Let's call this Plan A. At the core of this plan was a tighter cap: 118 million metric tons removed from the 2027–2030 emissions budget to help get the state back on track for its GHG targets. For context, current annual emissions exceed the 2030 target by roughly that same amount.



(https://energyathaas.wordpress.com/wp-content/uploads/2026/04/screenshot-2026-04-26-at-8.31.11-pm.png)

Notes: This figure shows California GHG emissions inventory numbers relative to the state's 2030 GHG emissions targets. Source: ***https://calepa.ca.gov/climate-dashboard/*** *(https://calepa.ca.gov/climate-dashboard/)*

Plan A didn't just tighten the cap—it also laid out how the allowances would be divided. Some would go to utilities to address affordability concerns. Some would be freely

allocated to certain industries to mitigate emissions leakage and facility exit. The remainder would flow to the **Greenhouse Gas Reduction Fund.** (https://ww2.arb.ca.gov/our-work/programs/california-climate-investments/california-climate-investments-funded-programs) Notably, under Plan A industry was allocated a larger share of this GHG allowance value pie than it has historically received.

Industry stakeholders argued that it wasn't nearly enough. Two months later, CARB responded with a **revised Plan B** (https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2026/cap_invest/nc_15d_ci_noticeada.pdf)that increased both the size of the pie and the slice served to industry. The 118 million tons removed under Plan A are now effectively put back into the program in the form of a *Manufacturing Decarbonization Incentive* (MDI). These allowances are set aside for firms in certain industries (e.g., refineries) that make qualifying decarbonization investments (e.g., industrial heat pumps, process electrification, on-site renewables). Firms that make these investments receive more free allowances for every unit of output they produce.

Here's my read of how these changes will apply. Let's consider the refinery example. Under Plan A, refineries would have received about **2.25 allowances per barrel** in 2028. The Plan B revision increases this baseline to about **3.04 allowances per barrel** and introduces an additional MDI incentive that can raise total allocation to over **6.1 allowances per barrel**. The benchmark GHG emissions rate for refineries is about **3.89 tons per barrel** (this applies to *refinery process* emissions, not emissions from your tailpipe). In other words, a qualifying refinery could receive free allowances well in excess of its GHG emissions.

How will Plan B impact the California carbon market?

Let's start with a simple textbook cap-and-trade system that is designed to meet an emissions target at least cost. If the cap is binding, it determines the total quantity of emissions. Add more allowances into the market and emissions rise one-for-one. The carbon price will fall.

The MDI design complicates the mechanics, but not the accounting. Firms receive these additional allowances if they undertake qualifying decarbonization investments. This can change who invests in abatement, but it does not change the fact that the cap has been relaxed. Adding MDI allowances implies more GHG emissions and lower GHG prices.

Of course, the reality of the California carbon market is messier. Here are three complications that matter.

1. This carbon market is far from complete

The textbook case conveniently assumes that we can cap total emissions. But California's carbon market covers only a small slice of the GHG emissions driving climate change. The industries it regulates—refining, cement, chemicals—compete in national and global markets. If higher California carbon prices push production out of the state, GHG emissions don't disappear. They move somewhere else.

(https://energyathaas.wordpress.com/wp-content/uploads/2026/04/tanker.webp)

If industrial production moves outside of California, GHG emissions from goods we consume happen outside our cap. **Source** (https://www.latimes.com/environment/story/2024-10-24/singapore-south-korea-the-middle-east-where-gasoline-will-come-from-when-phillips-refinery-shuts-down)

To mitigate this carbon "leakage" problem, California gives free GHG allowances to sources in industries deemed to be at leakage risk based on how much output they produce. In the refinery sector, for example, the more barrels refined, the more free allowances received. It might seem crazy to hand out free permits to firms and then require them to give them back to offset GHG emissions. But **when calibrated correctly,** (https://calepa.ca.gov/wp-content/uploads/2018/09/6e.-IEMAC_Meeting_Materials_9-21-18___Fowlie_and_Cullenward_Report_on_Emissions_Leakage.pdf) this can offset the incentive to relocate out of state while preserving the incentive to reduce emissions per unit of output.

The challenge is calibration. The number of freely-allocated permits per unit of output should reflect the value of keeping

this production in-state. Neither CARB nor industry has provided evidence to justify the rather large increase in production subsidies conferred under Plan B. Increasing these output subsidies may further reduce leakage—or it may just transfer more value to incumbent producers without materially changing production decisions.

2. The cap isn't really a cap

California's cap-and-trade program has a price ceiling. If we hit that ceiling, the GHG cap **turns into a fixed carbon tax** (https://energyathaas.wordpress.com/2023/11/27/californias-cap-and-trade-market-enters-its-teen-age-years/). Jim Bushnell and Aaron Smith have some **modeling work** (https://ww2.arb.ca.gov/sites/default/files/2023-11/nc-combinedSlides_Nov162023.pdf) that assigns a high probability to hitting this ceiling given the 2045 cap. If they're right, putting 118 million tons back in the program need not change the long run permit price, it just means that some of the additional permits CARB would ultimately have sold to defend the permit price ceiling would have been handed out already to incentivize industrial decarbonization investments.

3. Expectations matter

Firms make investment decisions based on what they think future market conditions will look like. A cap-and-trade program works best when the rules are clear and credible. If firms believe that the GHG constraint will get tighter, they can more confidently make decarbonization investments today to offset higher compliance costs tomorrow.

Along these lines, the Plan B pivot will undermine confidence. It signals that, when the going gets tough in this California carbon market, the policy stringency is dialed back and more allowances are allocated to stakeholders with leverage. A lack of confidence may already be priced in (perhaps this explains

[why allowance prices did not jump in response to carbon market reauthorization (https://energyathaas.wordpress.com/2026/02/09/why-are-california-carbon-prices-so-low/)](https://energyathaas.wordpress.com/2026/02/09/why-are-california-carbon-prices-so-low/) in the way economic models predicted).

If we're going to do this, we can do it better

I won't pretend to understand the political constraints that got us here. But if these concessions are really a done deal, the more constructive question is how to minimize the damage.

Right now, the MDI looks more like a capex reimbursement program than a GHG abatement procurement mechanism. It rewards dollars spent, not GHG emissions reduced. This means we are not systematically targeting the lowest-cost abatement opportunities with this incentive, and we could be paying for some projects that would have happened anyway. A short qualification window only reinforces that concern.

At a minimum, support could be tied more directly to verified emissions reductions rather than capital expenditures. Even imperfect screens for additionality—targeting projects that would not move forward without support—would improve the odds that these transfers actually deliver additional abatement. And rather than allocating funds administratively, CARB could introduce some form of competition or scoring mechanism to prioritize projects that deliver more abatement per dollar.

Finally, if we are going to spend billions subsidizing industrial decarbonization, we should also leverage this as an opportunity to learn. Standardized reporting on project costs, performance, and emissions impacts could help build a much stronger empirical foundation for future policy. Right now, regulators and researchers are operating with very limited

information about the true costs of industrial decarbonization. This program could help change that.

None of these changes eliminate the tradeoffs. But they would help ensure that we are getting something meaningful in return. I'm sure our blog readers have better suggestions around how to make the best of a challenging situation. The deadline to submit **public comments** (https://carb.commentinput.com/?id=5PhdbGHfs) is this Wednesday.

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The analysis and opinions in this post are my own and may not reflect the views of my IEMAC colleagues. I acknowledge some use of ChatGPT and Claude in drafting this blog post.

Categories

Uncategorized (https://energyathaas.wordpress.com/category/uncategorized/)

Meredith Fowlie

VIEW ALL

12 thoughts on "A Stress Test for California Carbon Pricing" ≥

Trump's BigOil&Gas US & Saudi allies have "Baked-in" their high fossil fuel prices for the foreseeable future. This is the Big Inflation Driver. It's not just commuter gasoline, it's trucking & aviation fuel too. As of early 2026, China has established the world's largest electric vehicle charging network, totaling over 21 million charging points. This reflects a nearly 48% year-over-year growth, widening a massive gap with the United States (~200,000 public stations) and the European Union (~910,000 public chargers).

Commuters require extraordinary fuel cost reduction and convenience incentives to rapidly switch to EVs. That's exactly why France & South Korea have already mandated solar canopy parking lot Virtual Power Plants, including on-site battery storage +Vehicle-2-Grid chargers at ALL existing parking lots over 80 spaces, nationwide, within 3 to 5 years, largest lots first. That's how you electrify, reduce & stabilize transportation costs, really FAST!

At the end of the day, something as simple as 'cap and trade' has turned out to be incredibly complicated, as the politicos horn in on taking the money for their unrelated-to-energy, pet projects (whoever termed 'cap and invest' ought to be fired or recalled), politcos try to get all the benefits without the pain (lost refineries, higher energy prices, lost jobs), and try to implement something that is a global problem at the state level, with none of the other states, the federal government or the world coming along. It's instead a tax and

subsidy program driven purely by politics, unfortunately. Free pot of gold for politicos to do as they want.

Just as Meredith "won't pretend to understand the political constraints that got us here," I won't pretend I understand all the modeling and calibrations she links to in her insightful post. But as a veteran (and historian) of California climate and energy politics, one overriding "political constraint" got us here: Twenty years after the passage of AB 32, we not only do not have national cap-and-trade market; we aren't even partnered with another state (though we are linked with Québec, and discussions are underway with Washington). Suffice it to say that this was not the expected scenario.

As Meredith notes, CARB is now "tasked with translating a **sweeping legislative** mandate into workable regulations." While I readily acknowledge that a lot of well-intentioned and hard work went into crafting that "sweeping legislative mandate," that was the easier part, as was the case with all the legislation that got us here. But CARB has the really hard part of taking increasingly ambitious climate and energy mandates and benchmarks and producing "workable regulations" — which also means different things to different stakeholders.

Don't get me wrong: I'm not suggesting the endeavor is not worth the effort. But this isn't 2006, when the embarkation on the path to greater sustainability, lined with hope and optimism, had a brighter horizon. The going has gotten tough, and we need to adjust our expectations.

Carbon is created at the "tailpipe". Keep the refiners and "tax the tailpipe". Buyers of EVs will win and big gas guzzling SUVs will lose. Refiners will reduce production of Gasoline over time as people choose Hybrid, hydrogen or Electrification over

fossil fuels. California is looking to replace the road use tax on gasoline with miles driven charges when the milage is submitted every two years with "Smog Station Certificates". Every automobile, truck, van or motorhome has and EPA registered economy miles per gallon rating. Switching to a two year registration prosses where registration renewal stickers on cars are issued on even years and Trucks, Vans and motor home issued on odd years could reduce the "log Jams" at the DMV and the carbon tax and road use taxes could be on registration renewals making older less economical vehicle exit the state rather than pay the high fees. Drivers only putting on 2,500miles a year would pay less than those with the same model vehicle driven 10,000miles per year.

Free allocation isn't just about leakage; the more significant issue is affordability. Free (output-based) allocation ("rationing" vs auctioning) shifts the regulatory emphasis from trying make GHG emissions unaffordable to making zero-carbon energy affordable. The marginal incentive for GHG reduction is not diminished by free allocation because zero-emission producers get the same output-based subsidy as high-GHG emitters. Rationing could be more effective than auctioning if it makes a higher carbon price politically and economically viable, and if fossil fuels are in competition with zero-carbon energy sources that get the exact same output-based subsidy.

CARB's "Plan B" makes it more clear that the "price GHGs out of the market" policy paradigm doesn't work in a world where affordability concerns are paramount. But rather than giving refineries "investment-based" subsidies via the MDI, why not give them and their zero-carbon competitors the same output-based subsidies?

Equally important to economic efficiency is price stability. It is impossible to make sound clean-energy investment decisions when you don't have the slightest clue what future carbon prices will be. The history of allowance price projections makes it clear that nobody can reliably forecast prices, although the price floor provides at least a modicum of price stability and predictability.

Re "Expectations matter": Probably the reason that allowance prices have been stuck at the $28 level over the past year — even after AB 1207 reauthorization — is that investors have no real expectation or belief that CARB will enforce its carbon budgets at any meaningful carbon price. Not only because "The cap isn't really a cap" (HSC 38562(c)(2)(A)(ii)(II)), but also because the price ceiling isn't really a price ceiling. CARB has carte blanche statutory authority to set the ceiling and to reduce the ceiling at will based on political perceptions of affordability. (HSC 38562(c)(2)(A)(iii)) The Legislature has basically told markets, in its SB-840 GGRF allocations, that it has no expectation that CARB will actually enforce its carbon budgets. (Meredith testified in the February 23 JLCCCP hearing that "In the ISOR, the CARB staff analysis projects that the GGRF revenues will never meet the minimum spending requirements anticipated for SB 840.")

The clearest sign of CARB's lack of resolve is its unwillingness to consider setting a price floor at a level sufficient to cover near-term SB-840 allocations. But it's not only CARB. Neither the IEMAC, LAO, nor environmental policy advocates including authors on the Haas blog have given CARB or the Legislature guidance on (1) what allowance price level would cover near-term SB 840 budget allocations, (2) expected consumer impacts of a price floor set at that level, and (3) whether a price floor should be established based on regulatory and statutory policy objectives. (My own estimates, which I've conveyed to CARB and IEMAC in public

comment letters, are (1) $36, (2) an additional GGRF subsidy of at most 0.08 ¢/kWh in retail electricity rates and 3.6 ¢/gal in gasoline prices — and zero impact at allowance prices above $36, (3) yes, the price floor should be policy-based if you want carbon markets to take your Cap-and-Invest regulation seriously.)

Ken Johnson

As long as California focuses only on the lever that controls carbon emissions from fossil fuels, the State will never get

even close to the 2030 target 259 mmt target. The State needs to move to an alternative source of fuel.

Thanks Meredith, I loved reading this blog. The (rather open ended) question that popped in my mind as I was reading this blog is what the willingness to pay for climate policy is in California (and other places that enact cap and invest)? I wonder if analysis of expected allowance prices as a result of adopted regulation can help better understand that, and how that varies across geographies and conext.

-Mohit (NRDC)

A good summary of how to spend a lot of time and effort trying to create politicized synthetic markets for our energy consumption. It is unfortunate that CARB (and the politicians edicting this work) do not take the time to evaluate the efficacy of our policy decisions to date. CO2 emissions have only been going up, no (global) "transition" whatsoever is occurring in our energy resources (or has ever occurred in history), and for California in particular, their residents suffer under the highest continental-U.S. energy prices.

The underlying reality is that the most successful policy will be one which optimizes between our three primary energy goals: reliability, cost, and pollution impacts. "Energy is wealth" and arbitrarily increasing energy costs across the board in California only serves to penalize the least fortunate among us.

A great study would look at whether the trillions we have spent subsidizing energy and manipulating energy markets would have been better spent investing in energy R&D of technologies that could help us better achieve our energy goals.

> The energy transition is roaring away in the rest of the world outside of the US. Most telling is how China has moved to both solar power and EVs in droves. Other countries are rapidly adopting the technologies that were first introduced in California. Even in the US more solar is being built to power the grid than any other technology.

The AB32 Scoping Plan in 2008 was driven by regulations and standards that did not face actual cost effectiveness evaluations. Only 23% of the projected reductions (34 MMT) were left to the discretion of emitters in the functioning cap & trade allowance program. I submitted comments on behalf of EDF pointing out this issues. The other 77% are various prescriptive measures, most of which had higher cost per tonne than the projected price of GHG allowances. The most difficult reductions measures were left to the CATP to sort out. That's part of why the state needs to keep on coming up with relief options.

Changing the allowances in this way will undermine the financial community's confidence in the value of allowances.

It's as through Bitcoin keeps on changing the calculation algorithm to make it easier to solve.

… might blockchains support emissions verification programs … ?

POTENTIAL LOST CAP-AND-INVEST REVENUE UNDER THE MANUFACTURING DECARBONIZATION INCENTIVE

Kyle Meng[1] **and Jordan Wingenroth**[2]
Environmental Markets Lab, UC Santa Barbara — April 2026

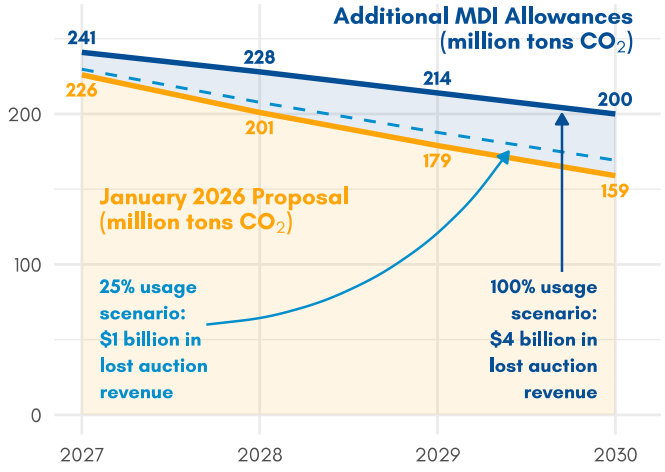
California Air Resources Board (CARB) introduced a Manufacturing Decarbonization Incentive (MDI) program in its April 2026 Proposed 15-Day Amendments for the cap-and-invest (C&I) program. This pool of pollution allowances is in addition to statewide pollution limits from the January 2026 Proposed Amendments and will likely lower demand for allowances sold at official auctions. **If fully utilized over the next four years, the MDI program could lower C&I auction revenue by $4 billion.** This revenue funds the Greenhouse Gas Reduction Fund (GGRF) and California Climate Credit (CCC).

In the April 2026 Proposed 15-Day Amendments, CARB introduced a new tranche of allowances for the MDI in addition to the official statewide cap. These MDI allowances may be granted to industrial compliance entities if they undergo specific forms of clean investment and can be used to meet emissions obligations under the C&I program. In total, CARB will allow up to 118 million allowances under the MDI, equivalent to the total 2027-2030 cap reduction between the current regulation and the January 2026 Proposed Amendments.

Our team at the Environmental Markets Lab analyzed the potential MDI impact on C&I auction revenue. By creating new allowances above the cap that are freely available for industrial compliance entities, the MDI lowers demand for CARB-auctioned allowances. With recently auctioned allowances selling at the price floor, this suggests that the number of MDI allowances would equal that of unsold allowances in future CARB C&I auctions. Unsold allowances, valued at the price floor, imply a loss in auction revenue and thus funds available for the GGRF and CCC.

To quantify this fiscal impact, we assume that additional MDI allowances would be distributed at the pace of the annual difference between the cap in the current regulation (blue line in the figure) and the cap in the January 2026 Proposed Amendments (orange line in the figure). We also assume that the macroeconomic conditions that place current allowance prices at the price floor would continue through 2030.[3]

To illustrate the range of potential outcomes, we evaluated several different MDI usage scenarios. If the entirety of the 118 million MDI allowances were released between 2027-2030 (the gray area in the figure), there would be a $4 billion loss in auction revenue over 2027-2030. For comparison, total auction revenue was $5.8 billion in FY 2024-2025, with $3.4 billion going to the GGRF and $2.4 billion to the CCC. **If this baseline revenue and spending share were unchanged during the 2027-2030 period, a fully utilized MDI would lower GGRF funds by $2.3 billion and CCC funds by $1.7 billion—a 17% reduction for each.**



Actual fiscal impact will depend on the rate of program adoption. The extent to which MDI allowances will be used is uncertain, and depends on macroeconomic conditions and on how the program is implemented. Total 2027-2030 auction revenue would fall by $1 billion, $2 billion, and $3 billion respectively if 25%, 50%, or 75% of the 118 million MDI allowances were used between 2027-2030.

One can look to recent California industrial emissions changes to understand potential future MDI usage. Between 2022-2023, industrial greenhouse gas emissions fell by 3.4 million tons. That emissions drop, if continued in 2026-2027 and granted MDI allowances, would be consistent with a 25% MDI usage scenario (dashed line in the figure). This estimate is based on existing GHG trends and thus is likely an underestimate as clean energy adoption should accelerate under the MDI.

Finally, the MDI is likely to push allowance prices, as reflected in the secondary market, below the price floor. This is because MDI allowances can be sold in the secondary market, outside the price floor maintained in CARB auctions.

[1] Associate Professor of Economics, UC Santa Barbara
[2] Data Scientist, UC Santa Barbara
[3] The 2026 price floor is $27.94 and is prescribed to increase annually by 5% plus the rate of inflation. We assume a constant 2% annual inflation.

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The Writing on the Wall: Why California Refineries Are Closing

Thomas J.P. Hersbach, Constance Cho,
Michael Mastrandrea, Michael Wara, and Deborah Sivas

February 11, 2026

Summary

Over the last several years, California has experienced a wave of petroleum refinery closures and conversions.[1,2] These are not isolated events, but only the most recent manifestations of a long-term decline in the state's oil industry. Crude oil production within the state has fallen by 75 percent since the 1980s (Figure 1a).[3] In turn, the in-state refining sector has significantly consolidated, with in-state refining capacity declining since at least 1982 (Figure 1b).[4]

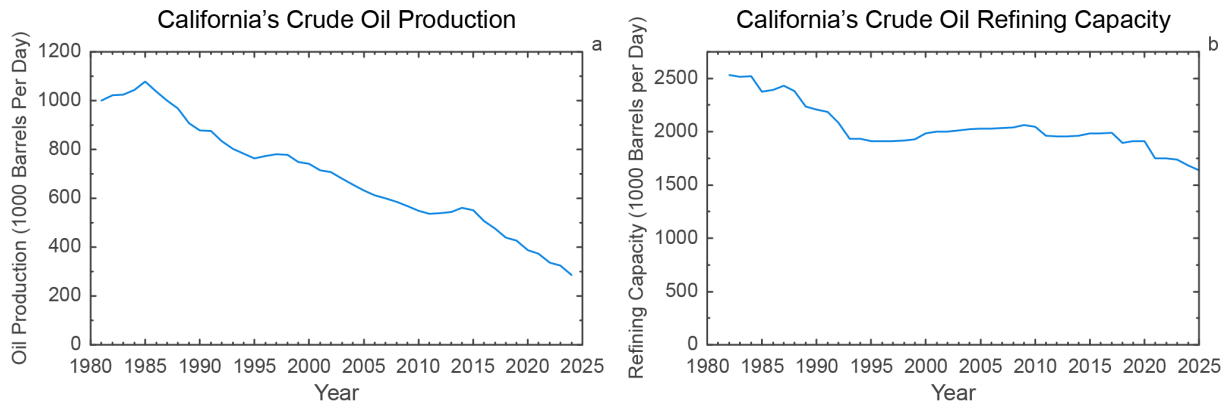

Figure 1: California's crude oil production (Panel a) and crude oil refining capacity (Panel b). Y-axis units for both panels represent a thousand barrels per calendar day. Refining capacity refers to operable atmospheric crude oil distillation capacity. No refining capacity data were reported for 1996 and 1998; data for these years were interpolated to create this graph. Data obtained from the United States Energy Information Administration.[3,4]

The downward trend in refining activity reflects myriad factors, including most critically: (**1**) the depletion of California's crude oil fields and a corresponding decrease in the economic viability of in-state crude oil production, (**2**) declining in-state gasoline sales, (**3**) declining in-state fossil diesel consumption, (**4**) ongoing national and global consolidation of the oil industry, and (**5**) increased availability of imported finished fossil fuel products. For these reasons, the downward trajectory in California petroleum refining capacity is likely to continue in the years to come.

Crucially, California does not have the legal authority to meaningfully affect the larger domestic and international factors at play. At the same time, the oil companies that own

private refineries in California make business decisions guided by their legal obligation to maximize corporate and shareholder value in the context of a global marketplace for oil.

This market reality presents both challenges and opportunities. California's remaining refineries are located primarily in populated urban areas where land is scarce and expensive, including four in Los Angeles County and three in the San Francisco Bay Area. Several of these refineries were built more than one hundred years ago; even the newest of them predate contemporary environmental laws. Collectively, the state's most recently closed refinery, the Phillips 66 Los Angeles Refinery, and the remaining gasoline-producing refineries occupy nearly 8,000 acres that could become available for new uses with future closures. Given the content of California's heavy crude oil and decades of refining activity at these sites, however, all of these facilities likely sit on contaminated soil and groundwater that will need to be addressed before repurposing can occur.

Communities and policymakers face significant questions around decommissioning, remediation, and appropriate redevelopment. In the absence of advance planning, these frontline communities and the state face very short windows to react to closures: Refineries typically make (re)investment decisions on a three to five year timeline driven by maintenance "turnaround" cycles.[5] At minimum, California should expect this question of (re)investment or closure to reoccur on this cycle. Comprehensive anticipatory planning for community and worker transitions with inclusive stakeholder processes can blunt the economic shock of sudden closure decisions when they eventually occur. However, to take advantage of the generational opportunity for economic, social, and environmental transformation at the remaining refinery sites, state and local policymakers will need to plan proactively.

Key Factors

1. California Crude Oil Has Become Comparatively More Expensive to Produce and Refine Due to Its Natural Characteristics, Long-Term Depletion, and the Increased Advantage of Crude Oil Incompatible with California Refineries

As the Phillips 66 CEO remarked in 2025, California has lost its "crude advantage."[6] Crude oil drilling in California began in the mid-1880s, and most of the state's oil fields were developed before 1950.[7] As these fields were exploited over many decades, productivity naturally and inevitably declined: Average California oil well productivity peaked at 25 barrels per day in 1963 and has since fallen to only 8 barrels per day.[8] Between 2000 and 2024, the declining productivity of California oil wells accelerated, decreasing by 52 percent (Figure 2b); at the same time, the total number of production wells remained relatively constant (Figure 2a). That decline reflects the physical reality of oil field depletion.

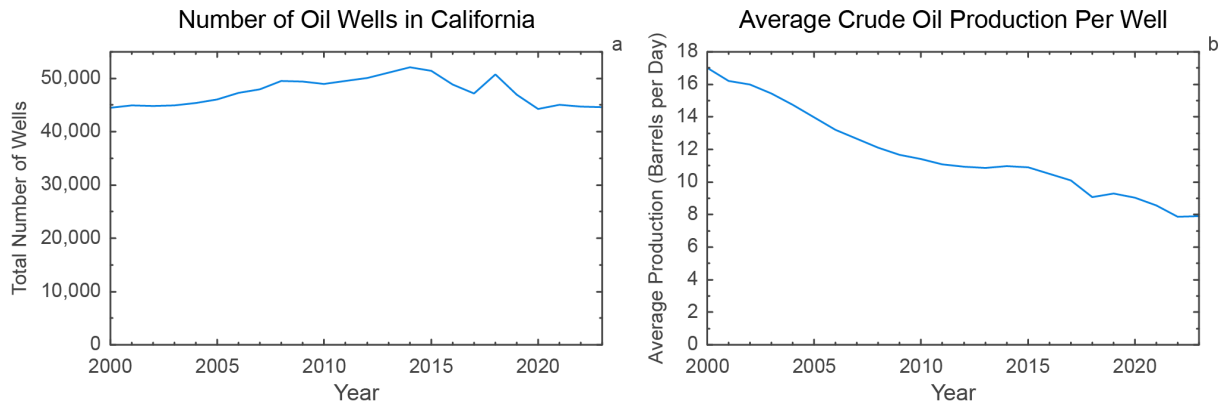

Figure 2: Number of oil wells in California (panel a) and average daily crude oil production per oil well in California (panel b), as reported by the United States Energy Information Administration.[9]

To compensate for the ongoing geologic depletion of California's once-rich oil fields, most drillers now employ more costly enhanced recovery techniques. Conventional fracking is typically not effective for boosting production of California's heavy crude oil; instead, oil field operators inject steam or heated water to reduce the viscosity of the heavy crude and facilitate its flow to the surface, typically burning natural gas to fuel this process. Such injection of steam or heated water increases the energy-intensity, production cost, and greenhouse gas emissions of drilling crude oil from California's declining fields.[8,10]

In contrast to California's aging refineries, which were built to process "heavy sour" crude, the construction and operation of refining facilities built to process "light sweet" crude elsewhere have become more economically desirable. California crude tends to be "sour"—that is, higher in corrosive and toxic sulfur content, unlike lower-sulfur "sweet" crude drilled in places like Texas, Oklahoma, and North Dakota.[11] In the early 2000s, the "fracking boom" lowered the price of "light sweet" crude.[12,13] Yet the challenge of refining "heavy sour" crude continues to be costly.

In summary, rising production costs for a less desirable commodity means that California crude is increasingly less competitive in the national and global marketplace. After peaking in the 1980s, in-state crude oil production has fallen by nearly 75 percent (Figure 1a). Unsurprisingly, in-state refining capacity has followed suit. Notably, this long-term decline in California production and refining capacity is a trend that predates state climate policies and market shifts to electric vehicles and hybrids.

As California crude has become less economically competitive, in-state refineries have steadily increased their reliance on imported crude (Figure 3). There are little data available to understand the continued impact of this shift. For example, there is neither publicly available data nor does the state collect information on whether, or to what degree, marginal amounts of in-state crude oil impact efficiency at each refinery. Additionally, there are no studies that have analyzed the net change in emissions that may result from increasing crude oil imports while decreasing in-state extraction.

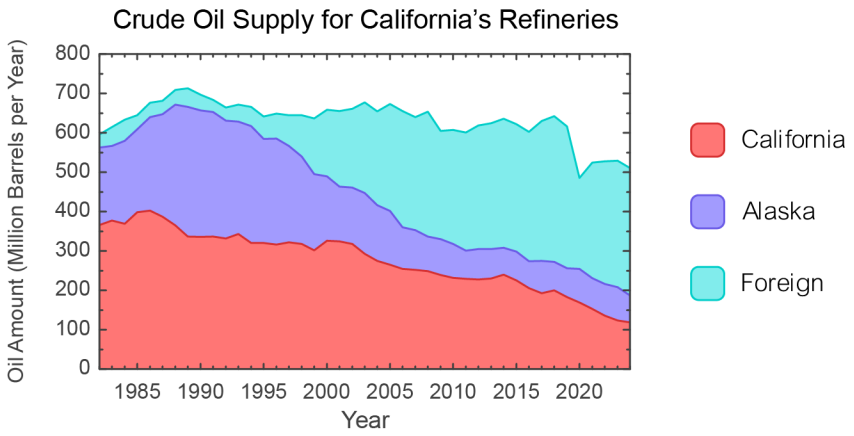

Figure 3: The origin of crude oil for California's oil refineries, as reported by the California Energy Commission.[14]

2. Declining Demand for Gasoline Is Contributing to Reduced Need for In-State Refining Capacity

While the relative cost of California crude oil is rising, the in-state demand for petroleum-based transportation fuel is falling. The majority of gasoline produced by California refineries is sold in state, with less than 20 percent exported, primarily to Nevada and Arizona.[1,15] In-state gasoline consumption peaked in 2005 and, as of 2024, has declined by 15 percent (Figure 4), with further decline projected to continue.[16,17] Increasing fuel efficiency and the shift to low- or zero-emission vehicles is primarily responsible for this decline.[18,19]

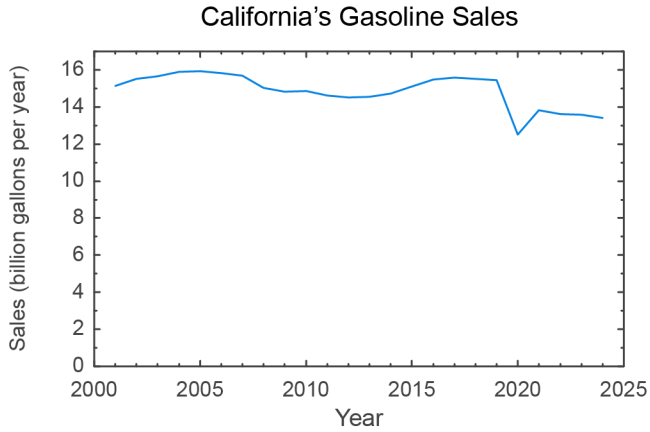

Figure 4: Annual taxable gasoline sales, as reported by the California Department of Tax and Fee Administration.[20] *Reported numbers include aviation gasoline, which accounts for approximately 0.1 percent of total sold gasoline.*

Because gasoline production accounts for roughly 65 percent of California's refining capacity,[21] declining in-state demand reduces the need for in-state refining capacity. The amount of refining capacity projected for utilization, in turn, has a strong influence on refinery profitability.[18,22] With a physical and financial "minimum viable scale" required to operate each refinery, the continued decline of the sector will not follow a smooth, linear

decline.[5] Oil companies may decide to close refineries earlier than in-state demand projections might otherwise indicate.[5]

3. California Diesel Production Has Shifted Dramatically from Fossil Diesel to Renewable Diesel and Biodiesel, Affecting Profitability of In-State Refining

Along with gasoline, California refineries produce other distillates, including most significantly fossil diesel and jet fuel.[1] California's heavy crude, in particular, generates a relatively fixed gasoline-to-diesel ratio.[23] Yet in-state consumption of fossil diesel has declined precipitously over the last decade, shifting to "renewable" diesel and biodiesel in response to federal and state renewable fuel policies (Figure 5).[24,25] In California, that shift is largely attributable to significant subsidies from the state's Low Carbon Fuel Standard (LCFS), which was adopted to incentivize the use of lower carbon liquid transportation fuels.[26] In 2024, renewable diesel and biodiesel comprised 74 percent of the state's diesel consumption,[27] 72 percent of which was imported.[28] Reduced in-state consumption of fossil diesel leaves California refineries with excess fossil diesel supply that must be exported, which further reduces profitability.[23]

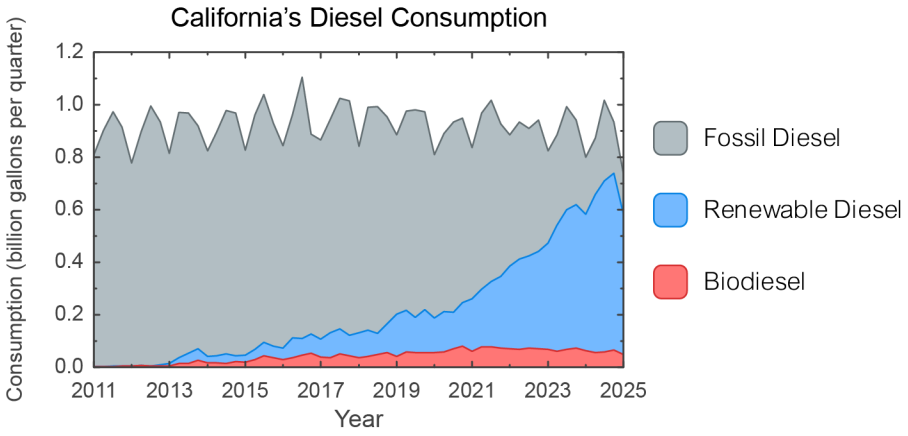

Figure 5: Quarterly diesel consumption, as reported by the California Air Resources Board.[27]

4. Global and National Consolidation of Refining Capacity Places Economic Pressure on California's Remaining, Older Refineries

Refineries operate most profitably when they can take advantage of operational efficiencies from economies of scale.[29] Accordingly, the oil industry has a history of consolidating oil infrastructure to maximize profits: Less competitive refineries are closed as other refineries are expanded. Since the 1940s, domestic refineries have steadily consolidated operations.[29] This is true in California, as well. California refineries are now, on average, twice as large as they were in the 1980s (Figure 6).

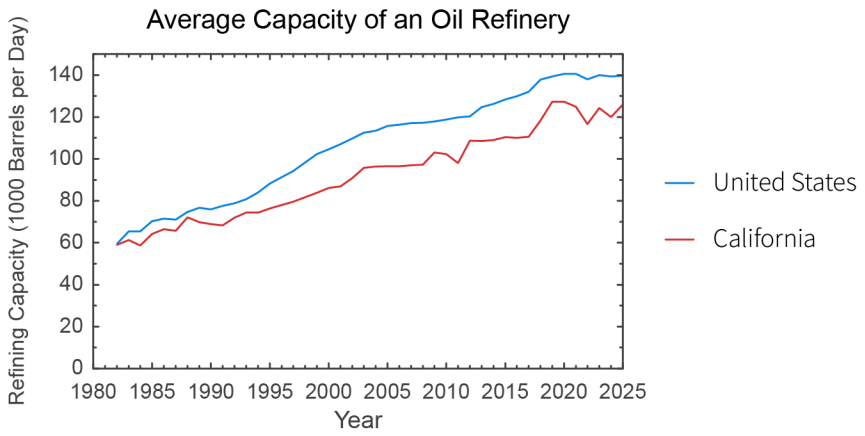

Figure 6: Average oil refining capacity, obtained by dividing the total refining capacity in the United States or California by the number of oil refineries in these areas. Data obtained from the United States Energy Information Administration.[30]

In recent years, the consolidation of domestic refineries has shifted refining capacity away from the East and West Coasts to inland states and the Gulf Coast.[31,32] These domestic trends, driven by the rational business decisions of national and international oil market players, are not limited to the U.S.; similar activity is occurring around the world. European refineries must now compete with newer and more efficient refineries in Nigeria and the Middle East, causing disinvestment in Europe's refining capacity.[33,34] Within the growth regions of Asia, the Middle East, and parts of Africa, investment has focused on newer, larger, more complex refineries that capture economies of scale while less competitive refineries have been closed.[35,36]

As in Europe, North American refineries are considered less competitive in the global oil market.[35] Despite their size, complexity, and high level of consolidation within the state, California refineries are no exception. While there are many different costs that can affect refining profit margins, California refineries have a significant fixed comparative disadvantage on the global stage—their age. Refinery age is a major risk factor for closure: Older refineries have less efficient equipment, are more prone to mechanical failures, and are less attractive for reinvestment.[22,31,37]

5. Imported Gasoline Is Now Available to Backfill Reductions in California-Refined Supplies

As production of California crude oil becomes more expensive, in-state demand for fossil products declines, and more efficient refining capacity shifts elsewhere, out-of-state and foreign refineries have been able to supply refined California-blend gasoline in sufficient quantities to help satisfy in-state demand.[38–40] Recent closure announcements by two sizeable California refineries (Phillips 66 in Wilmington and Carson, Valero in Benicia) confirm that these companies plan to replace at least some of the lost gasoline supply with products from out-of-state or abroad.[6,41–43]

Conclusion

These five irreversible trends all point in the same direction: California's refining sector is in decline and refineries will likely continue to close in the future, with significant consequences for surrounding communities. Yet there is scant publicly available information that would allow communities and policymakers to anticipate and plan for future closures. State law now requires one-year advance notice for a refinery closure, but notice alone is insufficient to allow for thoughtful and deliberative community planning. Phillips 66, for example, announced closure of its 130,000-barrel-per-day Wilmington/Carson refinery (roughly 1,300 acres) in October 2024 and shuttered that facility just over a year later, in December 2025. Valero has provided a similar one-year notice of its intent to close the 145,000-barrel-per-day Benicia refinery (900 acres) in April 2026. But local officials, union workers, and frontline communities have been left scrambling to participate meaningfully in the cleanup and redevelopment process.

Because it takes advance preparation to address the potentially significant impacts of plant closures, and because such closures provide a transformative opportunity to repurpose substantially sized urban parcels for other beneficial uses, state and local policymakers should act now to begin planning for California's eventual exit from the oil refining sector. Even without knowing the exact timing of future closures, there is significant work to be done. For example, there are major regulatory gaps around refinery asset retirement obligations that create immense financial risks to the public purse and to the communities where these facilities are located.[37,44–47] Fortunately, over the last five years, state and local government-sponsored stakeholder engagement and academic research,[48–51] alongside other academics, experts, and analysts,[37,45,52–56] have developed significant policy consensus about how to prepare proactively to maximize the public good for communities, workers, and all Californians.

* * * *

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The 2026-27 Budget:
Cap-and-Invest Expenditure Plan

GABRIEL PETEK | LEGISLATIVE ANALYST | FEBRUARY 2026

SUMMARY

2026-27 Greenhouse Gas Reduction Fund (GGRF) Expenditure Plan Implements New Allocation Methodology. The Governor's 2026-27 budget proposal is the first since the passage of Chapter 117 (AB 1207, Irwin) and Chapter 121 (SB 840, Limón). Together, these bills extended the cap-and-invest program and modified the methodology for allocating the associated GGRF revenues, including creating new allocation "tiers."

Expenditure Plan Allocates Discretionary Revenues to Various Activities. In its 2026-27 GGRF expenditure plan, the administration proposes to allocate a total of over $1.6 billion to discretionary activities, including: (1) $1.25 billion to backfill California Department of Forestry and Fire Protection (CalFire) costs that otherwise would be paid by the General Fund, (2) $250 million for activities specified in intent language in SB 840, and (3) $115 million to create a new light-duty zero-emission vehicle (ZEV) incentive program. The administration does not anticipate GGRF will have adequate revenues to support the full amounts identified in SB 840 for certain programs.

Proposed Activities Generally Reflect Recent Agreements, With Addition of New ZEV Program. We find that the administration's proposal to support the CalFire backfill and SB 840 intent items is consistent with recent legislative guidance. Notably, however, the administration chooses not to support any of the programs that were anticipated to receive out-year monies in the 2024-25 GGRF expenditure plan, including some funds that the state has already awarded to local transit agencies. Failing to provide these transit funds could have negative implications, such as on agencies' financial positions and ability to draw down federal grant funds. Instead, the Governor prioritizes providing GGRF to support the creation of an entirely new ZEV program.

Given General Fund Condition, Recommend Directing GGRF to Highest Priorities Across Budget. In a typical year, trying to maintain existing funding commitments makes sense. However, in light of the state's alarming multiyear budget deficits, we recommend the Legislature use GGRF as an important tool to help it fund its highest funding priorities across the entire state budget. This will necessitate reexamining existing GGRF commitments—both discretionary and statutory—to make sure they continue to reflect the Legislature's highest priorities, and making modifications accordingly. This could include consideration of whether to fund at least some portion of previous transit commitments, given the potential implications of not providing that support. We also recommend the Legislature apply a very high bar to its review of new spending proposals, whether from the General Fund or GGRF. Consistent with this guidance, we recommend rejecting the Governor's proposal to fund a new ZEV incentive program.

Consider Whether Proposed Statutory Changes Are Consistent With Legislative Intent. The administration proposes budget trailer legislation to codify its view that the SB 840 allocation methodology is only intended to apply to auction revenues (not interest income or any entering fund balance). The choice of which funds to include in the SB 840 methodology has important implications for the level of support programs receive under this new structure. Accordingly, we recommend the Legislature consider whether the proposed statutory changes conform to its intent.

Background

Cap-and-Invest Is a Key Program Aimed at Limiting Greenhouse Gas Emissions (GHGs). Since the cap-and-invest program was created through the passage of Chapter 488 of 2006 (AB 32, Núñez), it has served as one of the state's core policies intended to help it achieve its ambitious GHG reduction goals. In 2017, Chapter 135 (AB 398, Garcia) extended the statutory authorization for the program from 2020 to 2030. In September 2025, the Legislature adopted AB 1207 and SB 840, which authorized a second extension of the program (from 2030 to 2045) and made some important changes to it. (We discuss these changes in our December 2025 publication, *Overview of New Updates to the Cap-and-Invest Program*.)

Cap-and-Invest Revenues Are Deposited Into GGRF. Under the cap-and-invest program, the California Air Resources Board (CARB) issues a limited number of allowances each year. (An allowance is essentially a permit to emit one ton of carbon dioxide equivalent.) Under current regulations, the state gives away about half of these allowances for free to industrial facilities, electric utilities, and natural gas suppliers. CARB sells the remaining half of allowances at quarterly auctions and the revenues are deposited into GGRF. Historically, GGRF revenues have been used to support a wide range of programs, many of which are aimed at reducing GHG emissions. However, from a legal perspective, GGRF funds are considered akin to tax revenues, so they can be used for any purpose.

GGRF Monies Typically Allocated by Statute and Annual Budget Process. The Legislature has approached appropriating GGRF revenues through two main methods. First, the Legislature has set aside a portion of ongoing GGRF funding each year for certain programs or projects articulated in legislation (often referred to as "statutory allocations"). Second, the Legislature has allocated other available revenues through the annual budget act, typically for one year at a time (often referred to as "discretionary" allocations). In addition to these two main allocation methods, the state has also funded some ongoing state administrative costs—such as related to implementing GGRF-funded programs—from the fund. Once approved, GGRF funding for state administrative costs generally has been included in departments' base budgets in annual budget acts. (The administration sometimes refers to these as GGRF "state operations" costs.)

The 2024-25 Budget Agreement Included Out-Year Funding for Various Programs. The 2024-25 budget agreement took an atypical approach to allocating discretionary revenues, as it not only appropriated GGRF to discretionary programs for that budget year but also included plans to dedicate a large share of out-year discretionary GGRF revenues for specific purposes. The bulk of the agreed-upon planned GGRF spending was slated to backfill reductions to expenditures that were previously planned to be made from the General Fund for a wide variety of activities. Some of the planned spending was also related to fulfilling statutory agreements. For example, the 2024-25 GGRF expenditure plan included funding to support: (1) public transit, consistent with Chapter 54 of 2023 (SB 125, Committee on Budget and Fiscal Review) and (2) the Clean Energy Reliability Investment Plan (CERIP), consistent with Chapter 239 of 2022 (SB 846, Dodd). (For more details on the 2024-25 budget agreement's multiyear spending plan, please see our September 2024 publication, *The 2024-25 California Spending Plan: Natural Resources and Environmental Protection*.)

The 2025-26 Budget Package Directed Most Discretionary GGRF Spending to Support General Fund and Motor Vehicle Account (MVA). The 2025-26 budget agreement allocated all the GGRF that the administration projected to be available as of the budget act, thus leaving no projected fund balance. The agreement included funding for the statutorily required expenditures, as well as $1.7 billion in discretionary spending. Most of the latter allocation—$1 billion—was provided for a CalFire fund shift, replacing a like amount of General Fund support for the department to help address a budget shortfall. Additionally, to help make up for a projected deficit in the MVA in 2025-26, the budget included $81 million from GGRF to pay for costs that otherwise would have to be paid by that account. Other discretionary allocations represented some, but not all, of

the funding that was originally planned for 2025-26 as part of the 2024-25 multiyear GGRF expenditure plan discussed above. (Please see our October 2025 publication, *The 2025-26 California Spending Plan: Natural Resources and Environmental Protection*, for a summary of which programs received GGRF in 2025-26.)

Starting in 2026-27, Allocation of Revenues Is Guided by New Legislation. Senate Bill 840 not only made changes to the cap-and-invest program itself, but also made various modifications to the allocation of GGRF revenues starting in 2026-27. For example, SB 840 changed some statutory allocations from being set percentages of annual GGRF revenues to fixed dollar amounts. Senate Bill 840 also modified the order in which certain allocations are made, including setting aside $1 billion for discretionary allocations earlier in the prioritization process. (We discuss SB 840's changes to the statutory allocations of GGRF in greater detail in our recent report, *Overview of New Updates to the Cap-and-Invest Program*.)

In **Figure 1**, we summarize the GGRF allocations under SB 840.

Recent Legislation Expressed Intent for Use of Funds in 2026-27. In addition to the statutory allocations shown in the figure, the Legislature enacted statutory language expressing its intent to use discretionary GGRF monies to support certain other activities in 2026-27 and future years. Specifically, SB 840 expressed the Legislature's intent to provide a total of $250 million to fund the following specific activities from the $1 billion discretionary GGRF set aside in 2026-27:

- $125 million for transit passes.
- $85 million for climate-focused technological innovation.
- $25 million for seed funding for a University of California Climate Research Center.
- $15 million to rebuild Topanga Park (which sustained damage in the Palisades fire).

Figure 1

Statutorily Required GGRF Appropriations Pursuant to SB 840

Program	Department	Annual Amounts
Tier 1: Starting in 2026-27, auction revenues will be allocated first to the following programs:		
Manufacturing tax exemption	N/A	• Roughly $160 million
State operations[a]	Various	• Roughly $120 million
State Responsibility Area fee backfill	CalFire	• Roughly $90 million
Legislative Counsel Climate Bureau	Legislative Counsel	• $3 million
Tier 2: Then second to the following programs:		
High-speed rail project	HSRA	• $1 billion
Unspecified programs subject to appropriation[b]	Various	• $1 billion
Tier 3: Then third, if funding is available, to the following programs[c]:		
Affordable Housing and Sustainable Communities Program[d]	SGC	• $800 million
TIRCP	CalSTA	• $400 million
Community Air Protection Program—AB 617	CARB	• $250 million
Low Carbon Transit Operations Program	Caltrans	• $200 million
Wildfire and forest resilience—SB 901	CalFire	• $200 million
Safe and Affordable Drinking Water Program	SWRCB	• $130 million
Tier 4: Then fourth, remaining funding is subject to legislative appropriation for discretionary purposes.		

[a] SB 840 does not explicitly mention state operations as part of Tier 1, but references funding them prior to allocating Tier 3. The administration proposes budget trailer legislation to clarify that they are considered part of Tier 1.
[b] SB 840 included intent language for spending some of this funding in 2026-27.
[c] SB 840 requires the Department of Finance to proportionately reduce the amounts for these programs if funding is insufficient to fully support them.
[d] The Governor proposes budget trailer legislation to divide the Affordable Housing and Sustainable Communities funding into two separate programs.

GGRF = Greenhouse Gas Reduction Fund; SB 840 = Chapter 121 of 2025 (SB 840, Limón); CalFire = California Department of Forestry and Fire Protection; HSRA = High Speed Rail Authority; SGC = Strategic Growth Council; TIRCP = Transit and Intercity Rail Capital Program; CalSTA = California State Transportation Agency; AB 617 = Chapter 136 of 2017 (AB 617, C. Garcia); CARB = California Air Rescources Board; Caltrans = California Department of Transportation; SB 901 = Chapter 626 of 2018 (SB 901, Dodd); and SWRCB = State Water Resources Control Board.

Additionally, Chapter 5 of 2025 (AB 102, Gabriel) expressed the Legislature's intent to provide GGRF in 2026-27 and potentially future years to support some CalFire activities that otherwise would be funded from the General Fund. Specifically, if the General Fund continued to experience deficits in 2026-27, AB 102 expressed the Legislature's intent that GGRF cover $1.25 billion of CalFire's costs in 2026-27, $500 million in 2027-28, and $500 million in 2028-29. (If the General Fund was not projected to be in a deficit in 2026-27, GGRF would only cover $500 million for CalFire in that year.)

Allowance Prices Have Been Relatively Stable Since Passage of New Legislation. The passage of AB 1207 and SB 840 provided additional clarity regarding the future of the cap-and-invest program. As such, some expected that their passage could put upward pressure on allowance prices and potentially result in higher GGRF auction revenues compared to recent trends. As of the preparation of this report, only one auction—in November 2025—has been conducted since the passage of the two bills. However, the resulting revenues were roughly equivalent to the amount the state received from the August 2025 auction, as both allowance prices and the number of allowances sold were similar across the two auctions. In both August and November, allowances sold for roughly $28 each, which is much closer to the program's price floor ($26) than its price ceiling ($95). (We discuss the recent auction results in greater detail in our December 2025 publication, *Cap-and-Invest: November 2025 Auction Update and 2026-27 Budget Context*.)

Governor's Proposal

Proposes SB 840-Related Budget Trailer Legislation. The administration proposes budget trailer legislation to make various changes to SB 840. Some of the main proposed changes would memorialize its interpretation of the intent of SB 840 by clarifying that: (1) the SB 840 allocation methodology applies to auction revenues, not interest earnings or the entering fund balance, and (2) state operations costs should be considered as part of Tier 1. Other notable proposed changes include (1) dividing the Affordable Housing and Sustainable Communities (AHSC) Program into two allocations, (2) enhancing flexibility across two portions of wildfire resilience funding, and (3) expanding the eligible uses for the High-Speed Rail Authority's GGRF allocation to include its administrative and state operations costs. (We plan to discuss the AHSC portion of the budget trailer legislation in greater detail in a forthcoming publication, *The 2026-27 Budget: Streamlining California's Affordable Housing Funding System*.)

Allocates $3.8 Billion in Projected GGRF Auction Revenues Through SB 840 Methodology. The Department of Finance (DOF) forecasts cap-and-invest auction proceeds of $3.8 billion in 2026-27. As shown in **Figure 2**, DOF applies its interpretation of the new SB 840 methodology to these auction proceeds. Notably, the Governor proposes to allocate the $1 billion discretionary set aside within Tier 2 for two purposes: (1) $250 million for the legislative intent items identified in SB 840 and (2) $750 million to partially support the planned CalFire General Fund backfill.

Funds New State Operations Expenditures Within Tier 1. The Governor proposes to support a few new activities from the state operations portion of GGRF, which it would fund in Tier 1, as mentioned above. These consist of:

- ***Climate Change Assessment.*** Proposes $9.9 million over five years (including $355,000 in 2026-27) for various departments to support the development of the state's Sixth California Climate Change Assessment and associated research.
- ***AB 1207 and SB 840 Implementation.*** Proposes $2.1 million ongoing and seven positions for the California Public Utilities Commission (CPUC) and $871,000 ongoing (as well as additional funding from the Cost of Implementation Account) and ten positions for CARB to undertake new activities associated with implementing AB 1207 and SB 840 requirements. Such activities include implementing changes to the "California Climate Credit" rebates funded by free allowances provided to utilities and updating the rules governing the eligibility and quantification of offsets under the program.

Figure 2

Governor's Cap-and-Invest Expenditure Plan for 2026-27

(In Millions)

SB 840 Formula	
Estimated Auction Proceeds	**$3,770**
Tier 1	
Manufacturing tax exemption	$159
State operations	120
State Responsibility Area fee backfill	88
Legislative Counsel Climate Bureau	3
Subtotal Tier 1	($370)
Tier 2	
High-speed rail project	$1,000
CalFire General Fund backfill	750
SB 840 intent language items	250
Subtotal Tier 2	($2,000)
Tier 3[a]	
Affordable housing[b]	$396
Transit and Intercity Rail Capital Program	283
Community Air Protection Program—AB 617	177
Sustainable communities and agricultural land conservation[b]	170
Low Carbon Transit Operations Program	141
Wildfire and forest resilience—SB 901	141
Safe and Affordable Drinking Water Program	92
Subtotal Tier 3	($1,401)
Remaining Balance Available for Priority 4 Discretionary Activities	**—**
Total Projected Expenditures	**$3,770**
Outside of SB 840 Formula	
Estimated Non-SB 840 Funding	**$750**
Entering fund balance[c]	$250
Interest earnings	500
Proposed Non-SB 840 Expenditures	**$615**
CalFire General Fund backfill	$500
Zero-emission vehicle incentive program	115
Projected Remaining Fund Balance and End of 2026-27	**$135**

[a] Tier 3 amounts reflect proportional reductions to statutorily-defined amounts based on projected revenues, pursuant to the SB 840 methodology.

[b] The Governor proposes budget trailer legislation to divide the Affordable Housing and Sustainable Communities funding into two separate programs.

[c] A portion of the anticipated entering fund balance results from the administration's proposal to undo the $81 million transfer to the Motor Vehicle Account that was approved in the 2025-26 budget.

CalFire = California Department of Forestry and Fire Protection; SB 840 = Chapter 121 of 2025 (SB 840, Limón); AB 617 = Chapter 136 of 2017 (AB 617, C. Garcia); and SB 901 = Chapter 626 of 2018 (SB 901, Dodd).

- ***AB 617 Implementation.*** Proposes $1.6 million ongoing and 5.2 positions for CARB to implement Chapter 118 of 2025 (SB 352, Reyes) related to the Community Air Protection Program established by Chapter 136 of 2017 (AB 617, C. Garcia).
- ***CARB Consolidated Administration.*** Proposes $82,000 ongoing (as well as additional funding from other sources) and six positions to support various human resources and information technology-related functions at CARB.

Under DOF's Projections, Revenues Would Not be Sufficient to Fully Fund Tier 3 Programs in 2026-27 and Out-Years. Based on its auction projections and interpretation of SB 840, DOF does not anticipate GGRF will have adequate revenues in 2026-27 to support the full amounts identified for the Tier 3 programs in SB 840. Instead, DOF projects that the Tier 3 programs will be subject to proportional reductions in 2026-27 pursuant to the statutory methodology, receiving roughly 70 percent of the amounts specified in statute. The projected allocations are displayed in Figure 2. Notably, DOF also projects that Tier 3 programs may be subject to proportional reductions in the out-years as well, as shown in Figure 3 on the next page.

Allocates $615 Million Outside SB 840 Spending Framework for Rest of CalFire Backfill and ZEV Incentive Program. The administration assumes about $750 million in GGRF monies will be available in 2026-27 that are not from budget-year auction revenues and thus not subject to the SB 840 allocation process under its statutory interpretation. This includes an expected entering fund balance ($250 million), as well as projected GGRF interest income ($500 million). The estimated GGRF entering

Figure 3

Administration's Greenhouse Gas Reduction Fund Revenue and SB 840 Expenditure Projections

(In Millions)

	2026-27	2027-28	2028-29	2029-30
DOF GGRF Revenue Estimates[a]	**$3,770**	**$3,915**	**$4,066**	**$4,221**
Tier 1				
Manufacturing tax exemption	$159	$163	$168	$174
State operations	120	124	127	131
State Responsibility Area fee backfill	88	88	88	88
Legislative Counsel Climate Bureau	3	3	3	3
Subtotal Tier 1	($370)	($378)	($386)	($396)
Tier 2				
High-speed rail project	$1,000	$1,000	$1,000	$1,000
CalFire General Fund backfill	750	500	500	—
SB 840 intent items	250	—	—	—
Remaining discretionary set aside	—	500	500	1,000
Subtotal Tier 2	($2,000)	($2,000)	($2,000)	($2,000)
Tier 3[b]				
Affordable housing[c]	$396	$435	475	$516
Transit and Intercity Rail Capital Program	283	311	339	369
Community Air Protection Program—AB 617	177	194	212	231
Sustainable communities and agricultural land conservation[c]	170	186	204	221
Low Carbon Transit Operations Program	141	155	170	184
Wildfire and forest resilience—SB 901	141	155	170	184
Safe and Affordable Drinking Water Program	92	101	110	120
Subtotal Tier 3	($1,401)	($1,537)	($1,680)	($1,825)
Projected SB 840 Expenditures	**$3,770**	**$3,915**	**$4,066**	**$4,221**

[a] Revenue estimates assume allowances will sell at the same average premium above the price floor as has been the case for the last four quarters with fully subscribed auctions. DOF notes that this scenario is presented as an example and should not be considered as a market price forecast.

[b] Tier 3 amounts reflect proportional reductions to statutorily-defined amounts based on projected revenues, pursuant to the SB 840 methodology.

[c] The Governor proposes budget trailer legislation to divide the Affordable Housing and Sustainable Communities funding into two separate programs.

GGRF = Greenhouse Gas Reduction Fund; DOF = Department of Finance; CalFire = California Department of Forestry and Fire Protection; SB 840 = Chapter 121 of 2025 (SB 840, Limón); AB 617 = Chapter 136 of 2017 (AB 617, C. Garcia); and SB 901 = Chapter 626 of 2018 (SB 901, Dodd).

fund balance is higher than previously anticipated for a couple of reasons, including (1) a new proposal to undo the $81 million MVA transfer that was approved in the 2025-26 budget agreement, as the administration projects that account will not need it to remain solvent through 2026-27, and (2) lower-than-budgeted expenditures on some activities. As displayed in Figure 2, the administration proposes to use $615 million of the $750 million in additional revenues to support the following activities, thus leaving a projected GGRF fund balance of $135 million at the end of 2026-27:

- ***CalFire Backfill.*** Proposes $500 million to support the remainder of the planned $1.25 billion CalFire backfill.
- ***ZEV Incentive Program.*** Proposes $115 million to create a new light-duty ZEV incentive program. (The Governor also proposes providing $85 million from the Air Pollution Control Fund—similarly freed up from undoing the previously-approved MVA fund transfer—to support this new ZEV program, for a total of $200 million.)

Assessment

Administration's Revenue Estimates Appear Reasonable, but GGRF Revenues Remain Difficult to Predict. Based on currently available information, DOF's 2026-27 GGRF revenue forecast appears reasonable. However, GGRF revenues are inherently somewhat unpredictable. Moreover, while

one key near-term source of program uncertainty was resolved with its statutory extension, some remaining factors could potentially still create a heightened level of revenue unpredictability in the next couple of years. For example, CARB recently released draft regulations that propose to make various changes to the program—including to the total number of allowances issued and the allocation of those allowances across various purposes (such as GGRF and free allowances to utilities and industry)—that could affect GGRF revenues. Additionally, CARB still is considering linking California's cap-and-invest program with the program in Washington state. Such a linkage could affect allowance prices in both states as they come into alignment. Moreover, the current federal administration has been critical of California's cap-and-invest program, including in a April 2025 executive order. Should the federal government threaten action against the state's program, allowance prices could be affected.

Proposal Generally Reflects Recent Agreements, with Addition of New ZEV Program. The administration's proposal to provide $1.25 billion for a CalFire backfill and $250 million for SB 840 intent items is consistent with the guidance included in recent legislation. Notably, however, the administration does not propose to fund any of the programs that were anticipated to receive out-year monies in the 2024-25 GGRF expenditure plan, such as CERIP or transit, in either 2026-27 or future years. Instead of funding the programs envisioned in the 2024-25 GGRF plan, the Governor prioritizes providing GGRF to support the creation of an entirely new ZEV incentive program.

Neglecting to Provide Planned Transit Funding Could Lead to Disruptions for Local Capital Projects. The amounts planned in the 2024-25 GGRF package that are no longer included in the administration's multiyear spending plan (or in SB 840 intent language) include a total of $710 million that would have supported local transit agencies across the state. This includes $20 million for the Transit and Intercity Rail Capital Program planned for 2026-27, and $230 million in 2026-27 and $460 million in 2027-28 for the Zero Emission Transit Capital Program. In part because some of these funds had originally been scheduled to be provided in previous years but then were delayed due to the state budget condition, some local transit agencies already have committed portions of this funding to specific local projects. For example, the Metropolitan Transportation Commission in the Bay Area indicates that, consistent with the SB 125 plan it submitted to the Legislature, it programmed about $250 million of the anticipated funds which the Legislature has not yet appropriated for two Bay Area Rapid Transit expansion capital projects in order to help leverage billions of dollars in forthcoming federal support from the Capital Investment Grant Program. It states that failure to receive the anticipated funds could jeopardize local transit agencies' ability to draw down significant federal funding, and that agencies have entered into construction contracts based on state commitments. Accordingly, not providing this funding could be disruptive to affected local agencies. Additionally, some transit agencies planned to use some of this funding to offset operational funding shortfalls. The Legislature may want to learn more about potential consequences that could ensue from the administration's proposal to not fund these planned amounts and consider them as it develops its final GGRF spending package.

Given General Fund Condition, Directing GGRF to Support Core State Priorities Is an Important Budget Tool. In our view, it typically makes sense to try to maintain existing funding commitments. However, as we discuss in our January 2026 publication, *The 2026-27 Budget: Overview of the Governor's Budget*, the state faces alarming multiyear budget deficits, ranging from $20 billion to $35 billion annually. We expect that the Legislature will need to make very difficult decisions to address these deficits. Within this context, we think the Legislature should use GGRF as an important tool to help it fund its highest funding priorities across the entire state budget. This could include helping to support existing core services currently paid for by the General Fund. We note that, given the legal flexibility of GGRF, its funds could be used not only to support existing core environmental-related activities—such as parks and fire protection—but also other activities, such as in the areas of health and human services.

Since Much of GGRF Is Committed, This Approach Would Involve Revisiting Existing Commitments. As discussed above, the Legislature has already committed large portions of GGRF for specific activities in 2026-27 and out-years. Thus, using GGRF as a budget tool will necessitate reexamining existing commitments—both discretionary and statutory—to make sure they continue to reflect the Legislature's highest priorities. If any of these commitments represent lower-priority activities than programs at risk of being defunded, reallocating funding so it is instead directed to the highest-priority activities across the budget would make sense. (This could also include allocating funding consistent with earlier GGRF plans, such as to public transit.)

Very High Bar for Approving New Proposals Under Current Budget Conditions. We also believe the Legislature should apply a very high bar to its review of new spending proposals, whether from the General Fund or GGRF. This is because, in the context of a budget deficit, funding any new proposals will necessitate making commensurate reductions elsewhere within the budget. As we discuss in our companion report, *The 2026-27 Budget: Framework for Approaching the Natural Resources, Environmental Protection, and Agriculture Budget*, we do not think the Governor's proposal to provide GGRF to establish a new ZEV incentive program meets this threshold. (We also plan to discuss the ZEV proposal in more depth in a forthcoming publication, *The 2026-27 Budget: Proposed Zero-Emission Vehicle Incentive Program*.)

Does Administration's Interpretation of SB 840 Methodology Align With Legislative Intent? DOF indicates that its proposed budget trailer legislation clarifies its interpretation of the intent of SB 840 related to (1) the funds subject to the SB 840 methodology and (2) the treatment of state operations costs. A key question for the Legislature is whether it is comfortable that the proposed statutory modifications do indeed reflect its intent, as they have important implications for which programs receive funding under this new structure. Specifically:

- ***Considering Interest Income and Entering Fund Balance Discretionary and Outside of SB 840.*** The practical implication of the administration considering revenues from interest income and the entering fund balance outside of the SB 840 allocation process is that more than $1 billion annually will be set aside as available for discretionary purposes prior to computing allotments for Tier 3 programs. The precise amount of such available discretionary funding will vary by year depending on the entering fund balance and interest income. In 2026-27, for example, under this approach roughly $1.75 billion is available for discretionary purposes prior to funding Tier 3 programs, of which the administration proposes to spend about $1.6 billion. We note that the language of SB 840 indicates that the methodology applies to "moneys in the fund" and thus does not clearly limit it exclusively to auction revenues. However, the administration indicates that the intent of SB 840 was to apply the methodology only to auction revenues, consistent with historical practice.
- ***Providing State Operations Costs First Priority.*** By including funding for state operations in Tier 1, they are taken "off the top" before allocations are computed for nearly all other activities. The main implication of this approach is that any activities that are added to this category essentially result in less funding available to support programs in other tiers and a greater likelihood that Tier 3 programs may not receive their full statutory allotments. We note that SB 840 is not explicit about the allocation tier within which these activities should be covered. Instead, the statute references setting aside funding for them prior to computing allotments for Tier 3 funding.

Funding Proposals From State Operations Has Implications for Money Left Available for Other Tiers. Under the administration's interpretation of the SB 840 methodology (which would be codified in the proposed budget trailer legislation), activities that are funded as part of GGRF state operations are prioritized above nearly all other programs and activities. The administration indicates that because these funds typically support ongoing state staff, ensuring more certainty that they will be available is important so as not to risk staff layoffs if GGRF

revenues come in below expectations. While this rationale is reasonable, this approach is not without trade-offs. Most notably, because including state operations expenditures as part of Tier 1 means they receive first priority for available GGRF, adding new activities to this category can have the effect of gradually "crowding out" other GGRF-funded programs and activities. In light of this, we think the Legislature should carefully consider what types of activities it would like to include in this category—and potentially provide this guidance to the administration in statute, as appropriate—recognizing that this year's decisions could serve as a precedent going forward. For example, the administration's proposal to support the Sixth California Climate Change Assessment serves as a somewhat nontraditional example of a GGRF state operations category activity, in that it is not directly linked to implementing cap-and-invest or GGRF-funded programs and would support *one-time* activities rather than *ongoing* state staff. (We provide additional analysis of this proposal in our companion report, *The 2026-27 Budget: Framework for Approaching the Natural Resources, Environmental Protection, and Agriculture Budget*. We also plan to discuss CPUC's AB 1207 implementation proposal—also funded from the GGRF state operations category—in a publication, *The 2026-27 Budget: California Public Utilities Commission's Implementation of AB 1207*.)

Recommendations

Direct GGRF to Highest Legislative Priorities, Including for Supporting Core Activities Traditionally Funded With General Fund. We recommend the Legislature dedicate GGRF to its highest budget priorities across the entire state budget, not just within climate- or environment-related programs. To effectuate this, we recommend the Legislature review prior plans and commitments for spending GGRF—including discretionary and statutory allocations, as well as state operations expenditures—to make sure they continue to reflect the Legislature's highest priorities across the broader budget, and then make modifications accordingly. This could include consideration of whether to fund at least some portion of previous transit commitments, given the potential implications of not providing that funding. Additionally, we recommend the Legislature reject new discretionary GGRF proposals unless they meet an exceptionally high bar, as they both come at the expense of previous unmet GGRF planned commitments and mean forgoing the ability to use that amount of GGRF to help address the General Fund shortfall. Consistent with this guidance, we recommend rejecting the Governor's proposal to fund a new ZEV incentive program.

Review Proposed SB 840 Implementation Approach and Statutory Changes to Ensure Consistency With Legislative Intent. We recommend the Legislature carefully review the administration's proposed approach to implementing SB 840 to ensure that it is consistent with legislative intent and preferences, and make any associated statutory modifications, as relevant. This could include adopting the administration's proposed budget trailer legislation clarifying the funds subject to SB 840 and the prioritization of state operations costs, if those changes accurately reflect legislative intent. It could also include memorializing in statute the Legislature's preferred guiding principles for which types of activities the administration should include as GGRF state operations proposals going forward, as those activities would receive first priority for funding and thus can crowd out other GGRF-funded programs and activities.

Monitor Auctions and Adopt Spending Levels That Reflect Evolving Revenue Trends. Given the continued uncertainty around cap-and-invest revenues, we recommend the Legislature closely monitor upcoming quarterly auctions—in February and May 2026—to assess how revenues are materializing. We recommend the Legislature be prepared to modify its GGRF expenditure plan accordingly, should revenues from these auctions come in at higher or lower levels than currently anticipated.

LAO PUBLICATIONS

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DIVISION OF PETROLEUM MARKET OVERSIGHT

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OFFICIAL REPORT

2024 Annual Report

Year in Review, Gasoline Market Conditions, and California Gasoline Price Analysis

Gavin Newsom, Governor

October 2025 | CEC-900-2025-001

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ABSTRACT

SB X1-2 (Ch. 1, Stats. of 2023-24 Ext. Sess.), the California Gas Price Gouging and Transparency Law, established the Division of Petroleum Market Oversight (DPMO) as an independent division of the California Energy Commission (CEC).

DPMO is charged with protecting consumers through market oversight, investigations, economic analysis, and policy recommendations related to the transportation fuels market. SBX1-2 also requires DPMO to annually report its findings and recommendations to improve market performance to the Governor, the Legislature, the CEC, the Attorney General, and the California Department of Tax and Fee Administration (CDTFA). This is DPMO's first full-year annual report.

Chapter 1 ("Introduction") summarizes DPMO's market oversight, investigations, economic analysis, and policy recommendation functions under SB X1-2.

Chapter 2 ("Gasoline Market Conditions") provides a high-level overview of gasoline market conditions last year, including price levels, supply changes, and demand trends.

Chapter 3 ("Demystifying California Gasoline Prices") details DPMO's preliminary analysis of the net price difference between retail gasoline in California and in the rest of the U.S., after accounting for taxes, fees, and environmental program costs. DPMO finds that this difference is likely driven by higher gross gasoline industry margins, which may be associated with the exercise of market power through vertically controlled sales channels.

A Technical Appendix ("Gasoline Price Analysis: Methods and Findings") describing methods, data sources, and assumptions accompanies this report.

Keywords: Division of Petroleum Market Oversight, gasoline prices, mystery gasoline surcharge, price spikes, SB X1-2, AB X2-1

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION 1

About the Division 1

Independent Oversight and Investigations 2

Economic and Policy Analysis 2

CHAPTER 2: GASOLINE MARKET CONDITIONS 4

California Gasoline Market Conditions 4

National and Global Market Dynamics 8

CHAPTER 3: DEMYSTIFYING CALIFORNIA GASOLINE PRICES 10

Key Findings 10

Confirmation of the Mystery Gasoline Surcharge 10

Increasing Gross Gasoline Industry Margins 14

Explanation: The Exercise of Market Power? 16

Evidence: Gasoline Prices Along the Supply Chain 20

Result: Haves and Have-Nots 24

Conclusions and Recommendations 29

TECHNICAL APPENDIX: GASOLINE PRICE ANALYSIS METHODS AND FINDINGS A-1

Calculation of the Mystery Gasoline Surcharge A-2

Decomposing the Surcharge A-12

REFERENCES AND DATA SOURCES A-1

Annual Report References R-1

Data Sources for Annual Report Exhibits R-3

Data Sources for MGS Calculation R-4

Additional Data Sources R-4

LIST OF EXHIBITS

Exhibit 1: California Retail Gasoline Prices Were Lower, More Stable in 2024 and 2025 Than in Previous Years 4

Exhibit 2: A Closer Look at the Spring 2024 Price Spike 5

Exhibit 3: A Closer Look at the Fall 2024 Price Spike 5

Exhibit 4: Retail Gasoline Price Gap Between California and the Rest of the U.S. Has Been Growing Since 2015 11

Exhibit 5: Professor Borenstein Describes the "Mystery Gasoline Surcharge" in 2018 Energy Institute Blog Post 12

Exhibit 6: DPMO Confirms Professor Borenstein's Mystery Gasoline Surcharge 13

Exhibit 7: Higher Gross Industry Margins in California Have Driven the Surcharge Since 2015 15

Exhibit 8: Gross Gasoline Industry Margins in California Have Exceeded the Rest of the U.S. Since 2015 16

Exhibit 9: California's Top 4 Gasoline Refiners Controlled Nearly 90 Percent of State's Crude Refining Capacity in 2025 17

Exhibit 10: California Refiners Rely Heavily on Dealer Tank Wagon Sales Compared to the Rest of the U.S. 19

Exhibit 11: Average California-Rest of U.S. Spot Price Differences Stable Outside of Price Spikes Despite Post-2015 Surcharge 20

Exhibit 12: Wholesale DTW and Branded Rack Prices Have Increased Substantially Above Spot Prices Since 2015 21

Exhibit 13: At Retail, Branded Fuel Commands a Larger Price over Unbranded in California Compared to the Rest of the U.S. 22

Exhibit 14: Retail Gasoline Prices at Major Brands Have the Highest Surcharge 23

Exhibit 15: Gross Gasoline Refining Margins Are Higher for Refiners with Substantial DTW and Branded Rack Sales 25

Exhibit 16: California Retail Prices Spike, Even as Crude Costs and Rest of U.S. Retail Prices Are Stable or Declining 26

Exhibit 17: California Refiners Have Reported Significantly Higher Operating Expenses to the CEC Than to Investors 28

Exhibit A1: Gasoline Price Gap Between California and Rest of U.S. Has Been Growing Since the Torrance Refinery Fire in 2015 ..... A-1

Exhibit A2: Surcharge Appeared in 2015 after the Torrance Refinery Fire A-2

Exhibit A3: California Retail Gasoline Prices Reported by EIA and OPIS Are Close and Follow Same Trends A-4

Exhibit A4: After July 2010, California Tax Revenues from Gasoline Predominantly Come from Gasoline Excise Tax..... A-5

Exhibit A5: Since 2015, the California Price Net of Taxes Diverges from Rest of the U.S. Price Net of Taxes..... A-7

Exhibit A6: MGS Calculation Accounts for the Taxes, Fees, and Environmental Program Costs as of August 2025..... A-9

Exhibit A7: DPMO Surcharge Nearly Identical to Professor Borenstein's MGS A-11

Exhibit A8: Summary of Modeling Assumptions for Computation of Surcharge A-11

Exhibit A9: PADD 5/West Coast Acquisition Cost of Crude Closely Aligns with Crude Costs Reported by California Refiners.....A-14

Exhibit A10: Difference in Acquisition Cost of Crude between West Coast and Rest of U.S. Unchanged with Appearance of Surcharge.....A-15

Exhibit A11: Growth in MGS Closely Follows Growth in California's Gross Refining and Marketing Margin Premium Relative to Rest of U.S. A-16

Exhibit A12: Since Torrance Fire, Gross Refining and Marketing Margins in California Consistently Exceed Margins in Rest of U.S. A-17

Exhibit A13: California Refiners Rely Heavily on Close Vertical Relationships Relative to Rest of U.S. Refiners A-18

Exhibit A14: Wholesale Price Markup Has Grown Steeply for Contracted Fuel Sales Channels (DTW, Branded) after Torrance Fire.....A-19

Exhibit A15: California Branded Gasoline Price Difference is Significantly Higher than the Brand Premium in Rest of U.S. and Growing.....A-20

CHAPTER 1:
Introduction

About the Division

The Division of Petroleum Market Oversight (DPMO) is the nation's first independent watchdog agency overseeing the oil and gasoline industry. DPMO was established in 2023 by Senate Bill X1-2 (Skinner, Ch. 1, Stats. of 2023-24 First Ext. Sess.) (SB X1-2), the California Gas Price Gouging and Transparency Law. DPMO is an independent division of the California Energy Commission (CEC).

DPMO's statutory mandate is to protect California consumers by safeguarding the integrity of the transportation fuels market. DPMO's work falls into two categories:

- **Independent Oversight and Investigations:** DPMO closely monitors California's transportation fuels markets, with an early focus on the California gasoline market, to identify flaws in market structure, market power abuses, and any other way market participants act anticompetitively or harm consumers. DPMO actively investigates problematic conduct in this industry and may refer potential violations of the law for prosecution.
- **Economic and Policy Analysis:** DPMO provides the Governor, the Legislature, and the CEC with expert analyses, findings, and recommendations on issues related to transportation fuels markets and the interplay with California's clean transportation transition.

SB X1-2 and subsequent trailer bill language provided DPMO with a Director and a staff of ten. Governor Gavin Newsom appointed Tai S. Milder to lead DPMO in August 2023. Director Milder was confirmed by the California State Senate in May 2024.

By June 2024, DPMO was fully staffed. Under SB X1-2, DPMO staff is to be interdisciplinary, with economists, individuals with expertise in transportation fuels markets, and investigative staff with legal training.[1] Division Chief Ryan McCauley, a former Deputy Attorney General with experience enforcing antitrust and competition laws in California's fuels market, oversees the Investigations & Industry Analysis Branch comprised of five experienced prosecutors and enforcement attorneys. Chief Economist Dr. Gigi Moreno, formerly a professor, litigation consultant, and Senior Economist at the Southern California Association of Governments, leads DPMO's Economics Branch, which includes two additional Ph.D. economists and a senior data scientist.

[1] Public Resources Code section 25372.1(e).

Independent Oversight and Investigations

DPMO's Industry Analysis and Investigations Branch is composed of experienced prosecutors and enforcement attorneys with prior experience at the California Department of Justice, district attorney's offices in some of California's largest jurisdictions, and the Office of California's Labor Commissioner.

The Industry Analysis and Investigations branch detects and deters misconduct in the California market. DPMO accomplishes this mission through both real-time market oversight and focused investigative work. This includes multiple open matters related to the refining, wholesale, and retail sectors; outreach and engagement with market participants to ensure that they are complying with reporting requirements under state law; and, critically, day-to-day monitoring of trading activity on California's two spot markets.

Spot market pricing is typically assessed by private firms called "price reporting agencies," including firms like the Oil Price Information Service (OPIS) and Argus. However, reporting to price reporting agencies is voluntary and therefore incomplete. Thanks to the transparency provisions in SB X1-2, all spot market transactions for California transportation fuels must be reported to the CEC the day after they are consummated. DPMO actively reviews these daily spot market transactions and, when needed, contacts market participants concerning their trading activity. This type of real-time reporting and regulatory response is important because California's transportation fuels market is one of the largest in the world, both in terms of volumes and revenue, and because California has experienced frequent price spikes and has seen manipulative activity in the recent past.[2]

The CEC's trading data is much more complete than the data voluntarily reported to price reporting agencies, reflecting a materially higher volume of trading and more accurate price information. On multiple occasions, DPMO has observed material differences between the spot market prices assessed by price reporting agencies versus the prices reported to the CEC across all transactions.

Finally, the Industry Analysis and Investigations Branch tracks market developments, including market trends, proposed mergers or acquisitions, and the publicly reported profitability of major market participants.

While additional specifics of DPMO's oversight and investigations work are generally confidential, this regular and proactive engagement has brought much-needed transparency and scrutiny to California's transportation fuels market.

Economic and Policy Analysis

DPMO's Economics Branch is composed of three Ph.D. economists and a senior data scientist with backgrounds in academia, government, and industry. Their expertise includes antitrust litigation, transportation policy, energy economics, and demand analysis. They work in collaboration with DPMO's deputy director for policy.

[2] See, e.g., *People v. Vitol, et al.*, No. CGC-20-584456 (S.F. Super. Ct.) (complaint alleging manipulation of the California gasoline market by two multinational trading firms in 2015).

DPMO's economics and policy team conducts analysis of California's transportation fuels market by identifying market design flaws and market power abuses as well as providing guidance and recommendations to state policymakers on issues relating to transportation fuels pricing and transportation decarbonization.

DPMO began its work amid a major retail gasoline price spike in late summer 2023. In response to that price spike, DPMO issued its first "Interim Update on California's Gasoline Market," which identified the underlying market conditions that drove prices upward.[3] The Governor directed DPMO to provide additional analysis and policy recommendations.[4]

In January 2024, DPMO, following collaboration with CEC staff, delivered three policy recommendations focused on reducing gasoline price volatility and mitigating price spikes: (1) bringing transparency to California gasoline spot markets by publishing aggregated trading data; (2) requiring resupply planning by refiners during major planned maintenance events; and (3) establishing minimum inventory levels to maintain liquidity throughout the year.[5] DPMO staff are working with the CEC to implement the first recommendation.

In October 2024, the Governor and Legislature enacted Assembly Bill X2-1 (Hart and Aguiar-Curry, Ch. 1, Stats. of 2023-24 Second Ext. Sess.) (AB X2-1), which gave the CEC the authority to evaluate and implement the second and third recommendations. DPMO staff is continuing to support these workstreams, and the implementation of SB X1-2 and AB X2-1.

DPMO has also made significant progress in surfacing the potential drivers of unusually high retail gasoline prices in California relative to prices in the rest of the U.S., which has been referred to as the "mystery gasoline surcharge." Much of that progress is detailed in subsequent sections of this annual report.

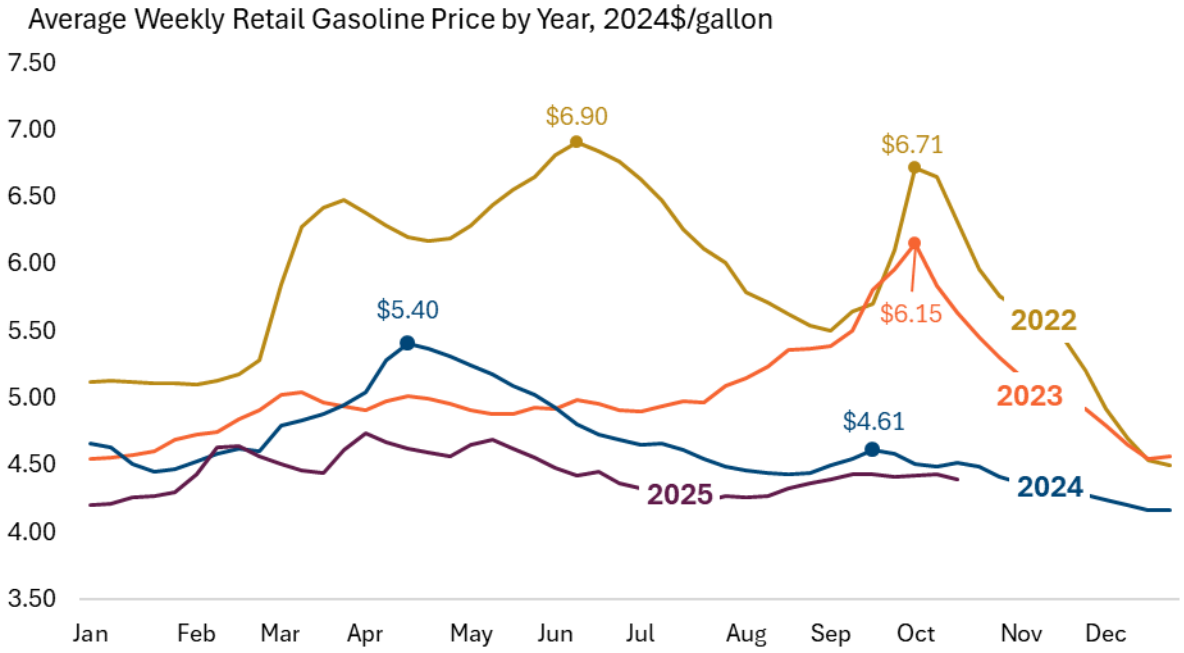
[3] Division of Petroleum Market Oversight. Sept. 22, 2023. "September 2023 Interim Market Update." https://efiling.energy.ca.gov/GetDocument.aspx?tn=252364&DocumentContentId=87378.
[4] Governor Gavin Newsom. Sept. 27, 2023. "Letter to CARB, CEC, and DPMO." https://www.gov.ca.gov/wp-content/uploads/2023/09/Winter-Blend-Directive.pdf.
[5] Division of Petroleum Market Oversight. Jan. 31, 2024. "Core Options for Reforming the California Gasoline Spot Market." https://efiling.energy.ca.gov/GetDocument.aspx?tn=254283&DocumentContentId=89644.

CHAPTER 2:
Gasoline Market Conditions

California Gasoline Market Conditions

As **Exhibit 1** shows, the California retail gasoline market in 2024 avoided a major statewide price spike of the magnitude seen in 2022 and 2023. According to the CEC, California consumers spent $2.3 billion less on gasoline in 2024 than in 2023.[6]

Exhibit 1: California Retail Gasoline Prices Were Lower, More Stable in 2024 and 2025 Than in Previous Years[7]



Note: Based on data from EIA Weekly CA Regular All Formulations Retail Gasoline Prices.

However, two smaller price spikes occurred in 2024 that were driven in part by planned and unplanned refinery outages: one in spring 2024, and another in late summer 2024.[8] These smaller price spikes cost Californians hundreds of millions of dollars. **Exhibits 2 and 3** show these smaller and more localized price spikes in more detail.

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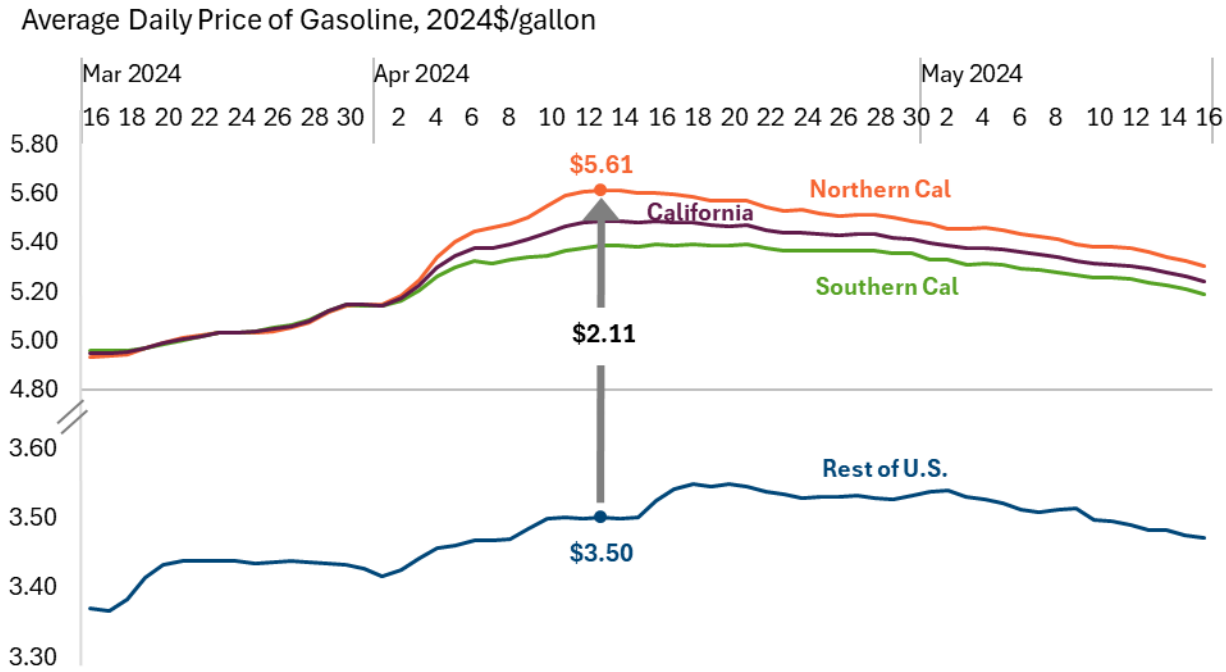
[6] California Energy Commission. Dec. 5, 2024. "Petroleum – Year in Review" [Workshop recording, at 00:21:20]. https://energy.zoom.us/rec/share/bzy1B901xJa3ZgWeLoScRuHwR4Pt1LjPYvnO2VaCa0pcB_7WUC7v8aghYM6fUHuv.yon8hBdORmRdWTJ7.

[7] Unless otherwise noted, all dollar figures are reported in constant 2024 dollars, with the base equal to the 2024 average U.S. Consumer Price Index (CPI) for all goods excluding energy. CPI from the U.S. Bureau of Labor Statistics, Series CUSR0000SA0LE. https://data.bls.gov/timeseries/CUSR0000SA0LE.

[8] Oil Price Information Service. Sept. 12, 2024. "Volatility and Uncertainty in Bay Area Gasoline Market Deter Trade" (Noting significant maintenance-based supply constraints).

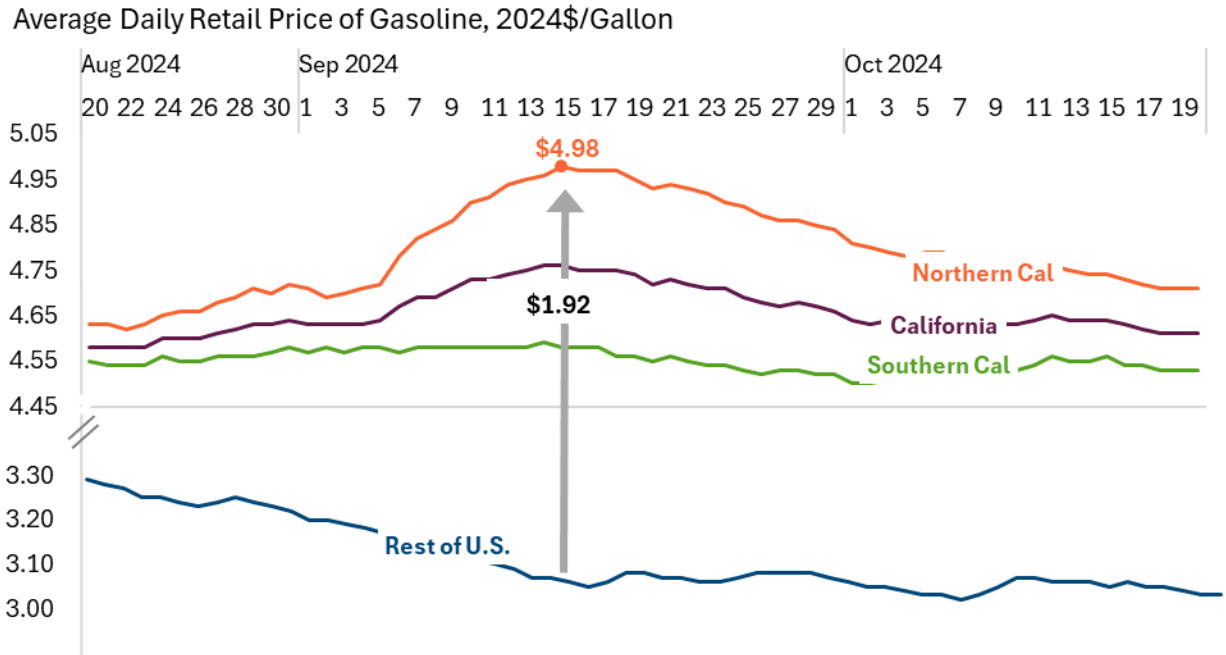
Exhibit 2: A Closer Look at the Spring 2024 Price Spike



Note: Based on DPMO analysis of OPIS retail price data. Retail prices include taxes, fees, and environmental program costs.

In spring 2024, retail gasoline prices rose to $5.61 per gallon in Northern California and $5.39 per gallon in Southern California. On April 13, 2024, the difference between retail gasoline prices in Northern California and the rest of the U.S. peaked at $2.11 per gallon.

Exhibit 3: A Closer Look at the Fall 2024 Price Spike



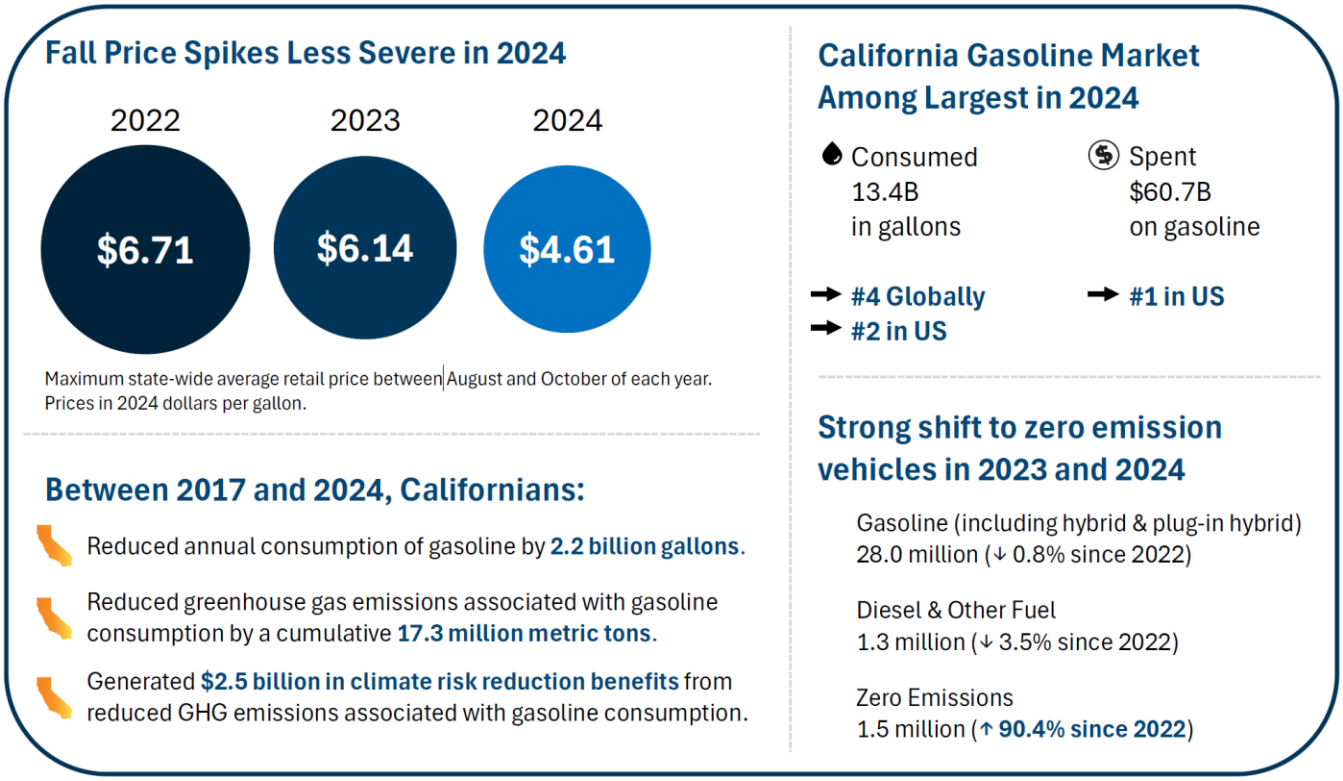
Note: Based on DPMO analysis of OPIS retail price data. Retail prices include taxes, fees, and environmental program costs.

In late summer and early fall 2024, retail gasoline prices rose to $4.98 per gallon in Northern California and stayed relatively stable in Southern California. On September 15, 2024, the difference between retail gasoline prices in Northern California and the rest of the U.S. peaked at $1.92 per gallon. California retail gasoline prices rose even as crude oil prices—the largest input cost for gasoline—were falling and gasoline prices in the rest of the U.S. were also falling.[9] The September 2024 price spike, sparked by unplanned maintenance at multiple Northern California refineries and driven by spot market volatility, is more fully described in DPMO's September 2024 Market Update and Consumer Advisory.[10]

The California gasoline market contracted in 2024. In February 2024, Phillips 66's Rodeo refinery stopped processing crude oil prior to its conversion to a renewable diesel refinery, reducing the in-state supply of petroleum fuels (including gasoline) by 5 percent.[11] Gasoline sales declined on average by 1.12 percent (roughly 415,000 gallons less per day) between 2023 and 2024.[12]

[9] Division of Petroleum Market Oversight. Sept. 13, 2024. "Market Update and Consumer Advisory," at pp. 2-3. https://efiling.energy.ca.gov/GetDocument.aspx?tn=259165&DocumentContentId=95236.
[10] Ibid.
[11] California Energy Commission. Oct 17, 2024. "California Oil Refinery History." https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/californias-oil-refineries/california-oil.
[12] California Department of Tax and Fee Administration. 2024. "Motor Vehicle Fuel 10-Year-Reports." https://www.cdtfa.ca.gov/taxes-and-fees/MVF-10-Year-Report.xlsx.

A Snapshot of California's Gasoline Market



Note: Registrations include total light-duty vehicles in 2024. Data from U.S. Energy Information Administration (EIA); California Department of Tax and Fee (CDTFA); State of California Department of Motor Vehicles (DMV); US Department of Transportation (DOT); U.S. Environmental Protection Agency. Climate risk benefits are based on the U.S. EPA scenario with a 2.5 percent near-term certainty-equivalent discount rate, *see*, EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances, November 2023.

Zero-emission and hybrid vehicle sales have played a critical role in reducing gasoline demand.[13] Gasoline consumption has now fallen by more than 5.9 million gallons per day since the recent consumption peak in 2017, and by more than 6.9 million gallons per day since the historic consumption peak in 2005.[14] That means that Californians have achieved a reduction in annual gasoline consumption of 2.2 billion gallons since 2017 and 2.5 billion gallons since 2005.

Lower in-state production of gasoline in 2024 was partially offset by increased imports and inventories. This contributed to historically low gasoline spot market prices in July and early August 2024.[15] In addition, gasoline inventories were higher during the late summer and early fall than they were in previous years. While this did not prevent a noticeable price spike in

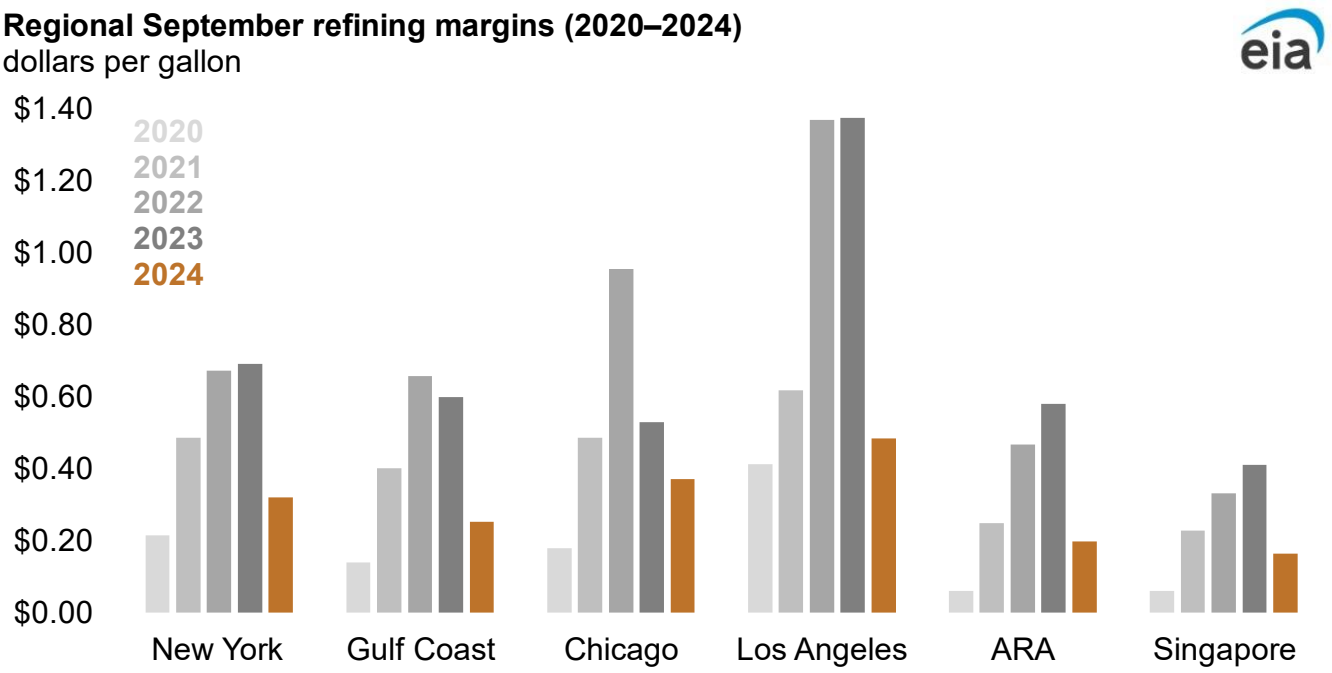
[13] California Energy Commission. 2024. "New ZEV Sales in California." https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/new-zev.
[14] California Department of Tax and Fee Administration. 2024. "Motor Vehicle Fuel 10-Year-Reports." https://www.cdtfa.ca.gov/taxes-and-fees/MVF-10-Year-Report.xlsx.
[15] Spot markets are physical markets where gasoline and other petroleum products are traded. California has two spot markets at refinery hubs in Los Angeles and San Francisco. Spot market prices are driven by local, real-time supply and demand conditions. The spot prices in California are also influenced by longer term expectations about national and international commodity trends measured by the New York Mercantile Exchange (NYMEX) futures price. See, e.g., Oil Price Information Service, March 10, 2023, "Pricing 101: Spot Fuel Markets Made Simple," https://www.opisnet.com/blog/spot-fuel-markets-made-simple/.

Northern California in the late summer, it did limit the severity of the price spike and kept Southern California prices relatively stable.

National and Global Market Dynamics

National and global refining margins peaked in 2022 and 2023 and declined in 2024. California gross refining margins significantly exceeded margins in other U.S. and global regions while following the overall trend, with historically high margins in 2022 and 2023 and moderate margins in 2024. According to EIA analysis, gross refining margins in Los Angeles neared $1.40 per gallon in September 2022 and September 2023, and fell to about $0.50 per gallon in September 2024, which was still the highest margin in the U.S. and also higher than benchmarks in Europe and Asia.

EIA Snapshot of Global Refining Margins



Note: Snapshot from EIA, Oct. 15, 2024, "Global Refinery Margins Fall to Multiyear Seasonal Lows in September," https://www.eia.gov/todayinenergy/detail.php?id=63447. "ARA" stands for Amsterdam-Rotterdam-Antwerp.

Notwithstanding that the highest gross refining margins are often seen in the United States, global refining capacity is poised to continue a long-term shift to favoring newer mega-refineries located in geographies with lower production expenses. One large U.S. refinery (the LyondellBasell refinery in Houston with a capacity of 264,000 barrels per day) closed this spring and one smaller refinery in California (Phillips 66's Wilmington facility) will cease refining in late 2025. This is consistent with a decades-long trend toward refinery closure and consolidation in the U.S., particularly for smaller, less efficient refineries.[16] New capacity

[16] David W. Meyer and Christopher T. Taylor. November 2015. "The Determinants of Plant Exit: The Evolution of the U.S. Refining Industry." Federal Trade Commission. https://www.ftc.gov/system/files/documents/reports/determinants-plant-exit-evolution-u.s.refining-industry/wp328.pdf.

investments in the U.S. are unlikely in the near term, especially given the recent economic headwinds driving a downturn in oil and refined product prices.[17]

In contrast, as many as 4.9 million barrels of daily refining capacity are coming online in Asia, the Middle East, and Africa between 2024 and 2028.[18] This includes Dangote Lagos (650,000 barrels per day, 2024), Pemex Don Bocas (340,000 barrels per day, 2025), Yulong Shandong (400,000 barrels per day, 2025), and Ratnagiri (1.2 million barrels per day, 2028).[19]

[17] Arathy Somasekhar. April 9, 2025. "US Refiners Unlikely to Spend Big to Process More Domestic Oil." *Reuters.* https://www.reuters.com/business/energy/us-refiners-unlikely-spend-big-process-more-domestic-oil-2025-04-09/.
[18] Energy Information Administration. August 2024. "Outlook on Global Refining to 2028." https://www.eia.gov/analysis/globalrefining/outlookglobalrefining.pdf.
[19] Ibid.

CHAPTER 3:
Demystifying California Gasoline Prices

Key Findings

- **DPMO confirms the "mystery gasoline surcharge."** California retail gasoline prices are higher than prices in other states, even after accounting for taxes, fees, and environmental programs. Between 2015 and 2024, the mystery gasoline surcharge averaged $0.41 per gallon, costing Californians $59 billion.[20] (Exhibits 4-6)
- **Higher gross gasoline industry margins make up the largest share of the surcharge.** California gross gasoline industry margins increased by $0.35 per gallon relative to the rest of the U.S. since the surcharge appeared. Gross industry margins peaked at $2.44 during the fall 2022 price spike and $2.02 during the fall 2023 price spike, as the surcharge hit record highs. (Exhibits 7-8)
- **Market power is a growing concern in the California market.** About 90 percent of in-state refining capacity is controlled by four companies, which reduces incentives to buffer the market against disruptions. About 50 percent of refiner sales are through vertically integrated sales channels. This may facilitate price increases in select refiners' branded sales channels. (Exhibits 9-10)
- **Californians face price spikes and increasing branded gasoline markups.** In addition to price spikes, wholesale prices for branded gasoline have increased substantially above spot prices since 2015 in California. The retail price difference between branded and unbranded gasoline is growing in California, but not the rest of the U.S., and retail gasoline sold at major brands has the highest surcharge of $0.75 per gallon since 2015. (Exhibits 11-14)
- **The refining sector has split into "haves" and "have nots."** During price spikes, all refiners receive elevated prices and margins. Outside of price spikes, the large, integrated refiners with branded sales can also benefit from higher prices and margins in their marketing and retail networks, while the smaller, non-integrated refiners with unbranded sales see tighter margins. (Exhibits 15-17)

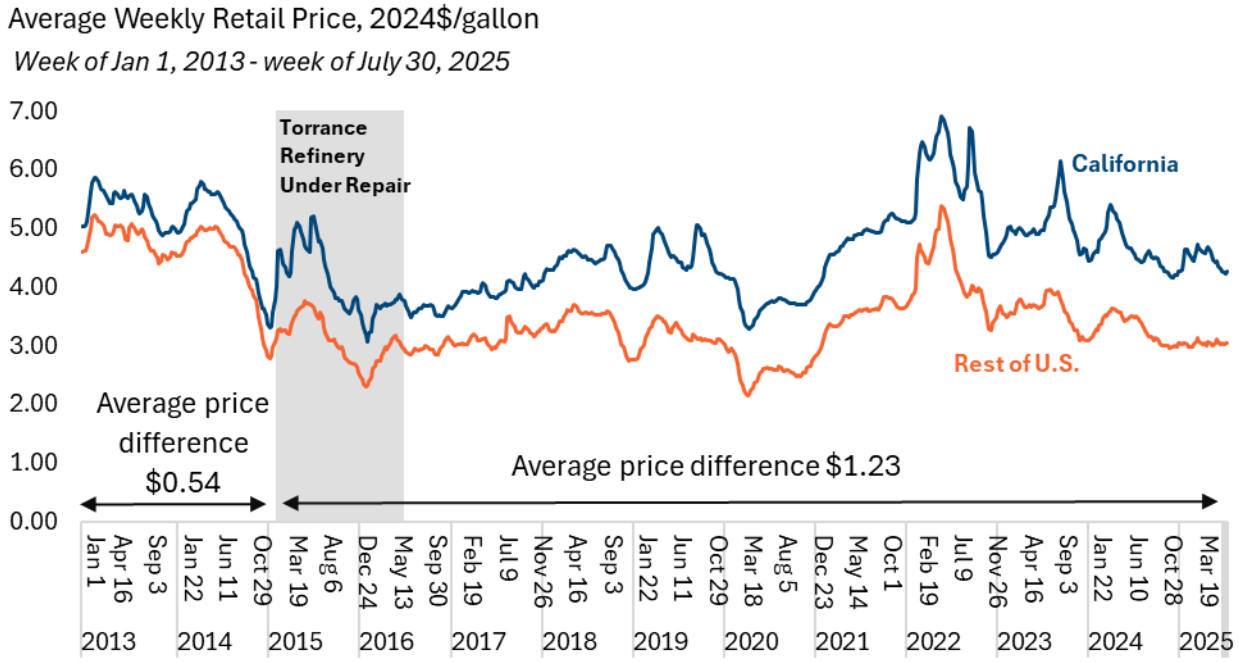
Confirmation of the Mystery Gasoline Surcharge

Before 2015, California retail gasoline prices were modestly higher compared to the rest of the U.S., and that retail gasoline price difference was attributable to differences in the price of crude oil and the cost of environmental programs, taxes, and fees. However, in early 2015, California gasoline prices increased and became more volatile than in the rest of the U.S.

[20] The mystery gasoline surcharge, or "surcharge," is an implied incremental cost imposed on California consumers above and beyond taxes and environmental program fees.

This change appears to be associated with the February 2015 Torrance Refinery fire, which significantly reduced in-state gasoline production capacity for over a year.[21] As supply decreased due to the fire, California retail gasoline prices spiked.[22] However, the gap between retail gasoline prices in California and the rest of the U.S. persisted even after the refinery was repaired, from an average of $0.54 per gallon pre-2015 to an average of $1.23 per gallon post-2015 (in 2024 dollars), as shown in **Exhibit 4**.

Exhibit 4: Retail Gasoline Price Gap Between California and the Rest of the U.S. Has Been Growing Since 2015



Note: Based on data from EIA Weekly U.S. and CA All Grades, All Formulations Retail Gasoline Prices.

In 2017, University of California, Berkeley Professor Severin Borenstein found that, since the refinery fire, the retail gasoline price difference between California and the rest of the U.S. exceeded the difference in taxes, fees, and environmental program costs. In other words, the retail gasoline price difference could not be fully explained by California's gasoline excise tax, gasoline blend standards, Low Carbon Fuel Standard (LCFS), or Cap-and-Invest (formerly Cap-and-Trade) Program.[23] Professor Borenstein called this unexplained price difference the

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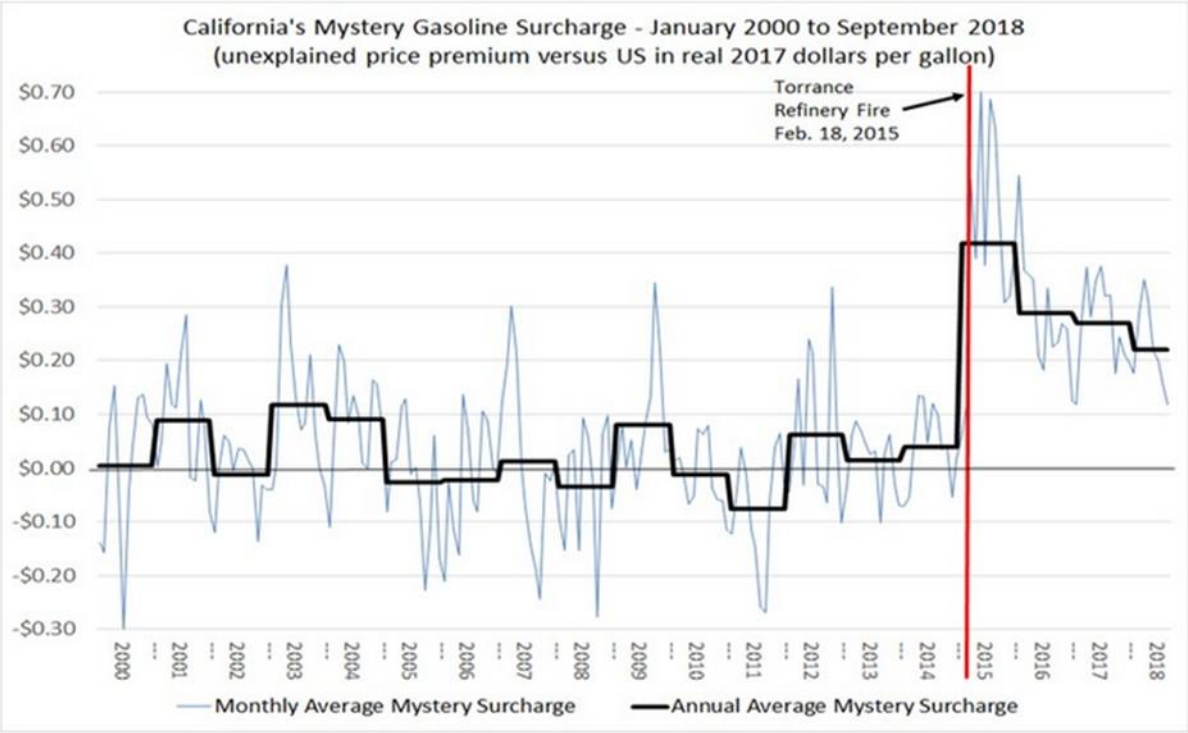
[21] The impact of the February 2015 Torrance fire is discussed in more detail in the Technical Appendix. DPMO will continue to analyze potential reasons why the MGS first appeared in 2015 and how the refinery fire may have been a contributing factor.

[22] U.S. Energy Information Administration (EIA). Feb. 27, 2015. "Petroleum refinery outage in California highlights markets' quick price reaction." https://www.eia.gov/todayinenergy/detail.php?id=20152.

[23] Professor Borenstein's and DPMO's calculations do not account for potential differences in ethanol blends. In California, ethanol can make up no more than 10% of gasoline ("E10"). In most states, ethanol can make up no more than 15% of gasoline ("E15"). However, only eight states can sell E15 year-round and fewer than two percent of gasoline stations in the rest of the U.S. sell E15. This extremely low adoption of E15 means that increased ethanol blending does not contribute significantly to the retail gasoline price difference in California and rest of U.S. See, e.g., Abdullah Rafaqat. March 13, 2024, "Gas Stations in the United States of America – Everything you need to know," Xmap, https://www.xmap.ai/blog/gas-stations-in-united-states-of-america-

"Mystery Gasoline Surcharge" or "MGS."[24] Over the years, he has updated the MGS calculation and continued to post his findings.[25] **Exhibit 5** is a snapshot from one of Professor Borenstein's early blog posts discussing the MGS. In it he writes of the MGS: "That surcharge—above the difference in taxes, fees, and production costs—averaged 2 cents from 2000 to 2014 and was never more than 12 cents in any of those years. But everything changed in 2015."[26]

Exhibit 5: Professor Borenstein Describes the "Mystery Gasoline Surcharge" in 2018 Energy Institute Blog Post



Note: Snapshot from Severin Borenstein, Oct. 15, 2018, "Trying to Unpack California's Mystery Gasoline Surcharge," https://energyathaas.wordpress.com/2018/10/15/trying-to-unpack-californias-mystery-gasoline-surcharge/.

DPMO has independently validated Professor Borenstein's findings using public and industry data. DPMO's methodology, data sources, and assumptions are discussed in detail in this

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everything-you-need-to-know#:~:text=xMap's%20essential%20geospatial%20insight%20into,States%20of%20America%20(USA).

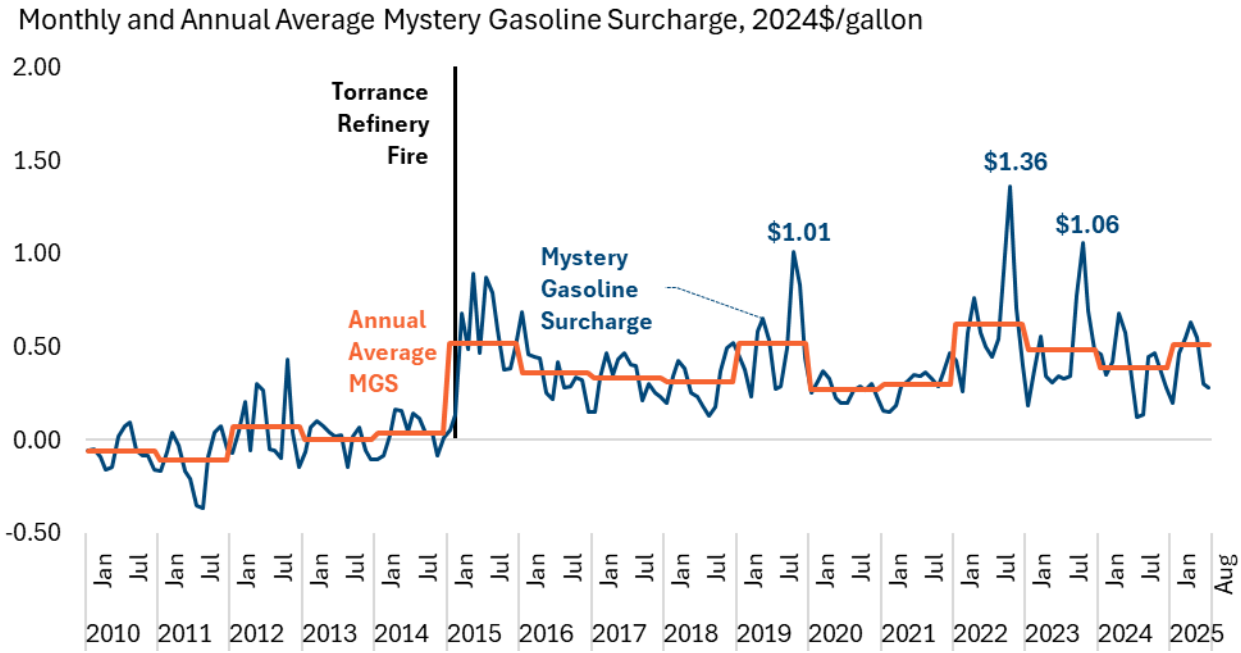
[24] Severin Borenstein. Oct. 30, 2017. "California's Real Gasoline "Tax" Problems." https://energyathaas.wordpress.com/2017/10/30/californias-real-gasoline-tax-problems/.

[25] See, e.g., Severin Borenstein, Oct. 30, 2017, "California's Real Gasoline "Tax" Problems"; Borenstein. Oct. 15, 2018. "Trying to Unpack California's Mystery Gasoline Surcharge"; Borenstein. Jan 9. 2023. "What's the Matter with California's Gasoline Prices?" https://energyathaas.wordpress.com/2023/01/09/whats-the-matter-with-californias-gasoline-prices/.

[26] Borenstein. Oct. 15, 2018. "Trying to Unpack California's Mystery Gasoline Surcharge."

report's **Technical Appendix**.[27] DPMO's calculation is nearly identical to Professor Borenstein's MGS and is shown in **Exhibit 6.**

Exhibit 6: DPMO Confirms Professor Borenstein's Mystery Gasoline Surcharge



Note: Based on DPMO analysis of data from EIA, CDTFA, and CARB. See the Technical Appendix for sources and methods.

Before 2015, the annual average mystery gasoline surcharge was negligible. In 2015, the surcharge suddenly rose to $0.52 per gallon. While the surcharge was smaller between 2016 and 2018 (years without significant price spikes), it rose to $1.01 per gallon during the October 2019 price spike. The surcharge was smaller again in 2020 and 2021 (during the COVID-19 pandemic), before peaking at $1.36 per gallon during the record-setting fall 2022 price spike and $1.06 per gallon during the fall 2023 price spike. Between 2015 and 2024, the annual average surcharge was $0.41 per gallon.[28]

With billions of gallons of gasoline sold in California each year, the cumulative impact of this surcharge is substantial, costing California consumers over $59 billion in extra payments for gasoline between 2015 and 2024. While taxes, fees, and environmental programs add to the price of gasoline, these costs were enacted through public processes and fund tangible investments in critical infrastructure, public health, environmental protection, and economic

[27] Exhibit A8 in the Technical Appendix summarizes MGS modeling assumptions and how each assumption affects the calculation of the MGS. Key assumptions include use of average state taxes, excluding gasoline taxes, for the rest of the U.S. due to data limitations; other states do not have environmental programs that impact the cost of gasoline production; exclusion of cap-and-trade obligations for stationary emissions; and the cost of ethanol is the same in California and the rest of the U.S.

[28] The calculation and analysis of the MGS relies on average values for prices, taxes, environmental fees, etc., as is standard practice in applied economic analysis. Averages summarize typical or middle values for groups (e.g., California, the rest of the U.S.) and help describe market conditions and trends. The MGS is an average value, as are the average statistics used to compute it. The actual values of these statistics vary around the average value.

resilience. In contrast, this surcharge is not transparent, and to the extent it represents increased profit margins, it offers no direct public benefit.

To bring transparency to the public and to policymakers, DPMO is working to demystify the MGS. In other words, why are California consumers paying higher prices compared to the rest of the U.S.?

Increasing Gross Gasoline Industry Margins

To analyze the mystery gasoline surcharge over time, it is important to identify two different stages of the gasoline supply chain: first, the refining of crude oil into gasoline; and second, the distribution, marketing and sale of gasoline to consumers. In the second stage, the gasoline is transported to retail stations and sold as branded or unbranded (generic) gasoline.

In the first stage, the "gross gasoline refining margin" is a basic calculation of the profitability of converting crude into gasoline. The gross gasoline refining margin is computed as the difference between the wholesale price of the gasoline produced by the refinery and the acquisition cost of crude oil, net of environmental program costs. At the marketing and distribution stage, the "gross gasoline marketing margin" is an indicator of the profitability of selling gasoline at retail, and is computed as the difference between retail prices and wholesale prices, net of taxes and fees.

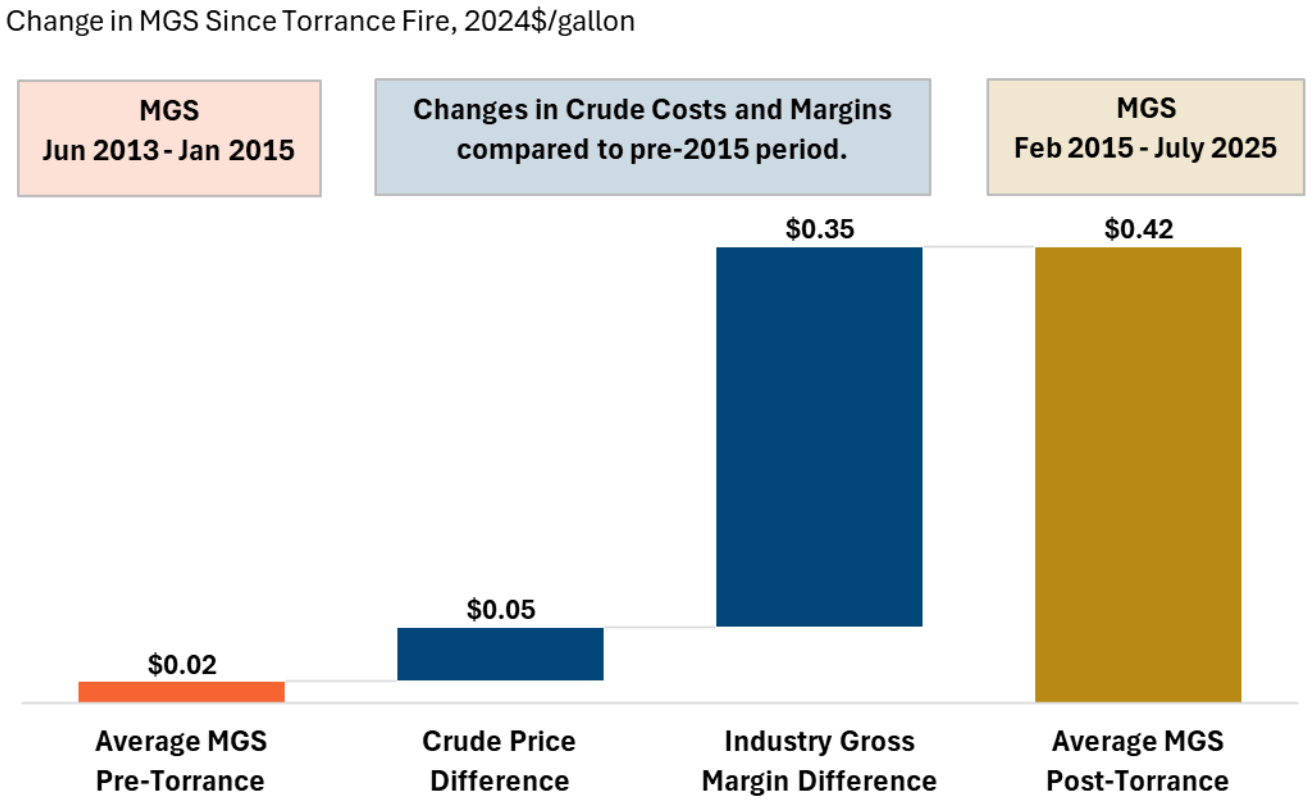
Taken together, the gross gasoline refining and marketing margin make up the gross gasoline industry margin, which is an objective measure of overall industry performance.[29] For the calculations below, gross gasoline industry margin equals the retail price of gasoline minus the cost of crude oil, taxes, fees, and environmental programs. Gross gasoline industry margins are not a full measure of refinery, distributor, or retailer profitability, as they exclude operating expenses and other products sold by the firms. Nevertheless, as in other industries, higher margins are often correlated with higher profits.

Public and industry data suggest that the surcharge is driven by higher gross gasoline industry margins in California relative to the rest of the U.S. To help explore the drivers of this surcharge, it can be equivalently expressed as the sum of the differences in gross refining and marketing margins and the cost of crude oil between California and the rest of U.S.[30] This breakdown is illustrated in **Exhibit 7.**

[29] Gross margin calculations are commonly used in the petroleum industry to assess performance. One type of calculation, called the "crack spread," assesses the potential profitability of petroleum refining by subtracting the commodity price of crude oil from the commodities prices of refined petroleum products.

[30] The Technical Appendix of this report describes the mathematical break down of the MGS into difference in the refining and marketing margins and the difference in the cost of crude between California and the rest of the U.S.

Exhibit 7: Higher Gross Industry Margins in California Have Driven the Surcharge Since 2015

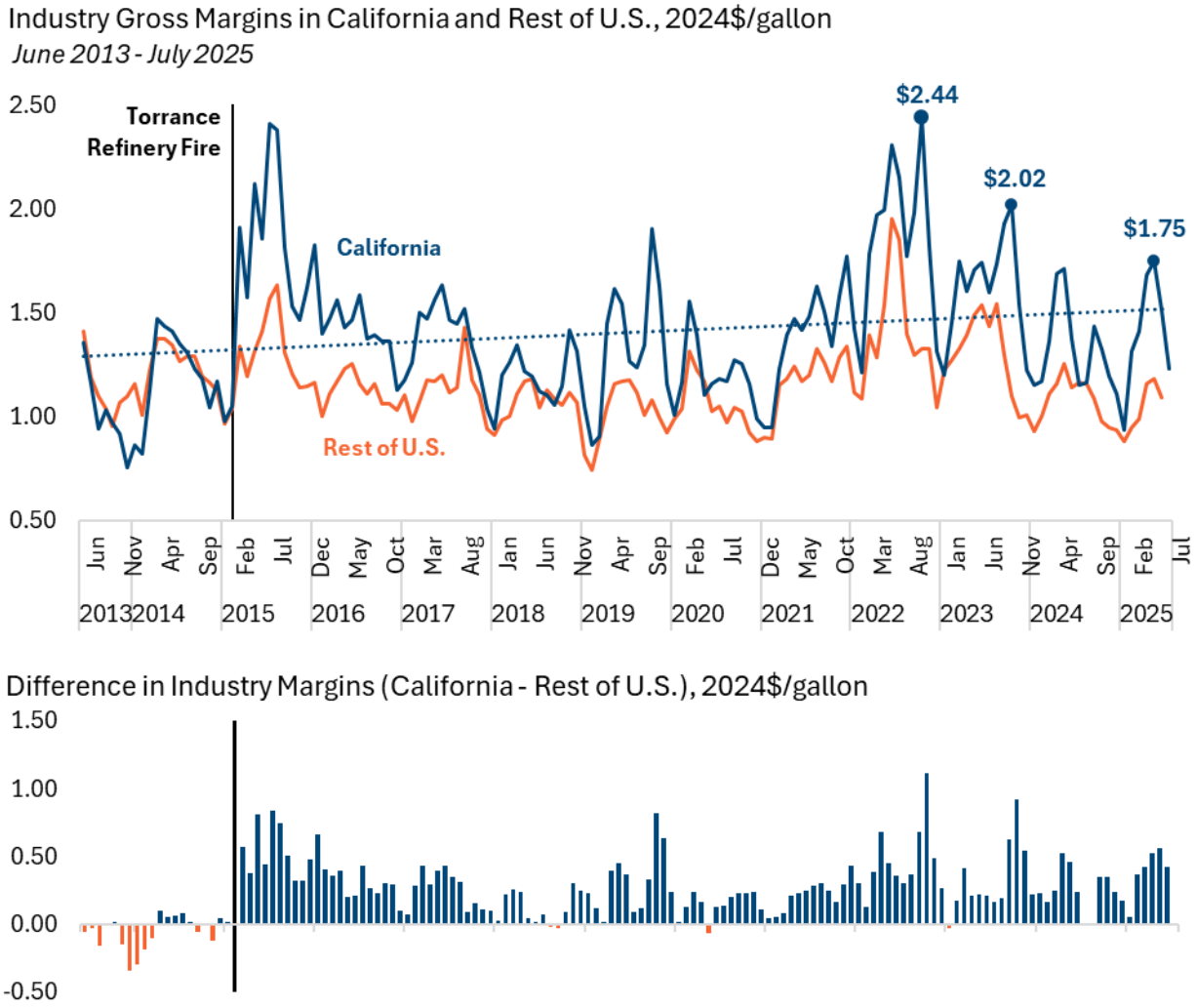


Note: Based on DPMO analysis of aggregated CEC Form M1322 data and EIA Form 782 data. In this analysis, the pre-Torrance period spans from June 2013 to January 2015, and the post-Torrance period extends from February 2015 to July 2025.

Between June 2013 and January 2015, the average surcharge was $0.02 per gallon. Between February 2015 and July 2025, this increased by $0.40 per gallon to $0.42 per gallon. Of that $0.40 per gallon increase, we can attribute $0.35 per gallon to increased difference in gross gasoline industry margins in California relative to the rest of the U.S. In contrast, the average increased difference in crude oil costs relative to the rest of the U.S. was $0.05 per gallon.

Before February 2015, the difference between gross gasoline industry gross margins in California and the rest of the U.S. fluctuated, with rest of U.S. margins exceeding California margins during some months and California margins exceeding rest of U.S. margins in other months. As **Exhibit 8** shows, this appears to have changed after 2015, with gross gasoline industry margins in California outpacing those same margins in the rest of the U.S.

Exhibit 8: Gross Gasoline Industry Margins in California Have Exceeded the Rest of the U.S. Since 2015



Note: Based on DPMO analysis of aggregated data from CEC Form M1322 and EIA Form 782. The CEC Form M1322 data are not available prior to 2013.

This persistent increase in gross gasoline industry margins drove a wedge between gasoline prices in California and the rest of the U.S., contributing to high retail gasoline prices. After February 2015, the average gasoline industry margin was $0.29 per gallon higher in California than it was in the rest of the U.S. This difference is especially stark during localized price spikes in California. Gross margins rose to $2.44 per gallon during the fall 2022 price spike and $2.02 per gallon during the fall 2023 price spike.

Explanation: The Exercise of Market Power?

One potential explanation for increasing gross gasoline refining margins is increasing market concentration and the exercise of market power by gasoline suppliers.

Market power refers to an individual firm's ability to raise prices above competitive levels. The most extreme case of market power is a monopoly. In a monopolistic market, a single firm controls supply and price. At the other extreme is a perfectly competitive market. In a perfectly competitive market, there are many firms and no individual firm can impact market

supply or prices. Most real-world markets are somewhere in between. These "in between" markets include oligopoly markets, where a small number of firms may have opportunities to exercise market power. When market conditions allow, these firms may restrict supply, raise prices, reduce competition, and receive profits above a reasonable rate of return. A reasonable rate of return is the return necessary to compensate firms for investing in a particular industry, taking into account factors such as risk and the amount of capital required, and may be determined by comparing (or benchmarking) a firm's profitability to the returns of similar firms in competitive markets. Profits above a reasonable rate of return are called "excess profits" and may reflect exercise of market power.

The gasoline refining market in California is best characterized as an oligopoly, with few firms controlling the vast majority of supply. As shown in **Exhibit 9**, as of January 2025, two companies (Chevron and Marathon) control about 56 percent of crude oil refining capacity in the state. Two other refiners (PBF and Valero) control about 34 percent of crude oil refining capacity in the state. In total, the top four companies control 90 percent of in-state refining capacity. After Phillips 66 closes its Los Angeles refinery in 2025, the top four firms will control 98 percent of in-state refining capacity. If Valero closes its Benicia refinery in 2026, market concentration will increase further.[31] In contrast, in the rest of the United States, the top four gasoline refiners control 48 percent of crude oil refining capacity. This divergence in market structure in California and the rest of the U.S. may help explain the surcharge.

Exhibit 9: California's Top 4 Gasoline Refiners Controlled Nearly 90 Percent of State's Crude Refining Capacity in 2025

Crude Refining Capacity Among California Refiners with Gasoline Production
January 2025

Rank	Refiner with Gasoline Production Capacity	Total CA Crude Refining Capacity (BPD)	Share of Total CA Crude Refining Capacity	Cum. Share of CA Crude Refining Capacity
1	Chevron Corp	530,271	33%	33%
2	Marathon Petroleum Corp	365,000	23%	56%
3	PBF Energy Co LLC	316,400	20%	75%
4	Valero Energy Corp	230,000	14%	90%
5	Phillips 66 Company	138,700	9%	98%
6	Kern Oil & Refining Co	26,000	2%	100%
Four-Firm Concentration Ratio in Rest of U.S.				48%

Note: Based on DPMO analysis of data from EIA Form 820. The table includes refineries with gasoline capacity and excludes refineries that do not produce gasoline and the Phillips 66 Rodeo facility, which converted to renewable fuel in March 2024. Rank is based on total crude refining capacity, which includes a company's refining capacity across refineries and products. Shares are rounded.

[31] Following the expected Phillips 66 Los Angeles refinery closure in late 2025, Chevron and Marathon will control about 61% of in-state refining capacity. If the Valero Benicia refinery closes in 2026, Chevron and Marathon's combined market share will grow to about 67%.

Refiner market power may play a role in contributing to or exacerbating price spikes. As DPMO has established previously, planned and unplanned refinery maintenance can cause wholesale and retail price spikes, particularly when it occurs during the late summer and early fall months.[32] Refiners with substantial market share may lack incentives to fully resupply the market during outages and maintain adequate inventories throughout the year. Even when adding that incremental supply is feasible, imported gasoline increases supply and may reduce prices and profits for suppliers. In a more competitive market, market participants would position themselves to quickly capitalize on higher prices by increasing supply, which would drive down market prices.[33]

This is not a new concern. In 1999, California Attorney General Bill Lockyer convened a Task Force on Gas Pricing following a significant price spike. The Task Force found that California's wholesale and retail gasoline markets were fundamentally less competitive than those in the rest of the country, with six companies controlling "nearly all" in-state refining and sales.[34] The report concludes that this lack of competition and market power contributed to higher prices and price spikes.[35] Notably, the market structure issues identified in this report pre-date California's Cap-and-Invest and LCFS programs.

Additionally, three of the five companies with major refining operations in California have substantial vertical controls with the distribution, marketing, and retail side of the industry. Chevron is integrated across the entire supply chain, including running two refineries and marketing gasoline at nearly 2,000 company-owned or franchised retail gasoline stations in California. Marathon owns the rights to ARCO in Southern California and Phillips 66 owns the rights to 76. In contrast, Valero has a smaller retail presence and PBF has no retail presence. Vertically integrated suppliers may influence prices downstream.

The importance of vertical controls in California relative to the rest of the U.S. is evident in refiner sales channel data, shown in **Exhibit 10.** These data show that California refiners are significantly more integrated than refiners in the rest of the U.S.

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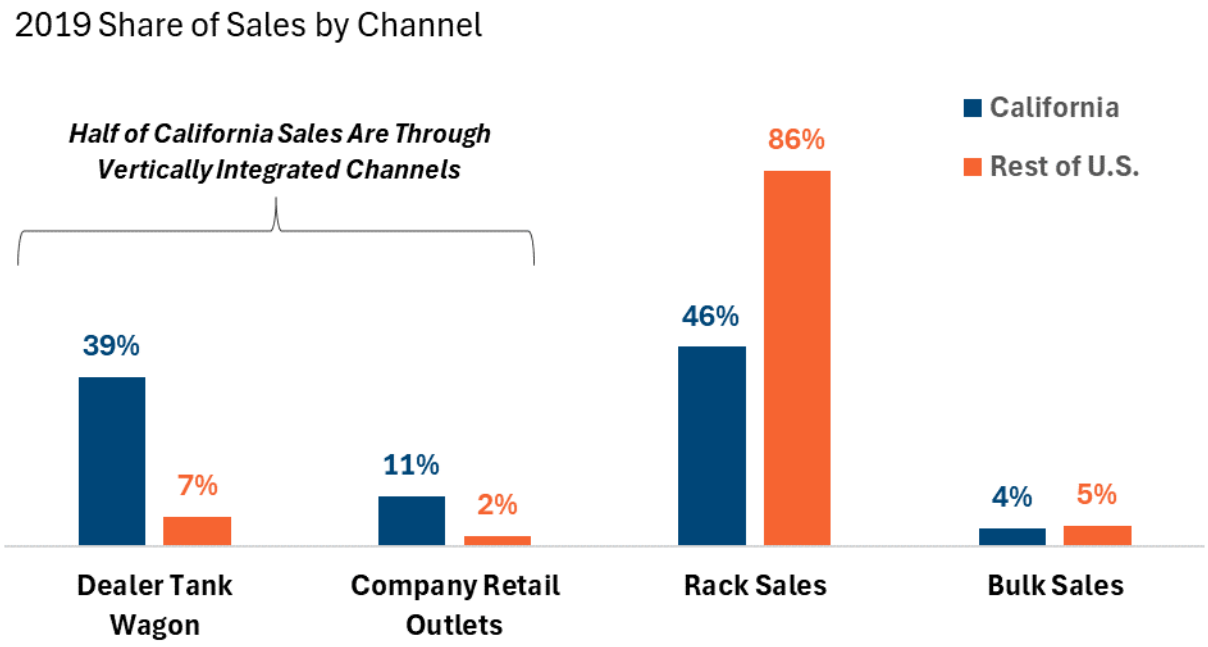
[32] Division of Petroleum Market Oversight. Jan. 31, 2024. "Core Options for Reforming the California Gasoline Spot Market"; Division of Petroleum Market Oversight. Sept. 19, 2024. "A Seller's Market: The Challenge of Market Concentration and Price Spikes." Presentation before the Assembly Petroleum and Gasoline Supply Committee. https://www.assembly.ca.gov/media/assembly-petroleum-and-gasoline-supply-committee-20240919.

[33] Neale Mahoney. Sept. 18, 2024. "California Gasoline Market Overview" [Recorded legislative hearing, at 1:53:06]. Presentation before the Assembly Petroleum and Gasoline Supply Committee. https://www.assembly.ca.gov/media/assembly-petroleum-and-gasoline-supply-committee-20240918; Division of Petroleum Market Oversight. Sept. 19, 2024. "A Seller's Market: The Challenge of Market Concentration and Price Spikes" [Recorded legislative hearing, at 1:32:29]. Presentation before the Assembly Petroleum and Gasoline Supply Committee.

[34] California Attorney General Bob Lockyer. May 2000. "Report on Gasoline Pricing in California," at pp. 59-60. https://oag.ca.gov/sites/all/files/agweb/pdfs/antitrust/gasstudy/gasstudy2.pdf.

[35] Ibid.

Exhibit 10: California Refiners Rely Heavily on Dealer Tank Wagon Sales Compared to the Rest of the U.S.



Note: DPMO analysis of EIA Form 782 data.

As of 2019 (the most recent year complete data are available), about 50 percent of refiner sales in California were through company-owned retail outlets or directly to retail gasoline stations via dealer tank wagon (DTW). In the rest of the U.S., just 9 percent of sales were through company outlets or via DTW. In fact, these data likely underestimate the presence of DTW sales in California. Companies without refineries in California may still use DTW to supply their branded stations, and refiners may sell to third parties that use DTW arrangements.

Vertical controls represent a major structural difference between California and the rest of the U.S. and may facilitate increased branded wholesale and retail prices. DTW contracts are similar to franchise contracts in other sectors and impose restrictions on independently owned retailers. Under most DTW contracts, retailers must purchase branded fuel from the refiner at the price offered by the refiner, which is significantly higher than generic gasoline sold at unbranded racks. Exit costs can be steep for DTW retailers, making it difficult or impossible for them to quickly change suppliers for cheaper sources of fuel. In contrast, unbranded retailers generally pay lower prices for generic gasoline distributed from unbranded racks and may enjoy more flexibility to purchase fuel from competing suppliers. In a more competitive market, branded and unbranded alternatives would apply downward pressure on branded gasoline at the wholesale and retail levels.

Market power may also facilitate unbranded wholesale and retail price increases. Because a refiner controls a large share of the market and sells branded and unbranded fuel, increasing branded wholesale prices could simply shift sales to the refiner's own alternatives. As a result, the refiner has an incentive to increase prices across all sales channels. If the refiner enjoys high margins and market power, this diversion becomes profitable. In a competitive market, refiners would limit price increases for fear of losing sales to competitors.

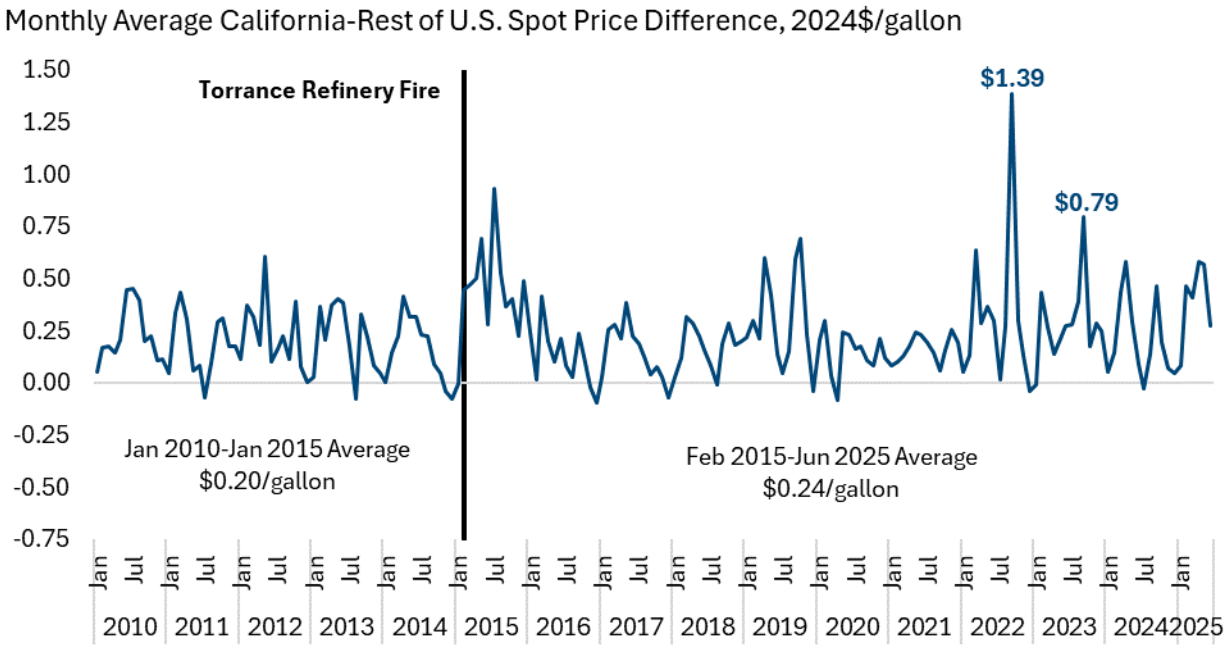
Evidence: Gasoline Prices Along the Supply Chain

Are gasoline prices along the supply chain consistent with the exercise of market power?

First, we consider gasoline prices on the spot market. Spot markets are physical markets where gasoline and other petroleum products are traded. California has two spot markets at refinery hubs in Los Angeles and San Francisco. Even though spot market sales represent a small portion of wholesale gasoline sales in California, nearly all wholesale gasoline sold in California is priced in reference to the spot market.[36] As a result, spot market prices have a magnified effect on wholesale and retail gasoline prices across the state.[37]

Is the California spot market where higher prices are observed? Professor Borenstein compared gasoline prices on the Los Angeles spot market to the New York and Gulf Coast spot markets, and he found that these price differences could not explain the mystery gasoline surcharge, simply because these price differences are small and have not changed significantly, on average, since 2015.[38] DPMO extended Professor Borenstein's analysis to include the San Francisco spot market and compares the average California gasoline spot price to spot prices in the rest of the U.S., as shown in **Exhibit 11**.

Exhibit 11: Average California-Rest of U.S. Spot Price Differences Stable Outside of Price Spikes Despite Post-2015 Surcharge



Note: DPMO analysis of monthly spot prices from EIA and OPIS. California spot prices computed as the average of Los Angeles and San Francisco spot prices. Rest of U.S. spot prices computed as the average of New York and Gulf Coast spot prices.

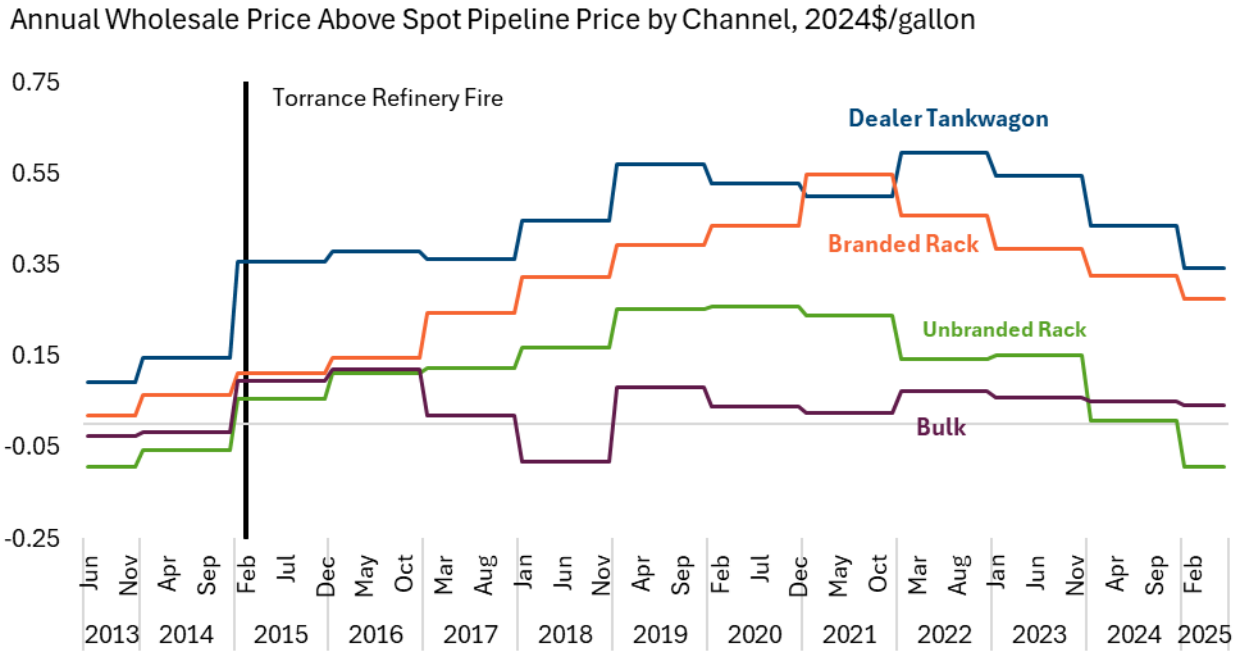
[36] Oil Price Information Service. "OPIS West Coast Spot Market Report." https://www.opisnet.com/product/pricing/spot/west-coast-spot-market-report/.
[37] See, e.g., Division of Petroleum Market Oversight. Jan. 31, 2024. "Core Options for Reforming the California Gasoline Spot Market," at pp. 2-4.
[38] Severin Borenstein. Oct. 15, 2018. "Trying to Unpack California's Mystery Gasoline Surcharge."

Between January 2010 and January 2015, the average spot price difference between California and the rest of U.S. was $0.20 per gallon. Between February 2015 and June 2025, it was $0.24 per gallon. However, during the price spikes of fall 2019, 2022, 2023, and 2024, the spot price differences, gross gasoline industry margins, and the surcharge are all significantly larger. This suggests that spot market prices are associated with higher gross margins and the surcharge during price spikes but may not be driving the difference outside of price spike periods.

As noted previously, however, most wholesale gasoline is not sold on the spot market. Refiners can sell large volumes of gasoline through bulk contracts, and they can sell smaller volumes of gasoline "at the rack" (physical locations where trucks pick up fuel) or directly to retail gasoline stations via DTW. Refiners can also sell directly to consumers through company-owned and operated retailers.

As shown in **Exhibit 12**, annual average wholesale gasoline prices in the branded rack and DTW sales channels have increased substantially above spot prices since 2015, while prices in the unbranded rack sales channel have increased more modestly.[39]

Exhibit 12: Wholesale DTW and Branded Rack Prices Have Increased Substantially Above Spot Prices Since 2015



Note: Based on DPMO analysis of aggregated CEC Form M1322 industry data. Wholesale prices in this chart are reported by refiners and exclude taxes, fees, and environmental program costs. This analysis excludes sales through company outlets.

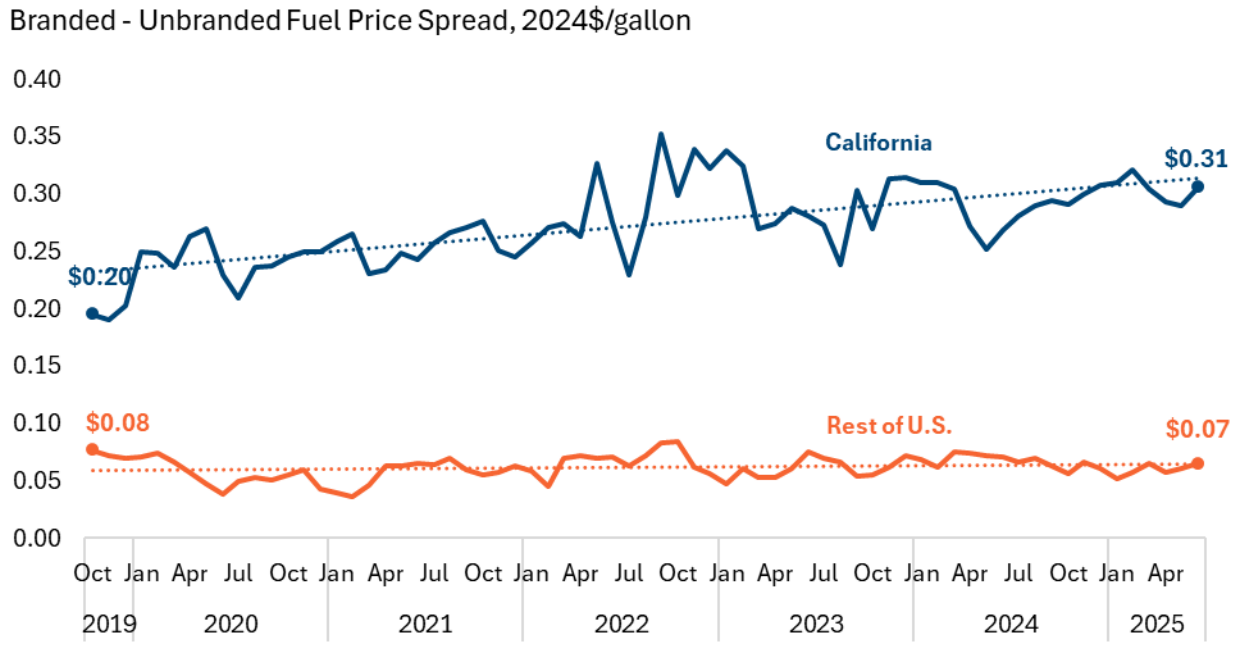
Between 2013 and 2024, annual average DTW prices increased from $0.09 per gallon to $0.43 per gallon above the spot price (a $0.34 per gallon increase). Annual average branded rack

[39] Spot prices reflect regional supply and demand conditions and serve as an approximation of refiner's opportunity cost of producing gasoline since they can buy gasoline on the spot market instead of producing it. Therefore, the wholesale price (net of taxes, fees, and environmental program costs) above the spot price received by refiners approximates the price premium for gasoline sold via different wholesale channels.

prices increased from $0.02 per gallon to $0.32 per gallon above the spot price (a $0.30 per gallon increase). Annual average unbranded and bulk prices have grown more modestly since 2013 (in real terms). If price increases in these sales channels in California have outpaced price increases in the rest of the U.S., then this could help explain higher gross gasoline industry margins and the higher prices in California relative to the rest of the U.S.

At the retail level, branded gasoline is significantly more expensive than unbranded gasoline in California relative to the rest of the U.S., as shown in **Exhibit 13.**[40] This difference is increasing. In 2019, branded gasoline was $0.20 per gallon more expensive than unbranded gasoline in California, and $0.08 per gallon more expensive in the rest of the U.S. By 2025, branded gasoline was $0.31 per gallon more expensive in California, and $0.07 per gallon more expensive in the rest of the U.S.

Exhibit 13: At Retail, Branded Fuel Commands a Larger Price over Unbranded in California Compared to the Rest of the U.S.



Note: Based on DPMO analysis of OPIS retail price data.

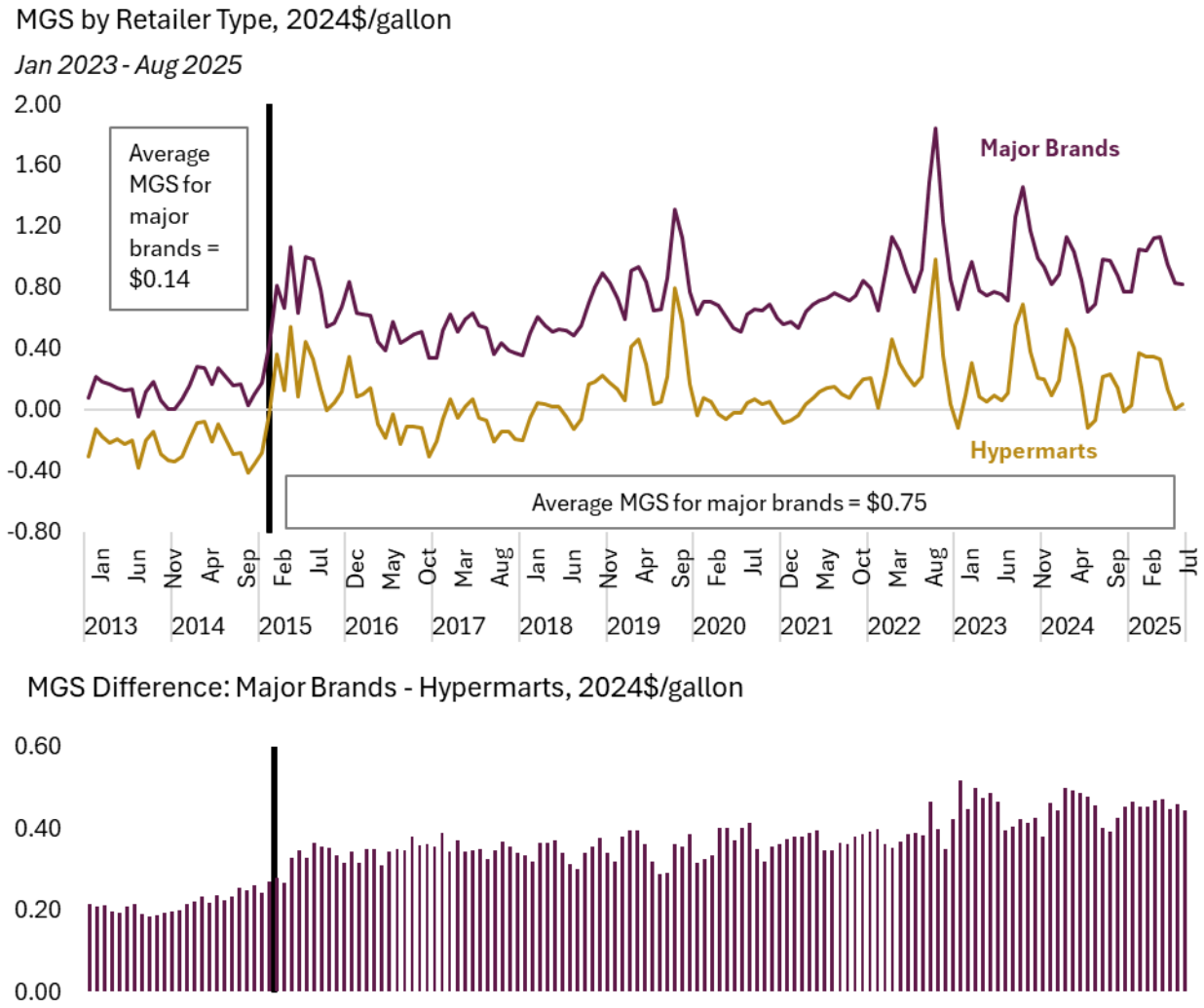
The data in **Exhibit 13** are consistent with the increased DTW and branded rack prices in Exhibit 12, as well as previous analyses from the CEC and the California Department of Tax and Fee Administration (CDTFA), which show an increasing price spread between higher-priced, branded sellers and lower-priced, unbranded sellers.[41]

[40] We define branded gasoline as gasoline marketed under a name brand (e.g., Chevron, ExxonMobil, Arco, Valero, etc.). Branded gasoline includes all gasoline grades.

[41] California Energy Commission and California Department of Tax and Fee Administration. May 3. 2024. "Review of the Price of Gasoline in California and Related Impact on State Revenues," at p. 34. 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 difference in retail price between major branded stations (Chevron, Shell, ExxonMobil, and 76) and unbranded stations is even more pronounced. As **Exhibit 14** demonstrates, retail gasoline prices at major brands have a significantly higher surcharge.

Exhibit 14: Retail Gasoline Prices at Major Brands Have the Highest Surcharge



Notes: DPMO analysis of OPIS retail data. Major retail brands include Chevron, ExxonMobil, Shell, and 76.

Before February 2015, the average mystery gasoline surcharge for major brands was $0.14 per gallon. Between February 2015 and August 2025, the average surcharge for major brands increased to $0.75 per gallon (a $0.61 per gallon increase). In other words, while branded gasoline was always sold at a slight premium in California, this premium increased substantially after 2015. In contrast, before February 2015, the surcharge for unbranded stations was -$0.08 per gallon, that is, eight cents less than the price in the rest of the U.S. after accounting for differences in taxes and environmental fees. After February 2015, the surcharge for unbranded stations increased to $0.37 per gallon (a $0.45 per gallon increase).

Increasing branded wholesale and retail prices of this magnitude are hard to explain. As previous CEC-CDTFA analysis notes, most gasoline is commingled when it is piped, stored, and delivered through shared distribution networks. Since the gasoline molecules are

indistinguishable, the only difference is proprietary additives. Proprietary additives are added to branded gasoline when trucks pick up the gasoline from terminal racks. The cost of these additives may be less than one cent per gallon, and many proprietary additives (including additives in TOP TIER™ gasoline) are also used in the rest of the U.S.[42]

In addition, any gasoline sold in California must meet state reformulated gasoline requirements, which include strict emissions and engine performance criteria (including detergents). DPMO is not aware of any publicly available research demonstrating that TOP TIER™ (or branded) gasoline outperforms non-TOP TIER™ (or unbranded) gasoline sold in California.[43] In 2019, the CEC asked the industry for evidence that branded gasoline outperforms unbranded gasoline in California. The industry did not provide any. The CEC was unable to independently verify claims that branded gasoline is superior to unbranded gasoline.[44]

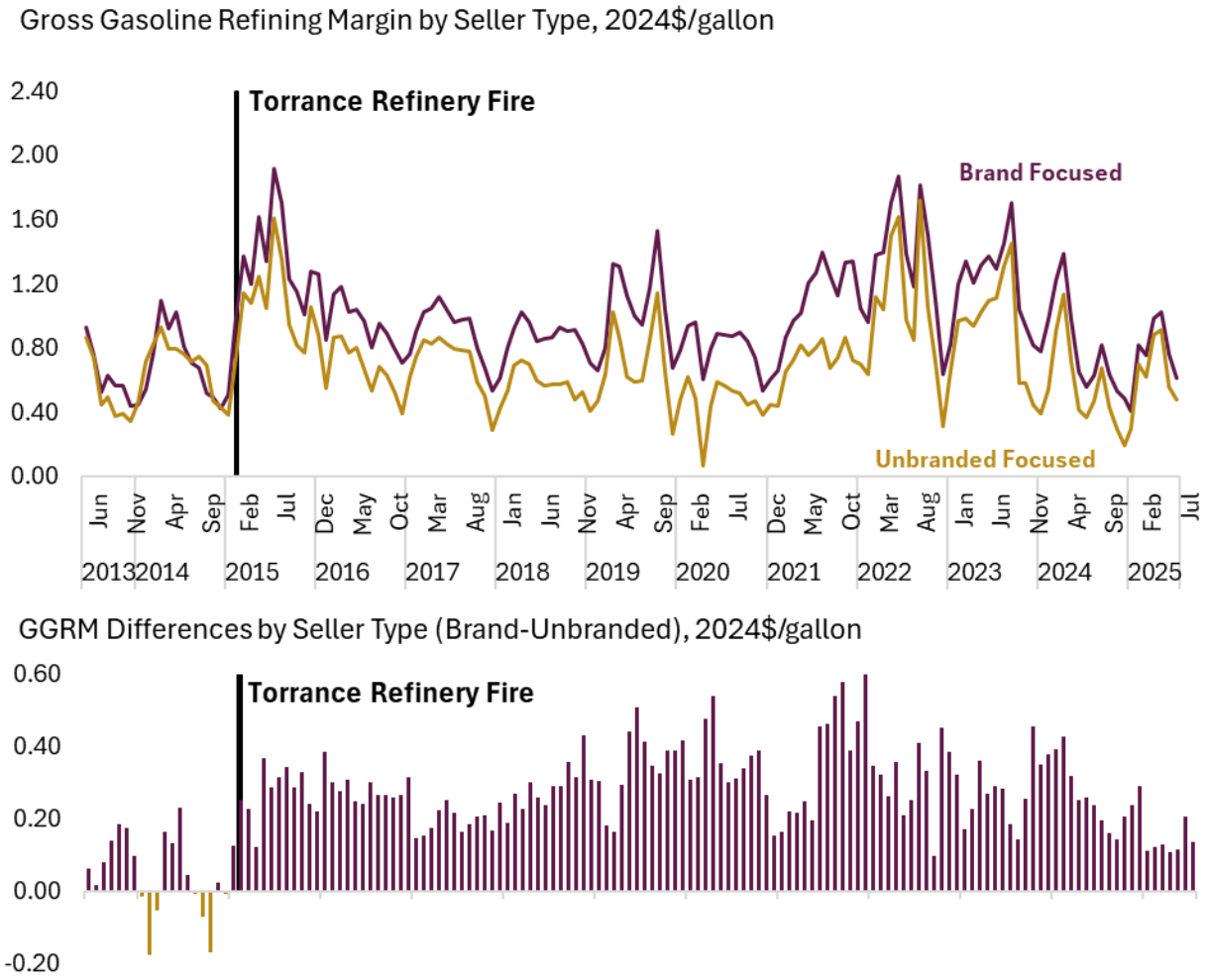
Result: Haves and Have-Nots

If wholesale and retail prices have increased so significantly, then why have certain market participants announced their intent to close California refineries?

Each refiner has a unique business model, and a distinguishing feature among California refiners is reliance on different sales channels. Integrated companies that sell large volumes to branded retailers (such as Chevron and Marathon) sell more gasoline through DTW and branded rack sales channels. Non-integrated companies that specialize in sales to unbranded retailers (Valero and PBF) sell more gasoline through the unbranded rack, bulk, and spot sales channels. Refiners with higher DTW and branded rack sales also have higher gross gasoline refining margins in California, as **Exhibit 15** shows.

[42] California Energy Commission and California Department of Tax and Fee Administration. May 3. 2024. "Review of the Price of Gasoline in California and Related Impact on State Revenues," at p. 37.
[43] While a 2016 AAA study (cited by Consumer Reports in 2024) found that TOP TIER™ gasoline did produce fewer engine deposits than non-TOP TIER™ gasoline sold in southern Texas, this study did not test California gasoline or any other boutique gasoline that contains a detergent. See, e.g., American Automobile Association. 2016. "AAA Fuel Quality Research: Proprietary Research into the Effectiveness of Fuel Additive Packages in Commercially-Available Gasoline." https://www.aaa.com/AAA/common/AAR/files/Fuel-Quality-Full-Report.pdf.
[44] California Energy Commission. Oct. 21, 2019. "Additional Analysis on Gasoline Prices in California," at pp. 8-9. https://www.energy.ca.gov/sites/default/files/2025-07/Gas_Price_Report_ada.pdf.

Exhibit 15: Gross Gasoline Refining Margins Are Higher for Refiners with Substantial DTW and Branded Rack Sales



Note: DPMO analysis of CEC M1322 data. "Brand focused" refiners include California refiners with more than 25 percent of wholesale volumes in the DTW and branded rack channels. "Unbranded focused" refiners are those with fewer than 25 percent of sales in DTW and branded rack channels.

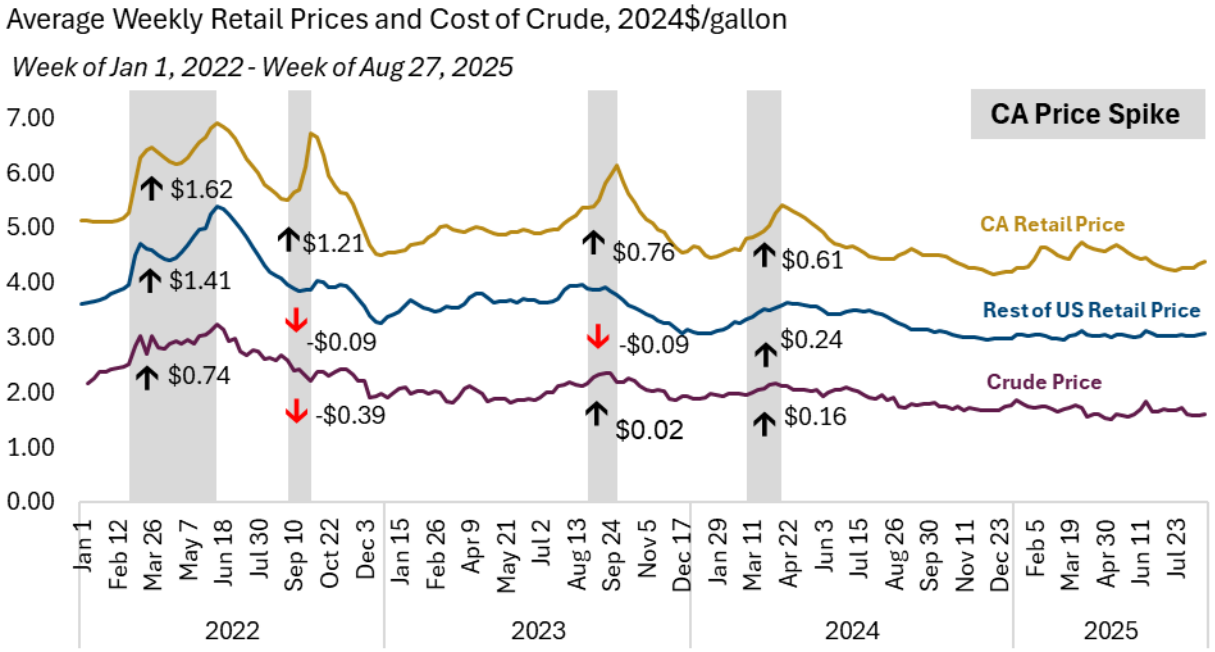
Before February 2015, both brand- and unbranded-focused refiners saw comparable gross gasoline refining margins. The brand-focused refiners' gross gasoline refining margins (GGRM) increased from an average of $0.67 per gallon between June 2013 and January 2015 to an average of $1.02 per gallon between February 2015 and July 2025 (a $0.35 per gallon increase). The GGRM for unbranded-focused refiners increased from an average of $0.62 per gallon between 2013 and 2015 to $0.73 per gallon (a smaller, $0.11 per gallon increase).

All refiners receive significantly higher prices and margins during price spikes. DPMO has previously presented data showing that localized price spikes – like the ones that occurred in 2019, 2022, and 2023 – are indeed profit spikes.[45] Previously reported data are consistent with

[45] Division of Petroleum Market Oversight. May 15, 2024. "SBX1-2 Overview and Update on Oil and Gas Market Oversight Activities" [Recorded legislative hearing, at 03:07:16]. Assembly Committee on Utilities & Energy. https://www.assembly.ca.gov/media/assembly-utilities-and-energy-committee-20240515; Division of Petroleum Market Oversight. "Division of Petroleum Market Oversight: Introduction" [Corresponding PowerPoint

public earnings reports and contemporaneous news coverage of record profits for the petroleum industry following the 2022 and 2023 price spikes.[46] During these periods, retail prices in California increased dramatically, in excess of crude oil costs, as **Exhibit 16** shows.

Exhibit 16: California Retail Prices Spike, Even as Crude Costs and Rest of U.S. Retail Prices Are Stable or Declining



Note: Based on DPMO analysis of EIA Weekly U.S. and CA All Grades All Formulations Retail Gasoline Prices. Cost of crude (Alaska North Slope) from Alaska Dept of Revenue. Shaded regions highlight time periods with sustained price increases in California.

For example, during the fall 2022 price spike, California retail gasoline prices increased by $1.21 per gallon while in rest of U.S. prices fell by $0.09 per gallon and crude oil prices decreased by $0.39 per gallon. During the fall 2023 price spike, California retail gasoline prices increased by $0.76 per gallon while rest of U.S. prices declined by $0.09 per gallon and crude oil prices increased by only $0.02 per gallon. California retail gasoline price increases in spring 2024 also significantly outpaced rest of U.S. and crude oil price increases.

One common question is whether these retail price spikes constitute a form of profiteering or even price gouging. While price gouging has various definitions, including specifically under the California Penal Code, it more generally refers to situations where a seller opportunistically raises prices without a commensurate increase in input costs or operating expenses, yielding much higher profits during the price increase. DPMO has reported previously that preliminary refiner margin data from price spike periods is consistent with price gouging during the time

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presentation, at slide 13]. Assembly Committee on Utilities and Energy. https://autl.assembly.ca.gov/system/files/2024-05/joint-agencies-may-15-assembly-sbx12-oversight-slide-deck-updated.pdf.

[46] Stanley Reed. Feb. 3, 2024. "Oil Giants Pump Their Way to Bumper Profits." *The New York Times*. https://www.nytimes.com/2024/02/02/business/oil-gas-companies-profits.html; Ron Bousso. Feb. 8, 2023. "Big Oil Doubles Profits in Blockbuster 2022." *Reuters*. https://www.reuters.com/business/energy/big-oil-doubles-profits-blockbuster-2022-2023-02-08/.

period identified by the Legislature in passing SBX 1-2.[47] This was based on publicly available data from the CEC's Estimated Gasoline Price Breakdown and Margins data, which showed that refiner margins had increased in excess of crude oil costs, taxes, fees, and environmental program costs.[48]

Certain refiners, however, may only be marginally profitable outside of price spikes. This is partly because refiners' operating expenses in California and the West Coast, while generally stable since 2014, are higher than in the rest of the U.S, in part because of higher labor and energy costs.[49] California refineries are also older than refineries in the rest of the U.S., historically configured for in-state crude oil production, and face declining year-over-year demand for gasoline and diesel. Publicly reported earnings data from Phillips 66, Valero, and PBF (the three companies that report regional net earnings) confirm this dynamic.

During the price spikes observed in 2022 and 2023, all three companies reported profits (between $0.29 and $0.45 per gallon) in their West Coast refining businesses. However, consistent with the subsequent national and global decline in petroleum product prices and refining margins,[50] all three companies reported marginal profits or losses in their West Coast refining businesses in 2024. Available pre-pandemic earnings data suggests that this dynamic is not new.

The California Oil Refinery Cost Disclosure Act (Allen, Ch. 374, Stats. Of 2021-22) requires refineries to submit operating costs, gross margins, and net margins for gasoline refining to the CEC. Unfortunately, the operating costs reported to the CEC and publicly released by companies are not comprehensive or consistent with one another, as **Exhibit 17** shows.

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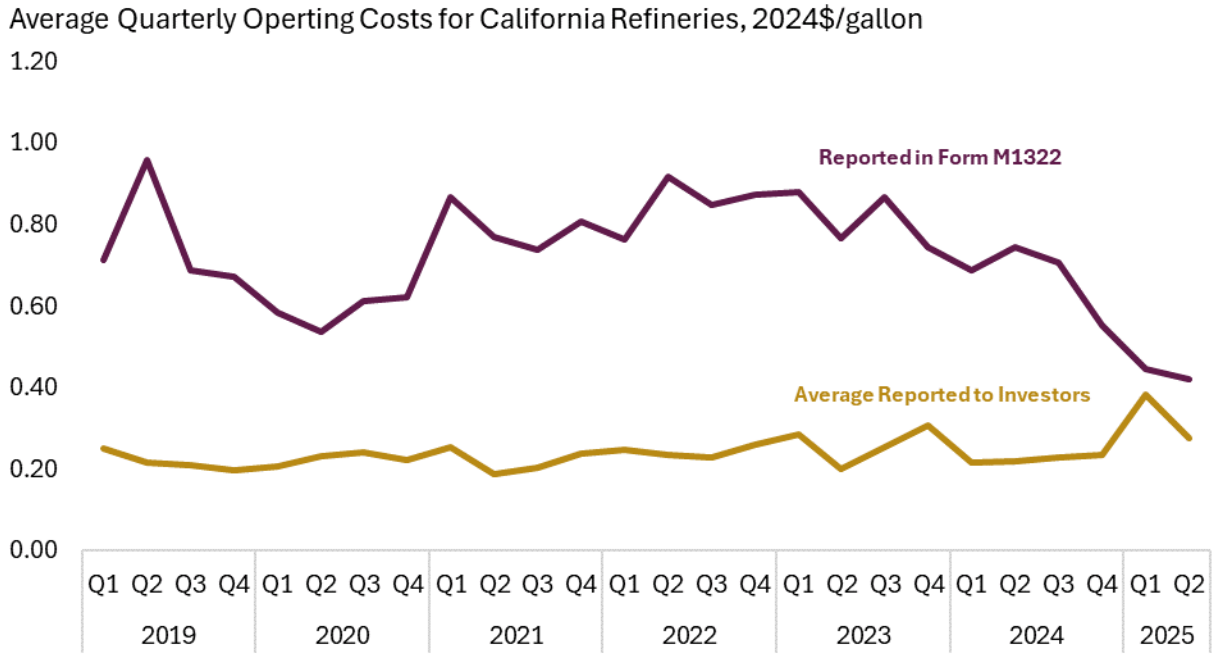
[47] SB X1-2. Section 1(d) ("Although preventable capacity limitations and inventory shortages played a role in the third quarter of 2022 price increases, they cannot account for all of those increases. Similar factors did not lead to extreme price spikes in prior years, suggesting that the sky-high prices Californians faced from August to October of 2022 were due in significant part to opportunistic price gouging by oil companies"). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320241SB2.

[48] Division of Petroleum Market Oversight. May 15, 2024. "SBX1-2 Overview and Update on Oil and Gas Market Oversight Activities" [Recorded legislative hearing, at 03:07:16]; Division of Petroleum Market Oversight. "Division of Petroleum Market Oversight: Introduction" [Corresponding PowerPoint presentation, at slide 13]. Assembly Committee on Utilities and Energy; Division of Petroleum Market Oversight. Sept. 13, 2024. "Market Update and Consumer Advisory," at p. 4; California Energy Commission. 2024. "Estimated Gasoline Price Breakdown and Margins." https://www.energy.ca.gov/estimated-gasoline-price-breakdown-and-margins.

[49] California Energy Commission and California Department of Tax and Fee Administration. May 3. 2024. "Review of the Price of Gasoline in California and Related Impact on State Revenues," at pp. 19-20.

[50] Energy Information Administration. October 15, 2014. "Global Refinery Margins Fall to Multiyear Seasonal Lows in September." https://www.eia.gov/todayinenergy/detail.php?id=63447.

Exhibit 17: California Refiners Have Reported Significantly Higher Operating Expenses to the CEC Than to Investors



Note: DPMO analysis of CEC M1322 data and quarterly earnings data reported to investors by California refiners. This chart only includes data for California refiners that report West Coast operating expenses and file 1322 data.

Between 2019 and mid-2025, California refiners reported average refining operating expenses of approximately $0.24 per gallon to their investors. During the same period, the same refiners have reported average refining operating expenses of approximately $0.72 per gallon to the CEC. The significant disparity between publicly reported earnings data and the data reported to the CEC for prior years hinders the state's efforts to better understand the particular costs that in-state refiners face. DPMO has been working closely with the CEC to improve this critical data stream.

In contrast to refining, the marketing sector may realize higher prices and margins with or without price spikes. Outside of price spikes, these companies benefit from increasing branded wholesale and retail gasoline prices and margins (as shown in **Exhibits 12-14**), control retail gasoline stations at prime locations, and own the rights to household brands that Californians recognize.[51] The potential profitability of marketing and retail is evidenced by the number of major brands that exited refining in California, but continued to market gasoline and other refined products to consumers. This list includes BP, ExxonMobil, Shell, and in 2025, Phillips 66.

[51] Prior analysis from the California Energy Commission and California Department of Tax and Fee Administration also shows significant growth in retail margins. See, e.g., California Energy Commission and California Department of Tax and Fee Administration. May 3. 2024. "Review of the Price of Gasoline in California and Related Impact on State Revenues," at pp. 31-36.

Conclusions and Recommendations

DPMO's analysis demonstrates that the extra surcharge between California and the rest of the U.S. is driven by higher gross industry margins. One possible reason is market power. In particular, certain companies' ability to increase markups through vertically controlled, branded sales channels (such as DTW and branded rack) may sustain higher retail prices, even as spot market prices are stable.

DPMO will continue investigating the California gasoline market and price trends in 2025 and 2026. This year, DPMO has turned its attention to the retail market by further exploring the price spread between branded and unbranded retail gasoline. DPMO is also focusing on the import market to better understand the conditions under which market participants bring additional supply into California. The role of market power will play a central role in both analyses.

DPMO recommends reviewing existing data streams and data collection authority necessary to better understand California's gasoline market. Reliable, consistent, and comprehensive data on refiner and major marketers' sales, vertical pricing, input costs, operating expenses, and other costs would support these efforts. This includes more complete data on: 1) historical volume and pricing for refiners' company outlet and other end user sales; 2) refiners' input costs, refining and marketing operating expenses, and other costs, so that the data reported to the CEC in Form M1322 more closely align with the companies' statements to their investors and the public through their SEC filings and quarterly earnings press releases; and 3) wholesale and retail operations of non-refiner major marketers that may be utilizing DTW, company operated stores, or other means of vertical pricing control.

DPMO continues to recommend the publication of aggregated and anonymized data on California spot market trading trends.[52] As noted earlier, there are sometimes material differences between the trade data reported voluntarily to price reporting agencies and the more complete picture that is reported to the California Energy Commission. This would bring much-needed transparency to California's spot markets and may provide more accurate volume and pricing information to market participants.

Finally, DPMO continues to encourage all Californians to shop around for gasoline. As noted earlier, while branded gasoline is usually more expensive, DPMO is not aware of any public evidence confirming that branded gasoline outperforms unbranded gasoline in California. All gasoline must meet CARB's stringent standards for emissions control and engine performance.

DPMO will continue supporting the administration's efforts to make retail gasoline prices more affordable for Californians as the state transitions to clean energy. This includes supporting price spike mitigation efforts (including the implementation of the resupply and minimum inventory authorities granted to CEC by ABX2-1), considering additional policy options that may mitigate the underlying causes of persistently high prices, and providing guidance and recommendations to the CEC and coordinating with CARB and other agency partners as they

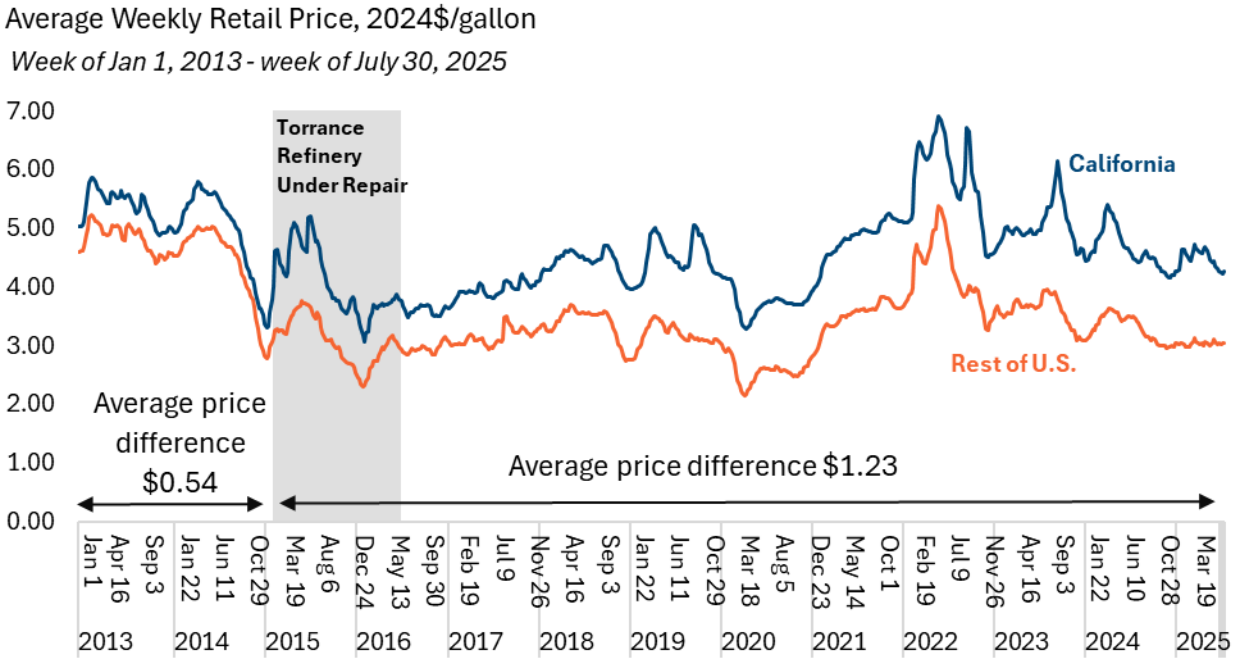
[52] Division of Petroleum Market Oversight. Jan. 31, 2024. "Core Options for Reforming the California Gasoline Spot Market."

move forward with the Transportation Fuels Transition Plan and transportation decarbonization.

TECHNICAL APPENDIX:
Gasoline Price Analysis Methods and Findings

On February 19, 2015, an explosion in the gasoline processing unit at the ExxonMobil Refinery in Torrance, California started a fire, severely damaging the refinery. The refinery was under repair for over a year and did not return to full production until May 2016. This event severely disrupted California's gasoline supply, generated illiquidity and volatility on the spot market, and consequently contributed to higher retail gasoline prices. However, even after the refinery was fully repaired and back online, the gap in prices between California and the rest of U.S. continued to increase. **Exhibit A1** reports historical retail gasoline prices in California and the rest of the U.S. and illustrates the growing gap in prices since 2015.

Exhibit A1: Gasoline Price Gap Between California and Rest of U.S. Has Been Growing Since the Torrance Refinery Fire in 2015



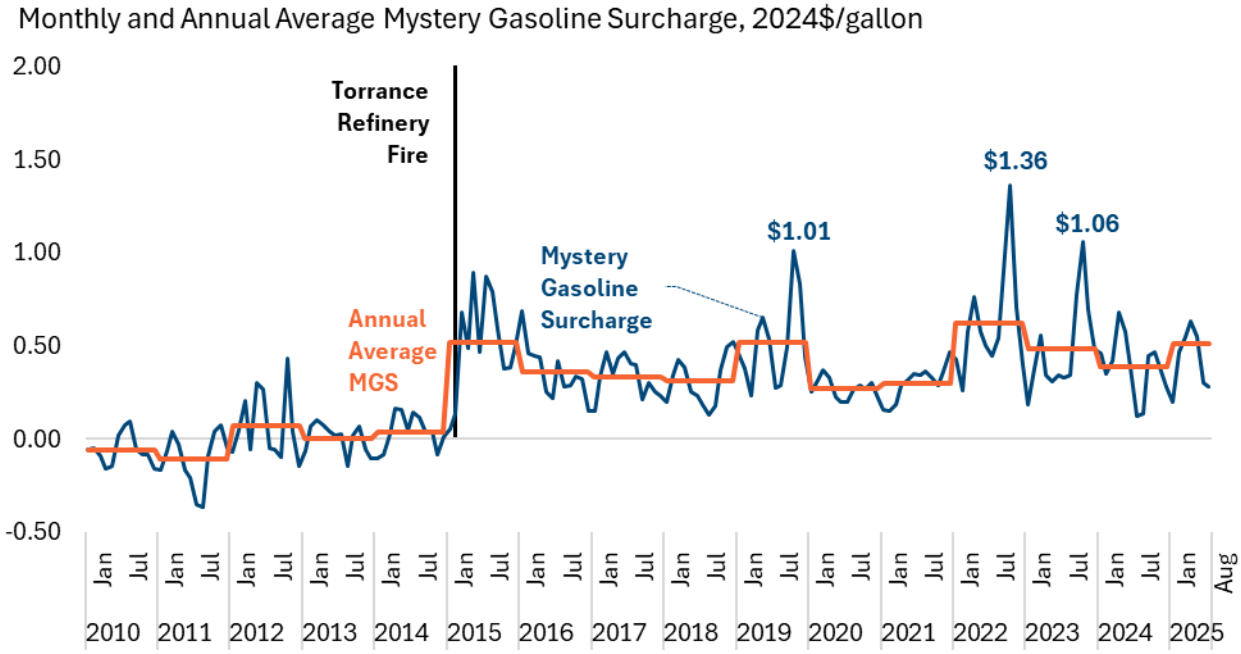
Note: Based on data from EIA Weekly U.S. and CA Regular All Formulations Retail Gasoline Prices.

University of California, Berkeley Professor Severin Borenstein first identified the growing price differential between California and the rest of the U.S. in 2017. Key to his analysis was accounting for California state taxes and fees for environmental programs (e.g., Cap-and-Invest, formerly known as Cap-and-Trade, and LCFS). Even after subtracting these costs from the California price, an unexplained price differential remained, which he called the mystery gasoline surcharge (MGS).[53]

[53] Severin Borenstein. Oct. 30, 2017. "California's Real Gasoline "Tax" Problems." https://energyathaas.wordpress.com/2017/10/30/californias-real-gasoline-tax-problems/; Borenstein. Nov. 1, 2017. "Opinion: Mystery Fuel Surcharge Much Costlier Than New Gas Tax."

Exhibit A2 reports the mystery gasoline surcharge and shows that since 2015, it has ranged from 27 to 62 cents per gallon. Since 2022, the surcharge has increased and become more volatile.

Exhibit A2: Surcharge Appeared in 2015 after the Torrance Refinery Fire



Note: Based on DPMO analysis of data from EIA and CDTFA. Computation based on methods from Severin Borenstein.[54]

Calculation of the Mystery Gasoline Surcharge

DPMO largely replicates Professor Borenstein's formula for calculating the mystery gasoline surcharge.[55] This is represented as the difference between retail gasoline prices in California and the rest of the U.S. after subtracting respective taxes, fees, and other environmental program costs:

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https://www.mercurynews.com/2017/10/29/opinion-mystery-ca-gas-charge-cost-families-1200-so-far/; Borenstein. Feb. 26, 2018. "California's Mystery Gasoline Surcharge Continues." https://energyathaas.wordpress.com/2018/02/26/californias-mystery-gasoline-surcharge-continues/; Borenstein. Oct. 15, 2018. "Trying to Unpack California's Mystery Gasoline Surcharge." https://energyathaas.wordpress.com/2018/10/15/trying-to-unpack-californias-mystery-gasoline-surcharge/; Borenstein. May 20, 2019. "The Mystery Gasoline Surcharge Gets Some Respect." https://energyathaas.wordpress.com/2019/05/20/the-mystery-gasoline-surcharge-gets-some-respect/; Borenstein. Feb. 10, 2020. "California's Mystery Gasoline Surcharge Strikes Back." https://energyathaas.wordpress.com/2020/02/10/californias-mystery-gasoline-surcharge-strikes-back/; Borenstein. Jan 9. 2023. "What's the Matter with California's Gasoline Prices?" https://energyathaas.wordpress.com/2023/01/09/whats-the-matter-with-californias-gasoline-prices/.

[54] Borenstein. May 20, 2019. "Calculation of California's mystery gasoline surcharge."

[55] Severin Borenstein. May 2020. "Mystery surcharge calculation 2019 May" [Excel spreadsheet]. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Ffaculty.haas.berkeley.edu%2Fborenste%2FMysterySurchargeCalculation2019May.xlsx&wdOrigin=BROWSELINK.

$$(1)\ MGS = \Big(\text{Retail Price}_{CA} - \text{Taxes}_{CA} - \text{Environmental Programs}_{CA} - \text{CARBOB Cost Premium}_{CA} - \big(\text{Retail Price}_{RoUS} - \text{Taxes}_{RoUS} - \text{Environmental Programs}_{RoUS}\big)\Big),$$

where,

- subscripts: California (CA) and Rest of the U.S. (RoUS), meaning U.S. minus CA
- Retail Price: CA and U.S. Regular All Formulations Retail Gasoline Price, $/gallon
- Taxes: CA, state, and federal gasoline taxes and sales taxes on gasoline
- Environmental Programs: CA Underground Storage Tank (UST) maintenance fee, CA Cap-and-Invest Program cost, Low Carbon Fuel Standard cost. We assume the costs of environmental programs are zero in rest of U.S.
- CARBOB Cost Premium: additional cost of producing CARBOB (California Reformulated Blendstock for Oxygenate Blending) over the cost of producing CBOB (Conventional Blendstock for Oxygenate Blending)

In DPMO's computation of the surcharge, dollar-denominated variables are measured in dollars per gallon and adjusted for inflation to average 2024 constant dollars, unless otherwise noted. DPMO relies on monthly data from January 2000 and through August 2025. In the following section, we detail our data sources and assumptions in computing the MGS.

Retail Prices: California and Rest of the U.S.

Following Professor Borenstein's approach, we measure retail gasoline prices using monthly average retail gasoline prices for All Grades, All Formulations fuels from the U.S. Energy Information Administration (EIA).[56] EIA reports prices for the U.S. as a whole and for individual states. We estimate prices for the rest of the U.S. (i.e., U.S. prices excluding California), using the following formula:

$$(2)\ \text{U.S. price without CA} = \frac{(\text{U.S. price}) - (\text{CA share of U.S. gasoline} \times \text{CA price})}{1 - \text{CA share of U.S. gasoline}}$$

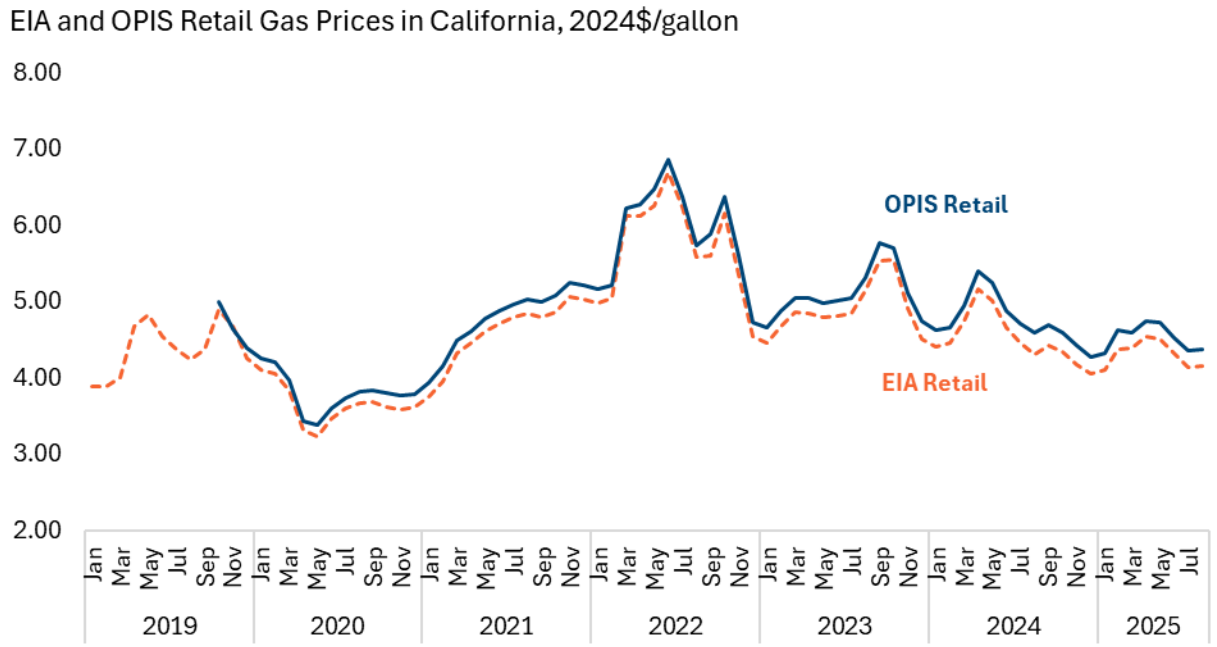
DPMO has adjusted the estimate of the rest of U.S. gasoline price from the U.S. average retail gasoline price. The original assumption was that California represents 10 percent of the U.S. gasoline consumption. In our calculation, DPMO directly computes California's share of gasoline sold in the U.S. for each year. We net out California's annual share of gasoline consumption from the U.S. to estimate a rest of the U.S. price. This percentage share updates each year. The maximum share was 11.5 percent in 2001-2003, and the minimum share was 9.7 percent (in 2025).

In addition to estimating the surcharge based on EIA retail price data, DPMO also computes this using retail price data from the Oil Price Information Service (OPIS). The OPIS data

[56] U.S. Energy Information Administration. 2024. "California Regular All Formulations Retail Gas Prices." https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epmr_pte_sca_dpg&f=m; U.S. Energy Information Administration. 2024. "U.S. Regular All Formulations Retail Gas Prices." https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epmr_pte_nus_dpg&f=m.

includes detailed geographic information, which allows DPMO to directly compute average gasoline prices outside California. The OPIS data also includes retail station brand information, which allows DPMO to compute the surcharge for branded and unbranded fuel. While the EIA retail price data are available since 2000, we have access to OPIS data starting in 2019. Another key difference between the EIA retail prices data and OPIS data is that EIA reports volume-weighted retail prices and OPIS does not provide sales data for each station, making the average prices derived from OPIS data unweighted. As a result, average monthly prices will differ between the two data sources, as shown in **Exhibit A3**.

Exhibit A3: California Retail Gasoline Prices Reported by EIA and OPIS Are Close and Follow Same Trends



Note: Based on EIA Monthly CA Regular All Formulations Retail Gasoline Prices and OPIS retail prices.

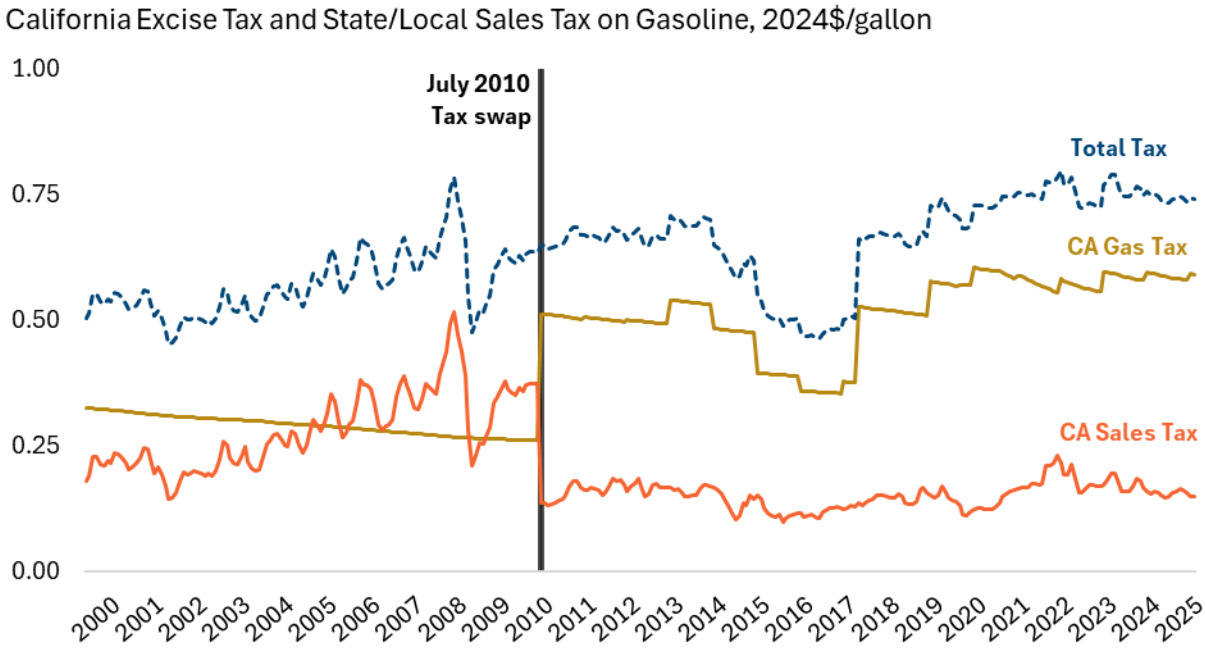
Differences in Taxes

This calculation accounts for differences in taxes in California and the rest of the U.S. For California, DPMO accounts for the gasoline excise tax, the state sales tax on gasoline, and the average special district sales tax. To account for taxes in the rest of the U.S., the MGS uses an average of total state taxes on gasoline but excludes local gasoline taxes (in large part because the U.S. Energy Information Administration – the source for this statistic – only captures state taxes on gasoline and not local taxes). Because the federal gasoline tax is the same in California and the rest of the U.S., the value of this tax cancels out from the overall calculation since it is present in both CA and in the rest of U.S.[57]

[57] The federal gasoline tax of 18.4 cents per gallon has not changed since 1993 and has not been adjusted for inflation. The revenue from this tax is allocated 60 percent for highway and bridge construction and 40 percent to earmarked programs (including mass transit projects). See U.S. Energy Information Administration. 2024. "How much tax do we pay on a gallon of gasoline and on a gallon of diesel fuel?" https://www.eia.gov/tools/faqs/faq.php?id=10&t=10; Federal Highway Administration. 2022. "Federal Tax Rates

To account for California taxes, we rely on data from the California Department of Tax and Fee Administration (CDTFA).[58] California first implemented a gasoline tax in 1923, and it has steadily increased in real terms. In July 2010, California implemented a "tax swap" between California's gasoline sales tax rate and the gasoline excise tax, where the state gasoline sales tax rate decreased from 8.25% to 2.25%, and the gasoline excise tax increased from 18 cents to 35.3 cents per gallon. Between 2010 and 2017, the gasoline excise tax rate fluctuated, and in November 2017 it increased significantly due to new legislation funding road and bridge repairs in the state. Since July 2019, California's gasoline excise tax has increased at a measured rate, increasing from 47 cents per gallon in July 2019 to 61.2 cents per gallon as of August 2025, increasing at roughly the rate of inflation. See **Exhibit A4**.

Exhibit A4: After July 2010, California Tax Revenues from Gasoline Predominantly Come from Gasoline Excise Tax



Note: Based on DPMO analysis of CDTFA CA tax data and EIA Monthly CA Regular All Formulations Retail Gasoline Prices.

California's gasoline sales tax rate is currently 2.25 percent: 1 percent of which is local sales tax, 0.25 percent goes to the state's General Fund, and 0.5 percent goes to the Local Public Safety Fund to support local criminal justice activities, and 0.5 percent goes to the Local Revenue Fund to support health and social services programs.

The special districts' sales tax varies by county, city, and towns throughout California. The CDTFA compiled yearly state-wide averages of the special district sales tax rate. Using data from CDTFA, DPMO updated the MGS calculation to reflect observed tax. The 2023 average

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on Motor Fuels and Lubricating Oil." https://www.fhwa.dot.gov/policyinformation/statistics/2022/fe101a.cfm; PBS NewsHour. Aug. 15, 2007. "Transportation Secretary Discusses Concerns About National Infrastructure." https://web.archive.org/web/20070929211337/http:/www.pbs.org/newshour/bb/transportation/july-dec07/infrastructure_08-15.html.

[58] California Department of Tax and Fee Administration. 2024. "Sales Tax Rates for Fuels." https://www.cdtfa.ca.gov/taxes-and-fees/sales-tax-rates-for-fuels.htm.

special district sales tax rate was 1.41 percent and the 2024 average was 1.48 percent.[59] Overall, the sales tax that California consumers pay on gasoline is roughly 15 cents per gallon but fluctuates with gasoline prices. As of August 2025, the state gasoline excise and the state sales tax on gasoline summed to 76 cents per gallon. (See **Exhibit A4** for the total tax value over time)

We estimate gasoline taxes for the rest of the U.S. using data from the EIA. The EIA reports average total state taxes on gasoline for all states. This average state tax is currently 32.6 cents per gallon and includes gasoline excise taxes, special taxes, and sales taxes on gasoline.[60] The EIA average state gasoline tax data excludes the federal gasoline tax and any county or local taxes. We estimate the average state gasoline taxes for all states excluding California, i.e., the rest of the U.S., using the following formula:

$$\text{(3) Avg U.S. State Gas Tax without CA} = \frac{\text{Avg state gas tax} - (\text{CA share of U.S. gasoline} \times \text{CA gas tax})}{\text{1-CA share of U.S. gasoline}}$$

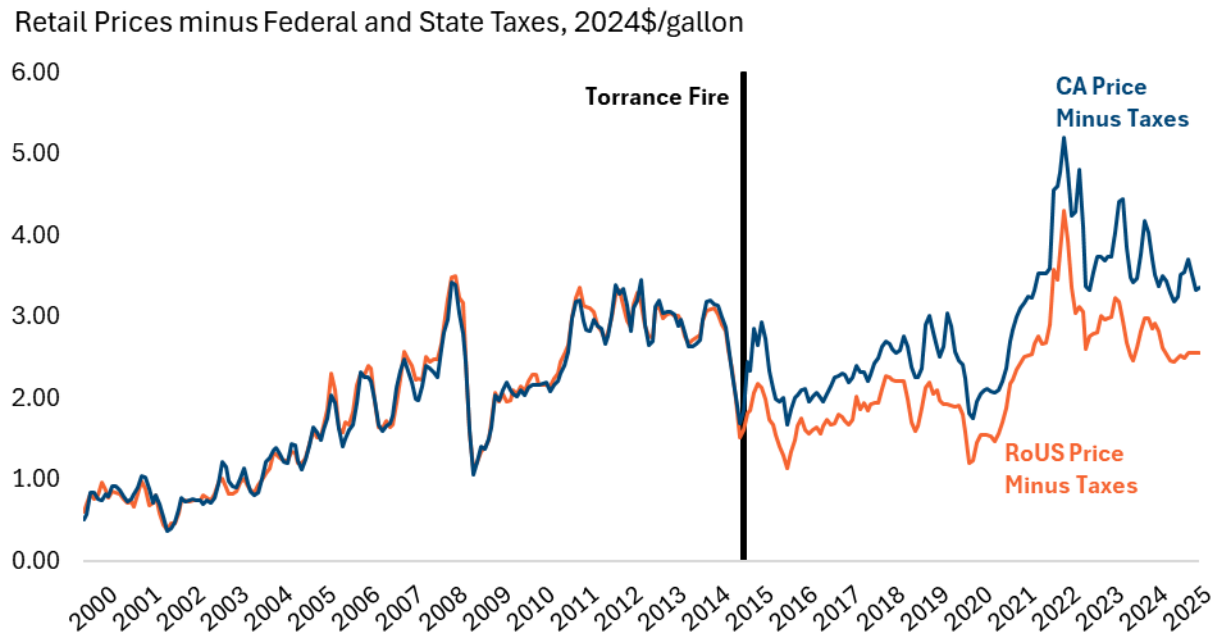
This formula follows the same approach for removing California from the average U.S. value as **Equation (2)**. Using this formula, the average value of state gasoline taxes in the rest of the U.S. (without California) is currently 28 cents per gallon.

When taking only taxes into consideration, one can observe the MGS emerging in the difference between California and the Rest of the U.S. in 2015. **Exhibit A5** demonstrates the diverging price-tax difference.

[59] California Department of Tax and Fee Administration estimate. Based on California Department of Tax and Fee Administration. 2024. "Average District Tax Rates with Operative and Sunset Dates." https://www.cdtfa.ca.gov/formspubs/cdtfa823.pdf

[60] U.S. Energy Information Administration. 2024. "How much tax do we pay on a gallon of gasoline and on a gallon of diesel fuel?" https://www.eia.gov/tools/faqs/faq.php?id=10&t=10.

Exhibit A5: Since 2015, the California Price Net of Taxes Diverges from Rest of the U.S. Price Net of Taxes



Note: Based on DPMO analysis of EIA U.S. and CA Monthly Regular All Formulations Retail Gasoline Prices, EIA federal and state tax data, and CDTFA CA tax data.

California Environmental Programs

The California Environmental Programs term in Equation (1) accounts for the cost of California's Underground Storage Tank Maintenance Fee, the Cap-and-Invest program, and the Low Carbon Fuel Standard. Since transportation is the largest source of harmful local air pollution and greenhouse gases, the Cap-and-Trade and Low Carbon Fuels Programs provide incentives for meeting consumer demand with cleaner fuels. These programs are implemented in response to statutory direction to achieve climate targets.

The Underground Storage Tank Maintenance Fee is currently 2 cents per gallon. The fee has been effective since 1991, starting at 0.6 cents per gallon. The revenue from this fee goes to the California Underground Storage Tank Cleanup Fund and provides "financial assistance to the owners and operators of underground storage tanks to remediate conditions caused by leaks."[61] CDTFA publishes the current and historical fee rates online.[62]

In 2013, California implemented its Cap-and-Invest Program to reduce greenhouse gas emissions by setting an emissions cap on approximately 80% of the state's greenhouse gas emissions and establishing a market for tradable emissions allowances.[63] Each year, many

[61] California Department of Tax and Fee Administration. 2024. "Underground Storage Tank Maintenance Fee." https://www.cdtfa.ca.gov/taxes-and-fees/fuel-tax-and-fee-guides/underground-storage-tank-maintenance-fee/.
[62] California Department of Tax and Fee Administration. 2024. "Underground Storage Tank Maintenance Fee," https://www.cdtfa.ca.gov/taxes-and-fees/special-taxes-and-fees-tax-rates/#undertankfee
[63] Legislative Analyst's Office. 2023. "California's Cap-and-Trade Program: Frequently Asked Questions." https://lao.ca.gov/Publications/Report/4811#:~=Cap-and-trade%20is%20one%20of%20the%20state%E2%80%99s%20key%20policies,to%20be%20emitted%20in%20the%20state%20each%20year.

emitters, including the petroleum refineries, receive free allocations of California Carbon Allowances (based on their historical output and emission), to minimize emissions leakage and support compliance.[64] Through 2024, oil refiners have received over $6 billion of value in free allowances. Emitters exceeding their free allocations must purchase more to account for their emissions, and those emitting below their allowances may sell their excess amount in the market. Quarterly auctions set the price of these allowances (or "credits", in $/ton of CO2). Additionally, in 2015, the program expanded to require fuel suppliers (refiners and importers) to purchase and surrender California Carbon Allowances for the tailpipe emissions associated with the fuel that they sell. Following Professor Borenstein's methods, we ignore the stationary emissions obligations of refiners (since their free allowances likely cover a substantial portion of those costs) and focus on capturing the cost of the tailpipe emissions in our calculation. We compute this cost as the current credit price (publicly available on the California Air Resources Board website) multiplied by the estimated greenhouse gas emissions from burning gasoline.[65] This simple calculation does not account for any hedging or other compliance strategy individual companies may be using to reduce their costs of compliance with the Program.

California's Low Carbon Fuel Standard (LCFS) is designed to decrease the carbon intensity of California's transportation fuel pool and provide an increasing range of low-carbon and renewable alternative transportation fuels to meet consumer demand.[66] Providers of transportation fuels must demonstrate that the mix of fuels they cumulatively supply for use in California meets the LCFS carbon intensity standards, or benchmarks, for each annual compliance period. These regulated entities may demonstrate compliance through a system of credits and deficits. Firms generate credits by supplying fuels with lower carbon intensity than the benchmark. Deficits result from supplying fuels with higher carbon intensity than the benchmark. The LCFS program incentivizes the production of clean fuels by allowing those fuels to generate credits.[67] Oil refineries must purchase (or earn) these credits to account for the carbon intensity of the fuels that they produce and sell. The MGS also accounts for the cost of this program, which went into effect in 2011. To estimate the cost impact of the LCFS on a gallon of gasoline for computing the MGS, DPMO relies on a simple calculation tool on CARB's website, the LCFS Credit Price Calculator.[68] This tool provides a simplified estimate of

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[64] California Air Resources Board. 2024. "Overview of ARB Emissions Trading Program." https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/guidance/cap_trade_overview.pdf; California Air Resources Board. 2024. "Auction Information." https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/auction-information.

[65] The carbon emissions from burning one gallon of pure gasoline are about 0.00887 tons, but in California gasoline is 10 percent ethanol. California's Cap-and-Trade program excludes ethanol tailpipe emissions from the cap. Therefore, the covered emissions from burning one gallon of CARBOB are approximately 0.007983 tons of CO2. The current cost of these emissions is the current credit price times 0.007983.

[66] California Air Resources Board. 2024. "Low Carbon Fuel Standard." https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard#:~=The%20Low%20Carbon%20Fuel%20Standard%20is%20designed%20to,reduce%20petroleum%20dependency%20and%20achieve%20air%20quality%20benefits.

[67] California Air Resources Board. 2024. "Low Carbon Fuel Standard." https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard.

[68] California Air Resources Board. March 13, 2009. "The LCFS Credit Price Calculator (version 1.3)" [Excel spreadsheet]. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fww2.arb.ca.gov%2Fsites%2Fdefault%2Ffil

the LCFS cost, in dollars per gallon, based on the following inputs: compliance year, fuel type (gasoline), and current credit price. This estimate also does not account for any potential hedging or other compliance strategy a company may use and assumes that 100% of the LCFS cost would pass onto consumers and therefore may not reflect actual real-world costs.

Exhibit A6 notes the tax and environmental program cost components in $/gallon the overall calculation accounts for, as of August 2025.

Exhibit A6: MGS Calculation Accounts for the Taxes, Fees, and Environmental Program Costs as of August 2025

Program	Cost ($/gallon)
Gas Tax	$0.61
Sales Tax	$0.15
Cap & Trade	$0.23
LCFS	$0.15
UST	$0.02

Note: Based on DPMO analysis of CDTFA and CARB data.

California CARBOB Cost Premium

California requires a unique blend of gasoline to meet federal and state air quality standards and has done so since January 1992.[69] Refineries mix the unfinished California blend, California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB) with 10 percent ethanol to produce CARB reformulated gasoline (CARB RFG), to sell to California consumers. CARBOB is more expensive to produce than gasoline blends sold outside California. To account for this difference in the MGS, we follow Professor Borenstein's methods and assume that between 2000 and 2025, producing gasoline to California standards is a constant 10 cents per gallon more expensive than producing gasoline in the rest of the U.S. However, this assumption likely overestimates the additional cost of meeting California's more stringent fuel specification. It ignores that other states also require "cleaner" gasoline (e.g., Washington, New York, etc.), and producers in these states also face higher production costs. Moreover, since 2003, national motor gasoline standards have become more stringent while CARB RFG standards have not changed.[70] Over time, the average cost of meeting gasoline

es%2F2022-03%2Fcreditvaluecalculator.xlsx&wdOrigin=BROWSELINK; California Air Resources Board. 2024. "Monthly LCFS Credit Transfer Activity Reports." https://ww2.arb.ca.gov/resources/documents/monthly-lcfs-credit-transfer-activity-reports.

[69] California Air Resources Board. 2024. "California Reformulated Gasoline." https://ww2.arb.ca.gov/our-work/programs/fuels-enforcment-program/california-reformulated-gasoline.

[70] U.S. Environmental Protection Agency. 2024. "Gasoline Reid Vapor Pressure." https://www.epa.gov/gasoline-standards/gasoline-reid-vapor-pressure; U.S. Environmental Protection Agency. 2017. "Fuel Trends Report: Gasoline 2006-2016"; California Air Resources Board. 2024. "California Reformulated Gasoline: Fuel Specifications and Test Methods." https://ww2.arb.ca.gov/sites/default/files/2020-03/gasspecs.pdf.

standards in the rest of the U.S. has been approaching the cost of meeting California gasoline standards.

DPMO Updates to Professor Borenstein's MGS Calculation

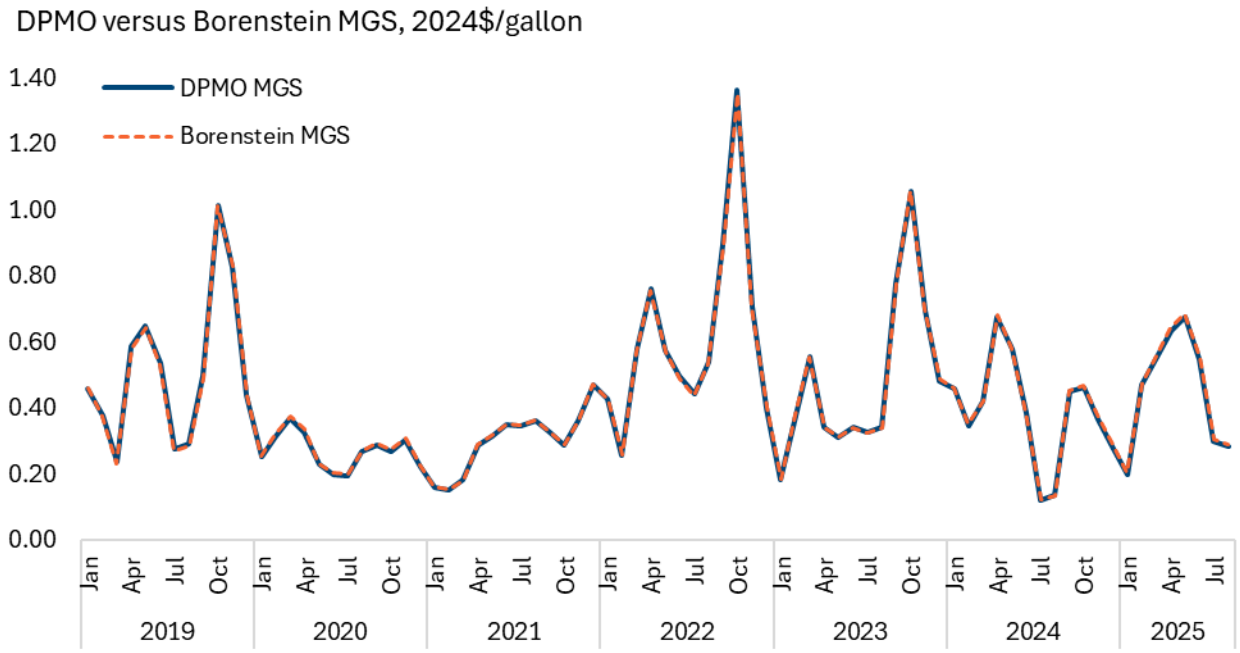
There are a few differences between DPMO's MGS calculation and Professor Borenstein's original MGS calculation:

- DPMO adjusts for inflation using the Consumer Price Index Less Energy, using the annual average as the base; Professor Borenstein uses the Consumer Price Index for all goods and the current month as the base.[71]
- DPMO adjusts the estimates of the average price of gasoline in the rest of U.S. Professor Borenstein's method assumes California represents approximately 10 percent of total U.S. gasoline consumption, but as described above, DPMO directly calculates California's share of gasoline sold in the U.S. For each year, DPMO nets out California's percentage share from the U.S. price to estimate a rest of the U.S. price. This percentage share updates each year, with the maximum share at 11.5 percent between 2001 and 2003, and the minimum share at 9.7 percent in 2025.
- DPMO adjusts the estimate of the average gasoline taxes in the rest of the U.S. Whereas Professor Borenstein assumes that California accounts for 10 percent of total U.S. gasoline taxes, DPMO computes the share directly using the same method described for the average rest of U.S. price of gasoline.

Despite these minor adjustments, **Exhibit A7** shows that DPMO's surcharge calculation is nearly identical to Professor Borenstein's original MGS calculation.

[71] U.S. Bureau of Labor Statistics. 2024. "Consumer Price Index for All Urban Consumers (CPI-U) Series CUUR0000SA0." https://data.bls.gov/timeseries/CUUR0000SA0; U.S. Bureau of Labor Statistics. 2024. "Consumer Price Index for All Urban Consumers (CPI-U) Series CUSR0000SA0LE." https://data.bls.gov/timeseries/CUSR0000SA0LE.

Exhibit A7: DPMO Surcharge Nearly Identical to Professor Borenstein's MGS



Note: Based on DPMO analysis of computed MGS.

Assumptions in the Surcharge Calculation

Estimation of the surcharge requires assumptions and poses limitations. DPMO is continuing to work to improve the accuracy and specificity of the MGS, in collaboration with Professor Borenstein and other independent economists. **Exhibit A8** summarizes the assumptions DPMO makes in this computation.

Exhibit A8: Summary of Modeling Assumptions for Computation of Surcharge

Assumption	Explanation	Impact of Assumption on Calculation
Incremental cost of producing CARBOB (above cost of CBOB) is 10 cents per gallon	We apply Professor Borenstein's estimate of 10 cents per gallon for the incremental cost of producing CARBOB. This likely overestimates the incremental cost of CARBOB.	Underestimates surcharge
No environmental programs accounted for in Rest of the U.S.	We assume that there are no environmental programs (e.g., Cap-and-Trade, LCFS, etc.) that impact gasoline prices in the Rest of the U.S. However, other states have such programs: Washington: Clean Fuel Standard (similar to CA's LCFS), Cap-and-Invest (similar to	Underestimates surcharge

Assumption	Explanation	Impact of Assumption on Calculation
	CA's Cap-and-Trade), both began in 2023[72] Oregon: Clean Fuel Program (similar to CA's LCFS), began in 2016[73] New Mexico: Clean Transportation Fuel Standard (similar to CA's LCFS), began in 2024[74]	
100 percent pass-through of state taxes and environmental program costs to consumers	Following Professor Borenstein, we assume refiners and retailers pass-through 100 percent of state taxes and environmental program costs to consumers, and that the retail price of gasoline includes these costs. This assumption may not reflect firms' actual costs given hedging and cost-minimization compliance strategies.	Depends on actual pass-through rate, and how it differs in CA versus the rest of U.S.
Cap-and-Trade refiner obligations for stationary emissions are not accounted for	We do not include the stationary emissions obligations of refiners, since the free allowances granted to refiners in the Cap-and-Trade program likely cover a substantial portion of those costs.	Depends on refiners' actual stationary emissions compliance costs and free allowances.
Cost of ethanol per gallon of gasoline is the same in CA as in Rest of the U.S.	We assume that the cost of ethanol or ethanol blends needed per gallon of gasoline is the same in CA versus the rest of the U.S. on average across states and over the course of the entire year, but realistically these costs vary.	Depends on actual costs and how it differs in CA versus the rest of the U.S. throughout the year.

Decomposing the Surcharge

We have written the surcharge in terms of the difference in prices, taxes, and fees in California and the rest of the U.S. An equivalent way of expressing the MGS is in terms of gross refining

[72] State of Washington Department of Ecology. 2024. "Clean Fuel Standard." https://ecology.wa.gov/Air-Climate/Reducing-Greenhouse-Gas-Emissions/Clean-Fuel-Standard; State of Washington Department of Ecology. 2024. "Washington's Cap-and-Invest Program." https://ecology.wa.gov/Air-Climate/Climate-Commitment-Act/Cap-and-invest.
[73] Oregon Department of Environmental Quality. 2024. "Oregon Clean Fuels Program." https://www.oregon.gov/deq/ghgp/cfp/Pages/default.aspx.
[74] New Mexico Environment Department. 2024. "Clean Transportation Fuel Standard." https://www.env.nm.gov/climate-change-bureau/clean-fuel-standard/.

and marketing margins and the cost of crude. Using this alternative expression for the MGS, we can further explore what drives the MGS in terms that are well-understood in the industry—gross margins and crude prices. Based on equation (1) above, we can write Borenstein's (2017) definition of the MGS as:

$$(4) \quad MGS = (P_{CA} - T_{CA}) - (P_{RoUS} - T_{RoUS}),$$

the net price of gasoline in California (i.e., $P_{CA} - T_{CA}$) minus the net price of gasoline in the rest of the U.S. (i.e., $P_{RoUS} - T_{RoUS}$). In equation (4), P_{CA} is the retail gasoline price in California and P_{RoUS} is the retail gasoline price in the rest of the U.S. T_{CA} are taxes and environmental fees in California (CA), including state and local taxes, the cost of the LCFS, Cap-and-Invest costs and an incremental cost of CARBOB-spec gasoline. T_{RoUS} are state taxes in the rest of the U.S. (RoUS).

We define the gross refining and marketing margin as the retail price of gasoline less the cost of crude and taxes and environmental fees, or

(5) $M_{CA} = P_{CA} - P_{CA}^{C} - T_{CA}$ for California, and

(6) $M_{RoUS} = P_{RoUS} - P_{RoUS}^{C} - T_{RoUS}$ for the rest of the U.S.,

where M_{CA} represents the gross refining and marketing margins in California and M_{RoUS} represents gross refining and marketing margins in the rest of the U.S. P_{CA}^{C} and P_{RoUS}^{C} represent the prices of crude in California and in the rest of the U.S, respectively.

By substituting the expressions in equations (5) and (6) into equation (4), and rearranging and collecting terms, the expression for MGS can be equivalently rewritten in terms of differences in gross refining and marketing margins (net of taxes and environmental fees) and differences in the cost of crude between the two regions.[75] Equation (7) summarizes this relationship:

$$(7) \; MGS = \left(M_{CA} - M_{RoUS}\right) + (P_{CA}^{C} - P_{RoUS}^{C}).$$

By decomposing the MGS into margins and the difference in crude costs, we can explore the drivers of the MGS in terms familiar to industry and consistent with language in DPMO's industry analysis in the main text of this report.

Crude Costs and the Surcharge

Using data reported by the EIA, we estimate refiners' cost of acquiring crude in California using data for the Petroleum Administration for Defense District (PADD) region 5 and for the rest of the U.S. using data for PADD regions 1-4.[76] EIA does not report state-level crude acquisition cost data and California makes up 65 percent of PADD 5 crude oil refining capacity. Therefore, the monthly PADD-level refiner acquisition cost of crude oil is a reasonable proxy of the crude cost for California refiners.

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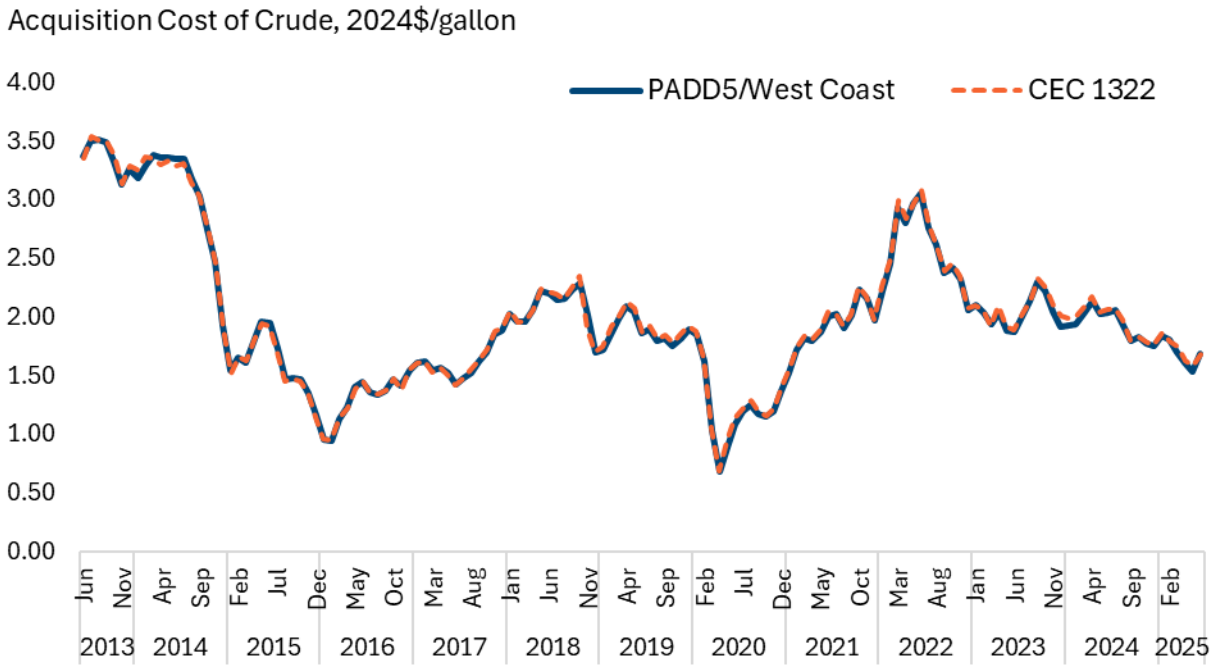
[75] "Equivalently written" means that substituting equations (5) and (6) into equation (7) gives back the original expression for the MGS in equation (4).

[76] PADD regions refer to EIA's geographic aggregation of U.S. states into 5 districts, referred to as "PADD regions" or "PADD." These aggregations facilitate regional analysis of petroleum market trends. See EIA. Feb. 07, 2012. "PADD regions enable regional analysis of petroleum product supply and movements." https://www.eia.gov/todayinenergy/detail.php?id=4890.

Moreover, we compared the PADD 5 acquisition cost of crude to the volume-weighted average acquisition cost of crude reported in CEC Form M1322 data for California refiners.[77] **Exhibit A9** plots the average acquisition cost of crude reported for PADD 5 by EIA and the average reported in CEC 1322 data for California refiners. We find that the aggregated costs reported by California refiners closely aligns with PADD 5 costs reported by EIA.

Exhibit A9: PADD 5/West Coast Acquisition Cost of Crude Closely Aligns with Crude Costs Reported by California Refiners



Note: Based on DPMO analysis of EIA Form 14 data and CEC Form 1322 data. PADD 5 includes Arizona, California, Nevada, Oregon and Washington states.

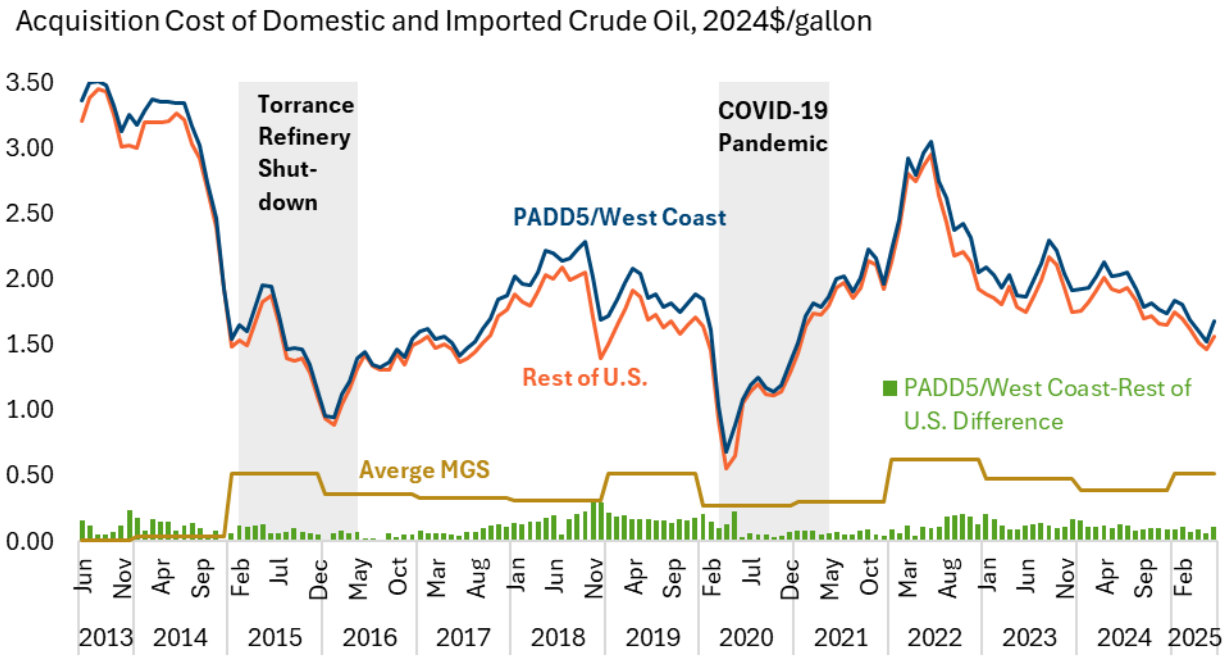
For the rest of the U.S., we compute the acquisition cost of crude as a volume-weighted average crude cost for PADDs 1 through 4, weighted by weekly PADD-level crude oil input volumes reported by EIA. We compute the volume-weighted averages for domestic, imported and a composite (import and domestic) cost of crude.

Exhibit A10 shows that between 2013 and mid-2025, the composite cost of acquiring crude on the West Coast (PADD 5) has been at or above the acquisition cost of crude in the rest of the U.S. (PADDs 1 – 4). In 2014, prior to the fire at the Torrance Refinery, the composite cost of crude in California was, on average, 10 cents per gallon higher than in the rest of the U.S. and the MGS was 4 cents per gallon. After the Torrance Refinery fire there was a shift in California's gasoline market that created a large jump in the surcharge to an average of 42 cents per gallon between 2015 and mid-2025. During this time, the average difference in the cost of crude between California and the rest of the U.S. was only 3 cents higher than before the appearance of a consequential surcharge in 2015. While the cost of acquiring crude oil in

[77] In this margin analysis, we use the average cost of acquisition to understand how margins compare between CA and the rest of the U.S. One might consider the marginal cost of acquisition to matter more for the calculation of the MGS value (which is separate from this decomposition of drivers).

California is persistently a few cents per gallon higher than in the rest of the U.S., differences in crude costs did not drive the emergence of the surcharge after the Torrance Refinery fire.

Exhibit A10: Difference in Acquisition Cost of Crude between West Coast and Rest of U.S. Unchanged with Appearance of Surcharge



Note: Based on DPMO analysis of EIA Form 14 data.

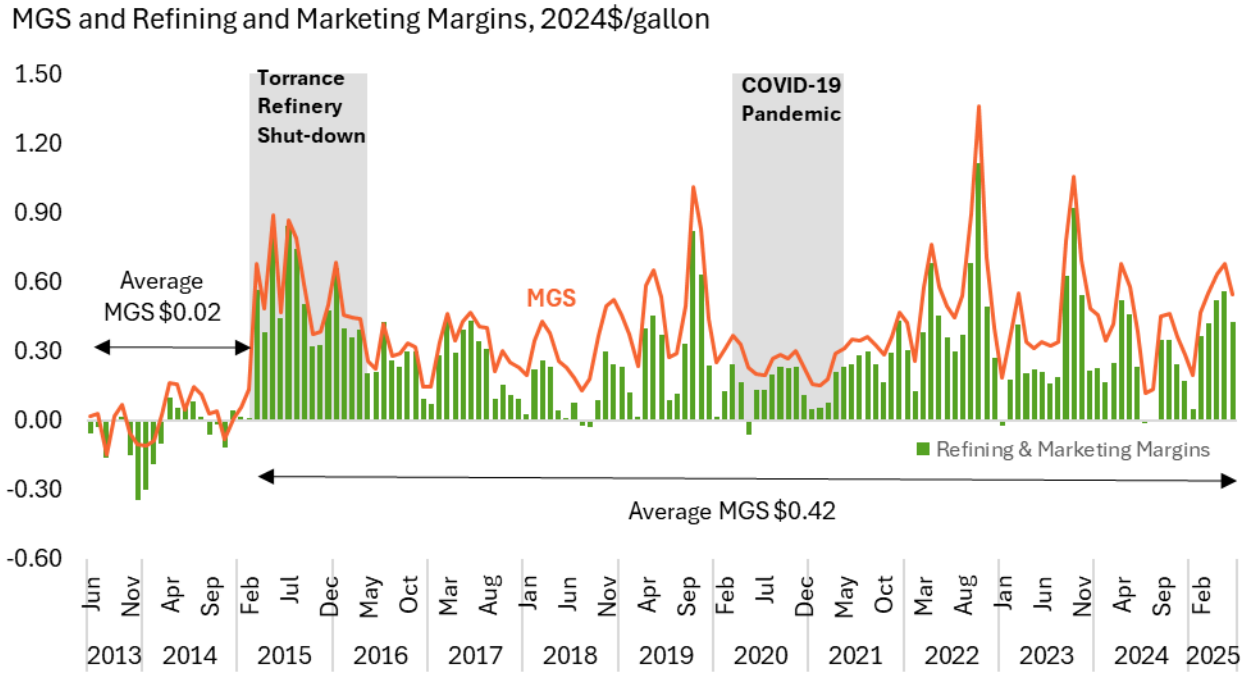
Margins and the Surcharge

While a higher cost of crude in California contributes to the MGS, it does not explain the appearance of a large and persistent MGS in 2015. What changes occurred after the Torrance Fire in California's gasoline market? To answer this question, we return to Equation (6), and focus on the remaining component of the MGS: the difference in refining and marketing margins in California and the rest of the U.S. In the period from June 2013 to January 2015, the average monthly gross refining and marketing margins among California refiners was $1.13 per gallon. After the Torrance refinery fire (from February 2015 to June 2025), this average increased to $1.45 per gallon. In the rest of the U.S. the average monthly gross refining and marketing margin was $1.18 per gallon between June 2013 to January 2015. After the Torrance fire, the average monthly margin in the rest of the U.S. fell to $1.16 per gallon.

Exhibit A11 reports the MGS and the monthly gross refining and marketing margin premium in California (difference in margins between California and the rest of the U.S). The average California margin premium jumped after the Torrance Refinery fire. On average, the MGS increased from 2 cents per gallon to over 40 cents per gallon before and after the Torrance fire. The California margin premium fluctuates month-to-month, but has been large and positive since early 2015, especially during California price spikes. Even during the COVID-19 pandemic, when demand for gasoline crashed and the global refining crack spreads fell to historic lows, California gross margins exceeded rest of U.S. gross margins by 15 cents per

gallon, on average.[78] **Exhibit A11** illustrates the close relationship between the California gross margin premium and the MGS. The MGS spikes align with retail price spikes and margin spikes.

Exhibit A11: Growth in MGS Closely Follows Growth in California's Gross Refining and Marketing Margin Premium Relative to Rest of U.S.

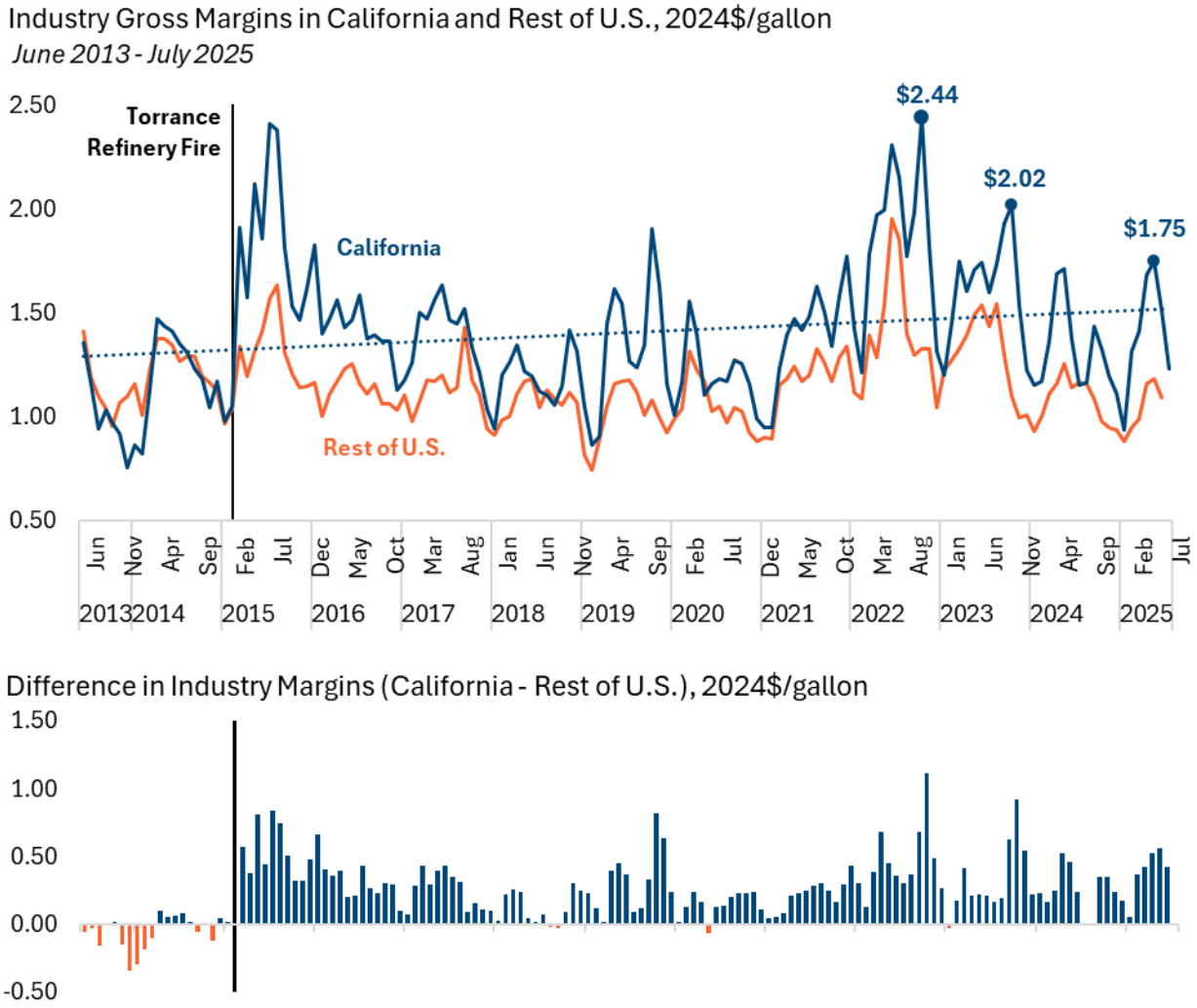


Note: Based on DPMO analysis of MGS and CEC Form M1322 data.

Exhibit A12 further illustrates the relationship between gross refining and marketing margins and the appearance of the MGS. Prior to 2015, the gross margins in California and the rest of the U.S. fluctuated together, with months where the rest of U.S. gross margins exceeded California margins. After 2015, the California gross industry margins have consistently exceeded margins in the rest of the U.S. and coincide with the appearance of MGS.

[78] In the petroleum refining sector, "crack spreads" are a key indicator of the profitability of converting crude oil into a refined product (e.g., gasoline, diesel, jet fuel, etc.) and to assess market conditions and trends in the sector. A crack spread is defined as the difference between the market price of crude oil (the input cost) and the prices of the refined products. When computing a crack spread, analysts assume a weighting among the different refined products produced by a refinery. For example, a common type of crack spread assumes a "3-2-1" spread that assumes that 3 barrels of crude produce 2 barrels of gasoline and 1 barrel of diesel.

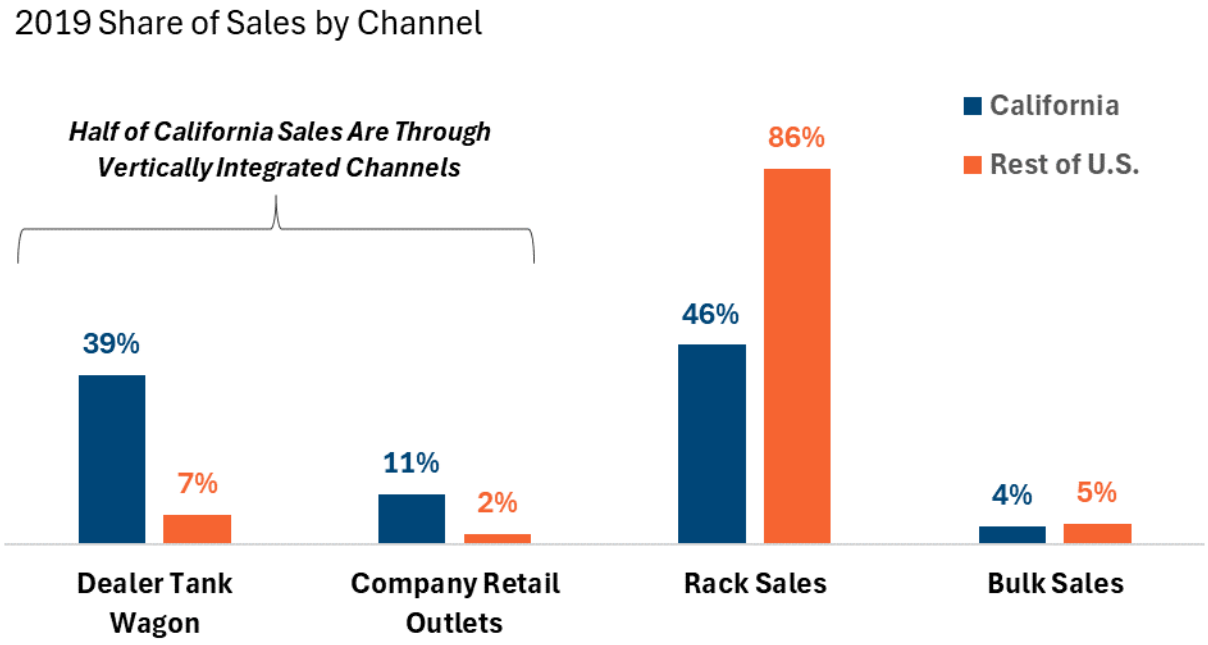
Exhibit A12: Since Torrance Fire, Gross Refining and Marketing Margins in California Consistently Exceed Margins in Rest of U.S.



Note: DPMO analysis of aggregated data from CEC Form M1322 and EIA Form 782.

The strong relationship between the appearance of the MGS and the California gross margin premium raises questions about structural differences between the California and rest of U.S. gasoline market. One observation is that vertical relationships appear to play a more important role in the California market than in the rest of the U.S. We can identify vertical relationships as the sales channels through which refiners sell fuel. In particular, sales through dealer tank wagon (DTW) and branded rack channels require a contractual relationship between the refiner and the retailer that dictates how the fuel is branded and sold. The dealer tank wagon contracts are particularly restrictive. **Exhibit A13** reports the share of sales by channels as reported by EIA in 2019, the last year EIA reports sales by channel for California and rest of U.S.

Exhibit A13: California Refiners Rely Heavily on Close Vertical Relationships Relative to Rest of U.S. Refiners



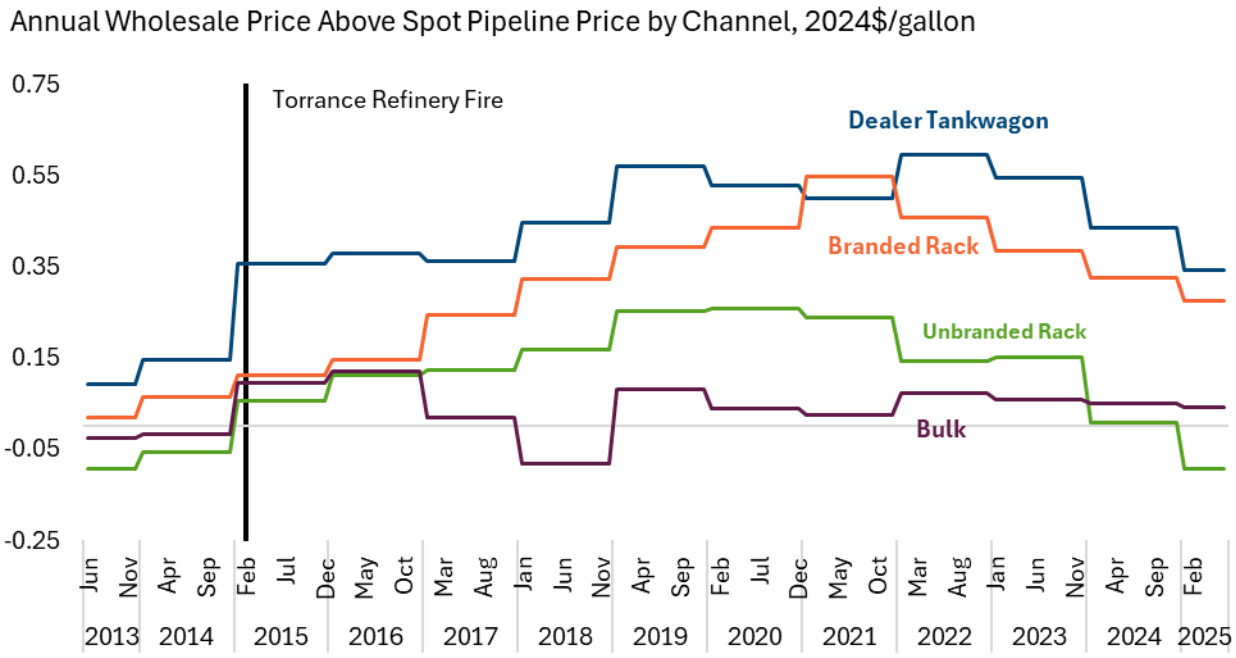
Note: DPMO analysis of EIA Form 782 data.

Exploring the sales channels further, we observe wholesale price markups growing steeply after the Torrance fire for DTW and branded sales, as shown in **Exhibit A14**. To compute the refiner's markup, we assume the spot market price is the refiner's opportunity cost of refining gasoline and define the markup as the volume-weighted average wholesale price of gasoline for each sales channel reported by refiners in the CEC M1322 data less the spot price of gasoline. To compute the markup, we rely on OPIS-reported spot prices, specifically the LA spot price for Southern California refineries and the San Francisco spot price for Northern California refineries. **Exhibit A14** reports the annual average price markup.

In 2014, prior to the Torrance Refinery fire, the average DTW markup was 15 cents per gallon. After the Torrance fire through June 2025, the average DTW markup more than doubled to 47 cents per gallon. We observe a similar increase in markup for refiner fuel sold via the branded rack sales channel. In 2014, the average branded rack markup was 6 cents per gallon. This average increased to 34 cents per gallon from post-Torrance through June 2025. While unbranded fuel sells without (known) vertical constraints from the refiners, we do observe the unbranded markup pulled up with the other channel sales.

Market power enables firms to increase prices above costs. California's gasoline refining sector is highly concentrated in absolute terms and relative to the rest of the U.S. The top four refiners with gasoline refining capacity in California control 90 percent of California's total refining capacity. In the rest of the U.S., the top four refiners with gasoline capacity control only 48 percent of refining capacity.

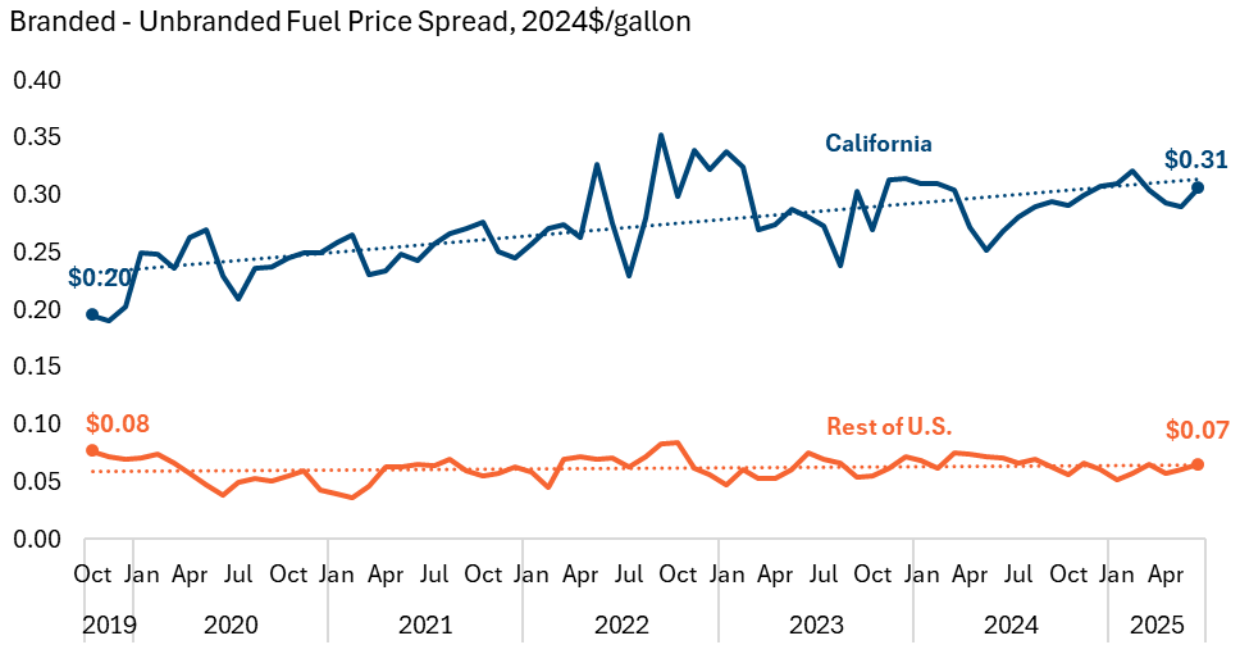
Exhibit A14: Wholesale Price Markup Has Grown Steeply for Contracted Fuel Sales Channels (DTW, Branded) after Torrance Fire



Note: DPMO analysis of aggregated CEC Form M1322 data and OPIS spot price data. Historic CEC Form M1322 data does not include prices for sales through company outlets.

We also observe a distinct pattern in price premium for branded fuel at the retail level in California relative to the rest of the U.S. **Exhibit A15** reports the retail price premium for branded fuel (relative to unbranded fuel) steadily increasing in California, whereas the price difference for branded and unbranded fuel in the rest of the U.S. exhibits a flat trend. Moreover, the branded price premium in California is significantly greater than the branded price premium in the rest of the U.S.

Exhibit A15: California Branded Gasoline Price Difference is Significantly Higher than the Brand Premium in Rest of U.S. and Growing



Note: DPMO analysis of OPIS retail price data.

DPMO's analysis of the MGS and gasoline gross margin differences in California and the rest of the U.S. suggests that market structure and vertical relationships help explain the MGS. Over the next year, DPMO will focus on further quantifying market power in California's gasoline market and uncovering the mechanisms that are driving the gasoline price differential in California relative to the rest of the U.S.

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