fueling CALIFORNIA

Consumer Alliance for Responsible Fuel Policies

What Makes the California Fuel Environment Different in Terms of Policy, Cost, and Vulnerability?

ORANGE COUNTY BUSINESS COUNCIL

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Executive Summary

Fuel serves a vital role in California's economy. Fueling California has commissioned the Orange County Business Council (OCBC) to analyze the factors that impact fuel supply and costs in California. The primary purpose of this report is to examine the crucial relationship between California fuel policies and the related costs and economic impacts borne by California consumers, both households and businesses. This analysis will determine "what makes California different" than other states in terms of fuel standards and policies. Out of this understanding, new policy initiatives can be developed which can help alleviate future "fuel spikes" caused by California's differences from other state and national policies.

The overarching question considered in Fueling California's research is: Why Are California Gasoline Prices Consistently Higher and More Variable Than Those in Other States?

Although price levels rise and fall over time, Energy Information Administration (EIA) (U.S. Department of Energy) data indicate that average retail gasoline prices are routinely much higher in California:

> *"California prices are higher and more variable than prices in other States . . . while gasoline prices, and oil prices in general, are currently high throughout the United States and even worldwide, California has been hit particularly hard. California prices are typically higher than the U.S. average, and thus the run-up this year began from a higher level. In addition, California retail prices often exhibit more volatility than other areas when markets tighten. This year is no exception, as the average retail price in California has risen about 58 cents since the beginning of this year, and stands at $2.56 per gallon, almost 33 cents higher than the national average . . . California has historically seen some of the highest, and most volatile, gasoline prices in the United States. The reasons for the striking differences in the behavior of California gasoline prices, as compared to those in other parts of the United States, are numerous . . . Several major factors contribute to the problem."*
>
> *Statement of John Cook, Director, Petroleum Division, Energy Information Administration, U.S. Department of Energy, before the Subcommittee on Energy and Resources, Committee on Government Reform, U.S. House of Representatives, May 9, 2005*

Without an accessible, reliable, and affordable fuel supply, California's economy would suffer, negatively impacting the business community, families, communities, regions, and ultimately the state budget. Yet Californians pay between five and fifteen cents extra per gallon in gasoline due solely to "boutique" fuel standards according to the California Air Resources Board. California also has the second highest state fuel taxes in the country.[1] Multiplied by the billions of gallons consumed by millions of consumers and businesses in a trillion dollar California economy, these excess costs quickly add up. While the cost of crude oil is the single largest factor driving the price of fuel, there are several additional factors causing higher prices that are within the control of policymakers in California. The purpose of this report is to analyze the various standards, policies, and factors existing in California that help create this significant cost difference.

1.California Energy Commission, "Causes for Gasoline & Diesel Price Increases in California," 28 Mar. 2003: 1-11.

Previous Research Studies Examining the California Fuel Environment

Since 2003 four reports—two federal, two state—have examined the reasons why fuel in California is consistently more expensive, especially during price spikes. It should be noted that the findings and conclusions of these four reports are consistent, with near identical trends surfacing from each report:

- On March 13, 2003, Governor Gray Davis asked the California Energy Commission (CEC) to examine the causes of rapid gasoline price increases in California in the years 1999, 2001, and 2003, respectively. The final report, "Causes for Gasoline & Diesel Price Increases in California," (2003 CEC) was released on March 28, 2003.

- Responding to many of the same constituent concerns, on March 27, 2003 Congressman Doug Ose, Chairman of the House Government Reform Subcommittee on Energy Policy, Natural Resources and Regulatory Affairs, asked that the Energy Information Administration (EIA) to examine the causes of the early 2003 increase in the price of California gasoline. The final report, "2003 California Gasoline Price Study Final Report," (2003 EIA) was released November 2003.

- In 2005, responding to requests from Senators Jim Jeffords and Barbara Boxer, the U.S. Government Accountability Office (GAO) looked at how special gasoline blends affect gasoline prices, with a special focus on conditions in California. The final report, "Gasoline Markets: Special Gasoline Blends Reduce Emissions and Improve Air Quality, but Complicate Supply and Contribute to Higher Prices", (2005 GAO), was released on June 17, 2005.

- On April 24, 2006, Governor Arnold Schwarzenegger directed the California Energy Commission (CEC) to investigate the prices of gasoline and diesel fuels, with particular emphasis on retail motor fuel prices, significant changes in prices charged by the petroleum industry for gasoline sold in California, and the reasons for those changes. The final report, "Spring 2006 Petroleum Fuels Price Spike: Report to the Governor," (2006 CEC), was released August 2006.

Research Reveals Similar, Consistent Findings

According to the 2003 California Energy Commission report:

> *"Prior to 1996, California gasoline prices were similar to gasoline prices elsewhere in the U.S. Since 1996, however, the Air Resources Board (ARB) Phase 2 reformulated gasoline (CaRFG 2) regulations have required California refiners to produce a special clean-burning gasoline known as CaRFG. The ARB standards are more rigorous than EPA's setting precise specifications for eight fuel parameters. Due to the higher production costs of this unique blend, California gasoline prices have generally been higher than average U.S. prices since 1996. Prior to the implementation of CaRFG gasoline, the ARB estimated the total increase in production cost would be between 5 and 15 cents per gallon."*

California's differences in fuel standards, taxes, and refining capacity have other consequences—making the state susceptible to shocks and outage risks that have and will continue to bring about significant price spikes unless changes are made. California's vulnerability to external shocks, the likes of which seem to be more frequent since California's fuel standards became dissimilar (the nature of which will be defined and analyzed later in body of the report). The same issues and problems are consistent with each different report.

According to the "California Gasoline Price Study" by the Energy Information Administration in 2003, California is described as follows:

> *"[California is an] isolated market, both geographically and because it uses a unique gasoline that most refineries outside of the State cannot produce. Gasoline price spikes are not unusual in California. Since the mid-1990s, California has experienced gasoline price run-ups that are more frequent and more severe than price spikes in most of the rest of the United States. Demand growth has caught up with the petroleum supply system in California. Refineries, ports, pipelines and distribution terminals are all experiencing constraints. Many times events, such as refinery outages that in the past had little impact, can push the system out of balance long enough to trigger large price increases."*

The 2003 CEC report detailed the major contributing factors to steep price spikes and overall volatility in California:

- "The California refinery system runs near its capacity limits, which means there is little excess capability in the region to respond to unexpected shortfalls;
- California is isolated and lies a great distance from other supply sources (e.g., 14 days travel by tanker from the Gulf Coast or 23 to 30 days from Asia, which prevents a quick resolution to any supply/demand imbalances; and
- The region uses a unique gasoline that is difficult and expensive to make, and as a result, the number of other suppliers who can provide product to the State are limited."

The 2003 EIA report further addresses the issues that arise with difference in California's fuel standards:

> *"The largest difference between California and U.S. average gasoline prices lies in the refining costs and profits element, and this is the component most directly affected by the different gasoline formulation used in California. Refining costs for California include the higher average cost of producing CARB reformulated gasoline in comparison to the mix of conventional, oxygenated, and reformulated gasolines represented in the national average."*

The importance placed on California's unique gasoline blend and fuel isolation is further addressed in the "Report to Congressional Requesters" produced by the US GAO in 2005:

> *"The proliferation of special gasoline blends has put stress on the gasoline supply system and raised costs, affecting operations at refineries, pipelines, and storage terminals. Once produced, different blends must be kept separate throughout shipping and delivery, reducing the capacity of pipelines and storage terminal facilities, which were originally designed to handle fewer products. This reduces efficiency and raises costs. In the past, local supply disruptions could be addressed quickly by bringing fuel from nearby locations; now however, because the use of these fuels is isolated, additional supplies of special blends may be hundreds of miles away."*

The 2006 CEC report also addresses the problem of isolation in California:

> *"The issue of price spikes in California is normally greater in magnitude and longer in duration compared to other regions of the United States due to the fact that alternative sources of supply are several weeks away by marine vessel."*

The 2005 GAO report offers more similarity in its findings:

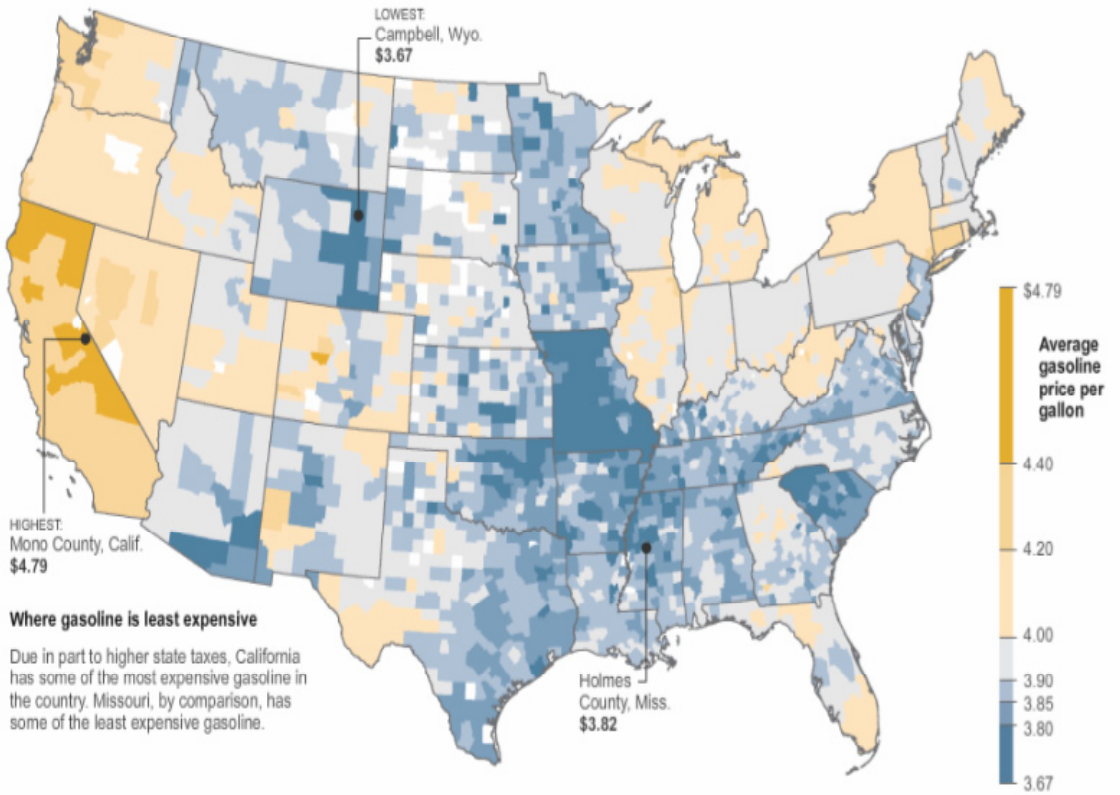
> *"If supplies of California gasoline are disrupted, they would expect prices to rise and it could take weeks for additional supplies to arrive. Nearby suppliers capable of blending California's gasoline blend are generally operating close to their full capacity. In the event that these supplies are disrupted, additional supplies generally come from Western Canada, the Gulf Coast, the Caribbean, or farther away, because there are only a few refineries capable of making this special gasoline blend and, as a result, supplies could take three weeks or more to arrive."*

The 2003 EIA report adds that:

> *"Few refineries outside of the West Coast are able to make CARB gasoline. Refiners must make additional investments to be able to produce this unique gasoline, and despite California's higher margins, most refiners outside the region are unwilling to spend those resources for the occasional cargo they would ship to the region."*

Isolation and fuel differentiation are documented problems for California and these problems become much more apparent when outages and/or shocks to the system occur. The problem is not associated with planned outages, but with external shocks to the system and unplanned refinery outages, both of which will likely continue to occur.

Figure 1: 2008 Gasoline Prices by County



Source: Oil Price Information Service, U.S. Census; Kevin Quealy / New York Times

According to the 2006 CEC report:

> *"Refineries experienced significantly more unplanned outage days in the first six months of 2006 than there were during the first six months of 2005 (175 vs. 58) and the average unplanned outage lasted almost twice as long in the first six months of 2006 compared to the same time in 2005. In turn three consecutive weeks of lower-than-normal gasoline production in California appears to have been a factor that contributed to the formation and magnitude of the April/May price spike for gasoline. Gasoline production in California was lower during this period than it had been in the five previous years."*

The 2005 GAO reported similarly:

> *"Unexpected or unplanned refinery outages, as well as unexpected extensions of planned maintenance outages, probably have a larger impact than planned outages. Unexpected outages have the greatest impact at the beginning of and during the high gasoline-demand summer-driving season when other California refiners may not be able to increase production to help replace lost volumes."*

The latest example of the effect of fuel price spikes on California consumers is from a report as recent as 2008. Demonstrated by a chart from the June 9, 2008 edition of the New York Times showing price differentials for gasoline by county across the United States, California is uniformly higher in price than other parts of the country.

Since the mid 1990's, California has adopted a series of policies to reduce air pollution, the state's carbon footprint and dependence on non-renewable sources of energy, namely crude oil. California residents and businesses have complemented these efforts by engaging in individual behaviors that are among the most progressive, environmentally sensitive and proactive in reducing oil consumption, conserving energy, and adopting fuel efficient practices. California has achieved remarkable success in many of these policy goals with resulting widespread positive outcomes.

However, in the midst of pursuing these admirable goals, other impacts of disparate fuel policies, perhaps unintended consequences, have arisen. While pursuing the aforementioned goals, California has developed several potential side effects influencing the cost of living and the cost of doing business in California. Over the same time period that policies have been put in place to fulfill fuel efficiency or environmental goals, the price of fuel throughout California has been creeping upward and is persistently the highest in the nation. Because of the high inelasticity of fuel—people and businesses need it to work, play, and transport goods—the increased cost for fuel is ultimately borne by the consumer. The result of higher fuel prices has been increased costs for consumers and businesses in California in comparison to other parts of the country.

Seven Key Factors Affecting California's High Fuel Costs

Why do California drivers consistently pay more for fuels than most other people in America? A series of related factors account for the high cost of fuel—gasoline, diesel, jet fuel—in the state:

- Currently, Californians pay between five and fifteen cents extra per gallon in gasoline according to the California Energy Commission and California Air Resources Board due to the increased refining costs for special blends required in California. In addition, California has some of the highest state taxes in the country.[2] Few refineries have the ability to

2. California Energy Commission, "Causes for Gasoline & Diesel Price Increases in California," 28 Mar. 2003: 1-11 found in 2003 California Gasoline Price Study: Preliminary Findings, Office of Oil and Gas Energy Information Administration, U.S. Department of Energy, May 2003.

make the California blend of gasoline thus the limited competition results in higher prices, greater volatility in prices (as refineries experience breakdowns and maintenance closures) and lower overall availability.[3]

- California state gasoline taxes—which total approximately 35.3 cents per gallon [4] —are 43% higher than the national average of state gasoline taxes. Only consumers in the State of New York pay higher gasoline tax rates. Californians pay both excise tax on gas and sales tax as well.

- California has among the most demanding set of environmental fuel policies in the world, leading to a myriad of distinct fuel standards. Given the economic inelasticity of fuel to most Californians, the cost of complying with these standards is ultimately passed on to the California consumer. New rules for the percentage of ethanol in fuel and demands on which kind of ethanol is blended into fuels results in confusion disruption. Refineries making these blends require additional distillation equipment and the blended fuel must be kept separate throughout the shipping and delivery process. [5] What's more, there are relatively few supply sources of the unique California blend of gasoline outside the state, so the fuel that Californians consume is distinctly differentiated from the "commodity" blend used by most Americans.

- California is a "fuel island" and has no pipelines linking it to out-of-state petroleum or crude oil supplies. This means all fuel must be imported in tankers, which are costly, slower and more prone to accident. Exacerbating the costliness of delivering fuel to California ports is their limited capacity to store fuel. In fact, the state has lost six million barrels of crude oil storage capacity over the last fifteen years.

- The state's refining capacity has stagnated for decades despite a rapidly growing demand for gasoline. A new refinery has not come online in California since 1969. In fact, twenty refineries have closed since 1980—including four since 1995. To keep up with growing demand, the efficiency of refineries has increased, stretching current capacity. Nevertheless, while capacity among California refineries grew by only 0.5% from 1995 to 2006, total sales of gasoline increased by 18%. [6] Demand for refined oil is expected to continue its upward trajectory, which has led the California Energy Commission to project that gasoline prices in 2030 will be between $3.34 and $4.78 in real terms [7] —compared to the $2.16 state average at the time of this writing. [8]

- California's "differentiated" fuel standards cause a continual risk of "supply outages". As California's fuel standards become more differentiated from surrounding states and the rest of the nation, it will likely become more difficult to find relief sources that are compliant with state regulations. This means that Californians are likely to become more vulnerable to price surges if there are supply outages. The state's growing population—which will lead to increased demand for gasoline—combined with the prevalence of earthquakes and other disasters underscore the long-term likelihood of such price surges in the future.

- California is isolated and lies a great distance away from other supply sources (e.g., 14 days travel by tanker from the Gulf

3. United States General Accounting Office, "Gasoline Markets: Special Gasoline Blends Reduce Emissions and Improve Air Quality, but Complicate Supply and Contribute to Higher Prices," Jun. 2005.
4. This includes a 6% sales tax, 1.25% county tax, plus additional local sales taxes and a 1.2 cpg state UST fee; "Notes to State Motor Fuel Excise and Other Taxes," American Petroleum Institute, 2009.
5.United States General Accounting Office, "Gasoline Markets: Special Gasoline Blends Reduce Emissions and Improve Air Quality, but Complicate Supply and Contribute to Higher Prices," Jun. 2005.
6.Energy Information Administration, California Total Gasoline All Sales/Deliveries by Prime Supplier (Thousand Gallons per Day)
7.Energy Information Administration, California Total Gasoline All Sales/Deliveries by Prime Supplier (Thousand Gallons per Day)
8."Transportation Energy Statistics," CA Gov. Energy Almanac, California Energy Commission, 2009 <http://energyalmanac.ca.gov/transportation/index.html>.

Coast. When a shortage occurs, extra supplies take a long time to arrive and the uncertainty created by such a lag causes prices to be higher as a hedge against this risk.

Some of these factors are obviously difficult to address cost-effectively, such as California's geographical location. Policies regarding fuel standards, however, can be changed with sufficient understanding of their true impacts on California's consumers and California's economy. During a time of severe recession in the California economy, the state may wish to reconsider the economic impact of, or at least the timing of, worthwhile environmental policy goals. Without economic recovery, the state is at risk of being unable to afford the worthwhile environmental policy goals it desires. Our hope is that Californians can enact progressive fuel policy initiatives and generate sufficient government revenue from taxing fuels while at the same time providing stable and affordable fuel prices for California residents and businesses. Policy options could include lowering gas taxes during periods of supply disruption, allowing an easing of special blend requirements temporarily if prices rise above a certain pre-determined point, and easing the regulatory difficulty to build and expand storage and refining capacity. Needed infrastructure investments can be made in pipelines to move oil or fuel to California more efficiently.

Because unplanned outages and "shocks to the system" will realistically never go away, California's current fuel standard differentiation puts the state in a continual risky, precarious position. Consequently, there will continue to be consumer outrage, media reports, and other negative ramifications over high and lengthy fuel price spikes unless there are constructive measures taken to address policy impacts outlined in this report.

For example, on June 15, 2009 the headline on the Los Angeles Times's business section was "Gas prices may imperil a recovery." Dr. Edward Leamer, Director of UCLA's Anderson Forecast, was quoted saying, "The gasoline rise is like a tax we feel very painfully every time we go to a gas station. It will tend to retard the economic recovery and make it less powerful."
With the statewide unemployment rate at 11.5% in May 2009, there has never been a more critical moment to assess the impact of the state's transportation fuel policies on the broader economy. This report is aimed at providing Californians with a balanced, accurate assessment of the cost associated with "fueling" our transportation, goods movement, and mobility needs under current and proposed policies, as well as an overview of how the state's unique fuel supply chain structure has developed over time.

This study examines the importance of accessible and affordable fuel for California's economy, identifies and explains the costs of fuel in California through examining the supply chain for fuel in California, and identifies policies and taxes that make California fuels more expensive. A balanced understanding of the opportunities and barriers for California fuel supply will ultimately result in a needed dialogue about the precipitating causes of high fuel prices in California. Furthermore, understanding how particular California policies, such as differentiated fuel standards and the state's fuel tax and fee structure, drive up the cost of fuel can also shed light on why California consumers pay more for gasoline on a consistent basis. Understanding the costs of these policies as well as knowing the exacerbating factors of supply chain issues for California constitutes an essential pillar to a better informed dialogue on the current and future cost of living and working in California. Understanding the fairness and true economic impact of California fuel policies, such as whether certain residents are paying a disproportionate share of fuel policy costs, is also critically important.

Introduction

Since at least the 1960s, California has been a leader in developing progressive environmental policies. As a result, the air Californians breathe today is demonstrably cleaner, the state's water is purer, and fuel use is down per capita. What's more, if several recent policies such as AB 32 and SB 375 are implemented successfully, greenhouse gas emissions from California will be reduced.

Californians are among the most fuel conscious citizens on the planet. Individual drivers and state policies have worked together to reduce oil consumption to promote a variety of objectives ranging from reducing our dependence upon foreign oil, curbing greenhouse gas emissions and air pollution, and promoting domestic technologies in support of a high tech economy. The state has historically been "out in front" of the nation regarding environmental causes and recent milestones underscore this leadership:

- Hybrid ownership: Last year, California led the country in new hybrid sales 11,839. In comparison, the combined total sales of the next four highest states were 9,681. What's more, the cities of San Francisco, Monterrey, Santa Barbara and San Diego have among the highest prevalence of new hybrid car ownership in the country—more than 1 per 1,000 residents—in comparison to a national average of 0.31 per 1,000 residents.[9]

- Natural Gas Vehicle Ownership: 18% of all U.S. Natural Gas Powered Vehicles are in California. [10]

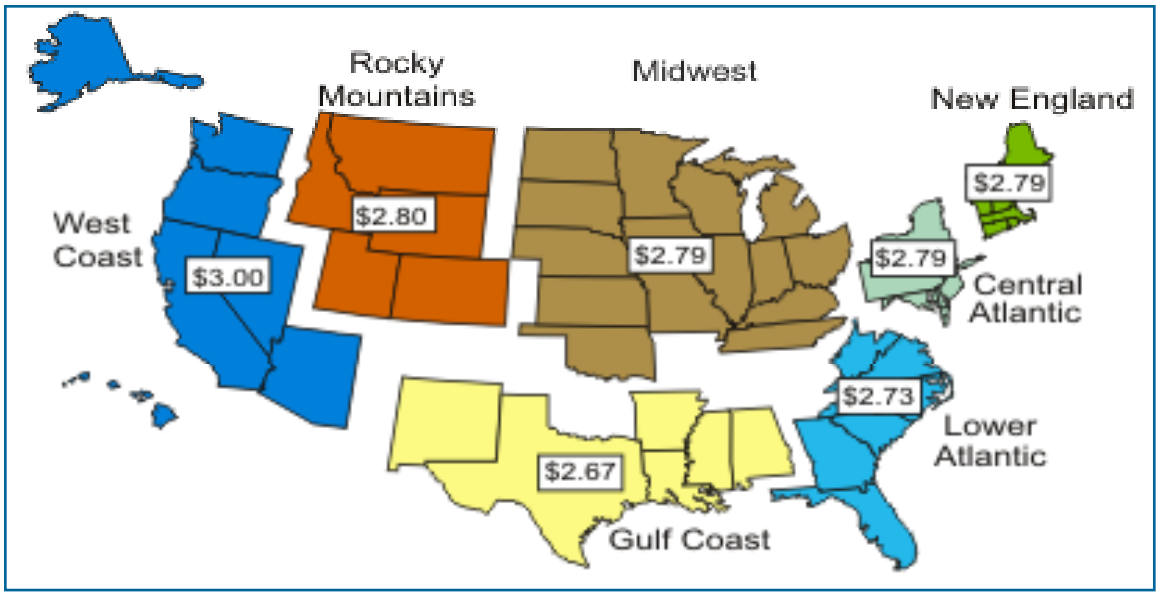
- Per Capita Energy Consumption: In 2003, California was 48th out of the fifty states in per capita energy consumption.[11] California utilized 67.6% of the energy per person of the United States average which amounts to 229 million BTUs per person. While a warmer climate has much to contribute towards California's low per capita energy consumption, Californians have also made choices that have major effects.

- Political Action: The California government has implemented a variety of proposals to reduce greenhouse gas emissions from all sources, including the number one source, transportation vehicles. With federal approval, the state has sets its own vehicle standards which the federal government once again adopted as its benchmark for 2016 standards. [12] The state is once again expected to take the lead in regulating tailpipe emissions and increasing the share of renewable biofuels in the transportation sector.

Despite these remarkable efficiency and conservation efforts, California fuel policy appears to have resulted in the most expensive fuel in the nation. California consumers pay the highest costs for transportation fuel in the nation. In 2007, gasoline prices in California peaked at $3.50 per gallon and as Figure 2 demonstrates, drivers on the West Coast paid an average of $3.00 per gallon, while drivers less than 1,000 miles away in Texas paid only $2.67 per gallon. What is it about California policies that cause consumers to persistently pay more for fuel?

9. "April 2008 Hybrid Market Dashboard," Apr. 2008 <http://www.hybridcars.com/files/apr08-hybrid-market-dashboard-v4.pdf>.
10. Presentation to California Energy Commission by the California Natural Gas Vehicle Coalition http://www.energy.ca.gov/proceedings/2008-ALT-1/documents/2009-01-08_meeting/presentations/California_Natural_Gas_Vehicle_Coalition-Presentation.pdf
11. U.S. Energy Information Administration from the California Department of Finance
12. "California Plans Next Steps to Cut Car Pollution," Reuters, 19 May 2009 <www.reuters.com/article/GCA-GreenBusiness/idUSTRE54J04Q20090520>.

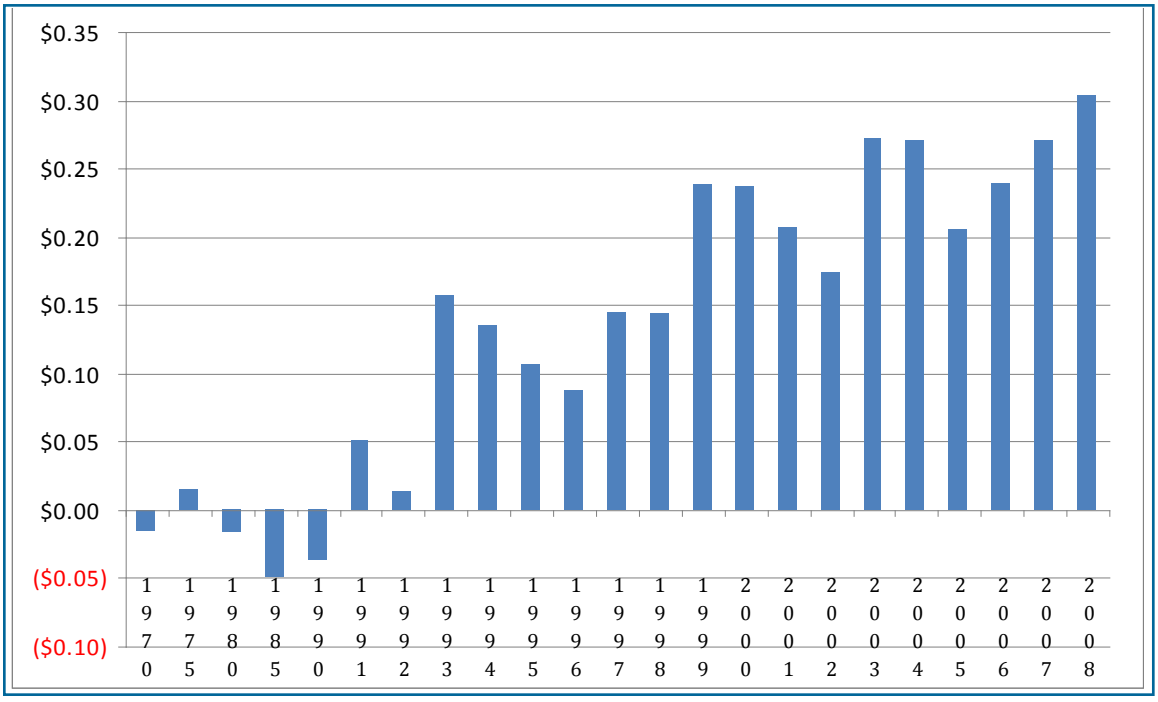
Figure 2: 2007 Average Regular Grade Gasoline Prices at Retail Outlets by Region (dollars per gallon, including taxes)



Source: Energy Information Administration, EIA-878, Motor Gasoline Price Survey

Examining data since 1970, Californians typically paid approximately the same price per gallon in retail gas prices as the rest of the country—until the mid 1990s (Figure 3). Where the nominal cost across the nation was approximately $0.36 per gallon in 1970 and California's cost was $0.34 per gallon, by 1991 the average cost across the nation was $1.10 per gallon and Californians paid $1.15 per gallon.

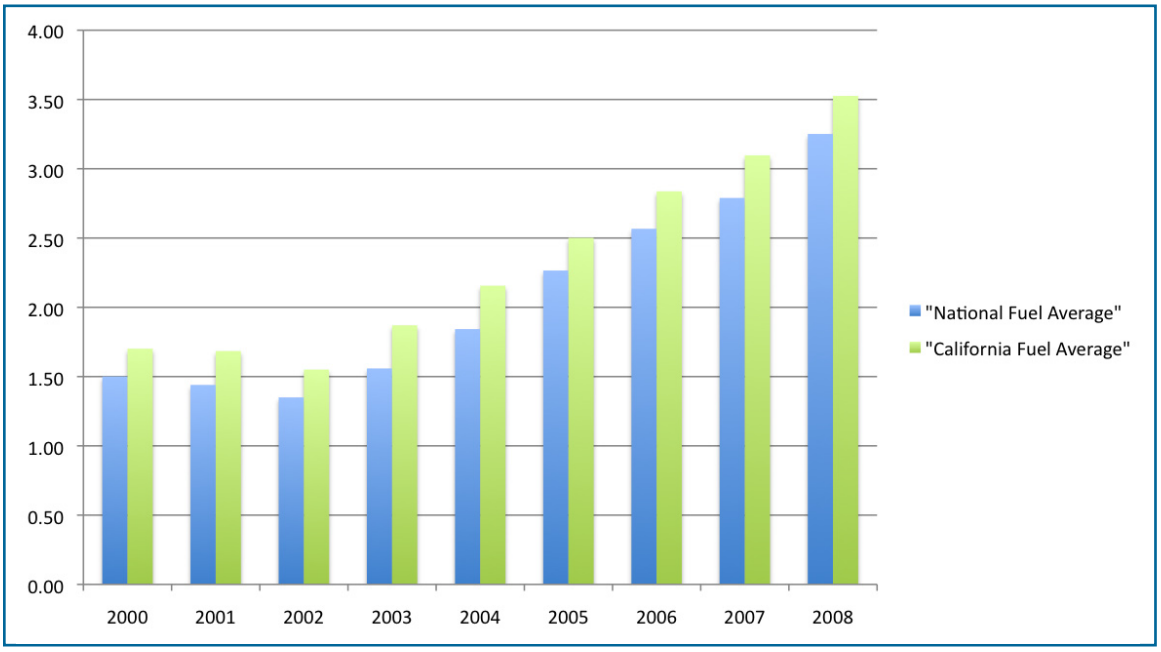
Figure 3: 1970-2008: CA & US Retail Gas Prices (nominal)



Source: Energy Information Administration, EIA-878, Motor Gasoline Price Survey

Figure 3, shows that beginning in 1991 Californians began to pay more per gallon than drivers in other parts of the country. Then over time, this differential expanded. The expansion became especially apparent during fuel price spikes caused by "shocks to the system." For example, in 2006 following Hurricane Katrina, while gas prices for the rest of the country returned to normal over time, Californians continued to pay much higher prices for much longer, thus demonstrating the vulnerability and the resulting prolonged impact of California gas prices to exogenous shocks. By 2008, the differential expanded such that Californians were paying $3.56 per gallon in comparison to $3.25 for the rest of the country.

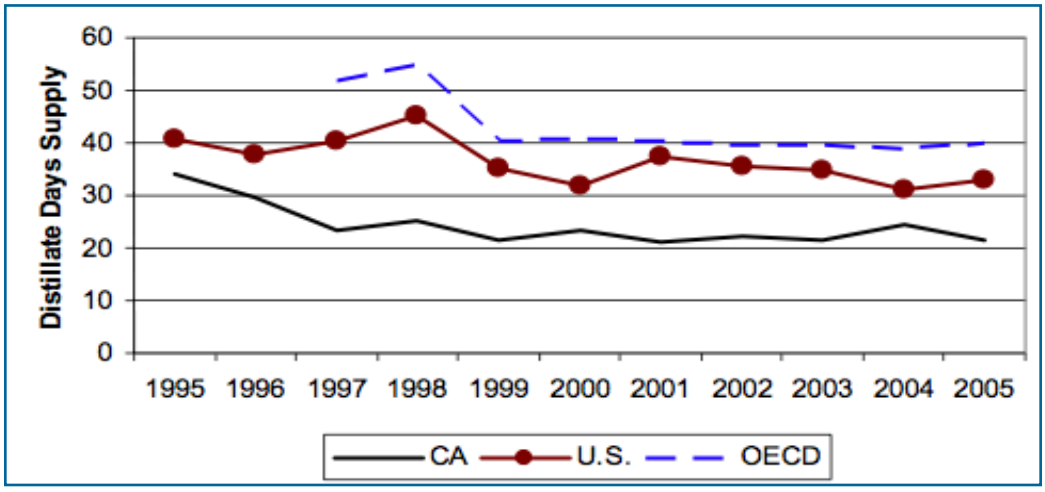
Figure 4: 2000-2008: CA & US Retail Gas Prices (nominal)



Source: OPISnet.com

California is particularly vulnerable to shocks since it has such a limited amount of gasoline in reserve. California's reserves are much lower compared to U.S. average reserves or those of other industrialized nations around the world (OEDC). California typically has approximately 20 days of supply of the distillates used to make gasoline, while the U.S. average supply is typically over 30 days and other industrialized countries average 40 day's supply.

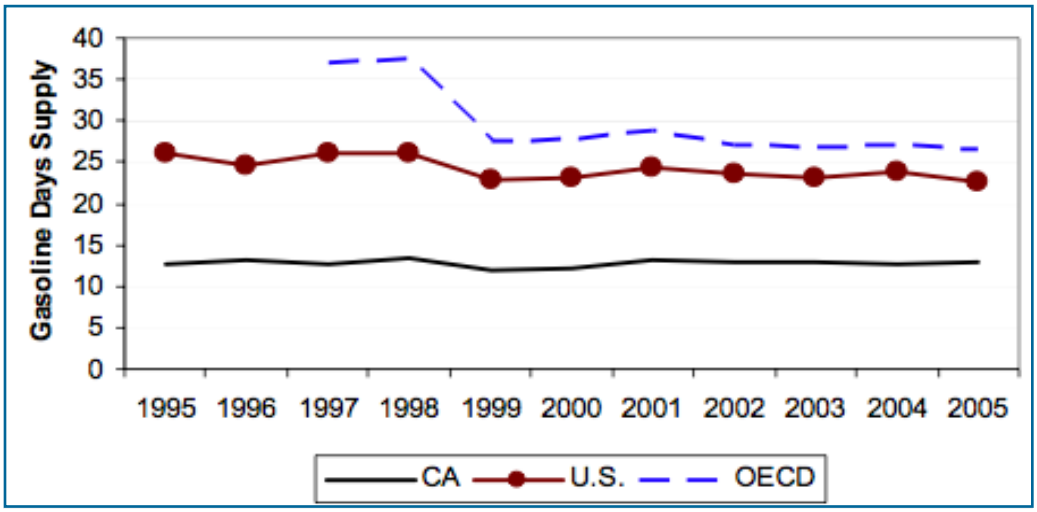
Figure 5: California, U.S. and OECD Distillate Days Supply



Source: EIA Petroleum Navigator Stocks, Product Supplied and Prime Suppliers date,
IEA Monthly Oil and Gas Survey, and IEA Oil Market Report.

In terms of actual day's supply of gasoline, the situation for California is much direr. California averages only a 10 day supply while the U.S. has an average of 25 days and the OEDC typically has a 30 supply. This risky supply situation seems to have become worse in recent years. Once a shock occurs, California fuel consumers are drastically impacted with few options available to adjust to or address the resulting fuel spikes.

Figure 6: California, U.S. and OECD Gasoline Days Supply



Source: EIA Petroleum Navigator Stocks, Product Supplied and Prime Suppliers date, CEC Weekly Fuels Watch Report, CA BOE Taxable Motor Fuels Sales, IEA Monthly Oil and Gas Survey, and IEA Oil Market Report.

Furthermore, despite California's ambitious strides to reduce our dependence on crude oil, petroleum-based fuel dominates nearly all forms of our respective consumer and business transportation sectors. Consider the following:

- Although 26 percent of all new hybrids sold in the US were registered in California for 2007, the proportion of hybrids to all new cars registered in the state amounted to only 4.86 percent. [13]

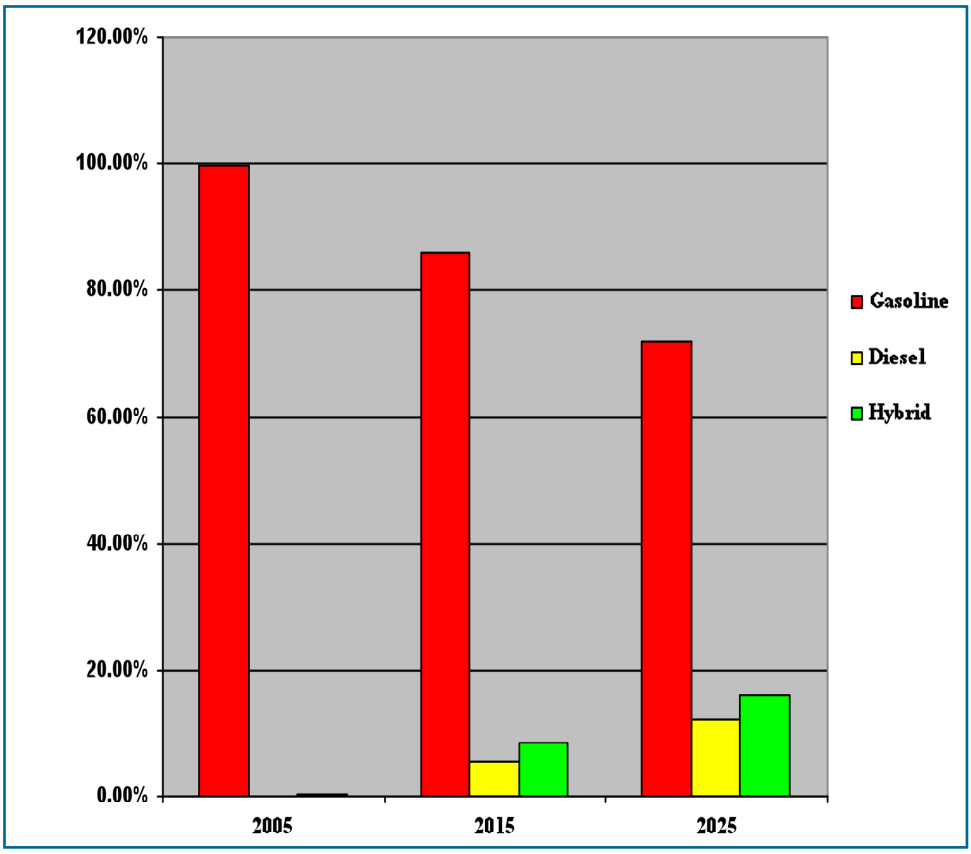
- Even though the state boasts one of the largest fleets of natural gas powered vehicles in the country, petroleum-based fuels currently account for 96 percent of the state's transportation needs. [14]

- In 2007, total gasoline sales in California were over $48 Billion (not including $9.7 Billion on Diesel [15]). Last year, California households spent over $2,600—or over 4% of their annual expenditures—on gasoline and oil. [16] While the impact on an average household at first may appear modest, the true impacts results in businesses hiring fewer people or relocating to other locations to maximize slim profit margins.

These factors are not likely to change quickly. Even with the state's aggressive adopted policies to encourage alternative fuels and the use of hybrid vehicles, California's dependence on petroleum is predicted to wane only ever so slightly over the next two decades. According to the CEC (see Figure 3), 72% of California's vehicles in 2025 will be non-hybrid vehicles running on gasoline. Another 12% of vehicles will run on diesel.

13. California Motor Car Dealers Association and R.L. Polk, Top 10 Hybrid Car Sales for 2007.
14. "California Petroleum Statistics & Data," CA Gov. Energy Almanac, California Energy Commission, 2009 <www.energyalmanac.ca.gov/petroleum/index.html>.
15. "California Petroleum Statistics & Data," CA Gov. Energy Almanac, California Energy Commission, 2009 <www.energyalmanac.ca.gov/petroleum/index.html>.
16. "Consumer Expenditure Summary Report," 24 Mar. 2009 < www.demographicsnow.com>.

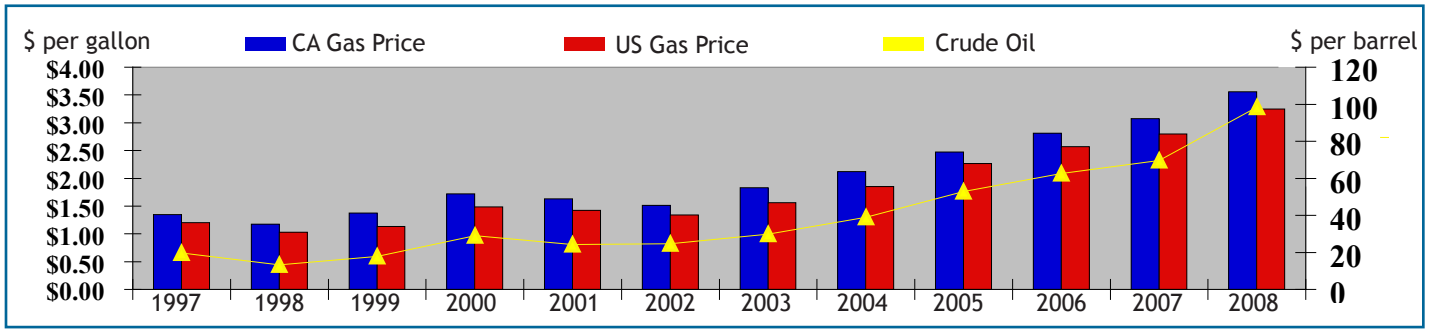
Figure 7: Composition of CA On-Road Vehicles from 2005 to 2030



Source: California Energy Commission

Between 2000 and 2007, the amount of gasoline sold in the state grew by 7.75% (or 1.1% on an annualized basis). Yet during that same stretch, the average cost of gasoline increased by 78% (an annualized rate of 11%). As can be seen in Figure 8, the weighted average sales price for California gas has been consistently higher than the U.S. average since 1997. In each of the preceding eleven years, Californians paid a premium that ranged from 15 to 31 cents per gallon over the U.S. average price. [17]

Figure 8: US vs CA Gas Prices and Crude Oil



Source: Analysis of material from the Energy Information Administration at http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm and, and American Petroleum Institute at http://www.api.org/statistics/fueltaxes/

Figure 8 shows the highly synchronized relationship between the cost of crude oil and the cost of gasoline using data from the Federal Trade Commission, Energy Information Administration. According to the Federal Trade Commission, 85% of the movement in U.S. gasoline prices over the last two decades can be attributed to changes in crude prices.[18]

17.Weekly averages of sale prices from retail outlets for regular gasoline & crude oil were weighted for each year (EIA)
18. Federal Trade Commission, "The Dynamic of Supply, Demand, and Competition," Jun 2005.

Figure 9: Components of California Gas Prices

	CA Gas Price	US Gas Price	Difference Between CA and US		Crude Oil Price Per Barrel	Crude Oil Price Per Gallon	CA Gas Price Minus Crude Oil Price	US Gas Price Minus Crude Oil Price		Average US All Taxes	CA All Taxes		CA Gas Price Minus CA Taxes and Oil Cost	US Gas Price Minus US Average Taxes and Oil Cost	Difference Between CA Price and US Price	Difference Between CA Price and US Price Including Taxes
1997	$1.35	$1.20	$0.15		$19.61	$0.47	$0.88	$0.73		$0.43	$0.63		$0.25	$0.30	($0.06)	$0.15
1998	$1.17	$1.03	$0.14		$13.18	$0.31	$0.86	$0.72		$0.43	$0.63		$0.23	$0.29	($0.06)	$0.14
1999	$1.37	$1.14	$0.24		$17.90	$0.43	$0.95	$0.71		$0.43	$0.63		$0.32	$0.28	$0.04	$0.24
2000	$1.72	$1.49	$0.24		$29.11	$0.69	$1.03	$0.79		$0.43	$0.63		$0.40	$0.36	$0.04	$0.24
2001	$1.63	$1.43	$0.21		$24.33	$0.58	$1.05	$0.85		$0.43	$0.63		$0.42	$0.42	$0.01	$0.21
2002	$1.51	$1.34	$0.17		$24.65	$0.59	$0.93	$0.75		$0.43	$0.63		$0.30	$0.32	($0.03)	$0.17
2003	$1.83	$1.56	$0.27		$29.82	$0.71	$1.12	$0.85		$0.43	$0.63		$0.49	$0.42	$0.07	$0.27
2004	$2.12	$1.85	$0.27		$38.97	$0.93	$1.19	$0.92		$0.43	$0.63		$0.56	$0.49	$0.07	$0.27
2005	$2.47	$2.27	$0.21		$52.94	$1.26	$1.21	$1.01		$0.43	$0.63		$0.58	$0.58	$0.01	$0.21
2006	$2.81	$2.57	$0.24		$62.62	$1.49	$1.32	$1.08		$0.43	$0.63		$0.69	$0.65	$0.04	$0.24
2007	$3.08	$2.80	$0.28		$69.65	$1.66	$1.42	$1.14		$0.43	$0.63		$0.79	$0.71	$0.08	$0.28
2008	$3.56	$3.25	$0.31		$98.44	$2.34	$1.22	$0.90		$0.43	$0.63		$0.59	$0.47	$0.11	$0.31

Source: Analysis of material from the Energy Information Administration at http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_w.htm and, and American Petroleum Institute at http://www.api.org/statistics/fueltaxes/

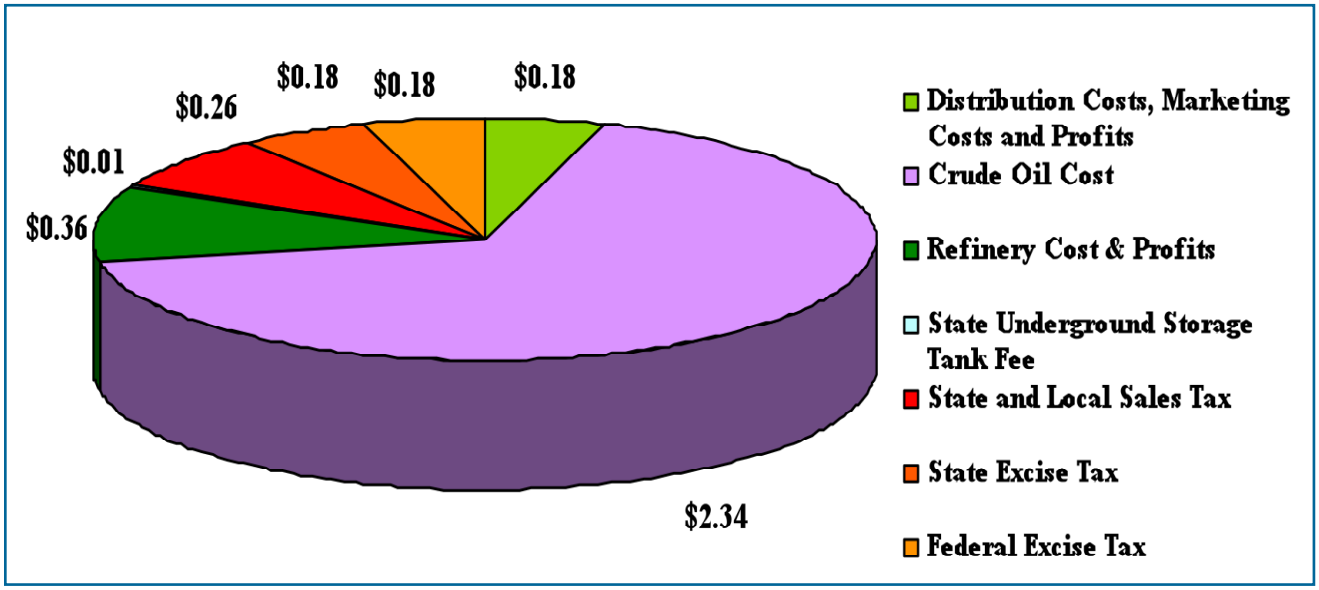
As Figure 9 demonstrates, since 1997 Californians have paid up to $0.11 more per gallon of gas than residents of other states once the price of oil and taxes are removed. Additionally, the difference in price between California and other U.S. states is increasing over time. Where the difference in the late 1990s was around less than four cents per gallon, the early years of this decade indicate the disparity grew closer to seven cents per gallon and has risen to up to eleven cents per gallon in recent years. Add in the excess cost incurred by Californians by passing $0.63 per gallon in taxes in comparison to $0.43 per gallon that average consumers in other states pay for taxes on fuel and Californians are paying a growing amount of extra costs for fuel. The final column of Figure 9 above shows how in 1997, Californians were paying an extra $0.15 per gallon (including extra taxes) but by 2008, Californians were paying $0.31 per gallon. This differential adds up to an extra ten percent for fuel that other drivers are not paying.

Figure 10 breaks down the major cost drives for California gas at its peak in 2008:

- Approximately 58% of the cost for the gasoline we pay at the pump is derived from the cost of extracting and transporting crude oil.[19]
- The second largest cost driver is federal and state taxes which comprise 58 cents per gallon [20] —or about 15% of a $3.51 retail price.
- The third largest driver of California's price at the pump is the cost of producing, distributing and marketing gasoline. Figure 7 demonstrates that this figure amounts to 36 cents on a per gallon basis (or 10 percent per gallon).

19. "Primer on Gasoline Prices," Energy Information Administration, 2007 <http://www.eia.doe.gov/bookshelf/brochures/gasolinepricesprimer/>.
20. American Petroleum Institute, Jan 2009.

Figure 10: California Branded Gas Costs & Margins 2008 ($3.51 Retail Price)
Unbranded cost & profit was one cent less ($0.35)



Source: Energy Information Administration

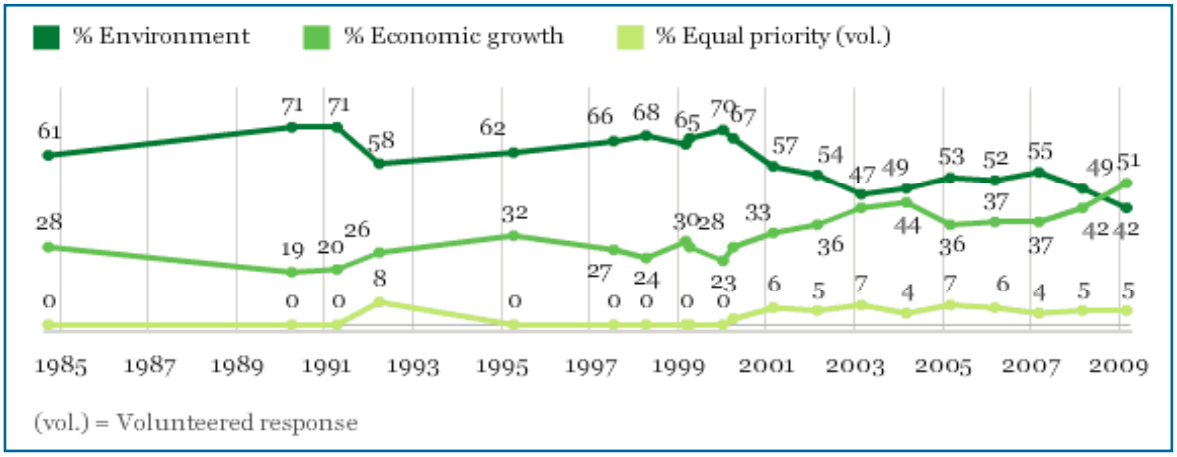
Given this situation, California can engage in a variety of activities. These include:

1. Reducing vehicle miles traveled;
2. Increase usage of public transportation; and/or
3. Invest in a more fuel efficient vehicles.

Another option is modifying, delaying, or addressing the unique California policies and factors that drive up the cost of gasoline in the state. Since 2000, California has adopted a series of fuel policies to reduce air pollution, the state's carbon footprint and its dependence on non-renewable sources of energy, namely crude oil. In the midst of these efforts, California's political leaders have pursued two potentially contradictory goals: (i) to reduce fuel consumption; and (ii) to reduce the environmental effects of fuel consumption. The former goal may contribute to the latter—such as when the state imposes higher gas mileage requirements for cars sold in California, which could reduce both fuel consumption and air pollution. At the same time, there have been a variety of spillover effects from switching energy sources that have offset the envisioned carbon reduction goals (e.g., an increase in ethanol production could reduce petroleum fuel consumption but increase air pollution) or further stress the state's gasoline supply chain.

Reflecting the deteriorating state of the economy, a recent Gallup Poll found that in terms of balancing the economy and the environment, a majority of Americans say economic growth should be given the priority—even if the environment suffers to some extent.

Figure 11: Majority of Americans Now Give Greater Priority to the Economy over the Environment



Source: GALLUP Poll

This is the first time in Gallup's 25-year history of asking Americans about the trade-off between environmental protection and economic growth that respondents favored economic concerns as the current top priority.

California consumers suffer economically from more expensive fuel. Actions should be considered to ensure that fuel prices do not hamper California's ability to succeed economically while also pioneering effective policies for environmental impact reduction. California's quest to become more energy independent becomes evident, but so too have the costs. Employers, workers and consumers in general are spending more money to pay for gasoline in addition to other goods and services impacted by higher gasoline prices such as food and air travel. Later in the report, we will consider whether the economic impact of these costs is borne disproportionately by lower income California families.

This report first examines fuel's contribution to, and impacts on, California's key economic sectors. Due to the ubiquitous use of fuel throughout California, our report examines the impact of consistently high fuel costs on businesses and consumers. Next, our report looks at the fuel supply chain in California:

- Extraction and delivery of crude oil to California;
- California's differentiated fuel standards;
- Refinement of crude oil into differentiated distillates;
- Conveyance from refineries to retailers;
- Jet fuel.

The fuel supply chain data is followed by an examination of state and federal fuel policies that affect the supply, usage, and cost of California fuel. Within this policy section, the report presents opposing and supporting arguments for fuel policy efforts in California. In addition to policy-mandated changes, California fuel is also influenced by current and prospective technologies that affect fuel consumption. California's identity as a "fuel island" leaves it more vulnerable to changes in fuel requirements and "supply outages"; California will be more impacted by its own policies, standards, and cost structure than other states that are closer to local sources, have more refinery capacity, and have more standard, typical fuel blends.

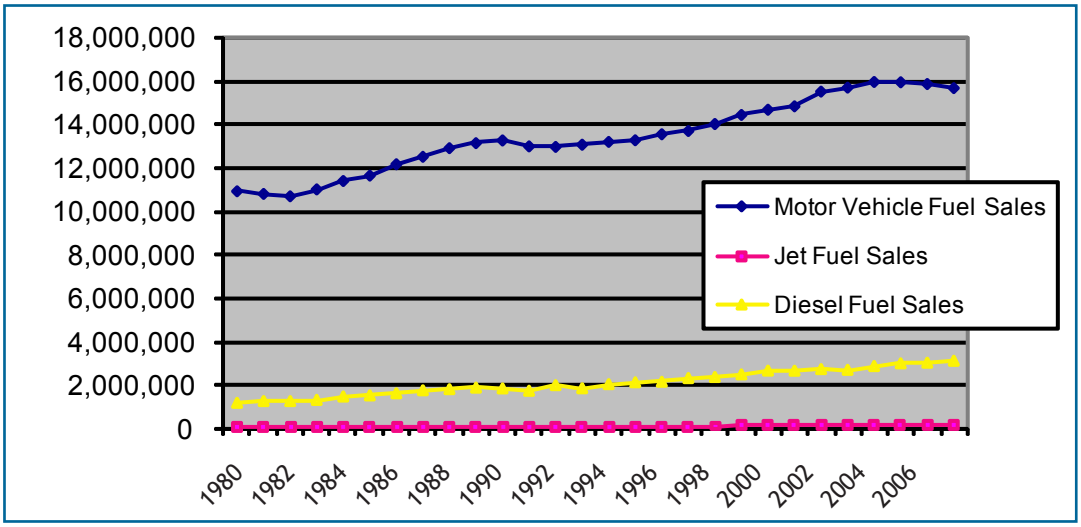
Fuel's Contribution to California's Economy

California's economy—the eighth-largest in the world, boasts the highest State Gross Product in the United States. Unfortunately, according to the California Employment Development Department, the state's 11.5% unemployment rate translates to the loss of 739,500 jobs in the last 12 months (May 2008 to May 2009). A case-by-case analysis of the sectors of industries in California reveals how disruptions, such as volatility in fuel prices, have a profound impact on the overall California economy.

Fuel Use in California

To power this economy, California residents and businesses utilize vast quantities of fuel. The chart below shows that California fuel usage has steadily increased over time with some leveling off in recent years.

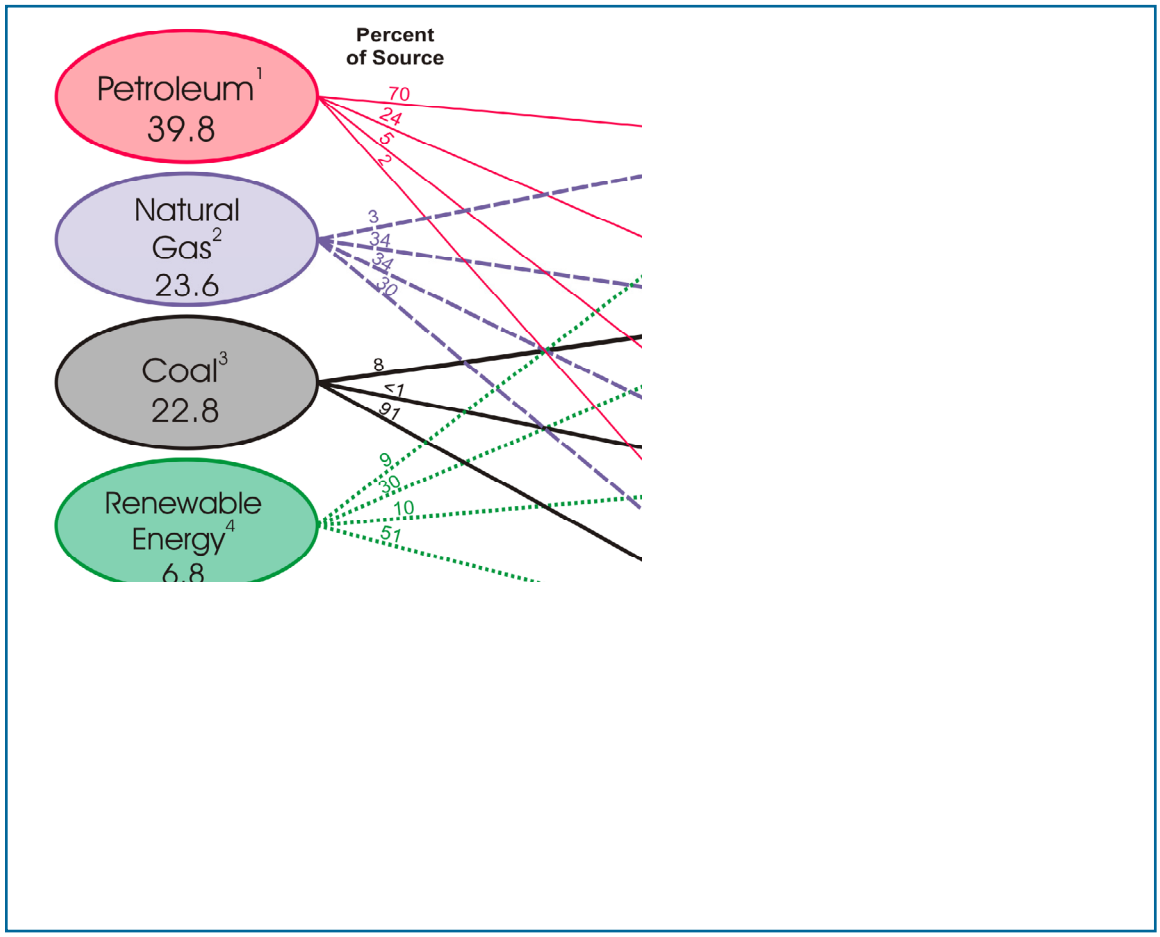
Figure 12: Thousands of Gallons of Fuel Sales in California 1980-2007



Source: State Board of Equalization, Research & Statistics Section Direct costs of fuel to key industries

As shown by the following diagram, petroleum contributes a large amount of energy to important sectors of the economy such as Transportation, Industry, Residential & Commercial, and Electric Power Generation. Approximately 98% of the Transportation Sector is powered by petroleum through the refinement into fuel while 44% of the Industrial sector is powered by petroleum and transported to final destinations for sale by fuel. As fuel prices rise, consumers pay more across the board for transportation, goods, and services.

Figure 13: U.S. Primary Energy Consumption by Source and Sector, 2007



Source: Energy Information Administration, Annual Energy Review 2007, Tables 1.3, 2.1b-2.1f and 10.3

Agriculture

In 2003, petroleum fuel and oils constituted 18% of inputs for California's agriculture sector. By 2007, that share rose to 29%.[21]

Construction

Less immediately obvious is how the construction industry is affected by high fuel prices. However, a careful analysis reveals the connection: the cost of construction materials increases when the cost of transporting them to wholesalers and construction sites increases. Also, the cost of construction increases as labor must be paid higher wages to compensate for travel costs to construction sites. On the front lines, people in the industry are discussing how fuel for vehicles are a rising share of construction job costs and becoming a major factor in determining bid amounts.

21. ""Agricultural Statistics Review," California Agricultural Resource Directory 2008-2009, 2009 <www.cdfa.ca.gov/statistics/files/CDFA_Sec2.pdf>.
22. Ken Simonson, "AGC Construction Inflation Alert," Associated General Contractors, Mar. 2008 <http://www.agc.org/galleries/econ/AGC_CIA08_webFinal.pdf>.

Kenneth Simonson's research found that petroleum products constitute 38% of the highway producer price index. These costs include the cost for fuel used in production as well as the extra costs from shipping materials to and from construction sites.[22] As fuel costs increase, the construction industry is caught with price pressures that result in lower employment, lower salaries or higher bidding costs. With over 650,000 workers statewide, the construction industry has long been considered a way up for lower educated workers seeking a middle class income. The double impact of the real estate market collapse and increasing costs for materials such as fuel means that the construction industry will have a long way to go before returning to anything resembling its previous incarnation earlier in the decade. As economic stimulus investments in public works infrastructure is a key state and federal pathway to recovery, California's higher fuel costs mean that fewer projects can be built translating into fewer jobs created.

Leisure and Hospitality Industry

Tourism is also impacted by high fuel prices as the fuel used to bring people to and from California increases. According to the Bureau of Economic Analysis, "Petroleum and Coal Products" (constituting refineries) constituted 24% of the inputs that are directly and indirectly required an additional dollar to the Air Transportation sector's total output.[23] "Petroleum and Coal Products" (constituting refineries) constituted 9% of the inputs that are directly and indirectly required to deliver an additional dollar to the Transit and Ground Passenger Transportation sector's total output.[24]

As fuel costs increase, the cost for airplane tickets and gasoline for the automobiles and vehicles bringing people to California also increases. When costs are too high people make other choices about where they want to travel. According to the California Division of Tourism, the tourism industry in California precipitated nearly $100 billion in visitor spending supported 924,000 jobs and accounted for combined earnings of $30.6 billion in salaries paid to workers in this industry. Approximately 47 million out of state visitors traveled to and through California in 2008 with an additional 13 million from international origins.[25] The tourism industry in California is dependent on fuel to power the vehicles that bring tourists to California. Many arrive by automobiles and trucks (43%) which are directly impacted by rising fuel costs. Others arrive by airplane (50%) or cruise ship (1%).[26]

Airlines

Jet fuel is a refined component of oil imported into California that is essential for transporting tourists to and from California. As fuel costs increase, the costs for plane tickets increase as well as airlines add fuel surcharges. With lowered accessibility to fuel in California due to it being a "fuel island" dependent on imported oil and subject to unique regulations on the composition of the fuel sold in state, airlines are particularly vulnerable high fuel prices and changing regulations. Because of this, many could cut back their presence in California and seek to avoid excess fueling in California to evade the high costs. Forty percent of airline costs are fuel.

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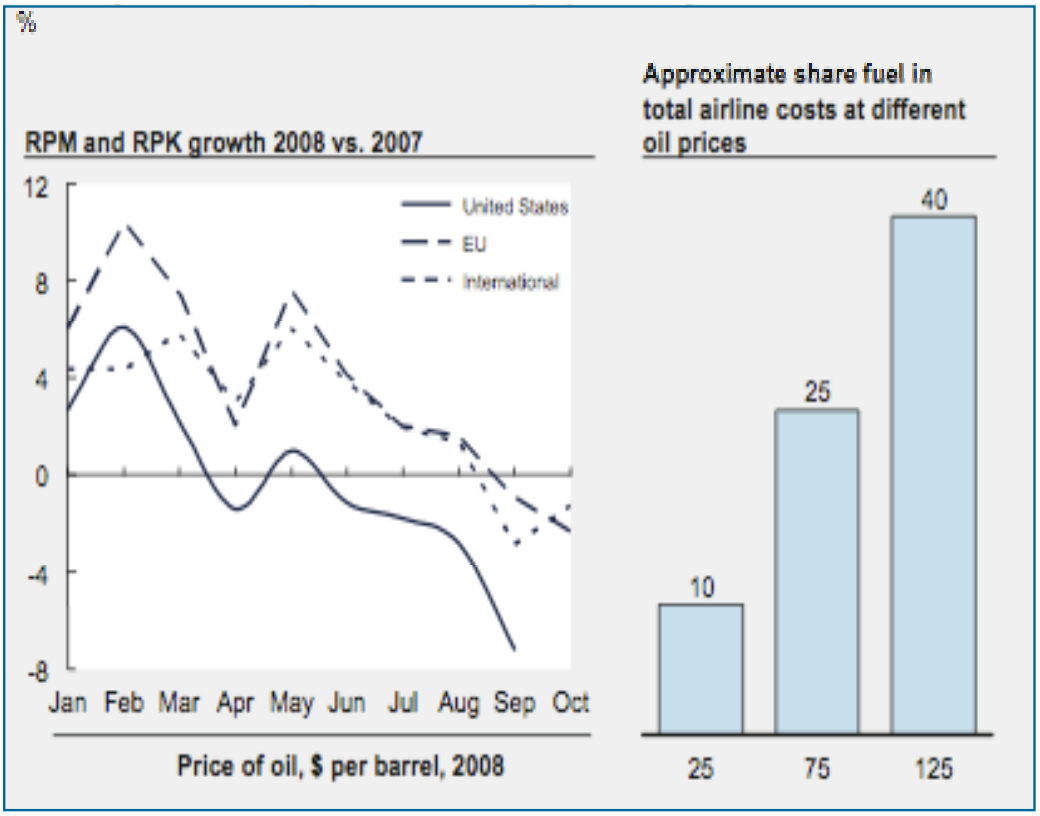
23. "Bureau of Economic Analysis: Industry Economic Accounts," U.S. Department of Commerce, 2007 <http://www.bea.gov/industry/index.htm>.
24. IBID
25. "California Division of Tourism," U.S. Government Accountability Office, 2005 <http://www.gao.gov/new.items/d05421.pdf>.
26. "California 2007: Data Tables Public Version Prepared By D.K. Shifflet & Associates, Ltd.," California Travel & Tourism Commission, 2009 <http://tourism.visitcalifornia.com/media/uploads/files/editor/ Research/2007_California_Data_Tables_-_Public_Version.pdf>.

Figure 14 : Along with air transport, where a large percentage of costs are in fuel



Source: IATA; US Bureau of Transportation Statistics; Association of European Airlines; McKinsey Global Institute analysis

Cruise Lines

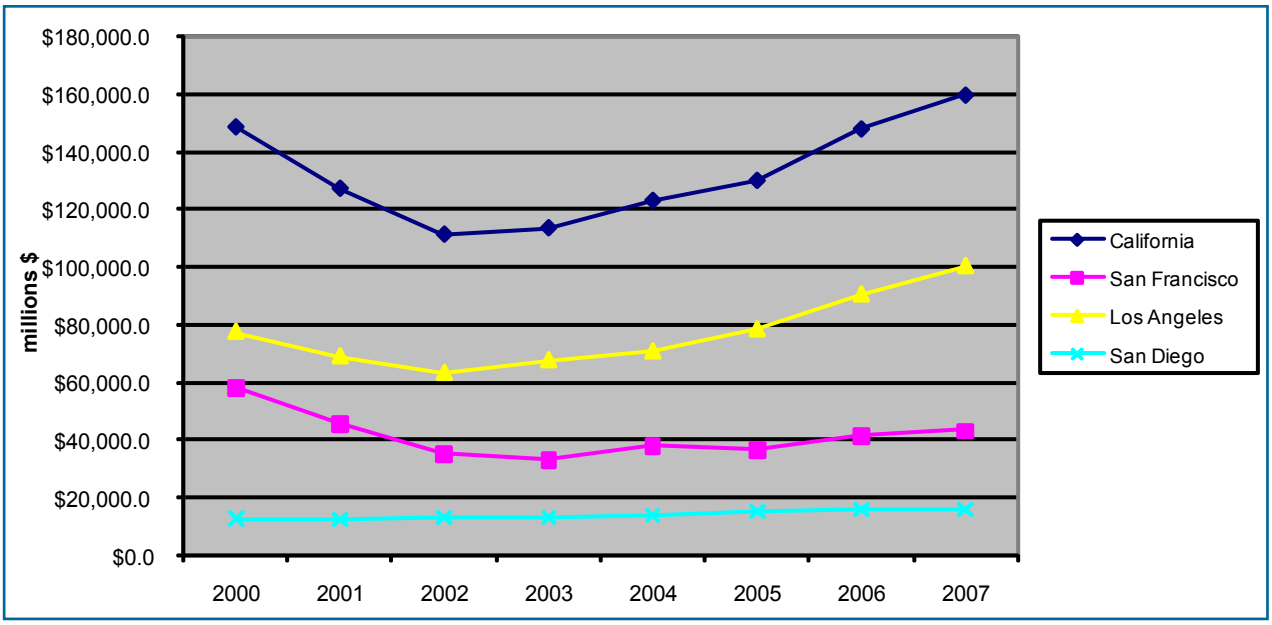
Cruise lines also bring a number of travelers to California who contribute to the local economy. As prices for fuels have increased in California, like airlines, cruise lines are taking their business elsewhere. With fewer ships calling port in California, fewer tourists are disembarking to spend money here in support of the local economy.

Wholesale Trade & Transportation Storage

The transportation, goods movement, and storage of goods have wide-ranging impacts on all industries. This sector constitutes approximately 3% of GDP in recent years and contributing almost twice that percentage in overall GDP growth making it a key source of vibrancy for the overall economy.[27] Furthermore, if fuel costs increase, then the cost of transportation for trucks, trains or planes that move wholesale goods across the state also increases since wholesale trade includes the transportation and storage of goods in California to other places across the state and around the country. While increasing fuel prices can be partially offset through increased efficiency, there are limits to measures that can be taken and after that, price increases are passed on to customers. However, this quickly results in lost market share so firms do everything possible to increase efficiencies as much as possible even if it means relocating facilities to other sites. According to the California Employment Development Department, the Logistics and Distribution industry in California employs 687,000 people and has been growing 7.8% since 2000.[28] One of the few drivers of good-paying job growth in Los Angeles County is the Logistics & Distribution industry cluster arising from the Ports of Los Angeles and Long Beach. Usage of the ports has been growing in recent years as well, even though slowing is apparent through 2009.

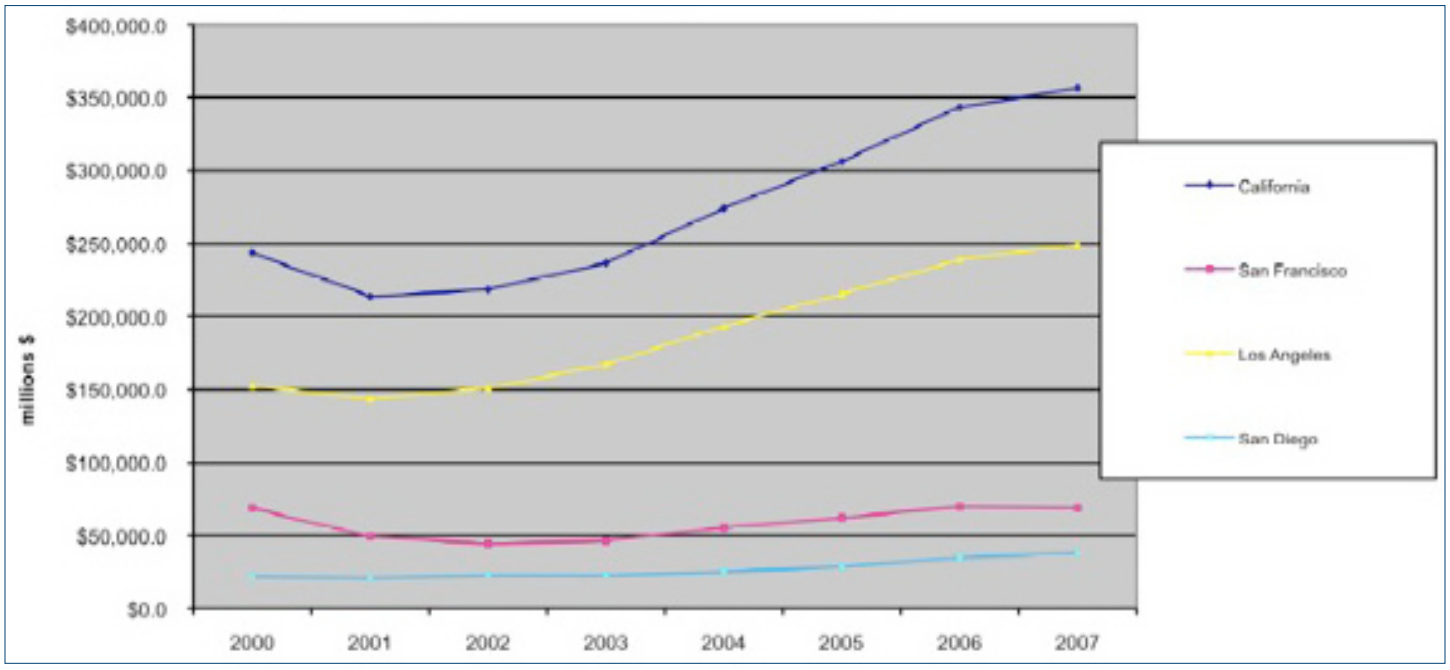
27. Robert J. McCahill, Kevin B. Barefoot, & Robert J. Corea, "Annual Industry Accounts: Revised Statistics 2004-2006," Bureau of Economic Analysis, Feb 2008 <http://www.bea.gov/scb/pdf/2008/02%20February/0208_indyacct.pdf>.
28. Research by the Orange County Business Council based on data from the California Employment Development Department.

Figure 15 : Exports Through CA Ports (By Custom District) 2000 - 2007



Source: California Department of Finance

Figure 16: Imports through CA Ports (By Custom District) 2000 - 2007



Source: California Department of Finance

With the expansion of the ports of Los Angeles/Long Beach and ports in the San Francisco Bay Area as well as expanded trucking and railroad capacity across the state to carry these imported goods, logistics and distribution is one of the primary growth industries of California. However, despite its strategic location, because of rising fuel costs, this potential may be stunted as California becomes less attractive a location to disembark and transport goods from East Asia and Latin America.

Ports

California fuel standards also have an impact on the ability of the ports of California to succeed. As international trade has slowed through 2009 and Panama has embarked on a major expansion of the Panama Canal allowing for larger ships to travel straight through to the East Coast, the logistics and distribution industry in California is in danger of losing market share since avoiding the high prices of fuel and transit costs through California makes more economical sense than maintaining our current lucrative status

quo. On June 16, 2009, the Los Angeles Times reported that imports to the Port of Los Angeles were down 17.7% to about 1.4 million containers, while exports were down 15.5% compared with the same period in 2008. At the Port of Long Beach, No. 2 in the U.S., container imports fell 22% in May. Exports fell 23.8%. For the year, Long Beach imports were off 27.4% and exports were down 29.3%.

Trucking

Essential for the maintenance and operation of the local economy since trucks bring so many of the retail and wholesale goods necessary for quality of life and jobs in California. Therefore, when fuel costs increase, the cost of transportation for trucks, trains or planes that move wholesale goods across the state also increases since wholesale trade includes the transportation and storage of goods in California to other places across the state and around the country. According to the Bureau of Economic Analysis, "Petroleum and Coal Products" (constituting refineries) constituted 13% of the inputs that are directly and indirectly required to deliver an additional dollar to the Truck Transportation sector's total output.[29] "Petroleum and Coal Products" (constituting refineries) constituted 3% of the inputs that are directly and indirectly required to deliver an additional dollar to the Warehousing sector's total output.[30] Widespread stories through the spring and summer of 2008 demonstrated how when gas was over $4 per gallon, consumers watched their grocery bills climb since the transportation costs to bring groceries to the stores also increased.

Manufacturing

Similarly, the cost of manufacturing increases as well when fuel costs spike. Transportation of materials to factories costs more resulting in higher supply costs. Labor costs increase as workers expect higher salaries to compensate for increased commuting costs.

Raw materials costs of the items being manufactured also increase as fuel costs increases. If oil suppliers can obtain a better return on investment by distributing oil for fuel instead of letting it be sold as a raw material for items such as plastics, then the cost of the remaining oil to be used for raw materials increases. Across the United States, huge amounts of fuel are used in the manufacturing process. The table below ranks the manufacturing subsectors in total fuel usage in 2006. Chemical Manufacturing is second and Paper Manufacturing is third in rank for the usage of oil in the United States.

Figure 17: U.S. Manufacturing Fuel Consumption, 2006 (Trillion Btu)

NAICS		Total	Net	Residual	Distillate	Natural	LPG and		Coke	
Code	Subsector and Industry	Fuel	Electricity	Fuel Oil	Fuel Oil	Gas	NGL	Coal	and Breeze	Other
324	Petroleum and Coal Products	3,436	137	58	25	833	29	53	*	2,301
325	Chemicals	2,639	512	23	10	1,247	7	164	*	675
322	Paper	2,187	248	86	12	377	4	205	0	1,255
331	Primary Metals	1,625	457	20	6	467	4	21	359	291
311	Food	1,173	249	25	16	630	3	145	1	105
327	Nonmetallic Mineral Products	951	147	3	30	306	5	319	11	129
336	Transportation Equipment	427	194	6	3	199	4	5	Q	16
321	Wood Products	418	91	2	15	75	5	15	1	215
332	Fabricated Metal Products	375	142	*	2	220	4	0	Q	Q
326	Plastics and Rubber Products	306	182	9	3	98	5	Q	0	*

29."Bureau of Economic Analysis: Industry Economic Accounts," U.S. Department of Commerce, 2007 <http://www.bea.gov/industry/index.htm>.
30. IBID

333	Machinery	186	111	Q	2	66	3	1	0	2
313	Textile Mills	153	66	2	*	41	*	32	0	12
334	Computer and Elect. Products	124	92	*	1	30	*	0	0	1
312	Beverage and Tobacco Products	99	30	3	1	31	1	20	0	13
335	Electrical Equip., Appliances, Components	82	44	0	Q	36	1	0	0	Q
323	Printing and Related Support	77	44	*	*	31	1	0	0	*
337	Furniture and Related Products	58	32	*	Q	14	1	3	0	7
339	Miscellaneous	58	33	Q	*	17	1	0	0	Q
314	Textile Product Mills	40	19	Q	*	16	Q	3	0	*
315	Apparel	13	7	*	*	6	*	0	0	*
316	Leather and Allied Products	3	1	*	*	1	*	0	0	*
	Total	14,428	2,837	243	128	4,741	77	994	374	5,035

Source: US Energy Information Administration at http://www.eia.doe.gov/emeu/mecs/predata/estimates.html
Q=Withheld because Relative Standard Error is greater than 50 percent.

Information Technology

Even the information technology sector suffers when fuel costs increase since so much of the IT sector requires manufactured items and their transportation to markets. If fuel costs increase, then the container ships, airplanes, trucks and cars containing these high tech items cost more thus reducing the profitability and success of the information technology sector.

Service

Service sectors such as business and professional, education, and health services are also impacted by increasing fuel costs. Increases in transportation costs mean that higher salaries need to be paid to workers to attract them to work in these fields. Transportation of workers to clients for accountants and lawyers increases when fuel costs increases. Health services are affected by fuel costs as transportation of ill individuals on ambulances and transportation of pharmaceuticals costs more when the fuel in the vehicles carrying these individuals and items increases.

In short, fuel costs drive up expenses across the board for California residents and businesses. No sector or part of the economy escapes these impacts. However, given the size of employment in key sectors of California's economy, due to multiplier effects even relatively small decreases in employment in key sectors that are dependent on fuel prices have significant impacts on employment in the state. For example, a 5% decline in employment in the wholesale trade sector results in over 34,000 lost jobs. A 5% decline in the Transportation Warehousing and Utilities sector results in over 24,000 jobs lost. A 5% loss in Leisure and Hospitality would result in over 77,000 jobs lost.

Figure 18: California Unemployment Change by Sector (2000 - 2009)

TITLE	2000	2005	2009	Change Since 2000	Number of Lost Jobs From a 5% Decline
Civilian Labor Force	16,657,800	17,532,400	18,538,100	11.29%	
Civilian Employment	15,820,300	16,499,900	16,667,700	5.36%	
Civilian Unemployment	837,600	1,032,400	1,870,400	123.30%	
Civilian Unemployment Rate	5.0%	5.9%	10.1%		
Wholesale Trade	637,500	664,600	687,200	7.80%	34,360
Transportation, Warehousing & Utilities	517,400	486,500	494,400	-4.45%	24,720
Leisure & Hospitality	1,312,900	1,454,700	1,548,300	17.93%	77,415

Source: California Employment Development Department

When a doubling of the unemployment rate in California between 2005 and 2009 is approximately results in 800,000 more unemployed individuals, a further five percent loss in just these three sectors results in over 130,000 jobs lost statewide. California can ill afford to have even minor decreases in key sectors such as tourism, wholesale trade and warehousing during a time of severe recession and high unemployment. Yet, too often, when policies are considered and "minor impacts" of five percent job losses in a "few" sectors are discussed, it is easy to overlook that the real impact means potentially hundreds of thousands of jobs lost.

Impacts of High Fuel Costs on Businesses and Consumers

- Regressive Nature of Impacts on Lower-Income Families

Higher per unit fuel costs disproportionately affect lower-income families. It could be argued that the burden of higher fuels costs is appropriately concentrated on those who drive more and produce the negative externalities associated with energy usage. From the perspective of an economist, that argument may hold; however, there are too many long standing structural barriers that prohibit lower-income families from reducing their levels of fuel consumption. These barriers include land use patterns and housing production. California has developed in such a way that lower-income families are forced to move further from job centers and face long commutes. California has consistently fallen behind its annual housing production goals set in place to ensure an adequate supply of affordable housing.[31] As a result, lower-income working households are forced to "drive 'til they qualify" for housing. Wealthier families have the ability to choose to live closer to employment centers, allowing them to reduce their dependence on fuel if they so choose.

Lower-income families spend more on transportation and other forms of energy consumption (typically their homes are less efficient) as a proportion of their expenditures.[32] Lower-income households have an even more inelastic demand for fuel than moderate- or above-moderate- income households do for all of the above described reasons. They are, therefore, disproportionately impacted by increases in energy costs. Higher fuel costs, taxes and other price increases are regressive because lower-income families are particularly vulnerable through transportation and land-use realities in the state.

Overall U.S. trends for the past 10 years (1998 – 2007) show that, while upper-income households spend more on gasoline and oil (due to various differences in spending habits by income group), low-income households spend a larger share of their income on gasoline and oil. The following table shows U.S. household expenditures on gasoline and motor oil for the years 1998 through 2007 by income group. [33]

Figure 19: Household Expenditures on Gasoline and Motor Oil (US)

	Low-Income	Middle-Income	Upper-Income
1998	$500	$1,003	$1,595
1999	$505	$1,079	$1,661
2000	$631	$1,297	$2,053
2001	$599	$1,253	$2,043
2002	$581	$1,245	$1,957
2003	$614	$1,352	$2,083
2004	$730	$1,579	$2,500
2005	$882	$1,997	$3,182
2006	$991	$2,182	$3,508
2007	$1,046	$2,418	$3,696

Source: Consumer Expenditure Survey, Bureau of Labor Statistics

The next table shows income group household expenditures on gasoline and oil as a proportion of income. For the year 2007, low-income households spent 7.5 percentage points more of their income on gasoline than upper-income households. Among driving households this difference is much greater. [34]

31.California Department of Housing and Community Development
32. Meg Power, "The Burden of FY 2008 Residential Energy Bills on Low-Income Consumers," Economic Opportunity Studies, 20 Mar. 2008 <www.opportunitystudies.org/repository/File/energy_affordability/Forecast_Burdens_08.pdf>.
33. Income groups are defined by the Bureau of Labor Statistics before tax income quintiles. Low-income is the first quintile; Middle, the third; and Upper, the fifth. Expenditure Tables are available by year and category online here: www.bls.gov/cex/csxstnd.htm.
34. It is worth noting that this figure is likely understated since low-income households generally have significantly lower vehicle ownership than upper-income households. Since the figures are aggregated over their respective categories, it is safe to assume that lower-income households with vehicles are spending much more than the stated average for the category as a whole, making the actual difference, when comparing driving households, much larger.

Figure 20: Household Expenditures on Gasoline and Motor Oil as a Percentage of Income (US)

	Low-Income	Middle-Income	Upper-Income
1998	7.1%	3.4%	1.7%
1999	7.0%	3.4%	1.5%
2000	8.5%	4.1%	2.0%
2001	7.6%	3.7%	1.9%
2002	7.0%	3.5%	1.7%
2003	7.4%	3.7%	1.7%
2004	7.9%	3.9%	2.0%
2005	9.1%	4.8%	2.3%
2006	9.9%	5.0%	2.5%
2007	9.9%	5.4%	2.4%

Source: Consumer Expenditure Survey, Bureau of Labor Statistics

Figure 21: Household Expenditures on Gasoline and Oil as a Percentage of Income (US)

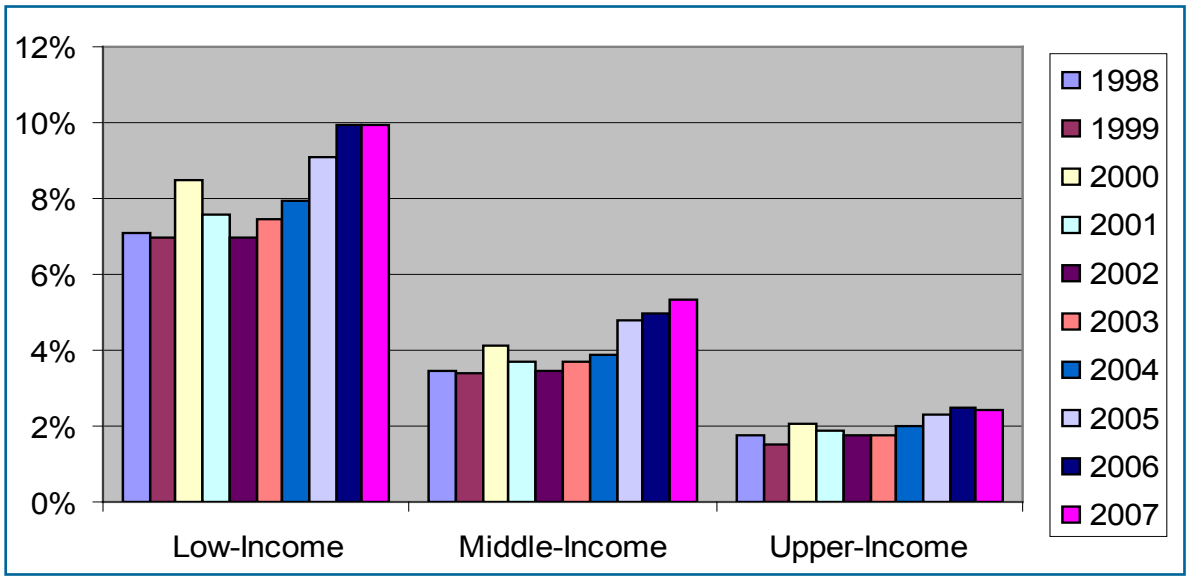
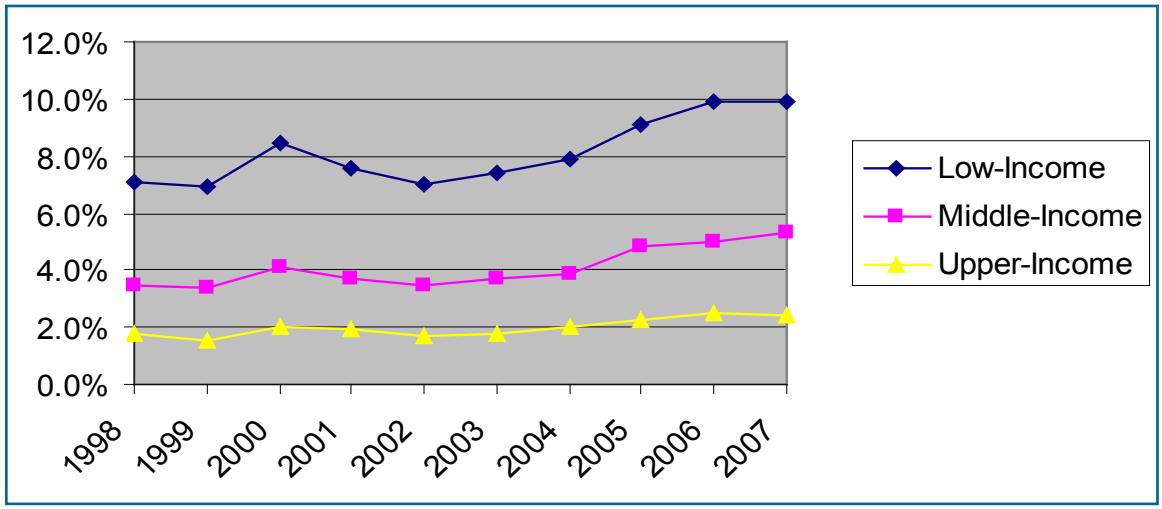


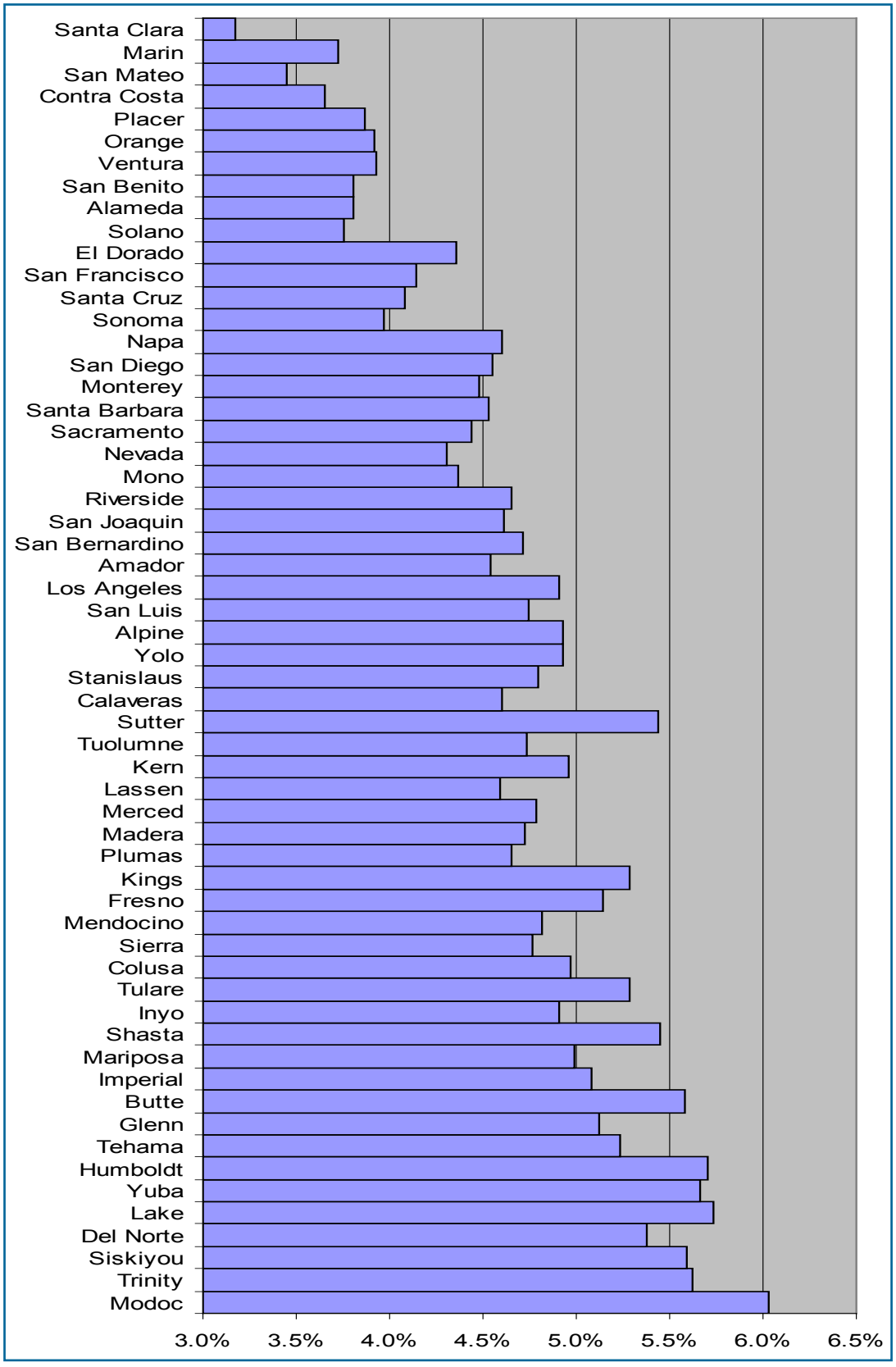
Figure 22: Expenditures on Gasoline and Oil as a Percent of Income by Income Group (US)



Source: Experian

The following chart shows California counties most impacted by higher fuel prices, ordered from lowest median household income to highest with their corresponding proportion of household income spent on gasoline and oil. For the most part the trend is consistent. The lowest median household county, Modoc, has the highest proportion of household income spent on gasoline at 6%, while the highest income county, Santa Clara, has the lowest proportion at 3.2%.

Figure 23: CA Counties by Median Household Income & Proportion Spent on Gas



Source: Experian

- Effect on Small Businesses Owners

Smaller businesses do not have economies of scale and, therefore, are disproportionately affected by increases in energy prices. Larger businesses are more able to absorb cost increases by distributing a larger portion to consumers, in smaller amounts at a larger scale; whereas in a smaller business, it would most likely have to distribute the cost increase at a smaller scale and in larger amounts. Cost increases also take up a larger proportion of small businesses' budgets. This can contribute to lower market competitiveness, which can stifle economic robustness.

Smaller businesses (<500 employees) play a major role in the US economy. They represent 99.7% of all the nation's employer businesses, employing 57.4 million Americans, which is 50.6% of the non-farm private sector workforce.[35]

California has a significant number of small businesses that drive a large percentage of economic activity in the state. Businesses with less than ten employees are 80% of the total number of businesses in the state. Firms with less than 100 employees are over

Figure 24: Size of Business Categories

	Total	0 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 249	250 to 499	500 to 999	1000 +
Number of Businesses	1,304,291	893,427	159,374	110,654	84,464	32,384	17,340	4,111	1,631	906
%	100.0%	68.5%	12.2%	8.5%	6.5%	2.5%	1.3%	0.3%	0.1%	0.1%
Number of Employees	15,747,249	1,090,118	1,057,069	1,504,624	2,574,072	2,228,270	2,586,766	1,400,583	1,123,166	2,182,581
%	100.0%	6.9%	6.7%	9.6%	16.3%	14.2%	16.4%	8.9%	7.1%	13.9%
3rd Qtr. Payroll (in thousands)	$189,452,863	$10,938,045	$10,230,617	$15,109,221	$26,699,701	$24,446,861	$30,563,765	$19,012,437	$15,900,527	$36,551,688
Percent	100.0%	5.8%	5.4%	8.0%	14.1%	12.9%	16.1%	10.0%	8.4%	19.3%

Source: California Employment Development Department

Paying some of the highest state fuel taxes in the country, California small businesses are at an economic disadvantage compared to the rest of the country. They do not have economies of scale where consolidation of operations can be instituted or savings can be accessed to whether a price spike or fuel shortage. When these events happen, small businesses must soldier on and take the hit. Given that so much of the state's payroll and so many of its workers are in small businesses, leaving them at risk like this is not smart policy and is a difficult expectation to place on such a large number of people. The increased cost of fuel to business and cost of living hurts Californians to a greater degree than the assumed benefits that come from higher taxes.

- Geographical Areas hurt worst by costs of CA fuel standards are those which have been hurt worst by the economic downturn and will take longest to recover—Inland Empire and Central Valley.

Areas hit worst by higher fuel costs tend to areas such as the Inland Empire and Central Valley because of their distance from the fuel supply chain. Since California depends on tankers as its major means of receiving fuel, these inland areas will have even higher prices due to transportation needs from the ports. These are also the areas where demand for fuel is even more inelastic; areas removed from central business districts and major urban areas. The Central Valley is a huge agricultural center and distribution of the valuable food supply will become more expensive, possibly raising grocery costs or making California producers less competitive than producers with lower transportation costs (due to importing from states or countries with much lower standards and cheaper fuel).

35."Small Business Drives the U.S. Economy," Office of Advocacy, U.S. Small Business Administration, 2005, 14 May 2009 <www.sba.gov/advo/press/06-17.html>.

These inland areas are also some of the most affected by the economic downturn. The following table shows the top ten counties in California by unemployment rate for April 2009. Notice that Imperial County is the highest by far for both April 2009 and 2008. The county with the lowest unemployment rate is Marin during the two listed years (7.2%, 2009; 3.2%, 2008).

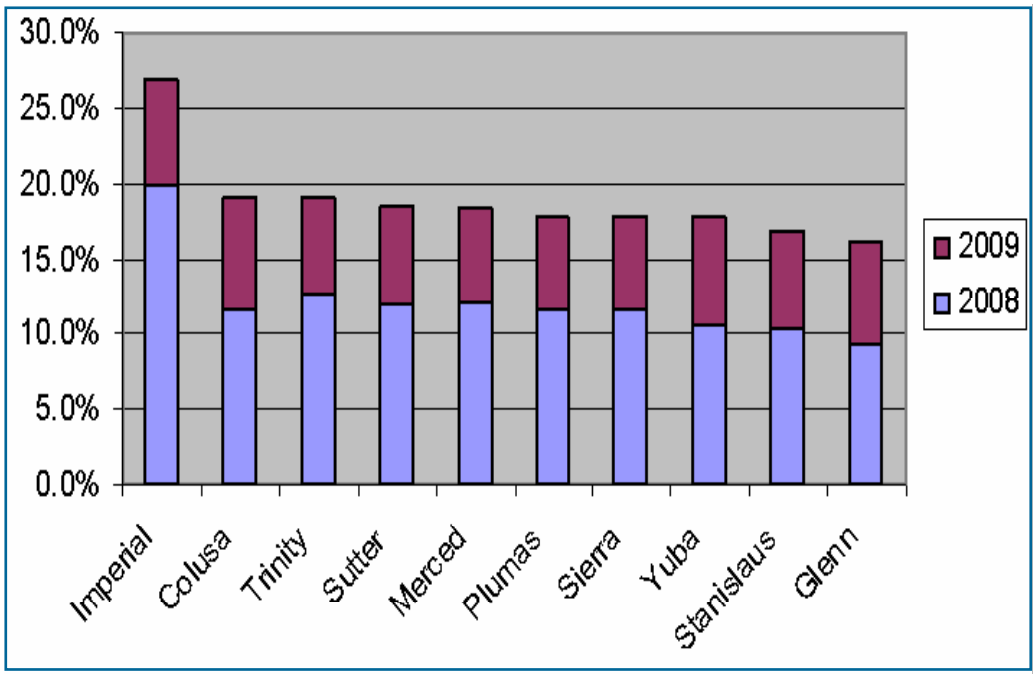
Figure 25: Top 10 CA Counties by Unemployment Rate

	2008	Increase	2009
California	6.0%	4.9	10.9%
Imperial	19.9%	7	26.9%
Colusa	11.6%	7.5	19.1%
Trinity	12.7%	6.4	19.1%
Sutter	12.0%	6.5	18.5%
Merced	12.2%	6.1	18.3%
Plumas	11.6%	6.3	17.9%
Sierra	11.7%	6.2	17.9%
Yuba	10.6%	7.3	17.9%
Stanislaus	10.4%	6.4	16.8%
Glenn	9.3%	6.8	16.1%

Source: California Employment Development Department

Of the ten California counties with the highest unemployment rates, the Central Valley is represented by Yuba and Merced (most if the 10 counties are in the Central Valley—Stanislaus is as well). The Inland Empire unemployment rate is somewhat higher than the average, but not as high as the top 10; however, the increase for both Riverside and San Bernardino Counties is 5.9 percentage points, higher than the State average. Riverside County had an unemployment rate of 6.9% in April 2008 and increased to 12.8% for April 2009, while San Bernardino County had a rate of 6.5% in 2008, which increased to 12.4% for April 2009.

Figure 26: Top 10 CA Counties by Unemployment Rate



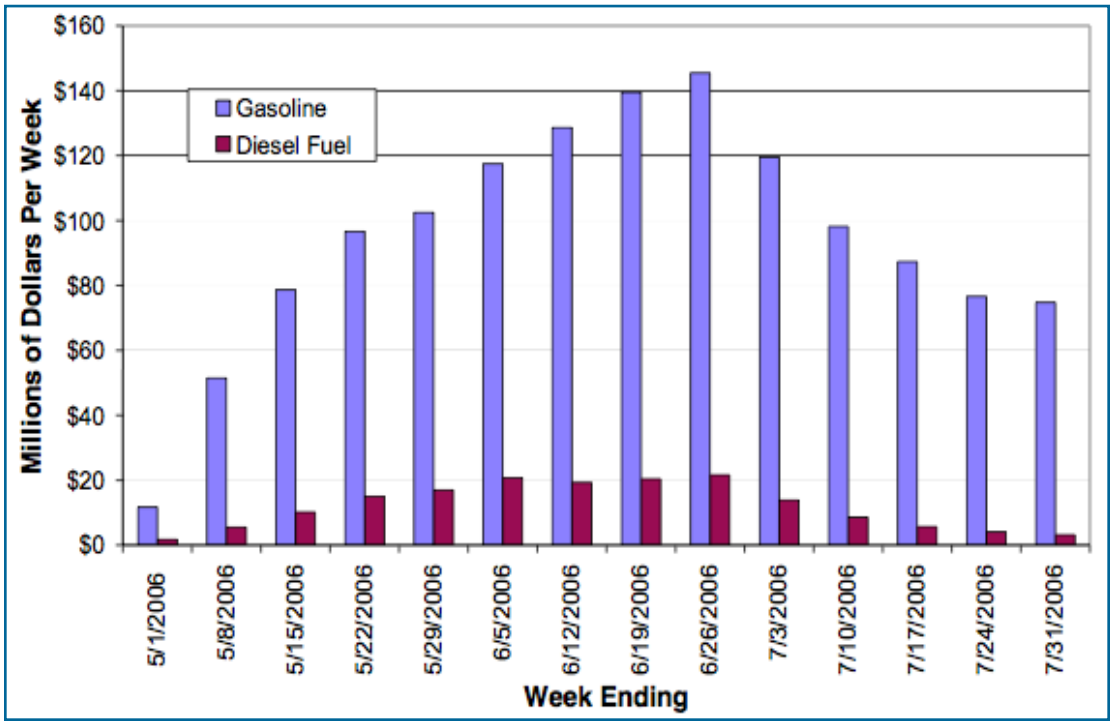
Source: California Employment Development Department

The Inland Empire is one of the hardest hit regions by the housing market downturn, which has devastating effects on local economy. Riverside County in 2008 has approximately 350,000 "upside down" properties, properties that are now worth less than the amount owed.[36] Furthermore, residents in these areas often commute long distances to work, making them more vulnerable to fuel price spikes and volatility in the supply chain, exacerbating an already financially burdened population. Recovery during the recession will take even longer with the additional burden of fuel price volatility, especially in these costlier markets inland.

- Extra costs are especially apparent during price spikes

While Californians pay significantly more for fuels on a regular basis, this is especially true during fuel price spikes. For example, examining the price spike magnitudes, during the summer of 2006, shows the dramatic effects increases had on California consumers and businesses.

Figure 27: Additional Trasportation Fuel Costs to California Consumers & Businesses



Sources: Energy Information Administration (EIA) - California retail prices. CA BOE - tax gasoline and diesel fuel sales. Alaska crude oil prices - Wall Street Journal.

- Impact on California State Budget of lost tax dollars

Higher fuel costs and increased volatility, due to California's unique fuel blend and the associated supply challenges, create a less competitive business environment. Increases in the costs and uncertainty of operating expenses can drive away certain business that might otherwise expand or move their operations to California. Declines in employment have been documented between 2000 to 2009 in key industries such as manufacturing; farming; and transportation, warehousing and utilities.[37] These are industries whose operating expenses are closely linked to fuel costs. Higher operating costs for many businesses, as a result of California's higher fuel costs and volatility, means California's economy is not as competitive as it could be.

36. Rick Bishop, "Inland 'Red Team' Anticipates 350,000 Potential Foreclosures," The Planning Report, Nov. 2008 <www.planningreport.com/tpr/?module=displaystory&story_id=1379&format=html>.
37. OCBC analysis of California Employment Development Department

Fuel Supply Chain for California

Understanding the logistics and costs associated with the supply, refinement, formulation, and distribution of gasoline is paramount to understanding the costs of fuel in California. This section sequentially outlines the factors that constrain the production, supply and movement of petroleum-based products and contribute to California's gasoline price premium. Here are the five distinct areas within California's fuel supply chain:

1. Extraction and Delivery of Crude Oil to California
2. California's Differentiated Fuel
3. Refinement of Crude Oil into Differentiated Distillates
4. From Refineries to Retailers
5. Jet Fuel

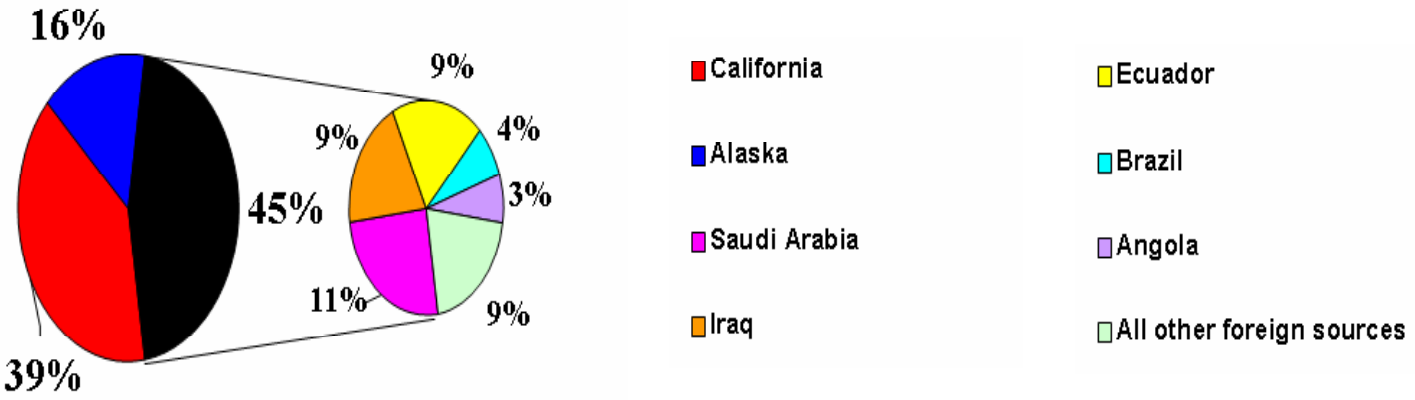
1. Extraction and Delivery of Crude Oil to California

Crude oil is the principal ingredient and cost driver in California's fuel supply. In addition to the cost of buying this global and finite commodity, is the cost of transporting it to California refineries. Since 1970—when the U.S. reached its peak in oil production—the nation has become increasingly reliant on oil imports. California, in turn, has seen its crude oil production reduced from its peak of 424 million barrels per year in 1985 to 250 million barrels in 2006. [38]

Thirty-nine percent of crude oil that gets refined in California comes from within the state. [39] The flipside to this is the state must import 61% of its crude oil in order to meet demand for the state's differentiated fuels. The breakdown of imports is as follows:

- 16 percent of crude oil is imported from Alaska
- 45 percent of crude oil is imported from foreign markets with Saudi Arabia, Iraq and Ecuador accounting for 64% of all foreign imports
- As supply of Alaskan Crude Oil has diminished over the last eleven years, imports from foreign markets have surged from 10% in 1996 to 45% in 2007

Figure 28: Crude Oil Sources for California Refineries (2007)



Source: Energy Information Administration

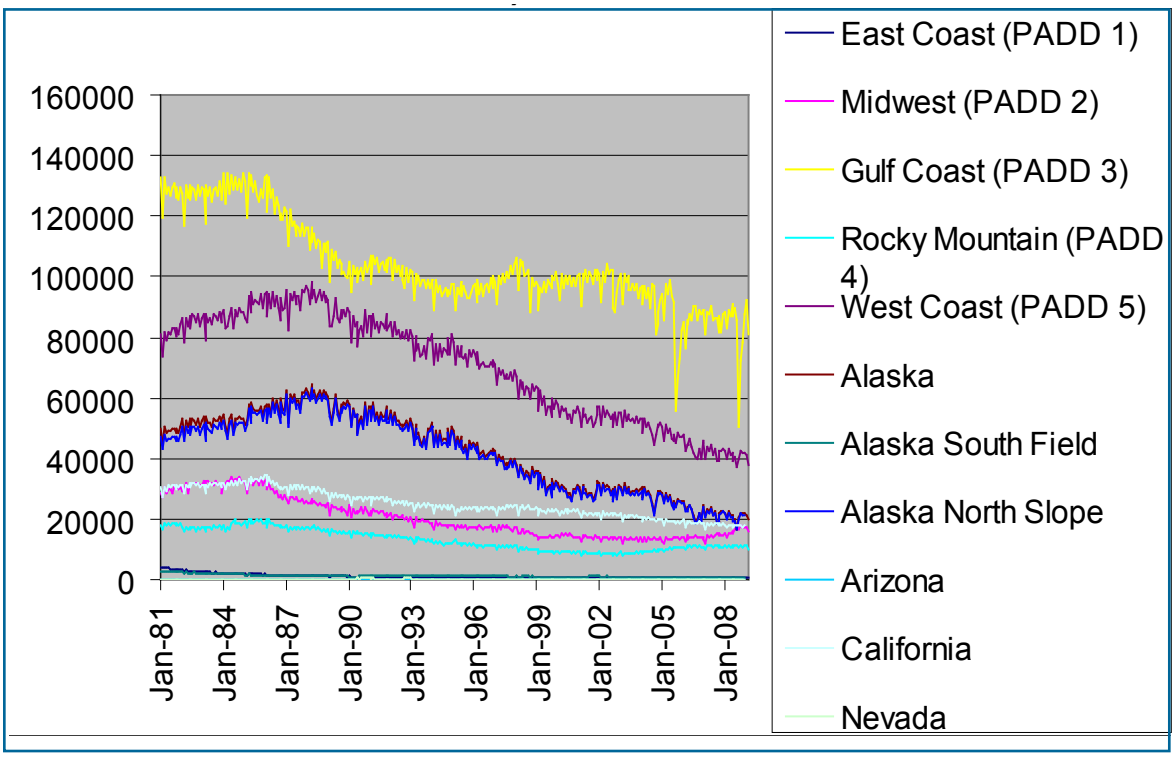
38. At 424 million barrels per year
39. "Spring 2006 Petroleum Fuels Spike Report to the Governor: Appendices, California Energy Commission," 2006.

Over time, the amount of oil imported to California is expected to increase. By 2030, the Energy Information Administration forecasts that crude oil will reach $130 per barrel (in 2007 dollars). With U.S. oil consumption expected to increase by 34% between 2005 and 2030 (or 1.4% annualized increase), our appetite for oil will be increasingly reliant on imported crude. The confluence of trends impacting crude oil prices include:

- Rapid economic growth in emerging markets;
- Collusion among OPEC member countries in limiting crude oil production levels;
- Political volatility and/or security issues in crude oil net exporting countries;
- The accelerating scarcity of crude oil—a non-renewable source of energy;
- Increased oil equipment and operating costs; [40] and
- The recent decline of the U.S. dollar.

Therefore, domestic oil supplies are decreasing with steady declines from Gulf Coast

Figure 29: Crude Oil Production in the US (1981 - 2009)

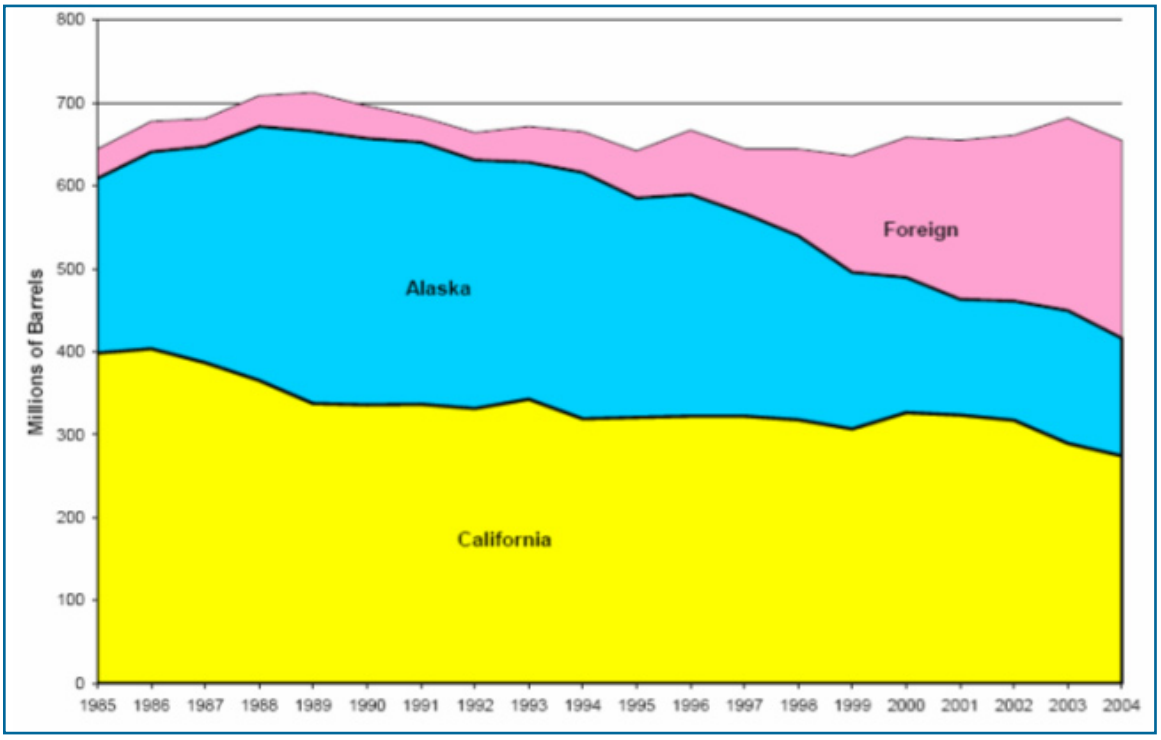


Source: EIA (2009)

With declines in domestic production, foreign crude oil has replaced the Alaskan oil that had been imported into California. California's slow decline in production and Alaska's more rapid depletion have increased the proportion of foreign oil from roughly 10% to 45%. In fact, 20%—or 130,000 thousand barrels a day—is imported from very distant locations in the Middle East.

40. In 2006, the EIA reported that oil equipment costs were up over 4% and operating costs increased by 3%; <http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/cost_indices_equipment_production/current/coststudy.html>.

Figure 30: Crude Oil Receipts bu Source for California Refineries



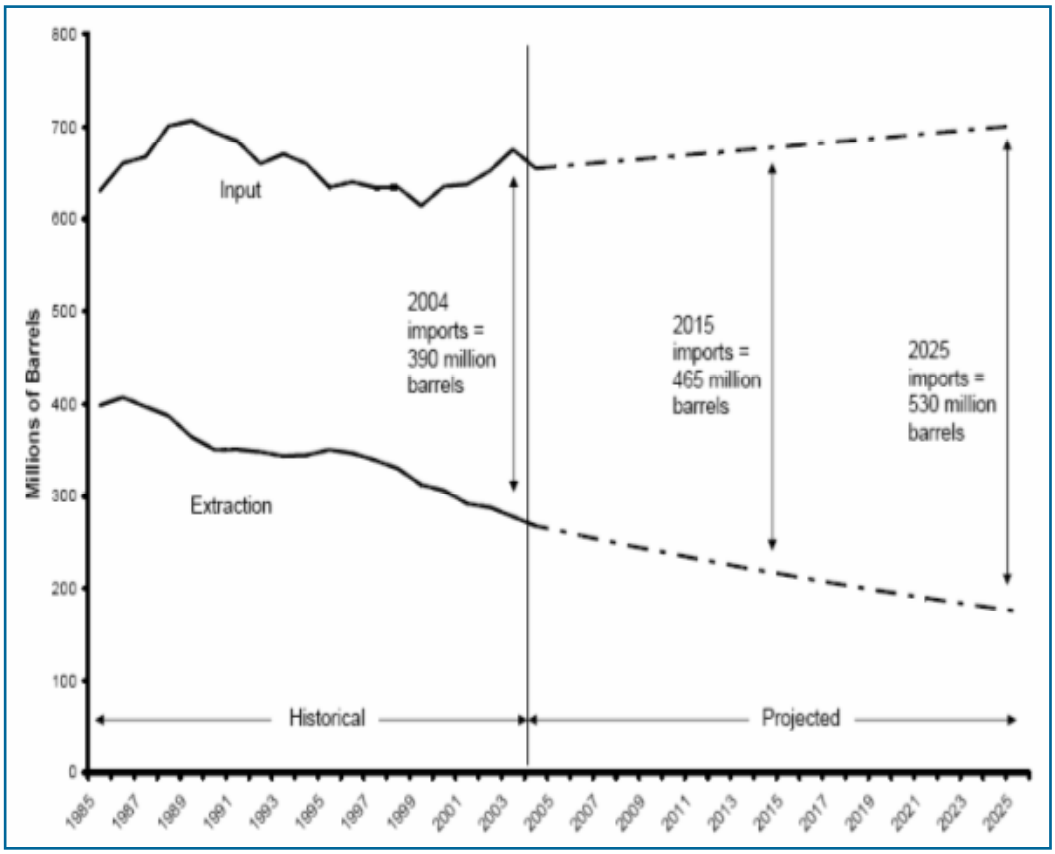
Source: Energy Commission PIIRA Database and CEC Staff Report 2005.

As input needed to meet demand rises and the trend of decreased domestic extraction continues into the future, the amount of imports required will continue to grow. The California Energy Commission estimates that in 2025, there will be a need to import up to 530 million barrels a year, an increase of 140 million barrels or 36% from 2004 levels. For California ports, these increases would translate roughly into an additional 150 shipments of crude oil received per year in 2015 and an additional 300 incoming shipments by 2025.[41] Imported oil will need to come through the ports and the capacity to handle this level of increase depends on how the ports decide to expand their operations,[42] if possible at all.

Over time, the gap is expected to widen. Extraction from California's oil supplies are expected to decline from approximately 300 million barrels currently to less than 200 million barrels by 2025.

41. "An Assessment of California's Petroleum Infrastructure Needs: In Support of the 2005 Integrated Energy Policy Report," California Energy Commission Staff Report. Apr. 2005: 17, CEC-600-2005-009.
42. IBID

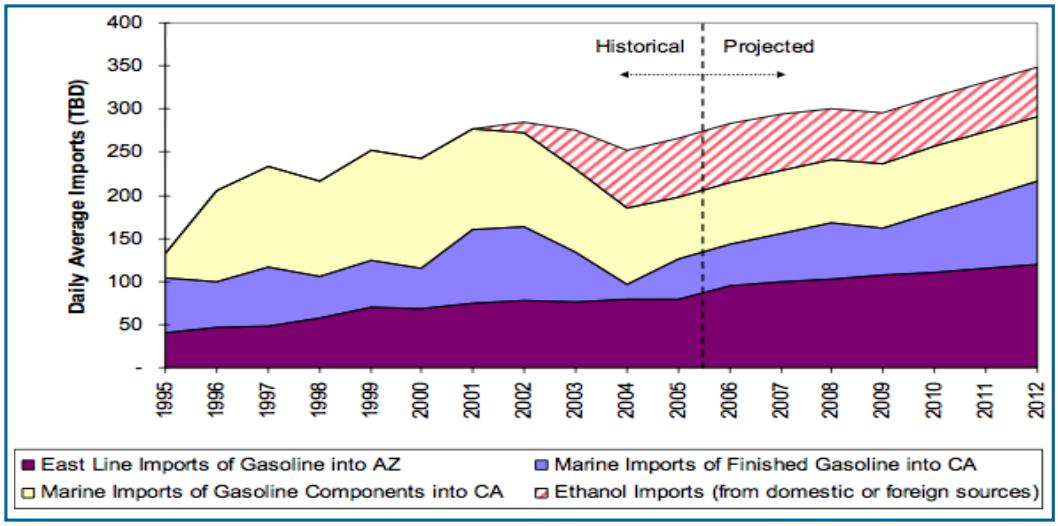
Figure 31: Historical and Projected California Cude Oil Extraction, Input and Imports



Source for historical data: Energy Commission PIIRA Database and CEC Staff Report 2005.

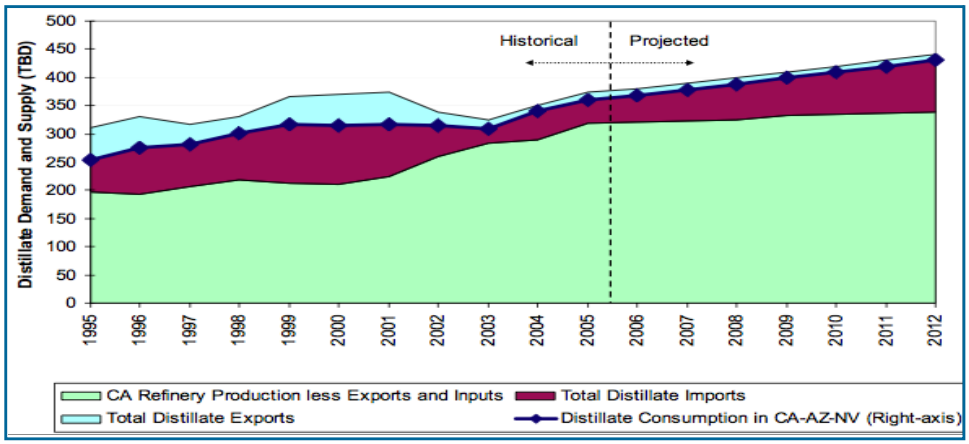
Another projection demonstrates the effect of increasing imports into California to make up for declining internal production. More gasoline is expected to be imported through the limited capacity of marine sources. In addition to the new requirements for greater ethanol content for gasoline due to new policy requirements from the State government (see section below), the limited marine capacity must also be utilized for importing ethanol from other regions which have the agricultural capacity to grow the corn or other biological components for ethanol.

Figure 32: Gasoline Imports in CA, AZ, NV



Source: CEC report: "Forecasts of California Transportation Energy Demand 2005-2025: In Support of the 2005 Integrated Energy Policy Report," CA BOE Taxable Fuel Sales Database, EIA Annual Energy Outlook 2006, Kinder Morgan Pipeline Flows, Wilson Gilette & Co Jones Act Data, ICF Estimates.

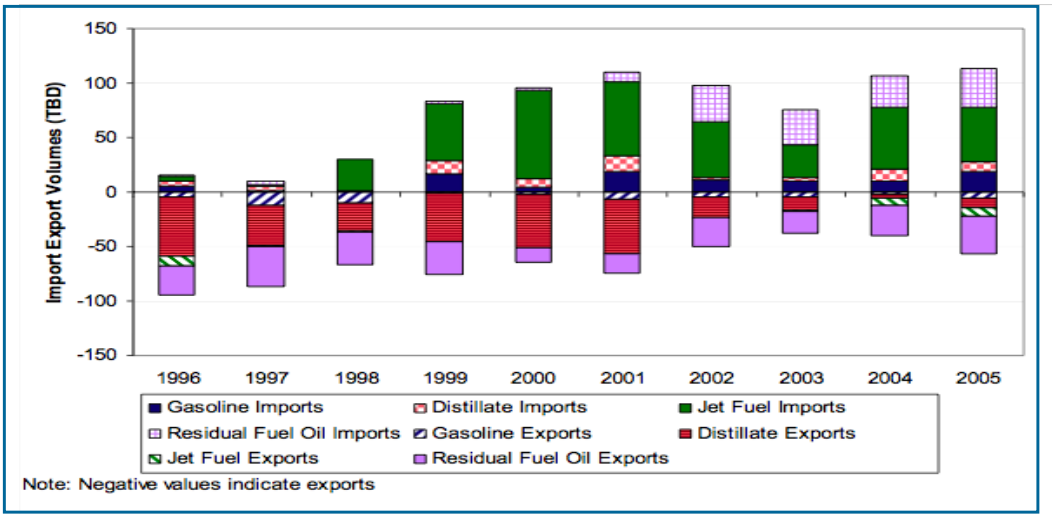
Figure 33: Distillate Supply and Demand: CA, AZ, NV



Source: CEC report: "Forecasts of California Transportation Energy Demand 2005-2025: In Support of the 2005 Integrated Energy Policy Report," EIA Petroleum Navigator Prime Supplier Volumes, CA BOE Taxable Fuel Sales Database, EIA Annual Energy Outlook 2006, Kinder Morgan Pipeline Flows, Wilson Gillette & Co Jones Act Data, ICF Estimates, CEC California Monthly Inputs and Outputs, EIA Petroleum Navigator Refinery Yield.

California ports are in high demand not only for imports but also for exporting product as well. Because of California's differentiated fuel requirements, some refineries in California produce fuel that is not used for the California market but is exported through the limited and overstretched marine capacity that currently exists.

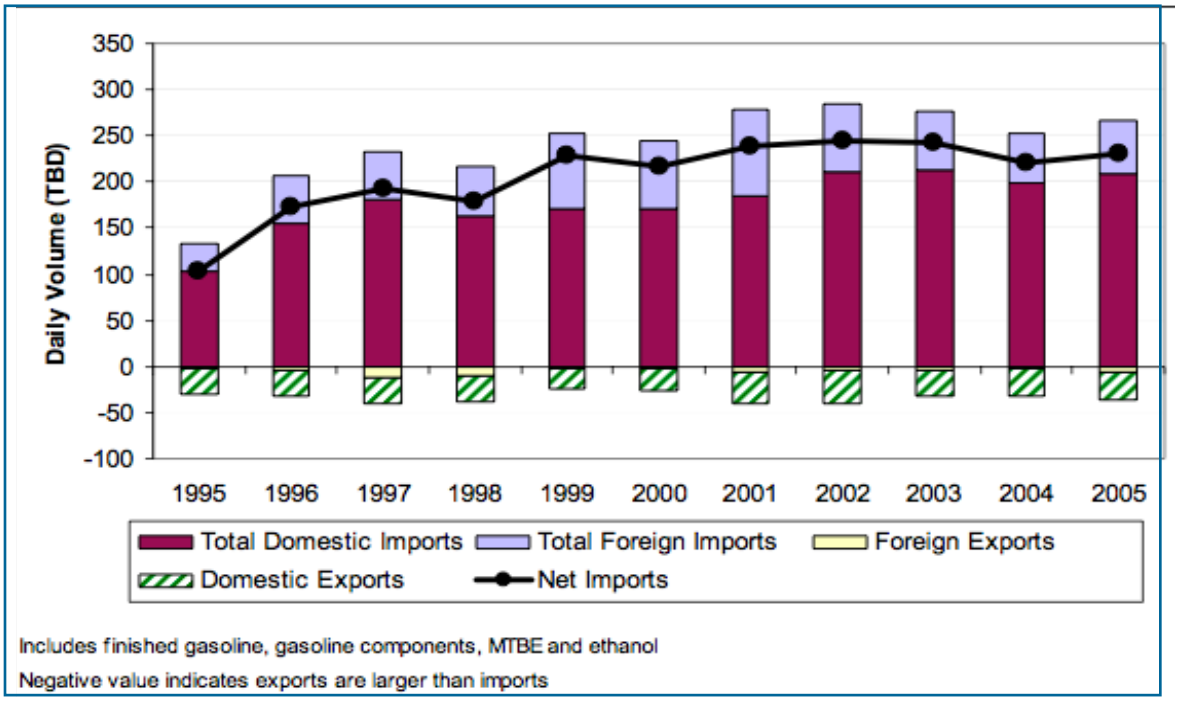
Figure 34: Foreign Imports and Exports of Finished Products in California, 1996-2005



Source: EIA Form-814 Company-level Imports and export data received from EIA

Because of California's specific fuel blend requirements, some refineries have opted out of producing California blend and instead refine gasoline which is exported to other locations.

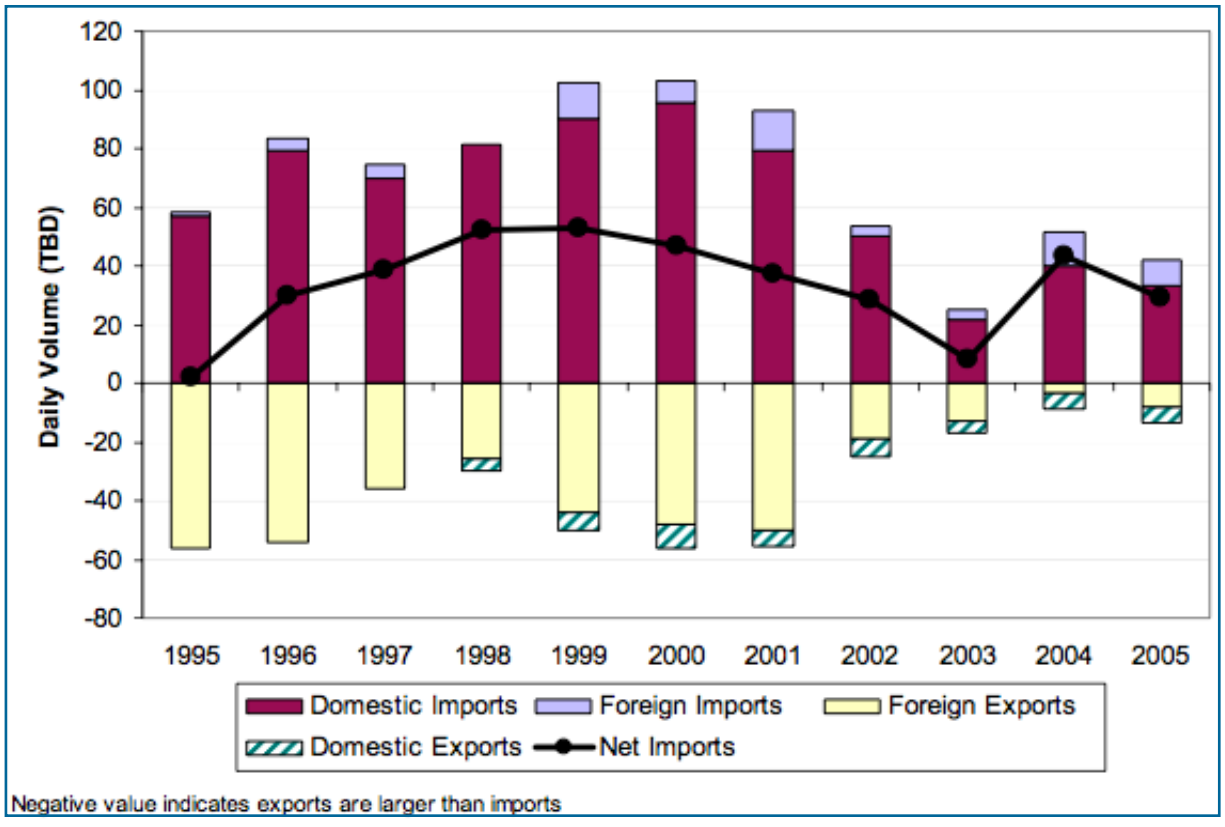
Figure 35: Total Imports and Exports of Gasoline in CA, AZ, & NV (1995-2005)



Source: EIA Form-814 Company-level Imports, Wilson Gillette & Co Jones Act Data, Kinder Morgan Pipeline Flows and foreign export data provided by EIA.

Ultimately this creates the ironic situation where gasoline needed by California is not produced enough in California even as California is a net importer of crude oil to make this product.

Figure 36: Total Imports and Exports of Distillate of CA, AZ, & NV (1995-2005)



Source: ICFI Analysis based on data from various sources

Other means for transportation of oil to California are not feasible. Due to the relative isolation and specific requirements of the California fuel market, no pipelines connect California to other major U.S. refining and crude oil producing centers. The trend toward increasing reliance on foreign crude imports has considerable logistical and cost consequences and will increase the strain on an already burdened infrastructure. Because it takes approximately 40 days to ship crude oil from the Middle East compared to around ten days from Alaska, the state must be able to store ample supply of crude oil in the event of a supply disruption. At the same time, our ports have to be able to accommodate the growing number of tankers it will take to supply our crude oil. If capacity is not increased, the state will become more vulnerable to exogenous shocks that result in fuel supply disruption.

There are many factors that influence capacity along the supply chain; however, the most important of these involve marine facilities and product transport since they supply the majority of the raw material needed to feed the rest of the chain. Marine facilities include terminal access, capacity and storage, while product marine transport includes tanker availability.

According to a report by the CEC, tankers are restricted and in high demand. The Jones Act puts restrictions on vessels moving between U.S. ports, which require certain things such as U.S. construction and workers. Environmental regulations also restrict which types of vessels are permitted to dock at ports. All of these regulations drive up costs along with the increasing demand for the limited number available. California's fuel supply relies heavily on tankers to supply and transport crude oil and refined products.

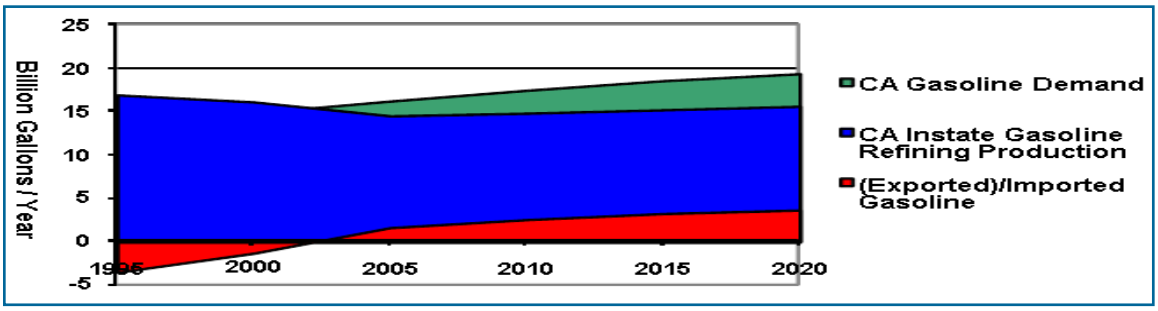
The three major ports in California are San Francisco and the Ports of Long Beach and Los Angeles. Most of the major refineries are located near these ports. The Ports of Long Beach and Los Angeles are the only facilities accessible by today's large crude oil tankers, known as "Very Large Crude Carriers" (VLCCs). San Francisco cannot accommodate VLCCs, therefore oil must be transferred to smaller vessels for delivery to port, a process that is subject to strict regulation and adds cost, inefficiency, and delays to the process.[43] All ports still have capacity for docking access; however, capacity in Southern California is becoming tighter. Docking access does not ensure storage capacity however.

Inadequate marine facilities can paradoxically contribute to political opposition to expansion of such facilities. Storage constraints and limited moorings mean that some tankers idle for days on marine bunker oil (which does not meet California's fuel standards). This contributes to surrounding negative air quality impacts, which is a particularly sensitive issue for the Long Beach and Los Angeles Ports due to surrounding residential land uses. Because of these surrounding uses, there is a preference for container ships rather than petroleum tankers and many operators report increasing difficulty to renew leases for existing petroleum terminal facilities. The Port of Los Angeles' most recent major expansion project included only a small increase in storage tank capacity for petroleum. [44] Pacific Energy Partners has considered an expansion of facilities to handle up to 250,000 barrels per day of imported oil and keeping 4,000,000 barrels of storage.

As foreign oil supplies replace domestic supply, the limited petroleum infrastructure in California's ports will become even more strained. Presently these facilities are barely adequate; however, demand for oil will continue to grow as well as the proportion that needs to be imported. The future capacity and price of oil for California is very closely linked to how and if the ports will meet the growing demand in the future.

43. "An Assessment of California's Petroleum Infrastructure Needs: In Support of the 2005 Integrated Energy Policy Report," California Energy Commission Staff Report. Apr. 2005: 17, CEC-600-2005-009.
44. IBID

Figure 37: CA Gasoline Supply/Demand Imbalance

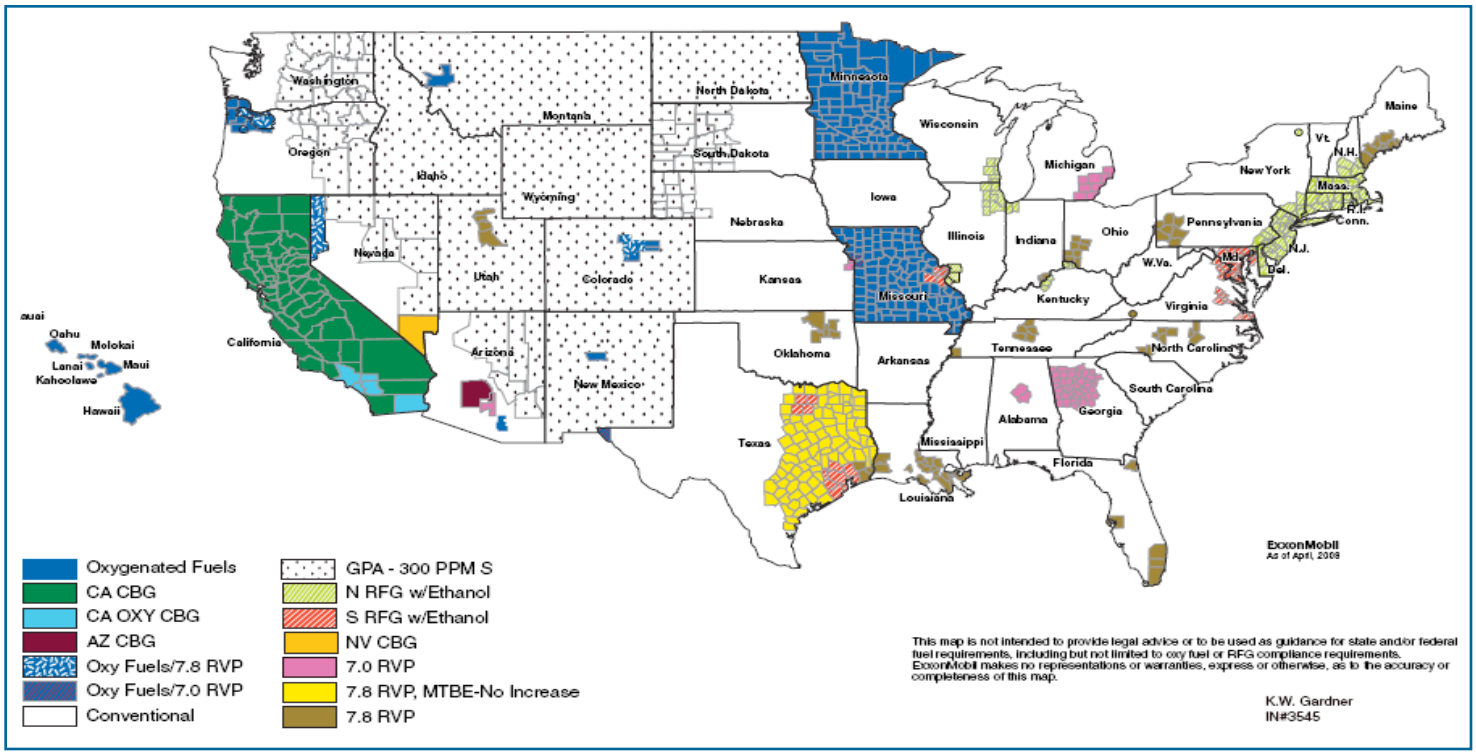


Source: ICFI Analysis based on data from various sources

2. California's Differentiated Fuel

Fuel requirements vary tremendously across the United States. The map below lists fourteen varieties of fuel; however, it would be impossible to show the many local varieties that exist in many places, which the 2005 GAO report estimates at over 45 different fuel blends. Federal regulation also mandates different types of fuel blends for specific cities and during various seasons of the year.[45]

Figure 38: US Gasoline Requirements



45. 1990 Clean Air Act amended to include reformulated gasoline in order to reduce summer smog in nine major metropolitan areas. Source: Coon, C. "Congressional Mandates Contribute to Higher Gas Prices," The Heritage Foundation, 2004 <www.heritage.org/Research/Regulation/em932.cfm.>.

The California Air Resources Board (CARB) mandates a California specific blend of gasoline called the California Clean Burning Gasoline (CA CBG). California, New York and Connecticut banned MTBE as an additive to gasoline, requiring refiners to substitute another additive such as ethanol, which requires the use of more crude oil during production. [46] In 2004 California phased out MTBE and substituted ethanol making it one of the largest markets for ethanol. [47] In California, Imperial County and the Los Angeles Metropolitan Area are required to use a special oxygenated blend (CA OXY CBG) because they are designated "ozone non-attainment" areas. [47]

Although not as significant an ingredient as crude oil, ethanol is increasingly being utilized in California's differentiated fuels and must be accounted for as an input cost. California requirements for increased ethanol content necessitate additional storage capacity. This storage capacity needs to be distinct from general operations because ethanol is particularly corrosive. [49] The state's demand for ethanol is expected to increase by 60% from 2005 and 2025 to 1.5 billion gallons per year. Currently, ethanol in the United States is primarily produced from corn. California is not a large corn growing state. The ethanol produced therefore is produced close to where it is grown. Since only 15% of that demand is expected to be met by California ethanol producers, bringing ethanol from plants in the Mid-West to refineries in California result in additional transportation costs to the costs of producing CA CBG. Ethanol cannot be transported by pipeline and, therefore, needs to be shipped by tanker, train or truck. Most terminals in the state where ethanol will be blended into the gasoline have made necessary modifications, which include the addition of rail facilities to deliver ethanol and increasing the storage available for ethanol.[50]

The substitution of ethanol for MTBE decreased the capacity of refineries supplying the CA CBG blend because the proportion per gallon of additive is less when using ethanol, thus for the same amount of crude refined, there is produced less gallons of gasoline to be distributed to California CA CBG consumers. [51] Another side effect of the ethanol substitution is decrease fuel economy. A gallon of the current CA CBG has less energy than a gallon of the previous MTBE blend, which means overall miles per gallon decreases and is a direct increased cost to consumers. [52]

From 1990 to 2001 California refiners upgraded their facilities at a cost of $5 billion. Some smaller refineries do not have the ability or incentive to invest such large sums in order to supply the CA CBG fuel blend. Four small refineries shut down while others export to surrounding states that do not require such upgrades.[53] The result is that overall capacity to supply Californians decreased. California must import CA CBG and diesel from out of state, either from other U.S. states or from Europe or the Caribbean. There are relatively few suppliers of this blend out of state and they are costly and slow to arrive during shortages. [54] When an unplanned refinery outage occurs, replacement supplies must be brought in via marine tanker. Locating and transporting this replacement gasoline (which must conform to the State's strict fuel requirements) can take from two to six weeks. [55]

The ability of California's existing petroleum infrastructure to keep up with demand for petroleum-based products in general is slipping; however, with the addition of a more complex fuel blend, the existing infrastructure is rapidly losing capacity to supply Californians with the appropriate gasoline at a reasonable price. Refineries spend a considerable share of their profits maintaining existing facilities.

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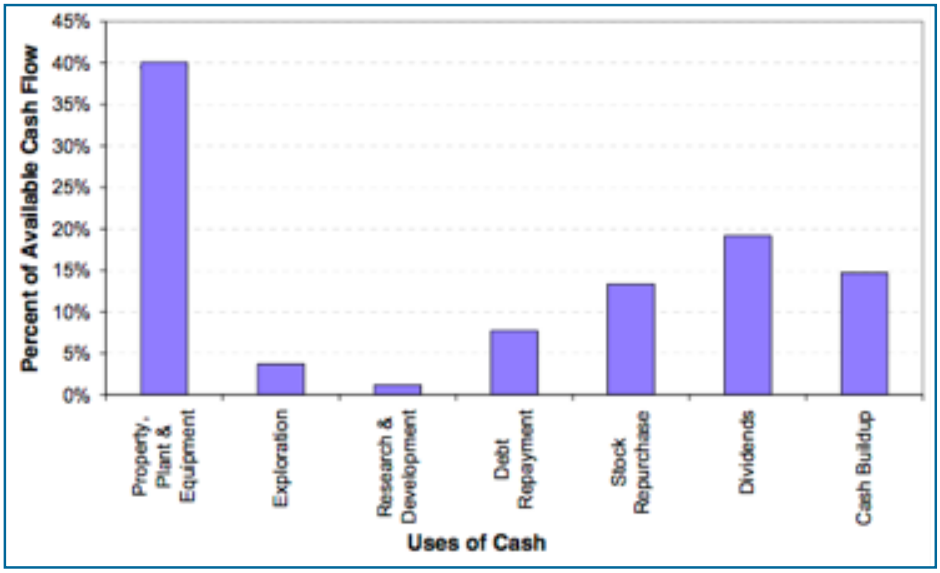
46. Charli E. Coon, "Congressional Mandates Contribute to Higher Gas Prices," The Heritage Foundation, 2004 <www.heritage.org/Research/Regulation/em932.cfm>.
47. EIA California State Profile: Overview Petroleum, found online here: tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=CA.
48. IBID
49. W. David Montgomery, et al., "The Social Costs of an MTBE Ban in California," Regents of the University of California, 2004.
50."An Assessment of California's Petroleum Infrastructure Needs: In Support of the 2005 Integrated Energy Policy Report," California Energy Commission Staff Report. Apr .2005: 28, CEC-600-2005-009.
51. Severin Borenstein, et al., "Market Power in California's Gasoline Market," University of California Energy Institute (UCEI), May 2004.
52.W. David Montgomery, et al., "The Social Costs of an MTBE Ban in California," Regents of the University of California, 2004: 24.
53. Michael Keeley, "An Economic Evaluation of the CA Energy Commission's 2005 Integrated Energy Policy Report and an Alternative Blueprint for California Transportation Fuel Policy," Cornerstone Research, California: 10 May 2006: 33-34.
54. IBID
55. EIA, State Profiles: California, found online here: http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=CA.

Figure 39: Major Uses of Cash by Five Major Petroleum Companies 2004

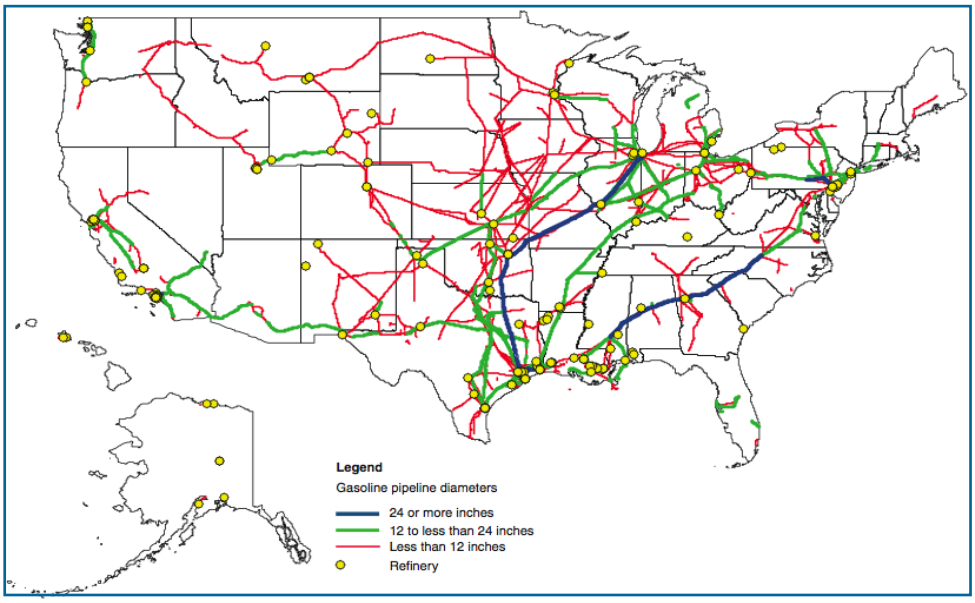


The effect of a proliferation of different fuel blends serves to fragment the existing infrastructure, complicating the processes of supply, refinement and distribution, and ultimately decreasing capacity and increasing prices for the consumers.

3. Refinement of Crude Oil into Differentiated Distillates

California has over twenty operating refineries that have the capacity to produce 2,042,188 barrels per day, while actual output is at 98.3% of capacity.[56] There are a total of 150 refineries in the United States that produce 17,225,797 barrels per day. California refines slightly over 12 percent of the nation's refined fuel. California is the third largest refiner in the United States after Louisiana (17.1%) and Texas (26.2%).

Figure 40: Map of Key Pipelines and Refineries, 2004



Source: GAO analysis of Department of Transportation and the Energy Information Administration data

56. "National Petrochemical Refiners Association (NPRA) United States Refining and Storage Capacity Report," Jan 2008, <http://www.npradc.org/docs/publications/statistics/RC2008.pdf >.

California refineries are the essential infrastructure for converting crude oil into the state's differentiated distillate fuel blends. In total, California boasts 12.2% and 2.2% of the U.S. and world refinement capacity, respectively. [57] However, of the 22 refineries in the state, only fourteen have made the upgrades necessary to produce California's "differentiated" blend of gasoline fuel. In short, while California may have large refinery capacity in general, not all of the products are intended for the California market. New standards as well as burdensome permitting processes, state and local regulations, mean fewer refiners want to make the upgrades to refine for California even as the demand for this product is actually growing. Some out-of-state refiners are stepping into the market opportunity, but being further away actually increases California's risk for supply disruption since it takes so long for this fuel refined further away to actually arrive.

Figure 41: California Operable Petroleum Refineries as of January 1, 2008

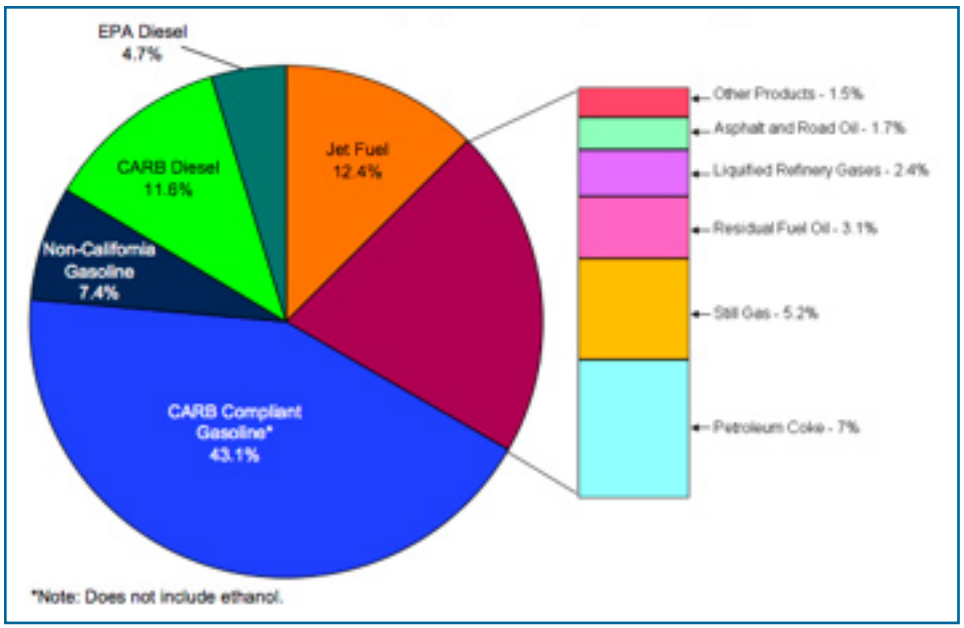
Refiner/Location	Barrels Per Day (in thousands)		Producing CARB Gasoline
	Operating	Idle	
Big West of California			
Bakersfield	66		Yes
BP West Coast Products LLC			
Los Angeles	265		Yes
Chevron USA Inc			
El Segundo	260		Yes
Richmond	242.9		Yes
ConocoPhillips Company			
Arroyo Grande	44.2		No
Rodeo	76		Yes
Wilmington	139		Yes
Edington Oil Co. Inc			
Long Beach		35	No
ExxonMobil Refining & Supply Co			
Torrance	149.5		Yes
Greka Energy			
Santa Maria	9.5		No
Kern Oil & Refining Co			
Bakersfield	26		Yes
Lunday Thagard Co			
Southgate	8.5		No
Paramount Petroleum Corporation			
Paramount	53		Yes
San Joaquin Refining Co Inc			
Bakersfield	15		No
Shell Oil Products US			
Martinez	155.6		Yes
Tenby Inc			
Oxnard	2.8		No
Tesoro Refining & Marketing Company			
Martinez	166		Yes
Wilmington	97		Yes
Ultramar Inc			
Wilmington	80.9		Yes
Valero Refining Co California			
Benicia	144		Yes
Wilmington	6.3		No

Sources: Energy Information Administration, Refinery Capacity 2008; CEC (2005)

Refineries are concentrated in three areas: Los Angeles, San Francisco and Bakersfield.

Crude oil is supplied to these refineries through a network of local pipelines and deliveries through adjacent ports. As referenced below, the state's refineries process the crude oil into several different products, with gasoline accounting for 61% of all output.

Figure 43: California Refinery Output in 2005 by Product Type



Source: CEC PIIRA Database

In order to fulfill the unique and stringent operating environment and complex and expensive fuel standards demands of the state, California refineries have evolved to become some of the most productive, complex and advanced refineries in the world. Consider the following:

- California refineries have been operating near 91% capacity since 1999 and actual output was at 98.3% of capacity for 2008. Minor modifications have allowed creeping growth to attempt to keep up with demand.

Company	Location	EIA Capacity 2001 (b/d)	EIA Capacity 2006 (b/d)	Capacity Increase or Decrease (b/d)	Owner in 2001
Big West of California	Bakersfield	66,000	66,000	0	Shell
Chevron U.S.A. Inc.	El Segundo	260,000	260,000	0	
Chevron U.S.A. Inc.	Richmond	225,000	242,901	17,901	
ConocoPhilips Co.	Arroyo Grande (Santa Maria)	41,800	44,200	2,400	Tosco
ConocoPhilips Co.	Rodeo (San Francisco)	73,200	76,000	2,800	Tosco
ConocoPhilips Co.	Wilmington (Los Angeles)	131,000	139,000	8,000	Tosco
ExxonMobil Refining & Supply Co.	Torrance	148,500	149,500	1,000	
Paramount Petroleum Corp.	Paramount	46,500	50,000	3,500	
Shell Oil Co.	Martinez	159,250	155,600	-3,650	Equilon
Shell Oil Products US	Wilmington (Los Angeles)	98,500	98,500	0	Equilon
Tesoro Refining & Marketing Co.	Martinez (Avon)	166,000	166,000	0	Tosco
Valero Refining Co.	Wilmington	78,800	80,887	2,087	Ultramar
Valero Refining Co.	Benicia	129,500	144,000	14,500	
BP West Coast Products LLC	Los Angeles	260,000	260,000	0	Arco
Totals		**1,884,050**	**1,932,588**	**48,538**	
Annual Capacity Growth				**0.50%**	

Source: EIA Petroleum Supply Annual. EIA Refinery Capacity Report, 2001 and 2006

But such creeping growth cannot be sustained forever. Most refinery capacity growth will likely be happening outside of California.

Figure 45: U.S. and CA Refinery Capacity Growth Outlook, TBD

Year	US Capacity January 1 (TBD)	Announced Expansions (TBD)	Capacity Creep (TBD)	Total Growth (TBD)	US Capacity December 31 (TBD)
2006	17,317	120	87	207	17,524
2007	17,524	55	88	143	17,666
2008	17,666	60	88	148	17,815
2009	17,815	240	89	329	18,144
2010	18,144	505	91	596	18,739
2011	18,739	0	94	94	18,833
2012	18,833	0	94	94	18,927
2006 - 2012		980	630	1,610	

Year	California Capacity January 1 (TBD)	Announced Expansions (TBD)	Capacity Creep (TBD)	Total Growth (TBD)	California Capacity December 31 (TBD)
2006	2,005	0	10	10	2,015
2007	2,015	5	10	15	2,030
2008	2,030	45	10	55	2,085
2009	2,085	0	10	10	2,096
2010	2,096	0	10	10	2,106
2011	2,106	0	11	11	2,117
2012	2,117	0	11	11	2,127
2006 - 2012		50	72	122	

Source: Company websites & press releases; Oil & Gas Journal Construction reports.
California data also from Ethanol Renewable Fuels Association

California's projected refinery growth rate lags the nation and rest of the world significantly, exacerbating California's fuel vulnerability. In most industries, such favorable market dynamics would attract new competitors and, as a result, the increased competition would drive down lower prices for consumers. The regulatory and operating barriers for California refineries, however, are so significant that a new refinery has not come online since 1969 (the last refinery built in the US was built in Louisiana in 1976). In fact, twenty refineries have closed since 1980—including four since 1995. According to industry experts, it is extremely unlikely that any more refineries will be built in California for the foreseeable future.

Figure 46: Refining Additions Announced as of July 2006

Year In Operation	Refiner	Location	Atmospheric Distillation Capacity (TBD)
2006	Coffeyville Resources	KANSAS, Coffeyville	15,000
2006	Gary-Williams Energy	OKLAHOMA, Wynnewood	20,000
2006	Navajo Refining Co.	NEW MEXICO, Artesia	10,000
2006	Valero Energy Corp.	TEXAS, Port Arthur	75,000
2007	ConocoPhillips	CALIFORNIA, Rodeo & Santa Maria	5,000
2007	Flint Hills Resources	MINNESOTA, Rosemount	50,000
2008	ConocoPhillips	CALIFORNIA, Los Angeles (Carson & Wilmington)	45,000
2008	Frontier Oil Corp.	KANSAS, El Dorado	11,000
2008	Holly Corp.	UTAH, Woods Cross	4,000
2009	ConocoPhillips	ILLINOIS, Wood River	25,000
2009	ConocoPhillips	LOUISIANA, Belle Chasse	40,000
2009	ConocoPhillips	MONTANA, Billings	25,000
2009	Sunoco Inc.	PENNSYLVANIA, Philadelphia	100,000
2009	ConocoPhillips	TEXAS, Sweeny	40,000
2009	ConocoPhillips	WASHINGTON, Ferndale	10,000
2010	Marathon Ashland	LOUISIANA, Garyville	180,000
2010	Motiva Enterprises	TEXAS, Port Arthur	325,000

Source: Company websites & press releases; Oil & Gas Journal Construction reports.

Refiners point to regulatory and institutional factors as the primary impediments to more aggressive refinery expansion plans in the state. These factors contribute to higher costs of undertaking new projects, compared to costs in other parts of the country. With some exceptions, there appears to be a general perception among refiners that California is not a hospitable or receptive state in which to consider major expansion. In essence, corporate investments in expanded refining capacity in the state do not measure up well against other supply options available to the industry. The only augmentations of capacity that have existed in recent years have included a change-over to CARB gasoline production with Paramount Petroleum in 2005, and the transfer of the Shell refinery in Bakersfield to Big West, LLC in 2005 with a potential for possible expansion. Meanwhile other states have had their refinery capacity increase.

The result is that overall capacity to supply Californians decreased. According to the National Petroleum Council, expansion at existing facilities is the only economical way to increase capacity;[59] however, permitting processes and environmental policy uncertainty discourage the level of investment needed to meet demand growth in the future. Current refining capacity is growing, but at a decreasing rate.[60] According to the CEC, with some exceptions, there appears to be a general perception among refiners that California is not a hospitable or receptive state in which to consider major expansion. In essence, corporate investments in expanded refining capacity in the state may not measure up well against other supply options available to the industry.[61]

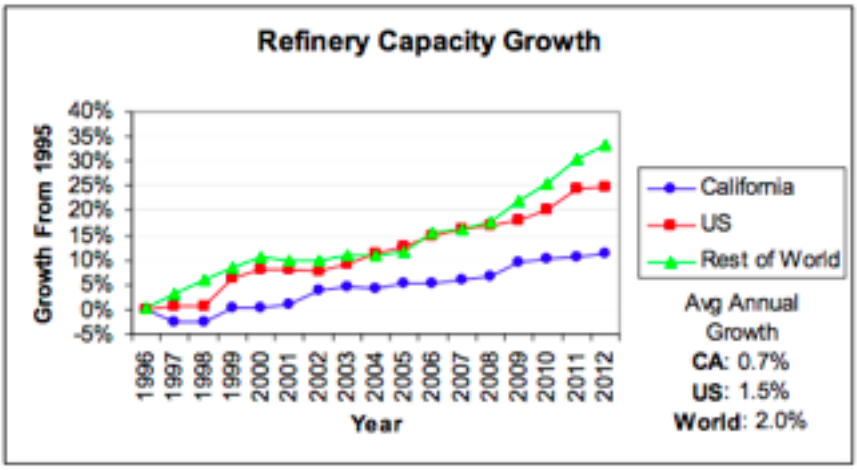
This is happening because of the state's regulatory environment, permit process, and widespread civil opposition to refinery projects in many California communities. Even the cost of significantly expanding an existing refinery, let alone building a new one, carries enormous risk. According to Bob Slaughter, the former President of the National Petrochemical & Refiners Association, a new refinery would likely cost in excess of $2 billion dollars and take at least 10 years to build, depending on how long it takes to get the permits.[62]

Refineries that have opted to continue operating in California have done so at a price: state refineries have invested nearly $6 billion to comply with the state's gasoline rules—which limit emissions and toxins. Such rules increase the costs of refining gasoline. Refining costs for California include higher than average costs for refineries since they must meet oxygenation and reformulation standards that are different than the typical gasoline produced for the rest of the country. The California Air Resources Board estimates that the additional costs of producing this "CARB" reformulated gasoline over conventional gasoline to be between five and fifteen cents per gallon.

As California's refineries bear the cost of compliance and are subject to a prohibitive building permit environment, they have been unable to keep their capacity in line with demand. Indeed, despite an 18% surge in demand for California gas between 1995 and 2006, capacity increased by only 0.5% per year compared to the U.S. average of 1.3% per year. As a result, Figure 12 demonstrates that over 1.6 billion gallons of gasoline—or ten percent of total demand—had to be imported in 2005. Forecasts indicate that gasoline imports could rise to as high as 19% to accommodate growing demand. Importing CARB gasoline from the few refineries out of state that produce it, is costly and slow, as imports mainly come through the ports, which as discusses above, have many restrictions and limitations.[66]

59. "Observations of Petroleum Product Supply," Dec. 2004: 6.
60. Observation on Petroleum Product Supply (2004), National Petroleum Council: p. 6. Available online here: www.npc.org.
61. "An Assessment of California's Petroleum Infrastructure Needs: In Support of the 2005 Integrated Energy Policy Report," California Energy Commission Staff Report, Apr. 2005: 22, CEC-600-2005-009.
62. Dale Kasler, "No New California Refineries Despite Soaring Gas Prices," Oakland Tribune 10 Jun. 2004.
63. "Why does gas cost so much in California?" Contra Costa Times 16 May 2005.
64. Where the state's refineries are able to add capacity, it's through incremental growth at existing facilities—so long as it can be justified economically and passes muster with environmental guidelines.
65. "Energy for California and the West: Supply, Demand and Infrastructure," Western States Petroleum Association, Jan 2008 < http://www.wspa.org/downloads/Supply-Demand-Infrastructure-January-2008.PPT>.(Data sources are CEC, US EIA, CARB and Oil and Gas Journal.)
66. Michael Keeley, "An Economic Evaluation of the CA Energy Commission's 2005 Integrated Energy Policy Report and an Alternative Blueprint for California Transportation Fuel Policy," Cornerstone Research, California: 10 May 2006.

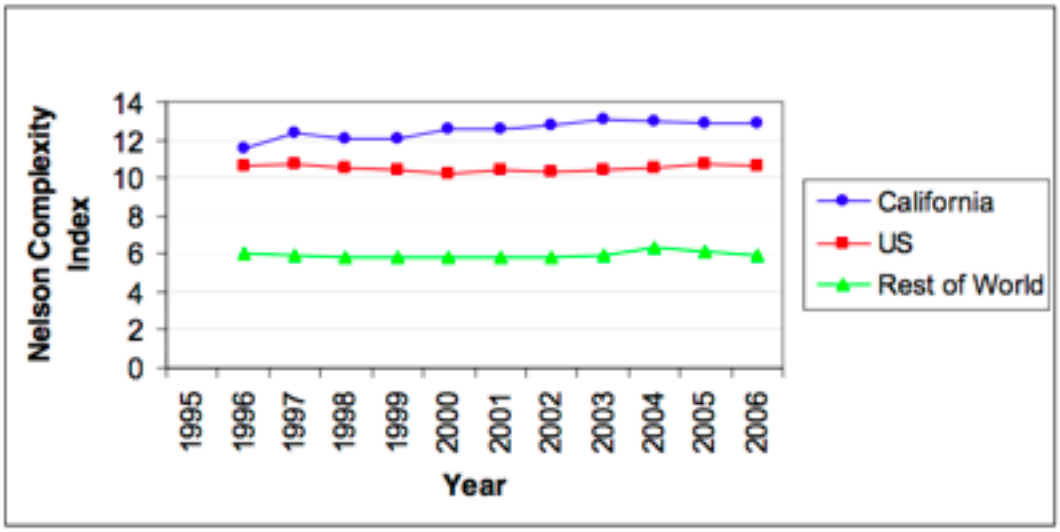
Figure 47: Global Expansion vs. United States and California



Source: Historical EIA Petroleum Supply Annual EIA Refinery Capacity Report and Oil Gas Journal. Worldwide Refining Survey, Forecast based on ICF Estimates.

The Nelson Complexity Index is a system that produces a "complexity factor" by adding up the complexity values assigned to all major pieces of refinery equipment and multiplying them by their crude distillation capacity. A more "complex" refinery will have a higher index number and therefore more costly equipment and a higher value. According to the Nelson Complexity Indicator, California refineries have double the complexity of the average global refinery and a higher degree of complexity relative to U.S. counterparts.[67]

Figure 48: Refinery Complexity

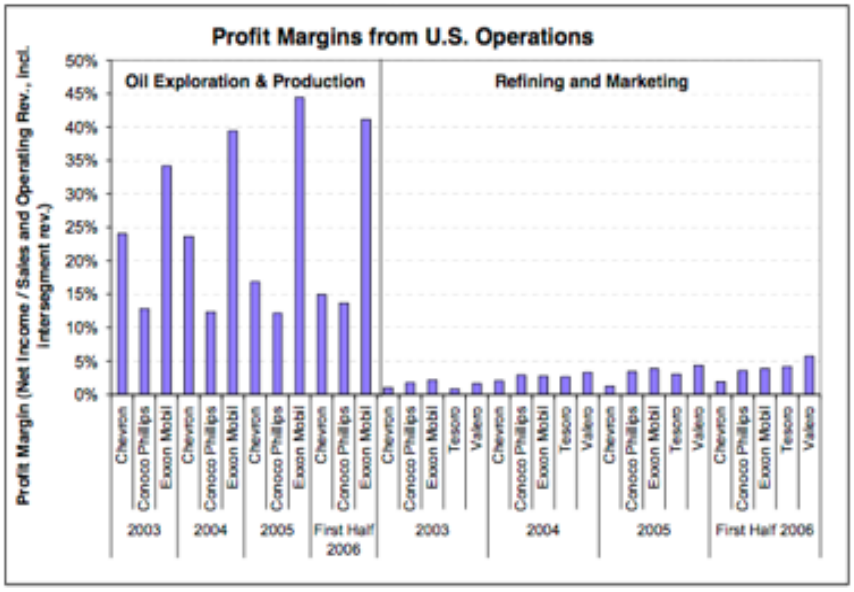


Source: Oil and Gas Journal Worldwide Refining Survey. ICF graphic.

However, profit margins for California refiners are very low considering the substantial capital investment necessary and ongoing costs of maintenance and operation.

67. "Spring 2006 Petroleum Fuels Spike Report to the Governor," California Energy Commission, 2006: 26-27

Figure 49: Profit Margins from US Operations



Source: CEC analysis of company management reports, SEC 10-K, 10-Q, 20-F and 6-K filings

4. From Refineries to Retailers

Once oil has been processed into gasoline or diesel, the fuel is shipped from the refinery, usually through a pipeline, to a refiner's terminal or to a wholesaler. California's pipeline infrastructure is divided into crude and clean fuels pipelines. The crude pipeline has excess capacity and delays are rare; however, the clean fuels pipeline networks, particularly gathering lines that deliver fuel from refineries and ports to the main Kinder Morgan lines, are near capacity. This is particularly true during the summer months. When the lines are congested alternatives include trucking and, in the Bay Area, using barges.

Figure 50: Northern California Kinder Morgan Pipeline System

Source: Kinder Morgan

Figure 51: Southern California Kinder Morgan Pipeline System

Source: Kinder Morgan

Kinder Morgan owns the major pipeline network that delivers clean fuels to distributors. Some refineries have trouble acquiring access, not to mention independent traders. Market access and access to the necessary infrastructure for fuel storage and delivery contributes to higher prices. A Chemoil facility recently expanded storage, but has not been granted access to the pipeline since it is a competitor of Kinder Morgan in the storage industry. Independent traders act as market regulators, taking advantage of price spikes by importing more fuel during shortages, whereas, others do not have the short term incentive. These traders have difficulty entering the market due to inability to access the necessary infrastructure. In the Chemoil case the storage facilities are intended for use by independent traders who will not use it unless it has access to the main distribution pipeline. [68]

Most of the State's existing pipelines were built during the 1950s and 1960s; however, they are long lasting and do not need major updating. There are current projects maintaining and expanding the pipeline infrastructure. As shown in the above images, the Kinder Morgan pipeline network is not linked between Northern and Southern California.

68. "An Assessment of California's Petroleum Infrastructure Needs: In Support of the 2005 Integrated Energy Policy Report," California Energy Commission Staff Report. Apr. 2005: 22, CEC-600-2005-009.

Like the state's refineries, retailers, too, are affected by the cost of complying with California's environmental regulations. By April 1 of 2009, the state is requiring to install new gas-dispensing nozzles that reduce smog-causing vapor emissions by 43 percent. The new nozzles are estimated to cost approximately $11,000—with most gas stations requiring six or eight of them. As many as 3,400 retail outlets have yet to comply with the requirement. According to press reports, at least 150 independently-owned gasoline stations in the state are prepared to close their operations.[69]

At the time of this writing, the state is at a major crossroads in mapping the future of importing, exporting, refining and distributing petroleum-based fuel. In 2007, the California Energy Commission summarized [70] some of the major constraints facing our petroleum infrastructure, namely:

- Important segments of the state's existing fuel infrastructure are already being used at or near capacity.
- The current capacity of existing marine infrastructure, particularly in the Los Angeles Basin, could decline as a result of the pressure to remove petroleum facilities from port areas and from requirements to meet seismic standards implemented by the State Lands Commission.
- Petroleum marine terminal capacity, marine storage, and gathering pipelines that connect marine terminals with refineries will have to expand to meet expected demand for fuels (primarily in Los Angeles)
- Expansion of transportation fuel marine infrastructure will become more difficult in the Los Angeles Basin as available land becomes increasingly scarce and subject to competing uses and because residents, community groups, and local authorities have expressed substantial resistance to such expansion.

5. Jet Fuel

Commercial aviation is vital to California's economy, supporting both tourism and California's residents and businesses. Commercial aviation generates $186 billion annually in economic activity in the state, and is ultimately responsible for 1.5 million jobs. Any tax increase of the magnitude that would result from the Carbon Tax can only have a detrimental effect on those contributions. In fact, due to the economic conditions of the industry, airline schedules for the fourth quarter of 2009 show that California will have lost 16.5 percent of its scheduled-air-service flights compared to 2007; imposing additional taxes will certainly not reverse that trend. In addition, imposing a Carbon Tax would provide carriers with even more of an incentive than currently exists to tanker in fuel on aircraft arriving from other states. This would result in the state not only not receiving any Carbon Tax on that fuel, but also losing the existing sales taxes on the additional tankered fuel (and ironically increasing carbon emissions as aircraft would be carrying and therefore burning more fuel than otherwise necessary).

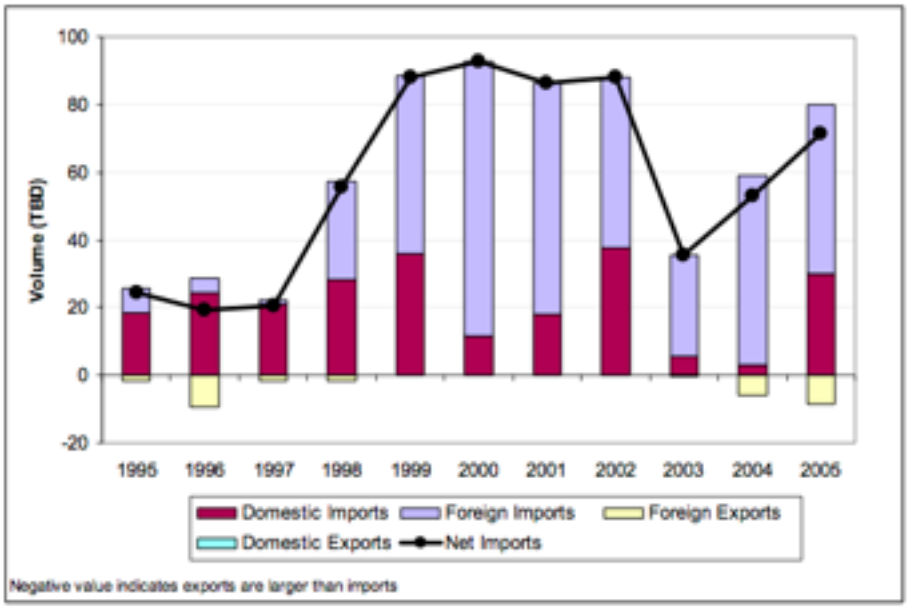
Statement in a June 26, 2009 letter from James C. May, President and CEO of Air Transport Association to Mr. Gerald Parsky, Chair of California Commission on the 21st Century Economy.

California's jet fuel supply hindrances mirror in many ways that of gasoline and diesel in that it has developed into a somewhat unique set of circumstances compared to other states and the United States—California tax policy, boutique fuel requirements, refinery capacity, storage and transportation limitations, and geographical isolation:

69. "Costly Clean Air Regulations Could Close 50 Gas Stations in OC," Orange County Register, 24 Mar. 2009.
70. California Energy Commission, "Integrated Energy Policy Report," 2007: 210 <http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF>.

- Because of limited pipeline capacity and geography, jet fuel must be imported by tanker to California. In times of normal, growing demand, California is a net short market for jet fuel, meaning imports are required. In addition, fuel produced and imported to California is used to supply airports in Nevada and Arizona. Understandably, jet fuel demand dropped considerably in the last year due to economic circumstances, which is evidenced by the sharp drop in jet fuel import activity. However, when the economy ultimately turns around, demand will start to grow again as will the risks associated with California's growing dependence on imports. From 2004 to 2007, LAX imported over 50% of needed jet fuel from out of state.

Figure 52: Global Expansion vs. United States and California



Source: ICFI Analysis based on data from various sources

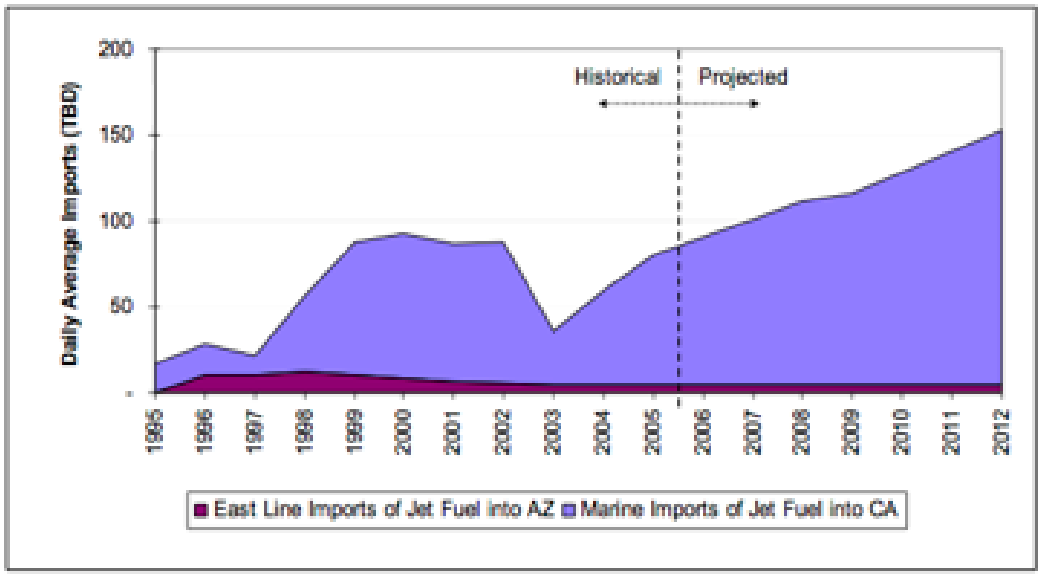
- California port capacity is also a barrier. When one jet fuel tanker is at the port, another jet fuel tanker cannot ship in. Also, to reach California port facilities, shoals have to be crossed and jet fuel tankers have to be light to navigate safely. For example, a 30-ton ship can only be at 50% capacity to make it across the shoals and into California ports.

- The ability to maintain sufficient supply of imported jet fuel is currently constrained by the amount of available jet fuel storage. The fuel committees at LAX and SFO initiated projects several years ago to ensure sufficient jet fuel storage on- and off-airport, but jet fuel storage remains a challenge despite airline's investment.

- In 2013, Kinder Morgan is supposed to remove their pipeline facilities with no option to reinstate them. California's airline industry is currently totally reliant on their facilities to transport jet fuel imports. If the Kinder Morgan pipeline is not available, airline jet fuel options will be extremely limited.

- California's constrained refinery capacity further impacts jet fuel supply. Additionally, the introduction of CARB reformulated gasoline gave the California refiners an incentive to maximize production of those products and cut the production of jet fuel, which then needs to be imported from offshore. However, this strong reliance on jet fuel imports makes the California airline industry very susceptible to "shocks to the system" and subsequent jet fuel price spikes. California jet fuel prices were the first to escalate after the introduction of CARB fuel.

Figure 53: Global Expansion vs. United States and California



Source: CEC report: *"Forecasts of California Transportation Energy Demand 2005-2025: In Support of the 2005 Integrated Energy Policy Report"*, CA BOE Taxable Fuel Sales Database, EIA Annual Energy Outlook 2006, Kinder Morgan Pipeline Flows, Wilson Gillette & Co Jones Act Data, ICF Estimates.

- Because California depends on jet fuel imports, the state becomes susceptible to other risks that affect pricing and jet fuel availability. The state is not only impacted by competition with other local states, but by increasing Asian market demands. Because California lies on a direct route to Asia and has no direct links to the refineries in the Gulf Coast like the rest of the U.S., buyers will measure the costs of locally produced California jet fuel against the cost of jet fuel produced in Asia. If the cost of jet fuel produced in Asia plus the transportation costs of importing the jet fuel from Asia to California is less that the cost of producing jet fuel in California, traders will elect to import fuel from Asia.

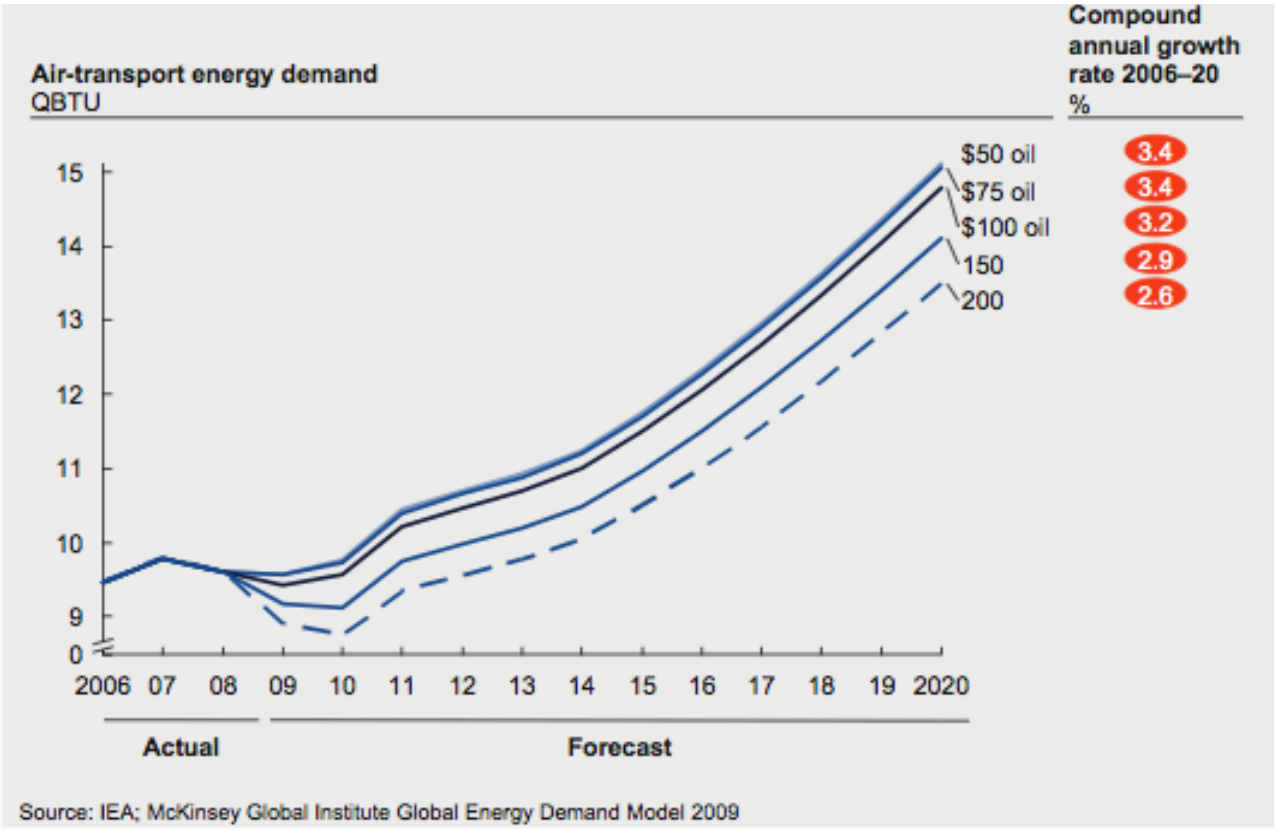
- As California increases the use of bio-diesel, there is an increased risk of jet fuel picking up FAME (fatty acid methyl ester) when the distribution channel includes multi-product ships or pipelines. FAME contamination requires separation of the entire batch of jet fuel until the FAME can be filtered or blended out, which impacts both fuel supply and available storage.

California's largest airline, United Airlines, is a real-world example of the significant disadvantages faced by large fuel consumers in California. United's price for jet fuel in California is anywhere from 8-10 cents above the price in the U.S. Gulf Coast, which is the major source of jet fuel for airlines throughout the rest of the United States. In California, there are no pipelines to the major refining complexes like there are in the rest of the United States. United is therefore dependent on Asian and Caribbean jet fuel imports to meet the demand. What clearly differentiates the California fuel environment for United Airlines from its operations in the rest of the U.S. is that California fuel sells at a premium on top of a 4.3% federal excise tax. For example, United's competitor, American Airlines, has a hub in Dallas, Texas, which has no sales tax and a direct link to the Gulf Coast.

A Carbon Tax, if implemented in California, would severely affect airline competitiveness in the state, resulting in a tax of approximately 18 cents per gallon on jet fuel. California already imposes the highest statewide tax on jet fuel of any of the 50 states. Early estimates illustrate that a Carbon Tax would cost air carriers in excess of an additional $500 million annually, at a time when the airline industry can least afford it. U.S. passengers and cargo carriers have reported losses of over $55 billion over the last eight years, with additional losses expected for 2009. Today, fuel is the airlines' largest cost center—airlines have every incentive to continue to reduce fuel burn and emissions.

In 2008, the airline industry spent almost $60 billion on fuel alone; the size of a carrier's fuel bills often mean the difference between profit and loss in any given year. On a seat-mile basis, the U.S. airlines have improved their fuel efficiency by more than 110% since 1978. In absolute terms, airlines burned 3% less fuel—and emitted 3% less carbon—in 2007 than they did in 2000, despite hauling 20% more passengers and cargo. These advances have been achieved by spending money—purchasing new aircraft, acquiring new engines, installing advanced avionics, retrofitting airframes with winglets and other efficiency enhancers. A Carbon Tax would divert millions of dollars from the airline industry that it would otherwise use to continue these advances; it would also inhibit related economic growth created by airlines.

Figure 54: Higher Jet-Fuel Price Scenarios Depress Air Transport Energy Demand Significantly



Source: IEA; McKinsey Global Institute Global Energy Demand Model 2009

Of course, ultimately all of these additional costs are borne by California consumers or visitors in the form of higher airfares. As already discussed in this report, jet fuel is a refined component of oil imported into California that is an essential industry for transporting tourists to, within, and from California. As fuel costs increase, additional costs are passed on to the traveler in the form of higher ticket prices. Coupled with lowered accessibility to fuel in California due to it being a "fuel island," and reliance on imported oil, airlines are particularly vulnerable to high fuel prices and changing regulations. As indicated by the chart above, air-transport demand is very susceptible to decline depending on the level of jet-fuel costs and related ticket prices.

As a result, many travelers will likely reduce or cancel their travel plans to California to avoid these higher costs, especially during a time of economic recession. Fewer travelers will cause declines in tourism jobs, a major California employer sector. This is especially troublesome for Los Angeles County, where tourism is now the largest employer according to a recent report by the Los Angeles Economic Development Corporation (LAEDC), outlined in a June 25, 2009 Los Angeles Times article titled "Tourism industry is L.A. County's No. 1 job generator, report shows."

Policies that Affect Fuel Supply and Cost in California

California fuel policy enacted to address issues such as global warming, air pollution, and environmental contamination have undeniably had a significant influence on the cost and availability of fuel in the state. These policies are unique to California, thus setting it apart from other states. While California policies in the transportation arena have been adopted by other states, given the nature of California supply chain situation, these policies have a disproportionate impact upon California.

California Fuel Policies

The policies put in place in California that have the broadest impact are the following:

California Air Resources Board Low Emission Vehicle (LEV) Program

The LEV program implemented in the early 1990s sought to reduce transportation emissions in California. One component sought to establish regulatory links between fuel quality and engine technology and encouraged the development of vehicles that emitted lower quantities of air pollution. Another component of the LEV program sought to promote the sale of electric vehicles. This component is widely considered to be a failure because automobile manufacturers argued that battery technology was not advanced enough for commercialization and a proper infrastructure for recharging electric vehicles was not established enough for the public to trust that electric vehicles could have sufficient range before needing a recharge at a convenient charging station.[71]

Phase-Out of Gasoline Additive MTBE

California was one of the first states to ban the gasoline oxygenate additive methyl tertiary butyl ether (MTBE) after it was detected in ground water. Ethanol, a non-petroleum product usually made from corn, is being used in place of MTBE. Gasoline with ethanol requires changes in the way it is produced and distributed. Some supply dislocations and price surges occurred in the summer of 2003 as the state moved to ethanol and away from MTBE. A report entitled "The Social Costs of an MTBE Ban in California" concluded that "the continued use of MTBE in California gasoline has clear and significant benefits relative to either the use of ethanol or the use of non-oxygenated RFG."[72] The substitution of ethanol has enormous cost relative to the benefits and the many overlapping policies regulating gasoline formulation mean that a change in one ingredient can force the change in others, which may have outcomes not foreseen or intended.

AB 2076 (2000)

Assembly Bill 2076 is legislation that recommends increasing biofuel uses in California. It encourages increased alternative fuel uses so that alternative fuels comprise twenty percent of automobile and truck fuels by 2020 and thirty percent by 2030. It also contains provisions to increase fuel efficiency in vehicles. A report entitled "Reducing California's Petroleum Dependence" made recommendations to increase the use of alternative fuels to 20 percent of on-road transportation fuel use by 2020 and 30 percent by 2030, significantly increase the efficiency of motor vehicles, and reduce per capita vehicles miles traveled. [73]

AB 1493 (2002)

Assembly Bill 1493 is legislation that requires lower greenhouse gas emissions in cars, trucks and sport utility vehicles by the 2016 model year starting in the 2009 model year. In order for this to happen, the California Air Resources Board has requested a Section 209 waiver from the Environmental Protection Agency to be able to supersede the Federal Government's authority to regulate fuel economy. For greenhouse gas emissions to be reduced, vehicle fuel efficiency (miles per gallon) needs to increase. Forty percent of

71. Larry Waterland, "California Alternative Fuels Market Assessment 2006," California Energy Commission, 16 Oct. 2006 < http://www.energy.ca.gov/ab1007/documents/2006-10-16_joint_meeting/presentations/WATERLAND_2006-10-13.PDF>.
72. W. David Montgomery, et al., "The Social Costs of an MTBE Ban in California," Regents of the University of California, 2004: 19.
73. This report is located at: www.energy.ca.gov/reports/2008-08-14_600-03-005.PDF

greenhouse gas emissions come from automobiles and trucks so any effort to reduce greenhouse gas emissions necessarily requires increased mileage in these vehicles. Twelve other states have joined in with this petition in their attempt to follow California's lead in greenhouse gas emissions.

Given this wide ranging impact, auto makers resisted this legislation and the Bush Administration denied California's right to set separate standards through a waiver on the Federal authority to set air quality standards through the Environmental Protection Agency. In early 2009, the Obama Administration began a review of this decision, which reversed the initial denial.

AB 1007 (2005)

Assembly Bill 1007 requires the California Energy Commission to propose methods to increase the use of alternative fuels in California. The methods are aimed at resulting in 20% of petroleum fuel displacement with alternative fuels by 2020 and 30% of petroleum fuels by 2030. A plan was adopted in December 2007.[74]

California Low Carbon Fuel Standard (2007)

As a result of the findings of State Alternative Fuels Plan report, the Governor issued Order S-1-07 on January 2007 to require a 10% carbon reduction in fuels by 2020. In order to meet such requirements, fuel providers must ensure that the mix of fuel they sell in California meet a declining standard for greenhouse gas emissions. This is expected to result in a tripling of California renewable fuels market with 20% of gasoline consumption being replaced with lower-carbon fuels. Starting in 2010 through 2020, California will begin the process of phasing in requirements that adjust the fuel content consumed in California. After a review and implementation of the best available technologies through 2010, by 2015 a three percent reduction in carbon intensity should be achieved and a six percent reduction in carbon intensity should be achieved by 2020. The declining standard of greenhouse gas emissions are to be measured in carbon dioxide equivalent units as measured across the lifecycle of carbon from consumption and production. This ensures that "upstream" emissions of greenhouse gases emitted in the production of fuel also are counted as well as the "downstream" emissions from the actual combustion of the fuels in engines.

Fuel providers are given the option of how they will accomplish the goals set forth by the declining standard. Using market-based mechanisms in a cap-and-trade program, fuel suppliers will be able to choose how they will reduce emissions, either directly through mixing renewable ethanol into the fuel, purchasing credits from electric utilities who supply electricity to electric vehicles or invest in future hydrogen technologies. The California Air Resources Board will have the authority to conduct random audits of suppliers; fuel suppliers that do not comply will be charged a fee both as a penalty to encourage compliance and as an offset for the projected cost of greenhouse gas caused by global warming.

Between 2010 and 2020, a twenty percent reduction in gasoline consumption is expected as a result of a projected tripling of the size of the renewable fuels market (corn, cellulose, sugar cane and/or switch grass ethanol) and the utilization of at least seven million electric or hybrid vehicles in California through an expected expansion of the market for these vehicles through technological changes expected to be implemented over the next decade. Furthermore, since transportation is such a large component of greenhouse gas emissions for the state, achieving a ten percent cut in carbon emissions will constitute nearly half of the required greenhouse gas emission cuts required by AB 32 to reduce greenhouse gas emissions to 1990 levels by 2020. Thirteen additional states may utilize this standard as well. These standards were adopted by the California Air Resources Board in June 2007 as Early Action Measures for fulfillment of the goals set forth by AB 32, The Global Warming Solutions Act, as a part of fulfilling AB 1007.

Bioenergy Action Plan (2005)

The Bioenergy Action Plan is a plan that documents various means by which bioenergy can be extracted from renewable natural

74. This legislation resulted in the publication and adoption of the State Alternative Fuels Plan, which can be found here: http://www.energy.ca.gov/2007publications/CEC-600-2007-011/CEC-600-2007-011-CMF.PDF.
75. Bioenergy Interagency Working Group, "Bioenergy Action Plan for California," July 2006 <http://www.energy.ca.gov/2006publications/CEC-600-2006-010/CEC-600-2006-010.PDF>.

resources. Included within this plan, regarding electricity generation, methane recovery and transportation enhancement, are specific actions with regards to fuel policy. Out of this report arose Executive Order S-06-06, where Governor Schwarzenegger established a target that a minimum of twenty percent of California's biofuels be produced within the state by 2010, forty percent by 2020 and seventy-five percent by 2050. [75]

AB 32 Global Warming Solutions Act of 2006

Assembly Bill 32 requires greenhouse gas emission reductions from all sectors to 1990 levels by 2020. This is a 29% cut in greenhouse gas emissions from current projected emissions for 2020. The California Air Resources Board has released "Early Action Measures" to begin to reduce greenhouse gas emissions, with requirements affecting the transportation industry. While AB 32 is not explicitly connected to fuel policies, the broad mandates of legislation have far reaching implications. Under pressure from the AB 32 requirements, other legislation is adopted in order to fulfill the expectations of this law. For example, some of the Early Action Measures to reduce the greenhouse gas emissions from transportation involve reformulating the contents of fuels to include lower carbon life cycle components such as ethanol.

AB 118 (2007)

Assembly Bill 188 directs the California Energy Commission to develop the Alternative and Renewable Fuel and Vehicle Technology Program. Through increases in vehicle registration fees and smog abatement fees, potentially $100 million will be set aside to fulfill financial incentives for investments in alternative fuels.[76]

Petroleum Storage Permit Process

In addition, the development of new petroleum storage facilities is substantially affected by policies that hamper their modification and development.

California Environmental Quality Act (CEQA) of 1970

CEQA requires state and local agencies that grant permits to developments to consider environmental impacts prior to the approval of proposed public or private projects. Conditional Use Permits granted by localities and Authority to Construct air quality permits from air quality regulation boards (e.g., South Coast AQMD) are subject to CEQA. The demands of CEQA therefore require the creation of an Environmental Impact Report which is costly and subject to controversy.

California Permit Streamlining Act (PSA)

The PSA is an update of permit requirements that sets time limits for the issuance of permits and the approval of public agencies. Since it sets strict timelines for CEQA lead agencies to issue permits, hypothetically the CEQA approval process is expedited.

Federal Government Fuel Policies

Overlapping California's fuel policy administration are federal fuel policies. As these policies are implemented, they also result in expectations of increased regulations and costs placed on fuel providers in California. In fact, much of the confusion on what the potential impacts of legislation regarding fuels results from potential overlap and mismatches between California's legislation and federal legislation. Also, given the potentially different policy agenda of the new presidential administration, national standards may conflict with or even supersede California's standards. Historically, California's lead on environmental laws has set the pace for the national debate with federal policy adopting most California policies. However, there is no guarantee of this. One policy proposal in the House of Representatives on greenhouse gas emissions, while similar to California policies on many levels, may reach further than California's policies or contradict them once the proposal completes the legislative process. Because of this, confusion abounds as to whether states such as California should even actively insist on moving forward on fuel standards since national standards may conflict resulting in wasted costs, duplicative efforts, and inefficiencies.

76. Additional information on AB 118 can be found at: www.energy.ca.gov/proceedings/2008-ALT-1/index.html

Clean Air Act of 1990

The Clean Air Act of 1990 promoted a variety of policies to clean the air of urban and rural areas throughout the United States. One component of this effort was the requirement that areas that fail to meet air quality standards must utilize reformulated gasoline in vehicles. Reformulated gasoline contained additives such as methyl tertiary butyl ether (MTBE) and ethanol as oxygenates to help oxygen burn more completely and reduce carbon monoxide. In major cities of California and other high air pollution regions across the country, MTBE was added to gasoline during winter months when air pollution was highest. However, MTBE was discovered to be seeping into ground water with increased risk for health problems. Gradually, California and other regions phased out MTBE (California completed its phase out at the end of 2002) and ethanol has replaced it as an oxygenate. California sought a waiver to the oxygenation requirement, which would have allowed the state to form a blend that did not require the substitution of ethanol, however, that waiver was denied.[77]

Energy Policy Acts of 1992 and 1995

The Energy Policy Act of 1992 encouraged the use of alternative fuel vehicles for public fleets. Many diesel powered public buses have since been converted to compressed natural gas, thus demonstrating the effectiveness of natural gas as a transportation fuel.

The Energy Policy Act of 1995 established a variety of tax credits such as a $0.50 per gallon for alternative fuel usage, a thirty percent credit for developing fueling infrastructure and a credit to cover fifty percent of the incremental cost of alternative fuel vehicles. [78]

Energy Independence and Security Act of 2007 (EISA)

The EISA requires the following transportation mandates to be made:

- Increased automobile mileage requirements (CAFE standards) with a requirement of fleet-wide average mileage of 25 miles per gallon by 2020
- Expanded transportation electrification to support plug-in hybrids
- Conservation requirements for federal fleet vehicles
- Expansion of the production of biofuels: by 2022, biofuel production is required to be thirty-six billion gallons with a requirement that 21 billion gallons of fuel must come for non-cornstarch products such as sugar or cellulose

The implementation of this component of the legislation is under the title of the Revised Renewable Fuel Standard (RFS2) which requires thirty-six billions gallons of biofuels by 2022. Currently nine billion gallons of corn ethanol was produced in 2008. By 2015, this is expected to rise to fifteen billion gallons in 2015. Subsequent to 2015, advanced biofuels such as sugarcane ethanol, cellulose or switch grass ethanol are expected to make up the difference in production up to the goal since the agricultural capacity of corn ethanol maxes out at fifteen billion gallons.

Analysis of Policies

Seeking to be a progressive global leader of environmental policies to reduce greenhouse gas emissions and hoping to capitalize on potential technologies that could emerge to address this issue on a global level, California political leaders have enacted a wide variety of policies that require significant change—and cost and added vulnerability to risk—in how the transportation sector, and all business activities, operate in California.

77. Ethanol has its own set of negative impacts that potentially could have been avoided if the federal oxygenation requirement could have been waived. Source: W. David Montgomery, et al., "The Social Costs of an MTBE Ban in California," Regents of the University of California, 2004.
78. Larry Waterland, "California Alternative Fuels Market Assessment 2006," California Energy Commission, 16 Oct. 2006 < http://www.energy.ca.gov/ab1007/documents/2006-10-16_joint_meeting/presentations/WATERLAND_2006-10-13.PDF>.

Opponents' Arguments to California's Fuel Policy Efforts

One side of the debate is the position of those opposed to these policies who say that these policies have gone too far and are too much, too soon, with California being too far out beyond the national dialogue on environmental policies and thus at risk of placing Californians at a significant competitive disadvantage versus other states and the national. Critics complain about overlapping and potentially contradictory policies result in administrative confusion and excessive costs.

As mentioned in page 6, the current economic climate is affording more sympathy for these concerns. With unemployment in California reaching double digits combined with the state's high costs of living and doing business, businesses and residents are concerned about increasing the state's economic vulnerability. Employment change statistics show that California typically has suffered more in recessions with greater job losses than the United States as a whole but has boomed more in expansions with greater job gains than the rest of the states combined.

Figure 55: Unemployment

The 1990 through 2000 employment data (Figure 13) demonstrates the familiar pattern of California suffering more than the nation in the 1990-91 recession (with job losses into 1992) and greater job gains than the nation through the 1993-2000 expansion. However, the recession of 2002-2003 resulted in California job losses at greater percentages than the nation as a whole, and the expansion of 2004-2007 was anemic in California with California even trailing the nation in 2006 and 2007. Then California exceeded the nation in job losses in 2008 and continues to do so through 2009.

Another issue that those who oppose these policy efforts argue is how to reliably and fairly measure the appropriateness, impact, and efficacy of legislation scientifically in terms of impacts on the environment and the economy. How will California know if the policies are having the environmental, fuel cut, and/or pollution reduction goals as expected? With many different means for measuring the carbon content of fuels, there is significant debate over whether the legislation is fulfilling its goals or resulting in a potential for higher than expected costs with few of the anticipated benefits. To date, there has been a dearth of reliable, balanced research on these critical questions. Depending on the source of the analysis and which method is being utilized to assess the impact, many different answers can be obtained. If that is the case with the current legislative platform regarding fuels, should even more legislation be passed before the true, long-term impacts are quantified and measured?

Those who oppose these policies state that given these uncertainties, the political establishment of California has marched on with additional legislation to fulfill a variety of environmental, social and economic goals without a coherent picture as to what is the

ultimate objective. Such a piecemeal method at policymaking on such an important topic results in unintended consequences that are not fully factored in as further legislation is formulated. While incremental policymaking may be the nature of how decisions get made in representative government, such a piecemeal approach undercuts the larger objective of government to provide a high quality of living for the residents of California with sustainable economic growth to pay for it.

Ultimately, regulatory policy can either help or hurt California's economic competitiveness and sustained underperformance on economic and job creation metrics. For example, over the last twenty years, California has gone from an economy where unemployment was consistently below the national average and income/salary growth was consistently above the national average to an economy where the opposite is typically the case. While the contraction of defense contractors at the end of the Cold War, the boom and bust and more modest recovery in high tech industries and becoming the epicenter of the real estate subprime mortgage crisis in recent years all play a part in California's economic woes, regulatory environment adds to these woes as well. New and revised regulations on topics such as fuel compositions result in a higher cost of living for California and a higher cost of business which help drive growing businesses away from the state. Arguably, learning how to adjust in a more stringent regulatory environment strengthens the surviving businesses over the long-term but how great are the costs in the meantime?

Now California's government is facing structural budget deficits, national economic crises and annual crises on spending plans and the leaders of California struggle with contradictory responses on how to address these issues. Sustained focus on economic growth and job creation results in increased tax revenues from higher employment and salaries. While other environmental, social and economic goals are certainly laudable, these policy efforts should be integrated within the larger picture of sustaining economic and salary growth throughout California instead of having them implemented without a sense of their consequences.

Supporters' Arguments in Support of California's Fuel Policy Efforts

The argument against those who oppose California's policy efforts is that California has routinely been the leader in political agenda setting for the nation given its large size. Its media impact upon the country drives the agenda nationally and California early on is likely to set the standard for what the nation ends up adopting. Examining the timeline of fuel policies since 1990, a pattern is apparent where California policies have been at least concurrent, though more recently, ahead of national fuel policies. Even the announcement in May 2009 of the Obama Administration brokering a deal between the states, Federal government and automobile manufacturers appears to support this contention since the new national standards will mimic California's standards.

For example, in 1990, the California Air Resources Board Low Emission Vehicle provided a model and mechanism for the more general national Clean Air Act to accomplish its goals. Furthermore, the national Energy Policy Acts of 1992 and 1995 provided support for alternative fuel as an alternative to California's support for electric vehicles. Then, starting in 1999 with the phase-out of MTBE with ethanol as the clean-air supporting substitute, California engaged in a series of policies such as AB 2076, AB 1493, AB 1007, the Bioenergy Action Plan, AB 32, and AB 118 and the California Low Carbon Fuel Standard which promoted biofuels. Subsequently, in 2007, the federal Energy Independence and Security Act (EISA) increased automobile mileage requirements and promoted the expansion of biofuels.

Figure 56: Timeline of Policies

	California Legislation	Purpose	US Legislation	Purpose
1990	California Air Resources Board Low Emission Vehicle Program	Links between engine technology and fuel quality. Promotion of electric vehicles	Clean Air Act	Reduction of air pollution
1992			Energy Policy Act	Alternative fuels for public fleets
1995			Energy Policy Act	Tax credits for alternative fuels
1999	Phase-Out of MTBE	Elimination of MTBE and replacement with ethanol for smog reduction		
2000	AB 2076	Increasing Biofuel Use		
2002	AB 1493	Increased Fuel Efficiency Standards		
2005	AB 1007	Targets for Alternative Fuel Use 20% by 2020, 30% by 2030		
2005	Bioenergy Action Plan	Biofuel Production Targets for State--20% by 2010, 40% by 2020 and 75% by 2050		
2006	AB 32	Greenhouse gas emissions reductions--1990 levels by 2020 and 80% below 1990 by 2050		
2007	AB 118	Increases in vehicle registration fees for financial incentives for alternative fuels	Energy Independence and Security Act (EISA)	Increase mileage requirements by 2020, expansion of biofuels
2007	California Low Carbon Fuel Standard	10% carbon reduction in fuels by 2020		

As this timeline demonstrates, California policy initiative appears to be followed by policy change at the national level. Not only are federal policies conforming to the pace set by California but policies in other states adapt as well. Twelve other states are adopting California's standards in AB 1493. Also, California's AB 32 has driven the policy agenda for greenhouse gas emission reduction even when Federal government action was minimal under the Bush Administration. Today, as the Obama Administration is pursuing a "green agenda," California's policy proposals are likely to be a template for national policy as California Congressperson Henry Waxman, the Chair of the House Energy and Commerce Committee proposes legislation for reducing greenhouse gas emissions nationally.

In addition, those who support these policy efforts assert that California's economic troubles are not the result of policy efforts at reducing fuel consumption, reducing greenhouse gas emissions, or any other sort of reputed action by policy makers at attempting to set an environmental agenda as being more important than economic but are instead the result of California's lack of proactive investment in social and physical infrastructure for the future. California's economy is struggling and risks future difficulties because of under-investment in the educational system, lack of investment in 21st Century infrastructure to match the investments of earlier California governments (e.g., the California Water Project), and lack of foresight about the true composition of California's prosperity in high-value added technologies.

Those who support regulation of fuel content and other endeavors in the name of reducing fuel consumption in California and/or promoting environmental goals believe that returning to forward-thinking government that pushes the envelope on developing necessary industries to address the demands of a "green" future is what California government ought to do. The government

should be supporting policies that help spur the development of industries that will prosper in an economy of low-carbon emitting transportation and manufacturing. By having government set policies that force businesses in California to prepare for the future, California to be ahead of the curve rather than continually playing catch up after some illusionary past is proven to be untrue. Ultimately, since California is the largest state and has an economy, which is comparable in size to that of France, the direction that California takes can impact the world for good and help make changes that are necessary for sustained human development.

Technologies that Affect Fuel Consumption in California

An understanding of technologies that affect the viability of the policies in California previously discussed is necessary. As technologies evolve, these policies may either become more realistic or less realistic, more effective or more ineffective in their ability to fulfill policy goals and in their economic impact such as on the price of fuel in California.

2007 Reformulated Gasoline "Predictive Model"

The measures adopted by California to meet the goals set by AB 1007 have resulted in debate on how to measure the carbon content of fuels. There is currently significant disagreement about how to exactly calculate the carbon intensity of fuels. Various standards include GREET,[79] BESS,[80] GHGenius,[81] FARI/FASOM,[82] and GTAP.[83] The California Air Resources Board has adopted the CARBOB model which examines emission data from 9,000 exhaust emissions tests as well as a variety of fuel variations and vehicle model, which with particular statistical software, is used to estimate the carbon content of fuels.

Ethanol Expansion for the United States

From a 2007 baseline, there will be an 85% increase by 2010 and 100% increase by 2012. However, by 2012 market saturation point of fifteen billion gallons a year of corn based ethanol is reached because E10 (10% ethanol per gallon of gasoline) is the highest amount of ethanol that can be used in current vehicles. The E85 (85% ethanol) standard is the only allowable alternative but it requires a different kind of engine. In addition, given the desire for greenhouse gas emission reduction, corn-based ethanol is a poor substitute for petroleum gasoline since it reduces greenhouse gas emissions by only 20% over its use lifespan. Other advanced biofuels reduce green house gas emissions with 50% life cycle greenhouse gas reductions.

Over time, corn ethanol production will level off and there is to be an expected increase advanced biofuels to fulfill the balance of the RFS2 standard for 2022. Cellulose biofuels are expected to ramp up from three billion gallons in 2015 to sixteen billion gallons. Other biofuels such as sugarcane ethanol (like in Brazil), renewable diesel and compressed natural gas are expected to emerge as well.

Figure 57: Revised Renewable Fuel Standards Requirement (RFS2) Requirements for Biofuel Production in Billions of Gallons per Year

	Corn Ethanol	Advanced Biofuels	Total
2008	9	0	9
2010	12	0.95	12.95
2015	15	5.5	20.5
2020	15	15	30
2022	15	21	36

Source: The Impact of Recent Legislation on Ethanol Use in US Fuel Transportation

79. The standard for Greenhouse Gas Emissions, energy use, Argonne
80. Another standard for Greenhouse Gas Emissions, energy use, Nebraska
81. Another standard for Greenhouse Gas Emissions, energy use, Canada
82. Examines land-use impacts, Iowa State

Ethanol Expansion in California

In order for AB 1007 targets to be met, a vast expansion of ethanol usage in California will be required. The use of ethanol will increase from 900 million gallons a year in 2007 to 1.5 billion gallons a year by 2012. Any higher uses of ethanol would require wider use of flex-fuel vehicles that operate on E85 (85% ethanol content) fuels. Since this requires a different kind of infrastructure for distribution stations, E10 fuels are the highest ethanol content available in the current fleet. However, this mandate is still quite large because almost all ethanol used in California comes from outside of the state (corn from the Midwest). Additionally, advanced biofuels developed out of other sources of ethanol such as switch grass or sugar cane from the Imperial Valley or other sources of biomass from agricultural, forestry and urban sources (biodiesel, renewable diesel, such as that used by the Nave and Marine Corps, or biomethane from animal manure from Central Valley dairies) may be possible.[84] In the meantime, this mandate for E10 fuels across California has a significant impact in driving up the cost of fuels since the ethanol additive must be imported from Midwestern locations rather than being native to California.

E20 (20% ethanol content) Fuels

To actually meet the goals of California legislation, there is increasing research on whether E20 fuels might be a way of reaching some of the targets. However, reliable information is not currently available as to whether the current fleet of vehicles can handle E20.

Augmentation of Sub-sets of Fuels such as Fischer-Tropsch Diesel.

Fischer-Tropsch diesel is diesel fuel derived from natural gas. It can be used in diesel engines in its produced form or as a blend. While it costs ten cents per more per gallon to produce, since it comes from natural gas, the greenhouse gas emissions are less and natural gas supplies are much larger than petroleum supplies in California and the United States. It can be used in existing infrastructure and vehicle engines. As a blend, Fischer-Tropsch Diesel has the potential to incrementally reduce greenhouse gas emissions since it is derived from natural gas which produces less carbon dioxide when it is burned.[85]

Compressed Natural Gas (CNG) Technologies

Compressed Natural Gas (CNG) is a technology that has wide application and use for the fueling of public fleets such as buses, garbage trucks and public agency transportation. However, CNG has much less use by the general public despite efforts to commercialize this technology for the public through the creation of vehicles such as the Honda Civic GX. The primary source of resistance is the perceived lack of refueling infrastructure for CNG vehicles. Public fleets start and return from the same location each day so they can be refueled from the same spot without much concern. While the public often does the same thing as freeway commuters travel to and from work each day, the public wants the option of being able to go to another location for fueling and not face the risk of running out of fuel far from a refueling site. However, the California Energy Commission Integrated Energy Report (IEPR) states that as of November 2005, there were at least 365 CNG stations in California and forty percent are public access.[86] Numbers of stations are expected to increase as deregulation has promoted CNG ownership and operation by private companies such as Clean Energy, Trillium and Pinnacle. However, in comparison to 13,000 retail outlets for traditional gasoline, the public perceives CNG to be an obscure and unreliable source of fuel.

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84. California Air Resources Board & California Energy Commission, "State Alternative Fuels Plan," Dec. 2007 < http://www.energy.ca.gov/2007publications/CEC-600-2007-011/CEC-600-2007-011-CMF.PDF>.
85. Further information about this potential is located in the 2003 report entitled "Reducing California's Petroleum Dependence," located at: www.energy.ca.gov/reports/2003-08-14_600-03-005.PDF.
86. California Energy Commission, "2005 Integrated Energy Policy Report," Nov. 2005: CEC-100-2005-007 CMF <http://www.energy.ca.gov/2005publications/CEC-100-2005-007/CEC-100-2005-007-CMF.PDF>.

Analysis of Technologies

Because California is far away from the corn producing regions of the Midwest, fuel requirements for ethanol increases place a disproportionate burden upon California drivers. Eventually as other advanced biofuels become developed, fuel requirements for biofuels may become less burdensome. In theory, the biological component of these fuels could be grown in California so the significant extra transportation costs will be moderated. Until then, the requirements will impact California more than other states that are closer to local sources. Executive Order S-06-06 (2005) seeks to hasten the implementation of advanced biofuels by requiring a target of a minimum of twenty percent of California's biofuels be produced within the state by 2010, forty percent by 2020 and seventy-five percent by 2050. However, when and if this policy goal actually occurs remains to be seen.

The argument for these requirements to be put in place before feasible is that the aggressive requirements will "force" change—requiring consumers and businesses to move much more quickly in developing the advanced biofuels, even at significant associate costs and economic burden. The counter-argument is that until these fuels are created, Californians will continue to suffer much higher prices in the meantime.

Another consideration is the fact that most engines currently in use can operate safely and efficiently on E10 gasoline or 10% ethanol content. However, the question arises about whether these same engines could run on higher ethanol content with that much more incremental savings in petroleum fuel and carbon dioxide release. Why not 15% ethanol or 20% ethanol content? With few experiments in place of these fuels on current engine technology, it is unlikely whether this incremental increase is even possible without requiring significant modification of existing engines. Even if it were marginally possible, the times and places where the higher ethanol content results in difficulties for drivers could result in consumer backlash and unwillingness to experiment with biofuels at all. A careful, step-by-step process would ideally be in place to ensure that the transition is as seamless as possible

Finally, potential technologies exist, which could supersede petroleum-based and ethanol-based fuels such as compressed natural gas, electric cars powered by fuel cells, plug-in electric vehicles, and hydrogen. While these technologies are not yet commercially viable, a major consideration for current fuel policies is how to develop a glide-path for the rapid adoption of any and/or all of these future technologies when they do become commercially viable. Do current policies or technological emphases get in the way of successful adoption of these future technologies or do they reinforce them? Much debate exists over whether a focus on existing technologies is even worth having since they will just prolong the current transportation paradigm at great expense and difficulty without any pay off for commercializing the future technologies that will address issues such as climate change, pollution and/or fuel shortages.

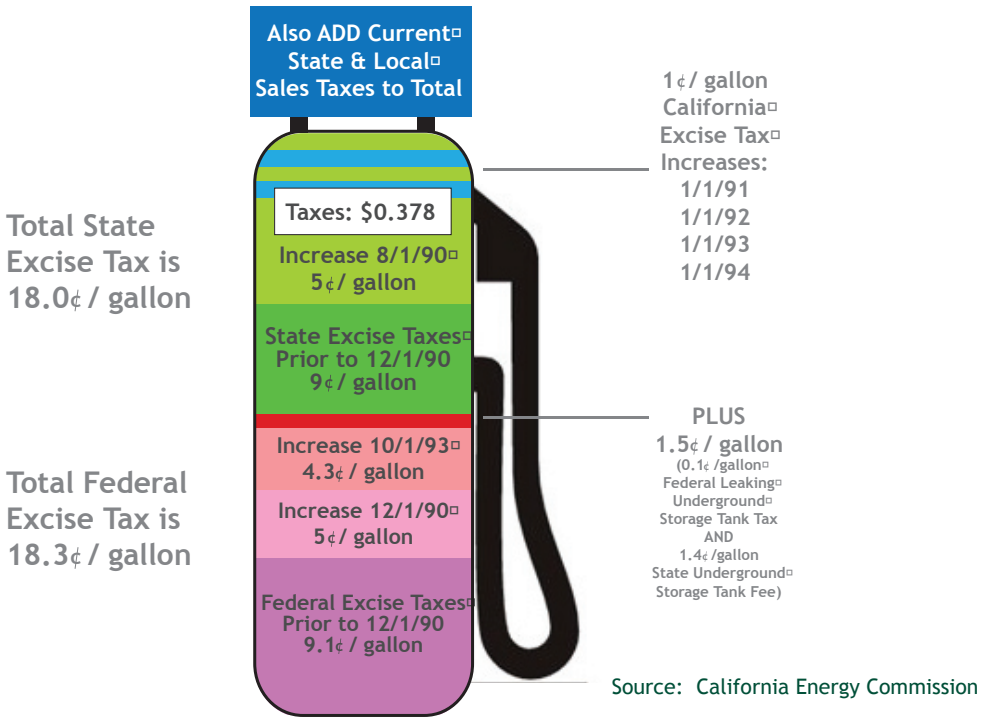
The Impact of Fuel Taxes, Surcharges and Other Fees Imposed by Government on the Price and Availability of Fuels

Current California fuel tax policy, coupled with other California specific policies and circumstances, contributes to California having the highest fuel prices in the nation. California has enacted one of the nation's highest combined (federal, state, local) gasoline taxes, 28% higher than the national average,[87] with California state gasoline taxes alone are 43 percent higher than the national average of state gasoline taxes. Californians pay both excise tax on gasoline and sales tax as well. The following table shows various federal, state and local taxes applied to fuel purchased. The figures represent weighted averages to balance out differences across jurisdictions within states, and where a percentage sales tax is applied the figure represents a snapshot of April 1, 2009 prices as reported by AAA.

California's combined gasoline taxes, 63 cents per gallon[88] compared to the national average of 43 cents per gallon. While State and Federal excise taxes compose only 36.4 cents per gallon, additional environmental and regulatory surcharges, as well as state, county and city sales taxes add more than an extra quarter per gallon. According to API, CA has the second highest taxes on gasoline in the nation. The top five states for higher taxes in order are: (1) New York, (2) California, (3) Washington, (4) Connecticut, and (5) Florida. The lowest is Alaska with no state taxes, only the federal excise tax of 18.4 cents per gallon (cpg). For diesel, Hawaii and Connecticut move to the top of the list, bumping New York and California to third and fourth respectively.

While businesses know the impact of higher fuel costs on everything from prices at the pump to cost of their goods and services, California gasoline consumers are seriously, and negatively, impacted by increases in the price of gasoline. The necessity of commuting patterns and reality of current transportation infrastructure and employment location prevents most consumers from significantly changing their consumption behavior. Even at $3.50 per gallon, California consumers purchased only 4.5% less fuel. Many drivers, especially commuters, simply cannot change their driving patterns without significant negative economic ramifications to their families.[91]

Figure 58: California Gas Tax



Source: California Energy Commission

87. American Petroleum Institute, "January 2009 State Motor Fuel Excise Tax Report," Jan. 2009.
88. There are various methods of aggregation used to calculate a combined per gallon gasoline tax by state. Figures will vary slightly by method, but California is consistently on top.
89. American Petroleum Institute, "April 2009 State Motor Fuel Excise Tax Report," Apr. 2009.
90. API State Gasoline Tax Report Summary (April 2009). Available online here: www.api.org/statistics/fueltaxes/index.cfm.
91. California State Board of Equalization, "Net Taxable Gasoline Gallons," 30 Apr. 2008.

Figure 59: Gasoline Taxes
Combined Local, State and Federal (cents per gallon)

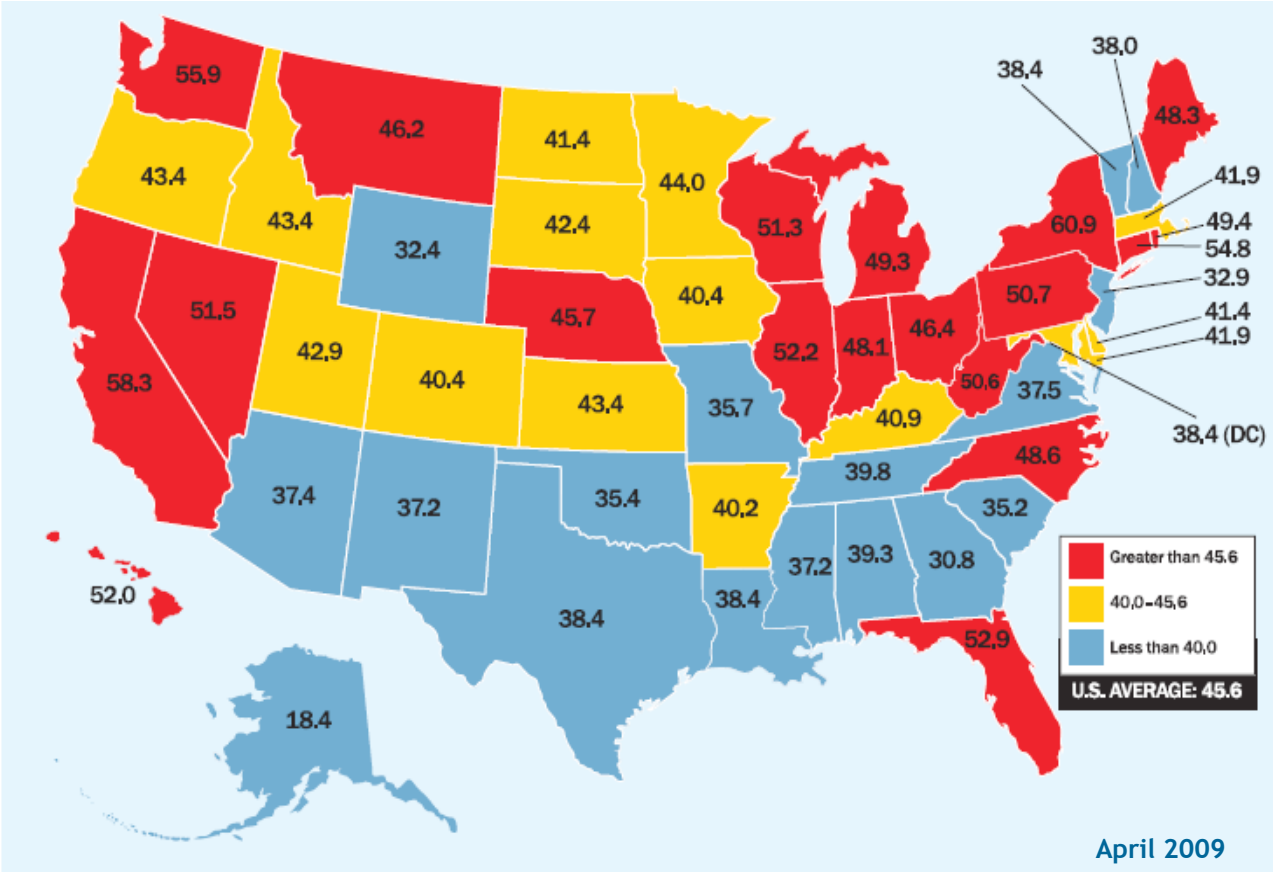
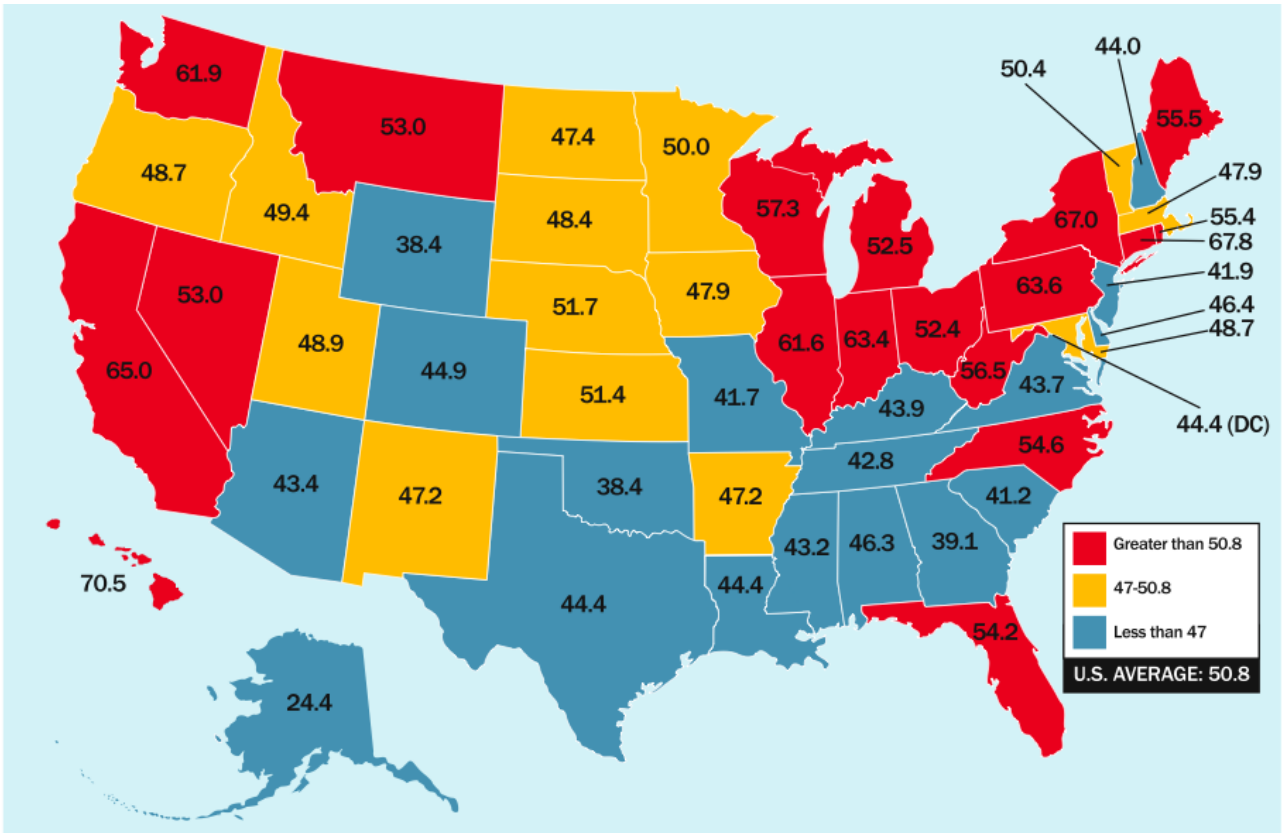


Figure 60: Diesel Taxes
Combined Local, State and Federal (cents per gallon)



Note - Figures above taxes by state for gasoline and diesel differ from other tax figures stated elsewhere in the report due to averaging of fuel tax costs across fuel types.

April 2009

What Are Some of the Costs of California Being Different?

- How much extra does it cost the average California family?

In terms of household expenditures on gasoline and oil, average California households spend over $1,000 per year on fuel taxes and average an estimated $277 more per year in gasoline taxes than the average American household.[92]

- Regressive Nature of Impacts on Lower-Income Families—"Gasoline taxes hit lower-income motorists the hardest".[93]

When gasoline tax revenue is not spent entirely on roads then it no longer adheres to the benefit principle as a true user fee, but becomes regressive.[94] When gas taxes fund deficit reduction or flow into general funds to be spent with income tax revenue on general government operations, income patterns of gas tax payers become increasingly important. Lower-income households are disproportionately affected by gas taxes as shown below.

Higher per unit fuel costs disproportionately affect lower-income families. There are too many long standing structural barriers that prohibit lower-income families from significantly reducing their levels of fuel consumption. Lower-income families spend more on transportation as a proportion of their expenditures.[95] They are, therefore, disproportionately impacted by increases in energy costs. Higher fuel costs, taxes and other price increases are regressive because lower-income families are particularly vulnerable to higher gasoline prices.

Furthermore, if fuel costs increase, then the cost of transportation for trucks, trains or planes that move goods across the state also increase. Widespread stories through the spring and summer of 2008 demonstrated how when gasoline prices were over $4 per gallon, average consumers watched their grocery bills climb since the transportation costs to bring groceries to the stores also increased.

Figure 61: Pertentage of Income Spent on Gasoline Taxes (US)

Source: Tax Foundation, Bureau of Labor Statistics

92. Experian and The Tax Foundation
93. Jonathan Williams, "Paying at the Pump: Gasoline Taxes in America," The Tax Foundation, 16 Oct. 2007: 17.
94. IBID
95. Meg Power, "The Burden of FY 2008 Residential Energy Bills on Low-Income Consumers," Economic Opportunity Studies, 20 Mar. 2008 <www.opportunitystudies.org/repository/File/energy_affordability/Forecast_Burdens_08.pdf>.

Analysis of California Fuel Tax Policies

Seeking to obtain funds for transportation infrastructure or punish gross pollution sources, political leaders in California have put in place a variety of taxes. While their intentions are commendable, the California gasoline tax policy, coupled with existing federal taxes, results in California having among the highest fuel prices in the nation. Additionally, because gasoline is a relatively inelastic good, the incentive to maintain and expand these taxes is strong.

While California gasoline consumers are seriously, and negatively, impacted by increases in the price of gasoline, the nature of gasoline elasticity prevents most consumers from significantly changing their consumption behavior. The short-term price elasticity of gasoline demand, from 2001 to 2006, range from -0.034 to -0.077. [96] This means that for every 10% increase in the price of gasoline, consumers will, over the next year, consume between 0.34% and 0.77% less gasoline. Thus, from an economic perspective, taxes, surcharges and other fees imposed by the government on the price of gasoline—a relatively inelastic good—tend not to affect the consumption or availability of the fuel. Even at $3.50 per gallon, California consumers purchased only 4.5% less fuel.[97] This illustrates not only the relative inelasticity of gasoline, but that drivers opt for more fuel efficient vehicles instead of abandoning gasoline consumption altogether. Many drivers, especially commuters, simply cannot change their driving patterns without significant economic ramifications.

There are various opinions about whether this inelastic dependence on gasoline, even in the face of high taxes, is a good thing or a bad thing. Gas tax proponents claim that taxes on gasoline can expand the availability of fuels. Supporters of this position say that these taxes create a price floor for gasoline. Since there is a guaranteed price for gasoline, suppliers have the incentive to invest in capacity increasing technologies that ensure an economically efficient amount of fuel for California. While it may appear California is constantly on the knife-edge of a supply disruption with little leeway in its supply chain, the reality is that suppliers, refiners and distributors have created an economically efficient model of fuel supply and distribution with the fewest environmental and economic hazards because of a guaranteed price resulting from the current tax regime. California refinery capacity has grown at a rate significantly below the national average (0.5% vs. 1.3%). At the same time, fuel consumption by Californians has increased 7.7% since 2000 even as fuel storage capacity is being reduced because of environmental concerns.

In addition, taxes on fuel directly charge those who utilize the infrastructure, such as the roads and bridges that vehicles travel on. Having taxes on fuel creates a fair funding source for infrastructure improvements. Instead of charging the general public, those who use the infrastructure should be charged for its development, improvement and maintenance. This method of taxation is not only fair, but also creates a dedicated funding stream for infrastructure advancement.

In short, supporters of gas taxes believe the taxes can and should be increased. Under this proposal, the government would set a minimum price at which consumers could purchase fuel. The difference between the minimum price and the economic price of the fuel would amount to a tax which would be used to promote the development of alternative energy sources.

Opponents of the current gasoline tax regime in California believe that such a proposal is a disaster, and that California's gas taxes ought to be reduced. Paying some of the highest state fuel taxes in the country, opponents believe that California is at an economic disadvantage with most of the country and the increased cost of business and cost of living hurts Californians to a greater degree than the assumed benefits that come from higher taxes. Also, along with residents of 45 other states, Californians pay sales tax on top of the excise taxes on gasoline thus creating "double taxation" with gas taxed by both sales and excise tax. AB 2621 (Strickland) was introduced in 2006 to eliminate the sales tax on gasoline. This proposal was defeated in committee. It was estimated that removing sales tax on gasoline would cost the state $523 million per year in government revenue.

96.Center for the Study of Energy Markets, "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand," Sept. 2006.
97. California State Board of Equalization, "Net Taxable Gasoline Gallons," 30 Apr. 2008.

This situation is even worse when taxes established for laudable purposes such as road construction can be redirected away from their intention in the midst of fiscal emergencies. As a "temporary" stop-gap, taxes are diverted from infrastructure investments to help close the annual budget gap that has emerged because of excessive policies that have cut into job growth and economic development which would ordinarily help California keep pace with steady tax revenue increases. While proponents of the taxes argue that these funds are raised with the intention of improving the state's highways and mass-transit, the reality is that much of the revenues are used to cover budget shortfalls. Proposition 42 was passed in 2002 to prevent this from happening in the future, with its purpose to restrict gas taxes to transportation purposes only. However, under the loophole that allows for diversions of transportation tax funds in fiscal emergencies, the previous practice has continued and very little has changed. Over the last decade, approximately $5.8 billion of these infrastructure funds were diverted to other budget priorities and have yet to be repaid.[98] Proposition 1A (passed in November 2006) sought to address this situation with limitations on how often a fiscal emergency can be declared to override Proposition 42 (the Governor must declare a fiscal emergency and two thirds of the State Legislature must agree to a diversion of funds), but it remains to be seen how this will operate in practice in the current economic environment. Given the negative feedback loop that stringent California policies have put the state on, opponents of gas taxes believe that the prognosis is not good.

In fact, those who oppose gas taxes fear that with more budget shortfalls on the horizon, a growing chorus of those in favor of increasing the gas tax to raise general purpose revenue is emerging.[99] While funds are not only diverted at the state level, they are arguably unfairly distributed at the federal level. Since 1956, California has received 97 cents for every dollar paid in federal excise taxes, but Alaska has received $6.66 for every dollar paid in federal excise taxes during the same period.[100] However, California—when compared to states that do not impose a sales tax on gasoline—does not fare any better in terms of infrastructure or state budgeting

The purpose of the gas tax is not only to fund infrastructure spending, but also to regulate harmful environmental externalities. Critics, however, take issue with the tax's effectiveness. They claim that polluters, rather than every consumer of gasoline, should be taxed in an effort to deter harmful behavior. Nationally, 10% of the vehicles on the road are responsible for generating 76% of volatile organic compound emissions—which are major contributors of smog in urban areas.[101] Yet, the uniform tax treats the other 90% the same as those who emit the most harmful pollutants. Furthermore, the tax is distributed unfairly across California's regions. The urgency of deterring a driver from increasing her vehicle miles traveled in Eureka or San Luis Obispo is considerably less than deterring a driver from increasing her vehicle miles traveled in the Los Angeles Basin due to the differences in smog and other pollutants in the area.

Supporters of the gas tax claim that by adding to the cost of gasoline, drivers will purchase less gas and thus drive less, thereby reducing congestion in urban areas. But, opponents of the gas taxes argue that, California, when compared to other states, continues to rank as one of the nation's most congested states. Congestion pricing, rather than a gas tax, has proven to be a far more effective tax designed to prevent congestion.[102]

Proponents of alternatives to the gas tax advocate a mileage-based tax, where drivers are charged based on the miles they travel. This would accommodate for improvements in vehicle gas mileage, and maintain a fair tax scheme. Oregon recently experimented with this system, using GPS technology to track the miles traveled by 280 individuals and charging them 1.2 cents for each mile driven.[103] A congestion pricing element may also be implemented by charging drivers higher taxes for miles driven in urban areas during rush hours.

98. Dan Weikel and Jeffrey L. Rabin, "Cargo has L.A. Traffic at a Crawl," Los Angeles Times, 10 Jun. 2008.
99. California Legislative Analysts Office, 15 Dec. 2008.
100. Federal Highway Administration, Highway Trust Fund Spending Received per Dollar Contributed, Fiscal years 1956-2005.
101. Joel Schwartz, "No Way Back; Why Air Pollution Will Continue to Decline," American Enterprise Institute, 2003.
102. National Commission on Energy Policy, "Congestion Charging: Solutions for the Escalating Problem of Vehicle Miles Traveled," 2006.
103. Jeffrey Leib, "Oregon May Get Some Mileage Out of Fee Experiment," The Denver Post, Jun. 2006.

While there are those who adamantly believe the gas tax should be increased to keep up with infrastructure demands, and to encourage investment in alternative sources of energy, others believe that reforming the gas tax is a more viable option. By reforming the tax scheme, political leaders can ensure that funds generated from the gas tax are protected and devoted solely for transportation spending.

Conclusion

Since the mid 1990s, California's elected officials have adopted a series of policies to reduce air pollution, the state's carbon footprint and its dependence on non-renewable sources of energy, namely crude oil. California residents and businesses have complemented these efforts through engaging in individual behaviors that are among the most progressive, environmentally sensitive and proactive in reducing oil consumption and promoting the common good of the entire nation. California has achieved remarkable success in many of these goals and such policy goals have positive outcomes for society.

However, in the midst of pursuing these admirable goals, other effects, impacts, and consequences have resulted. While pursuing the aforementioned goals, several potential side effects or "unintended consequences" have developed because of California fuel policy, such as vulnerability to gasoline price spikes, adverse economic impacts on low-income consumers, and direct and indirect impacts on the creation and retention of good-paying jobs in the state. Over the same time period that policies have been put in place to fulfill fuel efficiency or environmental goals, the price of fuel in California has been creeping upward. Because of the high inelasticity of fuel—people and businesses need it to work, play, and transport goods and there is no significant alternative—the price of fuel increases is borne by the consumer. The result of higher fuel prices has been increased costs for consumers and businesses in California in comparison to other parts of the country.

The reasons for these side effects which raise the price of fuel in California include the following:

- Californians pay between five and fifteen cents extra per gallon from higher taxes and fees in comparison to drivers in other states.
- California is a "fuel island" and has no pipelines linking it to petroleum or crude oil supplies, but instead must import an increasing share of fuel from shrinking domestic an distant international sources
- California has regulations that require special blends of gasoline
- The state's refining capacity has stagnated for decades despite a rapidly growing demand for gasoline.
- California is isolated and lies a great distance away from other supply sources (e.g., 14 days travel by tanker from the Gulf Coast)
- California's "differentiated" fuel standards cause a continual risk of "supply outages".

Due to the relative isolation and specific requirements of the California fuel market, no pipelines connect California to other major US refining and crude oil producing centers. The trend toward increasing reliance on foreign crude imports has considerable logistical and cost consequences and will increase the strain on an already burdened infrastructure. Because it takes approximately 40 days to ship crude oil from the Middle East compared to around ten days from Alaska, the state must be able to store ample supply of crude oil in the event of a supply disruption. At the same time, our ports have to be able to accommodate the growing number of tankers it will take to supply our crude oil. If the capacity is not increased, the state will continue to be vulnerable to exogenous shocks that result in fuel supply disruption.

Because of these factors, Californians will likely to continue to pay more in fuel than drivers in other states. While some issues are

inherently long-term in nature (new domestic oil sources, new refineries, alternative fuels), other factors (regulations, tax rates) can be adjusted or implemented differently to have less of an economic impact on Californians, especially during a time when the state is recovering from severe economic recession and high unemployment.

This report has sought to highlight how these issues have developed, how they interact and suggest possible mitigation measures. Some of these issues may appear impossible to surmount. But then upon further analysis are open to potential improvement once the true driving issues that cause them are uncovered. However, too often, policymakers are stuck with a false choice of either carbon dioxide emission reduction, decreases in pollution and reduced dependence upon foreign oil or economic growth, reduced regulation and increased efficiency. With a better understanding all of the various factors that influence the California fuel environment, policymakers can be more informed about why California is different than other states.

There is no inevitable reason why California fuels need to be more expensive in the future than other regions, vulnerable and subject to supply shocks and price spikes that disrupt the economic vitality of the state. Policies should be reviewed to help improve economic competitiveness factors while still maintaining progressive environmental policy initiatives. Some possible solutions to explore might include:

- Permitting processes for new refineries and/or storage facilities can be eased so Californians are not so vulnerable to supply shocks and/or limitations. The California Energy Commission conducted an extensive investigation and stakeholder input process in 2003 and 2004 that determined the state should do the following:[104]
  - Develop "best permitting practices" for petroleum infrastructure projects
  - The CEC should serve as a permit facilitator, coordinating multiple agency reviews, to ensure statewide interests are considered in permitting processes
  - The CEC should consider a one-stop permitting process for petroleum infrastructure projects spanning multiple jurisdictions
- Perhaps investments can be considered in pipeline infrastructure to move oil or fuel supplies to California more easily and efficiently.
- During periods of supply shock, special blend requirements can temporarily be relaxed if prices rise above a certain pre-determined point. A report by the University of California Energy Institute (UCEI) suggests that a fee-based CA CBG variance may be a very good policy to implement in order to stabilize prices and better even out supply.[105] Such a program would allow gasoline that is not compliant with California's standards to be sold in the state for a variance fee (such as the 15 cpg difference). The fee would ideally serve to limit incentives to drive up prices by producers, and in cases where market power is not the problem, would provide more supply to meet demand during outages without inducing imports that create pollution during more regular gasoline price days.

This report has sought to understand California fuel policy and highlight the costs, economic impacts, and susceptibility to fuel shortages and price spikes in order for California to move forward with a balanced fuel policy framework. Out of this understanding,

104. "An Assessment of California's Petroleum Infrastructure Needs: In Support of the 2005 Integrated Energy Policy Report," California Energy Commission Staff Report. Apr. 2005: 17, CEC-600-2005-009.
105. Severin Borenstein, et al., "Market Power in California's Gasoline Market," University of California Energy Institute (UCEI), May 2004.

new policy initiatives and options can be developed which can help alleviate negative economic impacts for California families, communities, and businesses while allowing California's ambitious environmental leadership to proceed in a sustainable manner. In such a way, California policymakers are not stuck with an "either-or" choice, but can have progressive policy initiatives and sufficient government revenue from taxing fuels as well as stabilized and affordable fuel costs for California residents and

Appendix

Entity	Title	Author	Year
American Antitrust Institute	Competition in U.S. Petroleum Refining and Marketing: Part II - Review of the Economic Literature	Diana Moss	2007
American Council On Renewable Energy (ACORE)	The Outlook on Renewable Energy in America Volumes I & II: Joint Summary Report		2007
American Petroleum Institute	Estimated Crude and Products Imports to the U.S. from Leading Supplier Countries		2008
American Petroleum Institute	PETROLEUM FACTS AT A GLANCE – February 2009		2009
American Petroleum Institute	Summary of Gasoline and Diesel Taxes by State		2009
American Petroleum Institute	Understanding Today's Crude Oil and Product Markets		
Analysis Group (Economic, Financial and Strategy Consultants)		Judson Jaffe and Jonathan Borck,	2008
Aspen Publishers	Environmental Protection: Law and Policy	Robert L. Glicksman, David L. Markell, William W. Buzbee, Daniel R. Mandelker & A. Dan Tarlock	2007
Biofuel Law & Regulation Group, EBI, IGB	An Economic Analysis of the Federal Renewable Fuel Standard (RFS)	Jay P. Kesan, Ph.D., J.D.	2008?
British Petroleum	BP Statistical Review of World Energy		2008
California Department of Energy	Compressed Natural Gas Fueling Stations in California		2009
California Department of Transportation	Historical Monthly Vehicle Miles of Travel		2008
California Energy Commission (prepared by Tiax LLC)	California Alternative Fuels Market Assessment 2006	Larry Waterland	2006
California Energy Commission (prepared by Tiax LLC)	Petroleum Watch		2009

California Energy Commission (prepared by Tiax LLC)	Oil to Car		2008
California Energy Commission (prepared by Tiax LLC)	DEVELOPMENT OF ENERGY BALANCES FOR THE STATE OF CALIFORNIA		2005
California Energy Commission (prepared by Tiax LLC)	TRANSPORTATION ENERGY FORECASTS FOR THE 2007 INTEGRATED ENERGY POLICY REPORT		2007
California State Board of Equalization	Gasoline Sales Tax Figures 2008 & 2009 (by company)		2008
Cato Institute	CAFE Changes, By the Numbers	ANDREW N. KLEIT	2002
Cato Institute	Don't Increase Federal Gasoline Taxes— Abolish Them	Jerry Taylor and Peter Van Doren	2007
Center for Energy & Environmental Studies, Boston University	Causes for an asymmetric relation between the price of crude oil and refined petroleum products	Robert K. Kaufmann and Cheryl Laskowski	2004
CENTER FOR ENERGY, RESOURCES, AND ECONOMIC SUSTAINABILITY (CERES)	Energy Efficiency, Innovation, and Job Creation in California		2008
Center for the Study of Energy Markets (CSEM)	The Implications of a Gasoline Price Floor for the California Budget and Greenhouse Gas Emissions	Severin Borenstein	2008
Chevron	Breakdown of Fuel taxes		2008
CRS	Energy Tax Policy: History and Current Issues		2006
Department of Energy	A PRIMER ON GASOLINE PRICES		2006
Energy Division, Oak Ridge National Laboratory	Future refining impacts of the clean air act amendments of 1990*1	G. R. Hadder	1991
Energy Information Administration	International Energy Outlook		2008
Energy Information Administration	Impact of Renewable Fuels Standard/MTBE Provisions of S. 517		
Energy Information Administration	Renewable Fuels Legislation Impact Analysis		2005
EPA	Renewable Fuel Standard Program Draft Regulatory Impact Analysis		

GAO	Gasoline Markets Special Gasoline Blends Reduce Emissions and Improve Air Quality, but Complicate Supply and Contribute to Higher Prices		2005
Green Tech Media	California Fuel Standards Create Biofuel Worries	Jeff St.John	2008
Latham & Watkins	SB 375 (Steinberg) — Carbon Caps, Transportation, Housing and CEQA	Paul N. Singarella	2008
LECG (a global expert services firm)	Analysis of the Proposed Severance Tax Impact on California Oil Production and Gasoline Prices	Dr. José Luis Alberro, Dr. William Hamm, Dr. Ronald H. Schmidt	2006
Milken Institute	Energizing California		2009
NPRA	NPRA United States Refining and Storage Capacity Report		2007
Renewable Energy, Technology Conference	Retech 2009 Agenda		2009
Resources for the Future	Automobile Externalities and Policies	Ian W. H. Parry, Margaret Walls, and Winston Harrington	2007
Resources for the Future	Should Corporate Average Fuel Economy (CAFE) Standards Be Tightened?	Ian W.H. Parry, Carolyn Fischer, and Winston Harrington	2004
Stanford Energy Market Forum	What Can Models Tell Us About Energy Demand/Efficiency?		
The B.E. Journal of Economic Analysis & Policy	Gasoline Price Differences: Taxes, Pollution Regulations, Mergers, Market Power, and Market Conditions	Hayley H. Chouinard, *Washington State University; Jeffrey M. Perloff, University of California, Berkeley*	2006
The Brooking Institute	Fuel Efficiency Standards: A Detour from the Cheapest Climate Protection	Adele Morris, Deputy Director for Climate and Energy Economics, Global Economy and Development	2009

Transportation Fuels Consulting Company	The Impact of Recent Legislation on Ethanol Use in US Transportation Fuel	Gary Herwick	2008
UC Berkeley Competition Policy Center	Vertical Integration in Gasoline Supply: An Empirical Test of Raising Rivals' Costs	Richard J. Gilbert and Justine S. Hastings	2001
Department of Agricultural and Resource Economics, University of California, 207 Giannini Hall, Berkeley, CA 94720-3310, USA	Reformulating competition Gasoline content regulation and wholesale gasoline prices	Jennifer Brown, Justine Hastings, Erin T. Mansur, Sofia B. Villas-Boas	2007
Universidad del CEMA	Product Differentiation and Market Power in the California Gasoline Market	Germán Coloma	