Understanding California's High Transportation Fuel Prices

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ABOUT THIS REPORT

This report was authored by Max Pyziur who heads EPRINC's downstream research program. Max has undertaken extensive assessments of U.S. fuels policy. His work focuses largely on the interaction of government regulatory programs and the cost of transportation fuels. Any assessment of transportation fuels presents formidable analytical challenges given the inherent complexities of evaluating processing systems that produce joint products in which regulatory programs will result in unexpected and unintended outcomes.

Regulatory programs, however, are an integral part of U.S. petroleum markets. U.S. regulatory programs seek to ensure active competition, environmental protection, promotion of alternative fuels, among many other objectives. This report examines the technical constraints and cost implications conferred by a large number of California programs to meet several environmental objectives. Of special concern is whether the fuel specifications set by California authorities are continuing to meet their stated goals in a cost-effective manner.

Enormous reductions have been made across the entire range of criteria pollutants. Although beyond the scope of this assessment, the accelerating cost of meeting California fuel standards shown in this report suggest that some effort should be made to evaluate whether the costs of the program, at the margin, remain effective and whether alternative lower cost strategies might be available to meet the State's environmental goals.

We welcome comments and discussion on all our research. Policy makers face a challenging environment in making critical tradeoffs from a broad set of public policy goals, and sound decision-making requires a full understanding of the issues that are at stake.

For comments or questions on this report, please contact Max Pyziur (maxp@eprinc.org or (917) 776-7234).

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President, EPRINC

ABOUT EPRINC

The Energy Policy Research Foundation, Inc. (EPRINC), was incorporated in 1944 as a not-for-profit organization that studies energy economics with special emphasis on the production, distribution, and processing of oil and gas resources. It is known internationally for providing objective analysis of energy issues.

The Foundation researches and publishes reports on all aspects of the petroleum industry which are made available free of charge to all interested organizations and individuals. It also provides analysis for quotation and background information to the media.

Furthermore, it has been called on to testify before Congress on many occasions, and it briefs government officials and legislators, and provides written background materials on request. Additionally, EPRINC has been a source of expertise for numerous GAO energy-related studies and has provided its expertise to virtually every National Petroleum Council study of petroleum issues.

EPRINC receives undirected research support from the private sector and foundations, and it has undertaken directed research from the U.S. government from both the U.S. Department of Energy and the U.S. Department of Defense.

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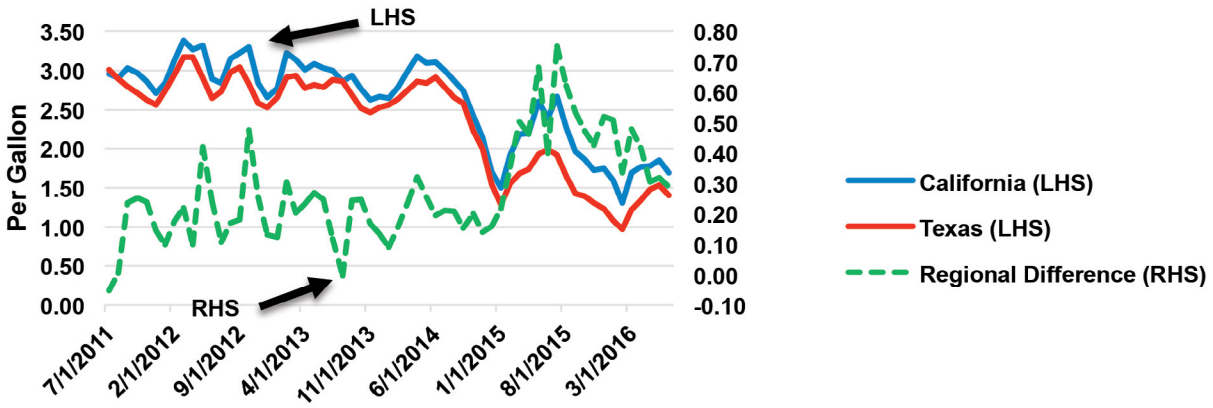
INTRODUCTION

In June 2016, California State Attorney General Kamala Harris issued subpoenas to the state's oil refiners requesting information on maintenance, repair, and trading activities at the companies since 2014. At concern were California's high gasoline prices relative to other parts of the United States, even when adjusted for California's unique fuel specifications. Some California consumer organizations welcomed the move, advocating that California transportation fuel prices were excessive because of uncompetitive practices and/or market manipulation by oil refining companies.

In addition, California's Federal legislators have requested that the U.S. Federal Trade Commission (FTC) investigate California's high transportation fuels for market manipulation and anti-trust violations. The FTC has initiated inquiries, but has not published anything conclusive supporting the view of market misconduct.[1]

While allegations of possible market manipulations have been made, assessment of prevailing data and price trends indicate that several state-specific attributes are the primary drivers of California's high transportation fuel prices. First, California requires that only its own specified gasoline and diesel formulations be marketed in-state. Accordingly, these formulations are only produced by California's refineries, making the state's drivers vulnerable to price spikes from loss of local supply. During attenuated periods of California-produced fuels, non-California sources are limited: California-specified fuel cannot be easily or quickly produced by refineries outside the state, and the cost of moving additional fuel supplies into California is also relatively high.

Figure 1
Monthly Refinery Gasoline-Regular Prices for California and Texas: 07/31/2011 to 07/31/2016



Analysis Based on EIA Data

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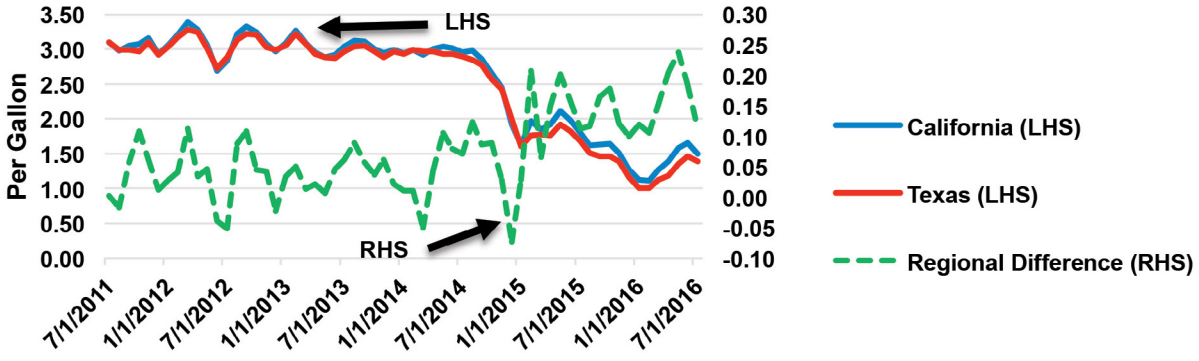
Figure 2
Monthly Refinery Distillate Prices For California and Texas: 07/31/2011 to 07/31/2016



Analysis Based on EIA Data *EPRINC*

Second, relative to the rest of the U.S., California's regulatory regime imposes a high cost structure. In 2006, California Assembly Bill (AB) 32 was passed empowering the California Air Resources Board (ARB) to develop programs to reduce Greenhouse Gas (GHG) emissions. Of the three developed, two (the Low Carbon Fuel Standard and the Carbon Capture Allowance cap-and-trade) programs are applicable to transportation fuels. The regulatory burden of these programs is expected to increase. However, compliance cost estimates of these regimes vary considerably.

Beginning on February 18, 2015, the Torrance refinery (then owned by ExxonMobil, now owned by PBF) began running at reduced rates due to a large explosion there, triggering emergency procedures. Under ordinary operating conditions, the facility can process 150 thousand barrels per day (TBD) of crude oil, almost 8% of California's refining capacity. It only resumed normal operations in May 2016 following thirteen months of extensive repairs. During this time, California transportation fuel prices spiked considerably above their already high trend over national averages.

In the ten years prior to the explosion, California refinery prices (prices charged by refiners to blenders, and other marketers, therefore excluding state and federal taxes) for regular gasoline averaged $0.20 more than those observed in the major refining centers of along the U.S. Gulf Coast (largely Texas). During the Torrance refinery outage, the average jumped to $0.49 per gallon and with greater volatility than those of Texas. After the resumption of production at the Torrance facility, the average differential declined to $0.32 per gallon, a level that is still higher to the period prior to the Torrance facility outage.

Similar trends can be found in California's price of diesel, although not of the same magnitude as gasoline. These differences are shown by the dashed green line in the Exhibits on previous page.[2]

The June 2016 subpoena issuance was not the first time that California has confronted its transportation fuel pricing predicament. This situation has been a subject of controversy since 1996, and it has led to several state organized task forces and commissioned studies. Notably in 2000, then California Attorney-General Bill Lockyer issued an extensive report authored by a large task force of industry participants, environmentalists, trade associations, and legislators.[3] The report's analyses were extensive as were the policy considerations. However, no recommendations were issued. In 2004, there was an update to this report.[4] Separately in 2015, the U.S. Energy Information Administration (EIA) published a study of PADD 5 transportation fuel markets. The PADD 5 district is comprised of all of

INTRODUCTION continued

the Pacific littoral states along with Nevada, Arizona, Hawaii, and Alaska. In particular, this study had extensive sections on the supply of California transportation fuels.[5]

Summarizing from these studies and other observations, California's high fuel pricing predicament can be attributed to several sets of factors; they include: state-specific fuel specifications; constrained arrangements of refinery capacity, logistics, and other sources of supply; and an elevated regulatory regime.

...several state-specific attributes are the primary drivers of California's high transportation fuel prices.

Table 1
Refinery Prices for Regular Gasoline*

	California	Texas	Difference
Ten Years Pre-Outage Average	2.47	2.27	0.20
During Outage Average	1.98	1.49	0.49
Post Outage Average	1.85	1.53	0.32

Refinery Prices for Diesel*

	California	Texas	Difference
Ten Yyears Pre-Outage Average	2.50	2.44	0.06
During Outage Average	1.59	1.44	0.15
Post Outage Average	1.65	1.47	0.18

* dollars per gallon
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FUEL FORMULATION

The 1990 Amendments to U.S. Clean Air Act (CAA) required the development of reformulated gasoline (RFG), a gasoline formulation designed to reduce smog and other air-borne pollutants in designated areas of the U.S. RFG usage began in 1995.

In 1996, California began requiring its own RFG formulations to be used state-wide. This formulation is generally known by its acronym CARB (California Air Resources Blendstock); newer types of CARB formulations use the acronym CARBOB (California Reformulated Gasoline Blendstock for Oxygenate Blending). The California Air Resources Board (ARB), CARB's governing authority, asserts that the formulation reduces smog-forming emissions by 15% and delivers considerable public health benefits. Because of its increased stringency, CARB requires more costly blending components, and it is almost exclusively produced by California refineries.

REFINING CAPACITY, TRANSPORTATION FUEL SUPPLY, DISPOSITION, AND LOGISTICS

There are 16 refineries in California with almost 2 million barrels a day of capacity that produce transportation fuel. Market dominance is diffused, with six companies owning 92.6% of California's refining capacity; the largest two are Tesoro and Chevron with 3 and 2 refineries, respectively, each controlling about 26% of California's total refining capacity. More details can be found in the adjacent table.

Some critics maintain that California refinery utilization is held back in order to boost operating margins; the charts on this page illustrate that California follows trend rather than deviates from it. The bulk of refining assets in PADD 5 (also known as USWC – U.S. West Coast) are located in California, another 600 TBD of refining capacity is in Washington State, and the remainder of PADD 5's 400 TBD of capacity is in Alaska and Hawaii.

PADD 5 refinery utilization is slightly lower than the national trend; but this is not of a magnitude to make a significant difference in pricing. Both PADD 5 and PADD 3 (also known as USGC – U.S. Gulf Coast) are presented for the purpose of comparison in Figure 3 and Figure 4."

Table 2
CA Refining Capacity (bbls/day by region)

Northern State	819,871	42.0%
Southern State	1,134,500	58.0%
Total	1,954,371	100.0%

CA Refining Capacity (bbls/day by company)

			# of Refineries
Tesoro	521,500	26.7%	3
Chevron	514,271	26.3%	2
Phillips 66	259,200	13.3%	2
Valero	210,000	10.7%	3
Shell	156,400	8.0%	1
Exxon/PBF	149,500	7.6%	1
Other	143,500	7.3%	4

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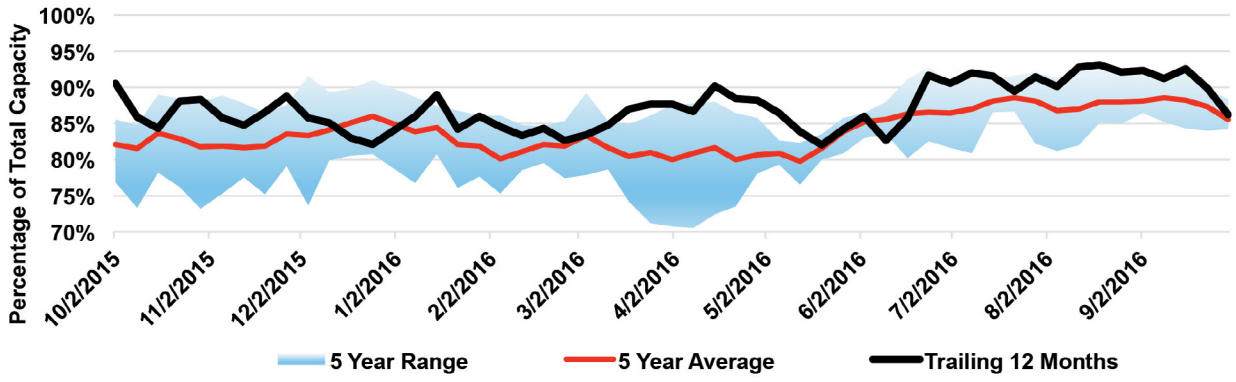
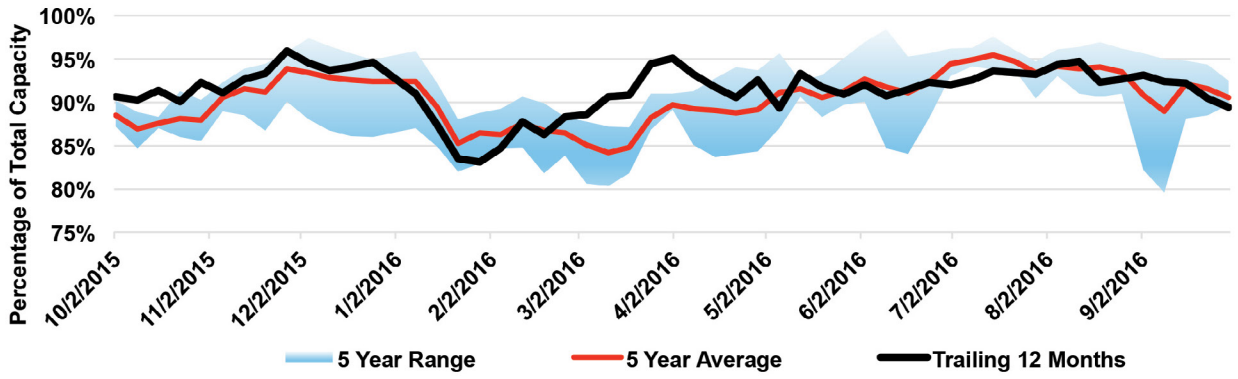
Figure 3
United States - PADD 5: Weekly Refinery Capacity Utilization



Analysis Based on EIA Data *EPRINC*

Figure 4
United States - PADD 3: Weekly Refinery Capacity Utilization



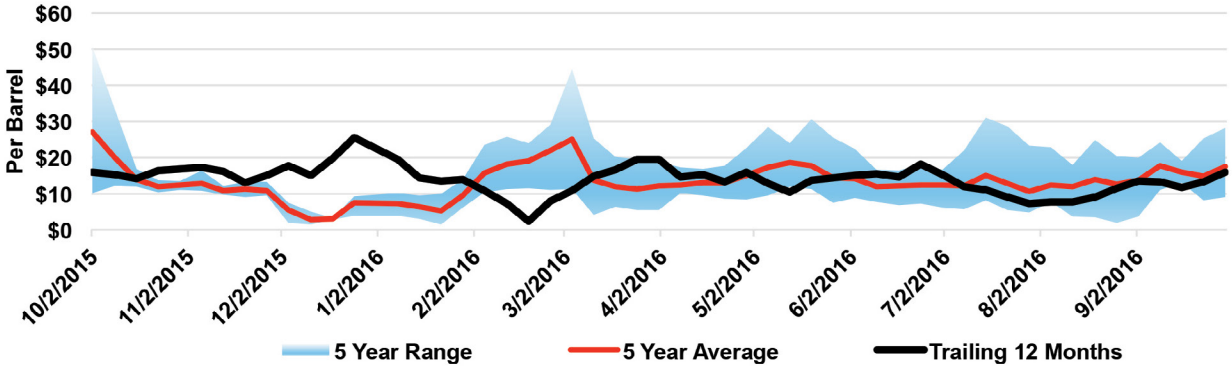
Analysis Based on EIA Data *EPRINC*

PADD 5 (USWC) refinery margins are little different from those in PADD 3 (USGC) where 50% of the U.S. refining facilities are located and refining is most competitive.

Almost 60% of California's refining capacity is located in the southern part of the state, close to Los Angeles, with the remainder located to the north in the area around San Francisco. Nevertheless, southern California refineries can satisfy only 87% of its area's demand. As a consequence, the remaining 13% of the region's demand, CARB and other state-specified formulations of transportation fuels, have to be shipped to southern California. There are no product pipelines between northern and southern California; so southern California's primary source for CARB are waterborne shipments from northern California. California's intrastate coastal shipments are under the jurisdiction of the Jones Act, a Federal statute that requires these sorts of shipments to use U.S.-built and -flagged vessels, operated by crews of U.S. citizens. Combined this adds another cost burden.

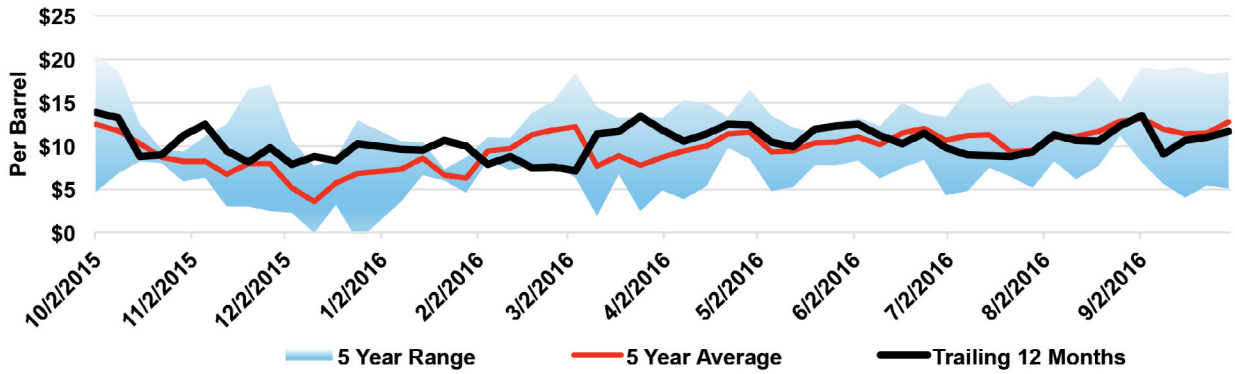
Furthermore, Pacific Coast states are logistically isolated from sources of supply available in the rest of the country and international exporting regions (more so California with its own fuel specifications). The 2000 California Attorney-General report identified a limited number of non-California

Figure 5
Weekly USWC-ANS-Coking Refining Margins



Analysis Based on EIA Data *EPRINC*

Figure 6
Weekly USGC-ANS-Coking Refining Margins



Analysis Based on EIA Data *EPRINC*

refineries capable of producing CARB (or CARB-feedstock); they are in the U.S. Gulf Coast (USGC), Caribbean, Korea, and Northwestern Europe. Therefore, California-bound CARB and other similarly specified products need to be shipped waterborne or by pipeline.

Currently, there are no pipelines to California shipping petroleum products from other parts of the U.S. There have been several proposals for new pipelines and conversion of other types of pipelines, notably those used for natural gas.

Waterborne shipments into California are costly because of the distance they have to travel from production centers. Additional challenges with waterborne shipments is that travel time creates price uncertainty: during the time of production and transport California prices can move considerably and unpredictably, potentially making California-bound cargos unprofitable, especially from Northwestern Europe.

Adding to the logistical challenge, non-California CARB producers do not produce CARB as one of their standard offerings. Only when required, CARB is ordered from these facilities. Once ordered, facilities need to first configure their operations so that CARB batches and/or cargoes can be produced. Generally, it takes between three to four weeks to deliver non-California produced CARB from the time that it is ordered.[7] Lastly, producing CARB at non-California production centers is disruptive to those regions' markets.

California's commercial product inventory capacity is limited, restricting the ability of stocks to dampen price swings from the loss of production. Regulators have extensively studied the possibility of developing a Strategic Fuel Reserve for California as a solution to the state's low product inventories. However, various assessments of the proposal are inconclusive as to whether or not the Reserve's benefits would create other problems. Operationally, policies would have to be developed on what price environments would be appropriate to fill the Reserve, and what would be the signals for releasing stocks into markets. Also, some analysts have raised concerns that state owned gasoline stocks might reduce incentives for commercial entities to build stocks. Other critics have pointed out that the shelf life of CARB is limited to a few months; thus, long-term storage would not be feasible without substantial management to turnover stocks on a regular basis.

Additional CARB challenges have arisen from the California ban of MTBE, a reformulated gasoline oxygenate with high-octane properties. MTBE was outlawed in 2003

in California because small amounts could contaminate drinking supplies. In place of MTBE, ethanol, almost exclusively produced from corn, replaced MTBE (later, with the Energy and Policy Act of 2005, MTBE's use as an oxygenate was effectively outlawed nationally).

While California's MTBE requirements could be produced at its own refineries, California only has five corn ethanol refineries with a total capacity of 13 TBD; because of this, almost all of California's ethanol requirements have to be shipped by rail or marine tanker from other parts of the United States.

Furthermore, with the implementation of Renewable Fuel Standard (RFS) in the Energy and Policy Act of 2005, and Congressionally amended in 2007 with substantial increases, California state refiners are faced, as are national refiners, with increasing blending mandates of biofuels into gasoline and diesel. These obligations face operational challenges and raise the cost of producing transportation fuels. In recent years, these compliance costs have risen considerably both in California and at the national level. Again, with the capacity of in-state corn ethanol refineries being low, California's transportation fuel requirements face additional costs of sourcing biofuel requirements from outside the region.[8]

The MTBE ban combined with the RFS add another layer of cost to California transportation fuels.

In 2006, California Assembly Bill (AB) 32, also known as the Global Warming Solutions Act was signed into law by Governor Arnold Schwarzenegger. The law empowered ARB to develop regulations and programs to reduce California's GHG emissions to 1990 levels by 2020. ARB produced three programs. Of these three, the Renewable Portfolio Standard was directed only at power generation. The other two, the Low Carbon Fuel Standard (LCFS), and California's Carbon Allowance (CCA) cap-and-trade program, have provisions specific to transportation fuels

In 2009, ARB adopted the LCFS. The LCFS program's goals seek to lower the carbon intensity (CI) of transportation fuels at least 10% by 2020 from a 2010 basis. In addition, the LCFS seeks to lower consumption of petroleum-based fuels. Like the RFS, the LCFS compliance costs fall largely on refinery operations; the goal is to reduce the CI of transportation fuels.

The LCFS law has been controversial: after hearing challenges to the LCFS law, a U.S. District Court ruled in December 2011 that the law was unconstitutional. On appeal, the law was generally upheld, but returned to the lower court for reconsideration of certain challenged provisions of the law. Resolution has not taken place, and the law remains in effect.

Estimates of LCFS transportation fuel price impacts are broadly diffused. Low estimates are promulgated by LCFS' proponents, while high estimates by the law's opponents; non-aligned academic studies present a wide range of point estimates. Nevertheless, all estimates indicate that the LCFS program is raising the cost of transportation fuels in California, and these costs will likely continue to increase. Both public and private sector analysis concludes that LCFS adds between $0.06 and $0.20 to a gallon for transportation fuel.[9] Putting aside federal and state taxes, as shown in the Table on this page, California drivers are paying roughly $4.8 billion per year to meet both state and federal fuel specifications for gasoline only. Putting aside federal and state taxes, as shown in the Table on this page, California drivers are paying roughly $4.8 billion per year to meet state fuel specifications for gasoline only. EPRINC estimates that the federal Renewable Fuel Standard[10] adds about $0.10 per gallon to the cost of gasoline. In California, this amounts to $1.5 billion annually in addition to state-specific costs.

The CCA cap-and-trade program began in January 2013 targeting power generation. Beginning in 2015 the program was expanded to include transportation fuels and natural gas transportation. Unlike the LCFS where there is a wide range of cost estimates, California's Legislative Analyst's office has provided an agency approved estimate to the state's legislators. The Legislative Analyst's office concluded that the per-gallon gasoline and diesel retail prices are $0.11 and $0.13 higher, respectively. The estimated total annual cost of the CCA on transportation fuels (both gasoline and diesel fuels) is $2 billion based on the assumption that Californians purchase approximately 15 billion gallons of gasoline (almost 1 million barrels per day) and about 3.5 billion gallons of diesel (almost 230 TBD).[11] Coupled with the LCFS and CCA, there have been further attempts by the California legislature and governor to reduce the use of petroleum-based fuels, targeting 50% reductions by 2030. As of September 2015, these legislative initiatives have been dropped.

Table 3
Estimate of CARB Gasoline Costs Above Texas RFG**

	Per Gallon Cost	*Annual Cost in $Billions
CARB Difference to Texas RFG **of which**	0.32	
Cost of CARB Formulation	0.11	$1.65
CCA Cap & Trade	0.11	$1.65
Cost of LCFS	0.10	$1.50
Total		$4.80

* Based on 15 billion gallons of gasoline consumption annually

** EPRINC estimates that the RFS adds another $0.10/gallon. In California this is an additional $1.5 billion in annual cost

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CONCLUSIONS AND FURTHER WORK

EPRINC's initial work here indicates that there are multiple policy and structural factors that keep California transportation fuel prices high. These include state-specific fuel formulations, limited supply sources beyond California, in-state logistical challenges, and a higher regulatory burden compared to the rest of the U.S.

The recent Torrance refinery outage brought on a period of higher and more volatile transportation fuel prices relative to the rest of the U.S. As yet, prices have not returned to levels prior to the outage. However, continued increases in prices in California relative to gasoline prices on the U.S Gulf Coast likely reflect the rising costs of meeting the LCFS and CCA as well as perceived price risk for potential disruption in supplies of CARB gasoline. In this market environment, we would expect refiners and terminal operators to hold higher inventories to address this risk, and these inventory carrying costs may be reflected in higher prices (above direct production costs at the refinery) to consumers.

Both national and California auto and fuel standards have made enormous progress in reducing so-called criteria pollutants (e.g., carbon monoxide, ground-level ozone, lead, nitrogen oxides, particulates, and sulfur dioxide), and EPA data shows consistent improvement in air quality throughout the state. Nevertheless, California drivers are paying nearly $5 billion more in transportation fuel costs than would be required under national standards. A central question facing state policy makers in the coming years is whether additional increases in fuel costs to California drivers are generating commensurate environmental benefits. Further regulatory initiatives are likely to move along a much higher cost function.

Further Reading:

Links to previous EPRINC downstream reports:

EPRINC's Updated Primer on Gasoline Blending
http://eprinc.org/2015/06/eprincs-updated-primer-on-gasoline-blending/

Condensate: An EPRINC Primer
http://eprinc.org/2015/02/condensate-eprinc-primer/

The Biofuel Mandate: Technical Constraints And Cost Risks
https://www.dropbox.com/s/j9lw1i7urw2fwc6/Biofuel%20Mandate%20Nov%202015.pdf?dl=0

CAFE, Gasoline Prices and the Law of Diminishing Returns: A New Agenda for the Midterm Evaluation
http://eprinc.org/2016/03/cafe-gasoline-prices-and-the-law-of-diminishing-returns-a-new-agenda-for-the-midterm-evaluation/

Lucian Pugliaresi testified before the U.S. Senate Committee on Environment & Public Works on February 24, 2016. The topic was the Renewable Fuel Standard.There were a series of follow-up questions from Senator Deb Fischer of Nebraska. Lucian Pugliaresi and Max Pyziur prepared answers for the record.Both the testimony and the responses to Senator Fischer are part of the official record of the Senate.

A copy of the testimony can be found here: http://eprinc.org/wp-content/uploads/2016/03/Testimony-before-EPW-on-RFS-Feb-24-2016.pdf

A copy of the follow-up questions and responses can be found here: http://eprinc.org/wp-content/uploads/2016/04/ResponseToQuestionsFromSenatorDebFischerApril2-2016.pdf

End Notes:

[1]According to the Federal Trade Commission. "The vast majority of the FTC's investigations have revealed market factors to be the primary drivers of both price increases and price spikes." See Gasoline Price Changes: The Dynamic of Supply, Demand and Competition, FTC 2005, https://www.ftc.gov/sites/default/files/documents/reports/gasoline-price-changes-dynamic-supply-demand-and-competition-federal-trade-commission-report-2005/050705gaspricesrpt.pdf.

[2]For the purposes of comparison in this analysis, refinery prices for transportation fuels are used for California and Texas; these are published by the Energy Information Administration. Retail prices are available, but show greater differences; this is because of different excise tax regimes and marketing/distribution factors. Therefore, refinery prices are a better basis for comparison.

[3]Task Force on California Gasoline Prices. (May 2000). Attorney General Bill Lockyer: Report on Gasoline Pricing in California, https://oag.ca.gov/sites/all/files/agweb/pdfs/antitrust/gasstudy/gasstudy2.pdf.

[4]Task Force on California Gasoline Prices. (March 2004). Attorney General Bill Lockyer: Report on Gasoline Pricing in California, Update 2004, https://oag.ca.gov/sites/all/files/agweb/pdfs/antitrust/gasstudy/gasoline.pdf.

[5]U.S. Energy Information Administration (EIA). (September 2015). PADD 5 Transportation Fuels Markets, https://www.eia.gov/analysis/transportationfuels/padd5/pdf/transportation_fuels.pdf.

[6]PADDs (Petroleum Administration for Defense Districts) were established by the Department of the Interior in 1942 to facilitate the War effort; usage lapsed in 1945. This designation was reinstated through legislative action in 1950, and has been used since for monitoring and data gathering. Geographically, they group the U.S and its territories into seven districts. PADD 5 is compromised the five western-most contiguous States along with Alaska and Hawaii.

[7]Borenstein, Severin (September 2015). Why Are California's Gasoline Prices So High?, https://energyathaas.wordpress.com/2015/09/28/why-are-californias-gasoline-prices-so-high/.

[8]For a full discussion of fuel specifications, cost considerations, and regulatory requirements for manufacturing gasoline, https://eprinc.org/wp-content/uploads/2015/06/Updated-Gasoline-Primer-2015.pdf.

[9]Western States Petroleum Association (July 2015). What is the True Cost of a Low Carbon Fuel Standard? http://washingtonstatewire.com/wp-content/uploads/2015/07/LCFS-Impacts-FINAL.pdf.

[10]For a discussion of the cost of the national renewable fuel standard, http://eprinc.org/2015/11/eprinc-issues-report-on-technical-constraints-and-cost-risks-to-the-renewable-fuel-standard/

[11]California Legislative Analyst's Office (March 4, 2016). Response to California Assemblyman Tom Lackey's Request for CCA's cost, http://lao.ca.gov/reports/2016/3438/LAO-letter-Tom-Lackey-040716.pdf.