

**GAO**

Report to the Honorable  
Dianne Feinstein, U.S. Senate

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April 2000

# MOTOR FUELS

## California Gasoline Price Behavior



**G A O**

Accountability \* Integrity \* Reliability

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# Contents

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<b>Letter</b>		3
<b>Appendix</b>	Appendix I: Comparison of Retail Gasoline Prices in California and Texas, a Benchmark for the U.S. Gasoline Market	26
<b>Figures</b>	Figure 1: California's Average Daily Gasoline Consumption Compared With Major World Markets, 1997	6
	Figure 2: California's Gasoline Demand/Supply Network	8
	Figure 3: California and U.S. Retail Gasoline Prices, Jan. 1, 1995, Through Dec. 31, 1999	10
	Figure 4: Comparison of California, Texas, and U.S. Retail Gasoline Price Spikes, Jan. 1, 1995, Through Dec. 31, 1999	11
	Figure 5: Retail Price Adjustments Relative to Changes in Wholesale Prices	16
	Figure 6: Retail Gasoline Prices in San Francisco and Los Angeles	19
	Figure 7: California, Texas, and U.S. Retail Gasoline Prices, Jan. 1, 1995, Through Dec. 31, 1999	26

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## Abbreviations

CARB	California Air Resources Board
EIA	Energy Information Administration
GAO	General Accounting Office

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B-285102

April 28, 2000

The Honorable Dianne Feinstein  
United States Senate

Dear Senator Feinstein:

Retail gasoline prices in the United States have risen sharply since early 1999, mostly in response to sharply rising world crude oil prices. Although gasoline prices have, in general, been relatively low for U.S. consumers—compared with both historical standards and the prices paid in many other industrialized countries—sharply rising gasoline prices can potentially have an adverse impact on U.S. consumers, as well as on the U.S. economy. Moreover, during the second half of the 1990s, retail gasoline prices throughout the United States have exhibited a high degree of volatility and fairly frequent spikes. Particularly in California, where consumers already generally pay higher average prices than they do elsewhere in the United States, the spikes have raised questions about the behavior of gasoline prices both within the state and between California and the rest of the country.

Concerned about the higher gasoline prices and the extent of price spikes in California, you asked us to analyze the behavior of gasoline prices in the state. Because we found no standard definition of a gasoline price spike, for this report, we define a spike as an increase of at least 6 cents per gallon in a 4- to 21-week period. As agreed with your office, this report addresses the following questions: (1) To what extent do retail gasoline prices spike more frequently and higher in California than they do in the rest of the United States, and what factors account for any difference? (2) Do retail gasoline prices in California rise faster than they fall in response to increases and decreases in the wholesale price of gasoline and, if so, why? (3) What factors account for differences in the retail prices of gasoline between San Francisco and Los Angeles?

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## Results in Brief

According to our analysis of gasoline price data, from January 1995 through December 1999, retail gasoline prices spiked no more frequently in California than they did in the rest of the United States, but the spikes that did occur were generally higher in California than elsewhere in the nation. Prices spiked seven times, and during six of the spikes, the price increases

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(the differences between the low and high prices) were between 3 cents and 31 cents per gallon higher in California than in the rest of the United States. Many federal, state, and oil industry officials told us that the higher price spikes in California were caused primarily by unplanned refinery outages that disrupted the state's tight balance between gasoline supply and demand. Because California refineries produce at almost full capacity, supply disruptions caused by refinery outages must be made up from other sources, such as out-of-state providers. However, obtaining gasoline from such providers is slow and costly because only a few out-of-state refineries can produce gasoline that meets the state's stringent emission-reducing standards and the gasoline must be shipped by tanker from far-away locations. In contrast, some West Coast retailers told us that reduced competition at the refinery and retail levels caused the higher California spikes. The Federal Trade Commission is currently investigating gasoline prices in California and other West Coast states.

According to the results of statistical modeling by the Department of Energy's Energy Information Administration, retail gasoline prices in California rise faster than they fall in response to a delayed pass-through of changes in the wholesale prices of gasoline—a behavior that has been observed in other markets. The model was not designed to explain the factors that account for this price behavior. Energy Information Administration officials believe, however, that this price behavior has little or no impact on consumers because their analysis shows that price increases and decreases at the wholesale level are generally fully passed through to the retail level, despite some delay. Oil industry officials and experts we contacted also told us that retail prices generally fully reflect changes in wholesale prices and that the observed price patterns may be due to the way retail sellers react to these changes. The officials and experts were uncertain about what effect, if any, this behavior could have on consumers.

Retail gasoline prices are higher in San Francisco than in Los Angeles, in part because of local supply and demand conditions. Retail gasoline prices were, on average, about 11 cents higher in San Francisco than in Los Angeles for the period from January 1992 through December 1999. Among the local supply and demand conditions that are important in explaining the price differences between the two cities are (1) the number and location of retail gasoline stations, (2) the costs of building and operating gasoline stations, and (3) consumers' incomes. Together, these conditions would be expected to lead to higher retail gasoline prices in San Francisco than in Los Angeles, although the exact magnitude of the effects on prices

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cannot be determined with the available data. The local supply and demand conditions we identified may not entirely explain the price differences between the two cities. Other factors, such as competition at the refining level, may help explain these differences, but we were unable to obtain proprietary data that would have allowed us to explore this possibility.

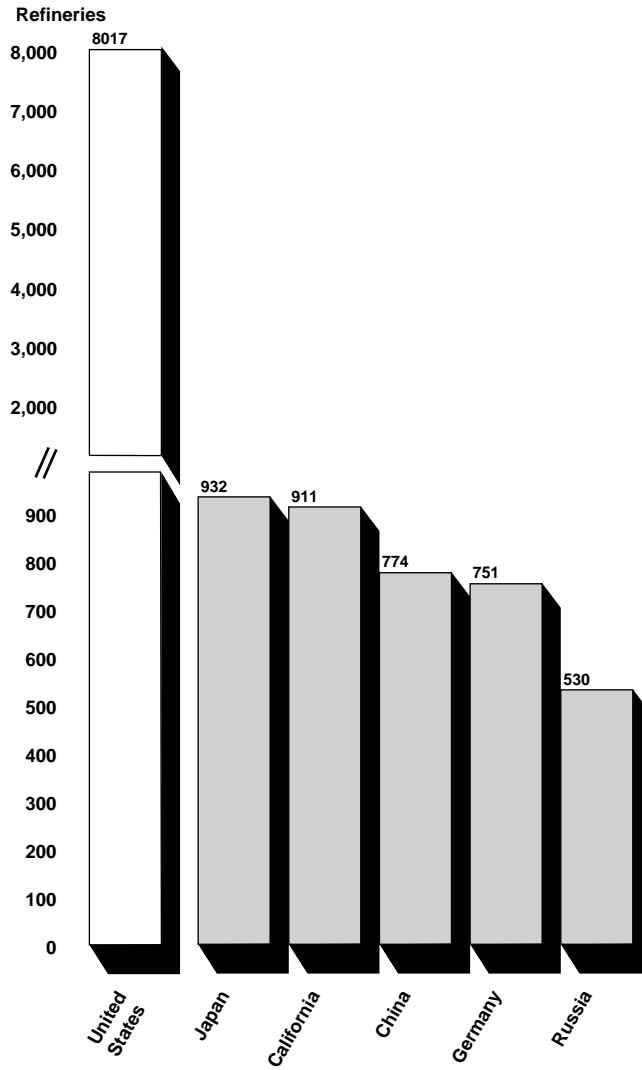
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## Background

Gasoline prices in California and the rest of the United States have risen sharply over the past year, largely because of increases in the price of world crude oil, which rose from a low of about \$12 per barrel in February 1999 to a high of about \$34 per barrel in early March 2000. In spite of this sharp rise, gasoline prices are still lower in real terms than they were at their peak in 1981. For example, in early March of this year, the average price of gasoline in the United States was \$1.50 per gallon, compared with about \$2.47 in 1981 (in 1999 dollars). In addition, the amount of oil the U.S. economy uses per unit of gross domestic product has decreased since 1979. Finally, average fuel economy for the new vehicle fleet—including light trucks and sport utility vehicles—has risen slightly since 1980, although it has been declining since about 1988 with the increasing share of light trucks and sport utility vehicles, which have a lower average fuel economy than cars. If fuel efficiency continues to decline, the impact of higher gasoline prices on consumers will also rise. Moreover, the increased price volatility over the last year may have adverse effects on consumers and the U.S. economy.

California consumed almost 1 million barrels of gasoline per day in 1999, more than any other state in the country. Furthermore, from 1996 through 1999, California's gasoline demand grew at an annual rate of about 1.4 percent. To put these data into perspective, in 1997 (the last year data were available for international comparisons) California was the third largest consumer of gasoline in the world, behind only the United States and Japan and ahead of such major countries as China, Germany, and Russia (see fig. 1).

**Figure 1: California's Average Daily Gasoline Consumption Compared With Major World Markets, 1997**



Consumption in thousands of barrels per day.

Source: Energy Information Administration (EIA).

According to oil industry, federal, and California officials, in general, California's gasoline demand is met almost entirely by supply from refinery production within the state. In 1999, 23 refineries in California made gasoline: 11, owned by five large refiners, had the capacity to make almost



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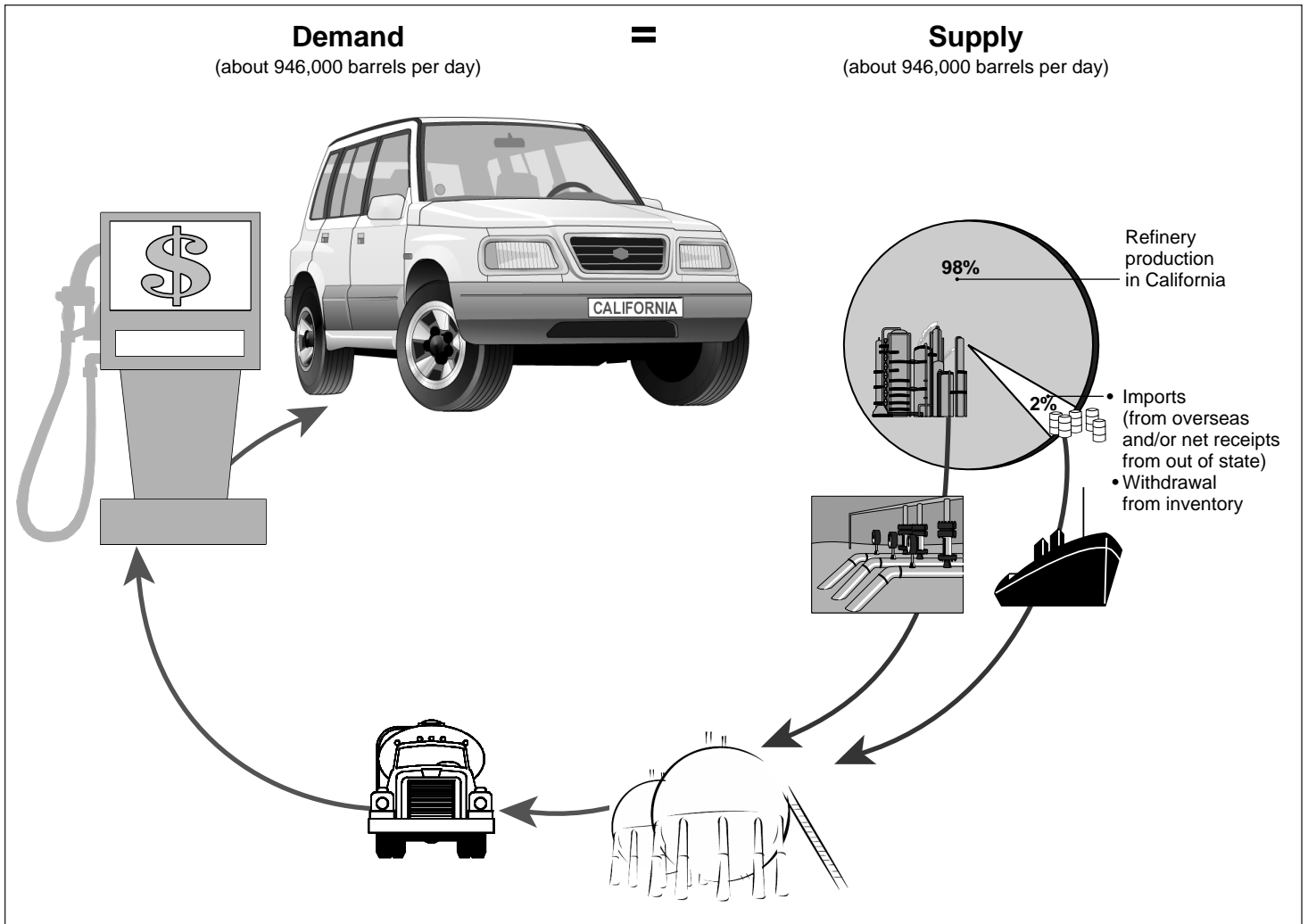
95 percent of the gasoline refined in the state, and 2, owned by independent refiners, had the rest of the gasoline-producing capacity. Other refineries made other petroleum products, such as asphalt and lubricants. Some conventional gasoline and gasoline that met federal standards for reformulated gasoline made by California refineries was shipped primarily to other West Coast markets, such as Oregon, Arizona, and Nevada.<sup>1</sup> Gasoline is transported primarily by pipeline from the refineries to storage terminals and then, typically, by truck from the storage terminals to retail gasoline stations.

The remaining supply comes from using existing gasoline inventories and from out-of-state providers. Gasoline brought into California from the U.S. Gulf Coast or other out-of-state locations typically travels by water on tankers or barges. Inventories and out-of-state providers generally play a minimal role except during disruptions in refinery production, when they become important supply sources. Events that substantially disrupt the supply of gasoline through this system could have a significant impact on the prices paid by consumers. Figure 2 shows California's gasoline demand/supply network.

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<sup>1</sup>Reformulated gasoline is designed to reduce harmful exhaust emissions that cause smog.

Figure 2: California's Gasoline Demand/Supply Network



Note: Demand/supply data are for 1998.

Source: EIA for demand/supply data; an oil industry official for supply percentages.

To improve its air quality, California established gasoline standards that are more stringent than the federal standards and different from those of any other state. On March 1, 1996, California implemented a program that exceeded the federal requirements for states to use reformulated gasoline in areas with serious ozone problems. The California reformulated gasoline program is administered by the California Air Resources Board (CARB). To

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make reformulated gasoline to meet the more stringent California standards, referred to as CARB gasoline, California refiners invested billions of dollars to modify their refineries to add sophisticated equipment and processes needed to make such gasoline. According to several industry officials and experts and CARB officials, some refiners, especially smaller ones, that could not make the needed modifications, partly because of high modification costs, shut down their refineries. This contributed to the reduction in the number of refineries in California that can make gasoline.

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### Gasoline Price Spikes Were No More Frequent in California Than in the Rest of the Nation but Were Generally Higher, Primarily Because of Refinery Outages

The retail price of regular gasoline spiked the same number of times in California and in the rest of the United States from 1995 through 1999.<sup>2</sup> However, all but one of the price spikes were higher in California than elsewhere in the country. Many federal, state, and oil industry analysts and officials believe that the California spikes were higher primarily because unplanned refinery outages disrupted the state's tight balance between gasoline supply and demand. In contrast, some West Coast gasoline retailers believe that the higher California spikes resulted from reduced competition at the refinery and retail levels.

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### Retail Gasoline Price Spikes in California Were No More Frequent but Were Generally Higher

Regular gasoline retail prices spiked seven times in California and in the rest of the United States (excluding California) from January 1, 1995, through December 31, 1999, as shown in figure 3. Moreover, five of the seven California spikes started at about the same time as the U.S. spikes, and six California spikes overlapped the corresponding U.S. spikes by at least 4 weeks. Generally, these spikes coincided with increases in crude oil prices and increases in the demand for gasoline during the spring and summer driving seasons.<sup>3</sup> Price spikes in California and in the rest of the

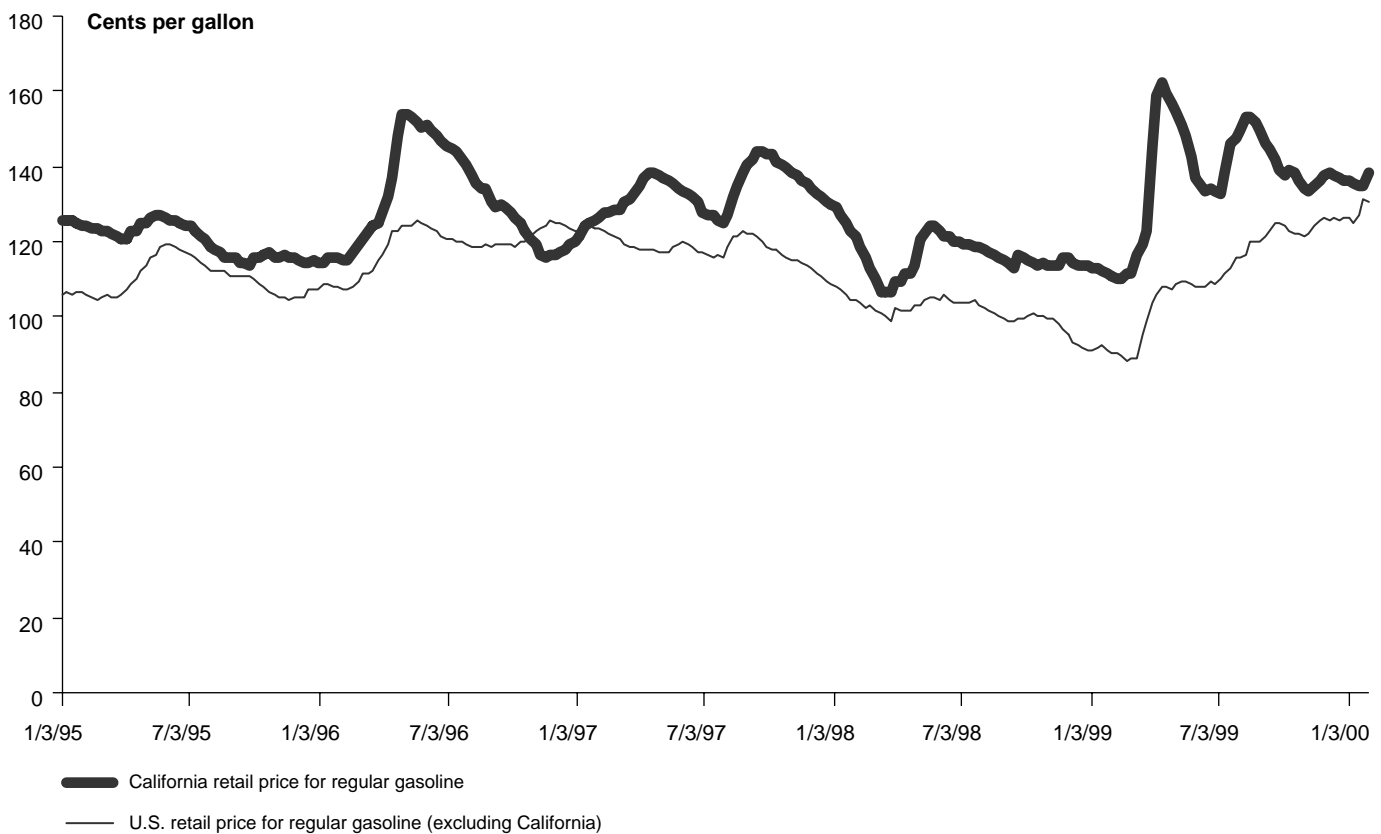
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<sup>2</sup>Because we found no standard definition of a gasoline price spike, we analyzed gasoline prices in California and in the rest of the United States (excluding California) between Jan. 1, 1995, and Dec. 31, 1999, to identify apparent spikes. During that time, there were seven periods when California and U.S. prices increased by at least 6 cents per gallon in a relatively short period of time—from 4 to 21 weeks. For this report, we refer to these increases as spikes.

<sup>3</sup>The director of EIA's Petroleum Division testified on Mar. 9, 2000, that gasoline retail prices in the United States were about \$1.50 per gallon—about 23 cents higher than at the beginning of the year—citing increases in crude oil prices as a major contributing factor.

United States occurred at different times only between the fall of 1996 and the spring of 1997. During this period, U.S. prices spiked in the fall of 1996, and California prices spiked in the spring of 1997, with a 1-week overlap.

**Figure 3: California and U.S. Retail Gasoline Prices, Jan. 1, 1995, Through Dec. 31, 1999**

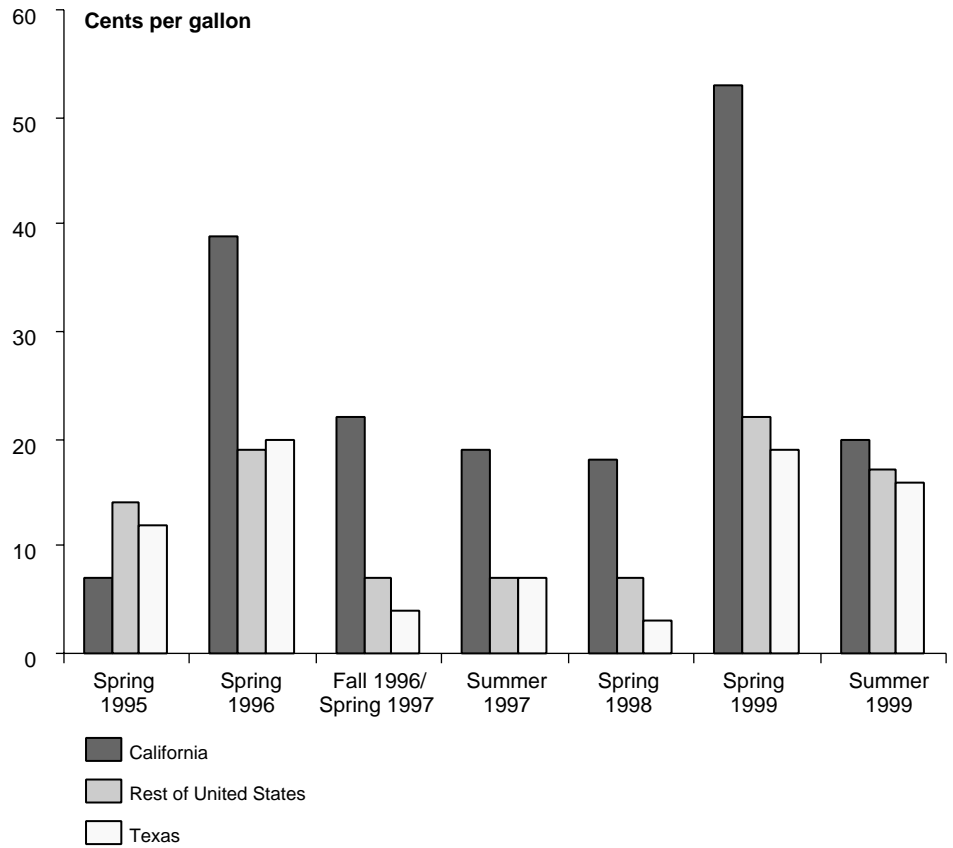


Source: EIA.

In terms of size, retail gasoline price spikes were higher in California than in the rest of the United States from January 1, 1995, through December 31, 1999, with one exception, as shown in figure 4. During six of the spikes, the California price increases (the differences between the low and high prices) were between 3 cents and 31 cents per gallon greater than the corresponding price increases in the rest of the United States. The smallest difference occurred in the summer of 1999, when California prices spiked 3 cents per gallon higher than prices in the rest of the United States (20 cents versus 17 cents). The largest difference occurred in the spring of 1999,

when California prices spiked 31 cents per gallon higher (53 cents versus 22 cents). Conversely, U.S. prices spiked 7 cents per gallon higher than California prices (14 cents versus 7 cents) in the spring of 1995.

**Figure 4: Comparison of California, Texas, and U.S. Retail Gasoline Price Spikes, Jan. 1, 1995, Through Dec. 31, 1999**



Source: EIA.

In addition, the relationship between California and U.S. prices changed after CARB gasoline requirements were implemented. The difference between gasoline prices in California and in the rest of the United States increased by about 6 cents per gallon—California prices were 10.5 cents per gallon higher than U.S. prices before CARB and 16.9 cents per gallon higher after CARB.

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A comparison of the number and size of gasoline retail price spikes in California and in Texas—a large refining state that is comparable to California in terms of its role in the U.S. gasoline market—corroborated our finding that spikes were no more frequent but were generally higher in California than in the rest of the United States. (See app. I for details of this related analysis.)

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### Higher Price Spikes in California Were Due Primarily to Unplanned Refinery Outages, but Other Factors May Have Contributed

Many oil officials and analysts told us that refinery outages were the primary reason California gasoline prices spiked higher than prices in the rest of the United States. However, some West Coast retailers believe that reduced competition was the primary reason.

### Unplanned Refinery Outages Were the Primary Cause of Higher California Price Spikes

California refineries had unplanned outages every year from 1995 through 1999. When such outages disrupted the California gasoline supply, oil companies met demand with gasoline from other sources. They obtained gasoline from out-of-state providers, used existing inventory, and increased production at California refineries whose operations were not disrupted. Obtaining gasoline from such sources was necessary when refinery outages significantly disrupted California's supply, as they did in the following instances:

- On April 1, 1996, an explosion at the Shell refinery in northern California virtually shut down the refinery's production, which amounted to about 100,000 barrels of gasoline a day. Before the Shell refinery was fully repaired, explosions and mechanical problems disrupted operations at several other refineries. According to the Energy Information Administration (EIA), these disruptions affected about 12 percent of the state's production for several months. Our analysis showed that California gasoline prices spiked about 39 cents per gallon that spring. The spike was primarily due to the refinery disruptions, according to CARB and oil industry officials. Gasoline was brought into California from as far away as Finland to make up for the lost production.
- An explosion at Tosco's northern California refinery in February 1999 and subsequent outages in at least three other California refineries significantly disrupted gasoline production for several months, adversely affecting 12 to 15 percent of the state's production, according to EIA and others. California Energy Commission officials and oil industry analysts told us that these outages forced some oil companies

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to buy gasoline on the spot market, driving up wholesale prices and, consequently, retail prices. Our analysis showed that California retail prices spiked 53 cents per gallon that spring. Gasoline from U.S. Gulf Coast, U.S. Virgin Islands, and foreign refineries helped lower prices. However, additional problems at several California refineries in the summer disrupted the state's supply again, and these disruptions were exacerbated by a June 10 explosion that shut down part of the Olympic Pipeline, which transports thousands of barrels of gasoline a day from Washington State to Oregon. Federal, state, and oil industry officials told us that the West Coast gasoline market is interrelated and that a major supply disruption anywhere in the region affects supply and prices throughout the region. Our analysis showed that California retail prices spiked 20 cents per gallon that summer. According to EIA, gasoline from the U.S. Gulf Coast and U.S. Virgin Islands was used to meet California's gasoline demand.

Bringing gasoline into California is slow and costly because California is isolated from out-of-state sources in two ways. First, only a few refineries outside the state can make gasoline that meets the state's CARB gasoline requirements. These few refineries are not set up to make CARB gasoline routinely, and they have to reconfigure their refining operations to produce it. Some oil industry officials told us that making the decision and reconfiguring for CARB gasoline production takes up to a week and adds costs for blending, storing, and segregating the gasoline. Second, because California has no pipelines that can bring gasoline into the state, tankers and other means must be used. According to oil industry analysts, CARB gasoline has been brought into California by tankers from the U.S. Gulf Coast, the U.S. Virgin Islands, and countries as far away as Finland, Singapore, and South Korea. According to EIA and oil industry officials and analysts, shipping gasoline into California from these locations takes between 11 and 40 days and adds 3 to 12 cents per gallon to the retail price.

To a limited extent, oil companies have also used gasoline in inventory and have increased output at uninterrupted refineries to meet demand when some California refineries' production has been disrupted. California inventories offered little potential relief because oil companies maintain relatively low inventories to avoid tying up resources. Similarly, California refineries can increase their production to only a limited degree because they are already operating at almost full capacity. According to CARB officials, California refineries were operating at about 97 percent of capacity in 1999.

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## Reduced Competition May Have Contributed to Higher California Spikes

Several West Coast retailers we contacted and others believe that reduced competition at the refinery and retail levels was the primary reason why California spikes were higher than U.S. spikes from 1995 through 1999. According to the executive director of the California Service Stations and Automotive Repair Association, which represents about 850 gasoline service stations, a lack of competition in California caused the spring 1999 spike. Testifying before the California legislature on April 28, 1999, he noted that consumption in the state increased 30 percent between 1982 and 1999, while the number of refineries decreased from 43 to 23 and the number of service stations decreased from 14,687 to 9,513. Similarly, representatives from the Automotive Trade Organizations of California, which represents the owners of over 2,000 service stations, repair facilities, and related businesses, told us that reduced competition was the major cause of the California price spikes. Additionally, the executive director of the Automotive United Trade Organization, which is headquartered in Washington State, attributed the generally higher gasoline price spikes in California and other West Coast states to the limited competition facing large oil companies in these states at both the refiner and the retail levels. In addition, referring to a 1999 preliminary report on California gasoline prices, the California attorney general issued a press release expressing concern that the relative lack of competition in California contributed to the state's high gasoline prices.<sup>4</sup> We could not confirm that reduced competition was the primary reason for the higher California price spikes because the information needed to do so, such as oil companies' pricing formulas, plans, or policies, was not readily available.

The Federal Trade Commission is investigating gasoline prices in West Coast states, including California, Oregon, and Washington. This investigation was prompted by allegations of anticompetitive behavior by oil companies. As of January 2000, Commission officials had reached no conclusions on the matter.

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<sup>4</sup>Keith Leffler and Barry Pulliam, *Preliminary Report to the Attorney General Regarding California Gasoline Prices* (Nov. 22, 1999).



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## Retail Gasoline Prices in California Rise Faster Than They Fall in Response to Changes in Wholesale Prices

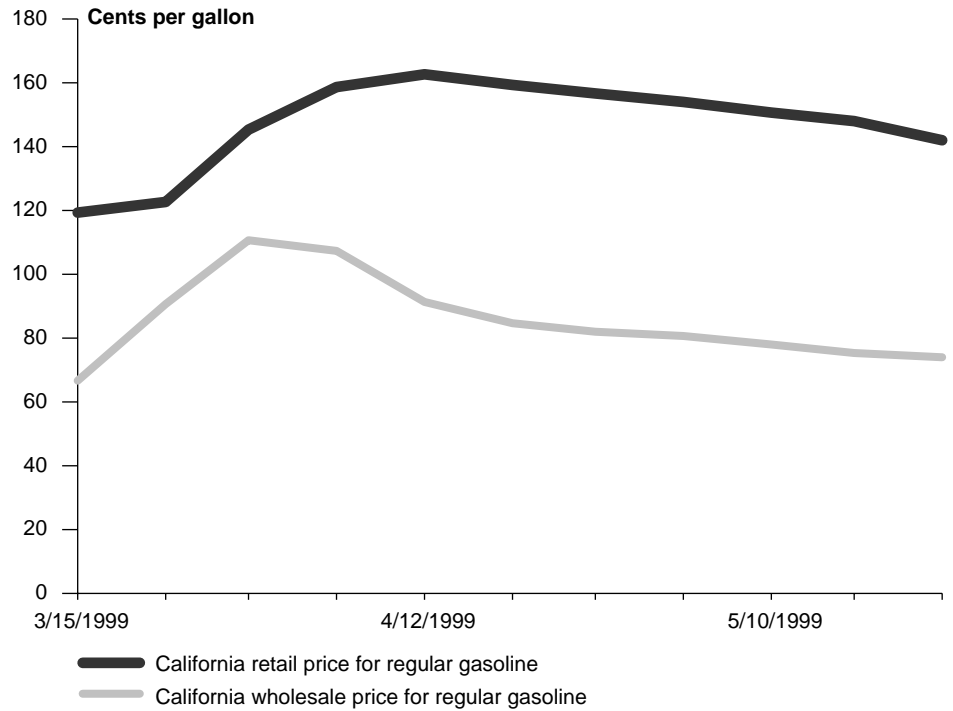
According to statistical modeling completed by EIA at our request, from April 1996 through July 1999, retail gasoline prices in California rose faster than they fell in response to changes in the wholesale prices of gasoline. In other words, the pattern of retail price adjustments to increases and decreases in the wholesale prices of gasoline was asymmetric.<sup>5</sup> The modeling did not separately estimate how much faster retail prices increased versus decreased in response to wholesale price changes. A previous study by EIA also found this asymmetric pattern for price adjustments in the Midwest, and the pattern is consistent with the findings of several other studies cited in the EIA report.<sup>6</sup> Figure 5 illustrates an asymmetric pattern of retail price adjustments to wholesale price increases and decreases using California price data over a 10-week period during the price spike in the spring of 1999.

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<sup>5</sup>EIA's statistical modeling also tested for the pattern of gasoline retail price increases and decreases in response to changes in the wholesale price in Texas, using Texas data for the same period. The result showed that retail prices in Texas also rose faster than they fell in response to changes in wholesale prices.

<sup>6</sup>See *Price Changes in the Gasoline Market: Are Midwestern Gasoline Prices Downward Sticky?* DOE/EIA, Washington, D.C. (Mar. 1999).

**Figure 5: Retail Price Adjustments Relative to Changes in Wholesale Prices**



Source: EIA and the Oil Price Information Service.

As the figure illustrates, when wholesale prices rose, retail prices adjusted to this increase by also rising, but with a lag. However, the figure also shows that before retail prices reached their peak, wholesale prices began to fall. Again, retail prices responded to wholesale prices by falling, but with a lag. The figure also shows that retail prices rose at a faster rate than they fell. Although retail prices did not reach the peak of the increase in wholesale prices before the latter started falling, they stayed up longer, or fell more slowly, than the decline in wholesale prices. In this example of an actual price spike, retail prices rose for 4 weeks and fell for 6.

The finding that retail gasoline prices have risen faster than they have fallen in response to wholesale price changes may have little or no implication for gasoline consumers apart from a consideration of the extent to which the wholesale price changes were passed on to consumers. EIA officials told us that their analyses of the data for California and other U.S. markets have shown that while the time taken for wholesale price changes to be fully reflected at the retail level varies among markets, all increases and

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decreases in wholesale prices were completely passed through to the retail level. According to these officials, because both increases and decreases in wholesale prices are ultimately fully passed through to the retail level, the pattern of the pass-through has little or no adverse impact on consumers. Many of the oil industry officials and experts we contacted also believe that, in general, because of competition at the retail level, retail prices fully reflect wholesale price changes, although they do so with a lag when prices are changing.

To understand why retail gasoline prices may rise faster than they fall in response to wholesale price changes, and because there is no consensus in the economic literature as to why, we discussed this asymmetric price pattern with EIA and other oil industry officials and experts. EIA officials said that the observed pattern is almost entirely driven by the way retail prices respond with a lag to changes in wholesale prices. In general, this explanation is consistent with the description of the price patterns depicted in figure 5 above.

In our discussions with oil industry officials and experts, several of them said that retail gasoline prices probably rise faster than they fall in response to wholesale price changes because retailers try to make up, during falling prices, for revenues lost when wholesale prices were rising. According to some oil industry officials and experts, although retail prices may rise fairly quickly in response to increases in wholesale prices, the increases in retail prices may not always fully reflect the wholesale price increases. They said that retailers exercise caution in raising their prices when wholesale prices are rising to avoid decreased sales and to forestall any backlash from consumers and public officials. Therefore, they explained, when wholesale prices fall, retailers lower prices more slowly in an attempt to recoup revenues lost when prices were rising. Furthermore, some argued that while retail prices may be slow to follow when wholesale prices fall, competition eventually forces retail prices down. The officials and experts we contacted said they did not know what impact this pattern of price adjustments would have on consumers. Furthermore, they pointed out that such price patterns are generally short lived and are not typical of long-run price behaviors.

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## Retail Gasoline Prices Are Higher in San Francisco Than in Los Angeles, in Part Because of Local Supply and Demand Conditions

Retail gasoline prices are higher in San Francisco than in Los Angeles, and these differences have increased since the introduction of CARB gasoline in 1996. The price differences between the two cities are explained in part by local supply and demand conditions, including (1) the number and location of retail gasoline stations, (2) the costs of building and operating gasoline stations, and (3) consumers' incomes. These local supply and demand conditions may not entirely explain the price differences between the two cities. Other factors, such as competition at the refining level, may help explain these differences, but we were unable to obtain proprietary data that would have allowed us to explore this possibility.

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## Retail Prices in San Francisco Have Been Higher Than in Los Angeles Since at Least 1992

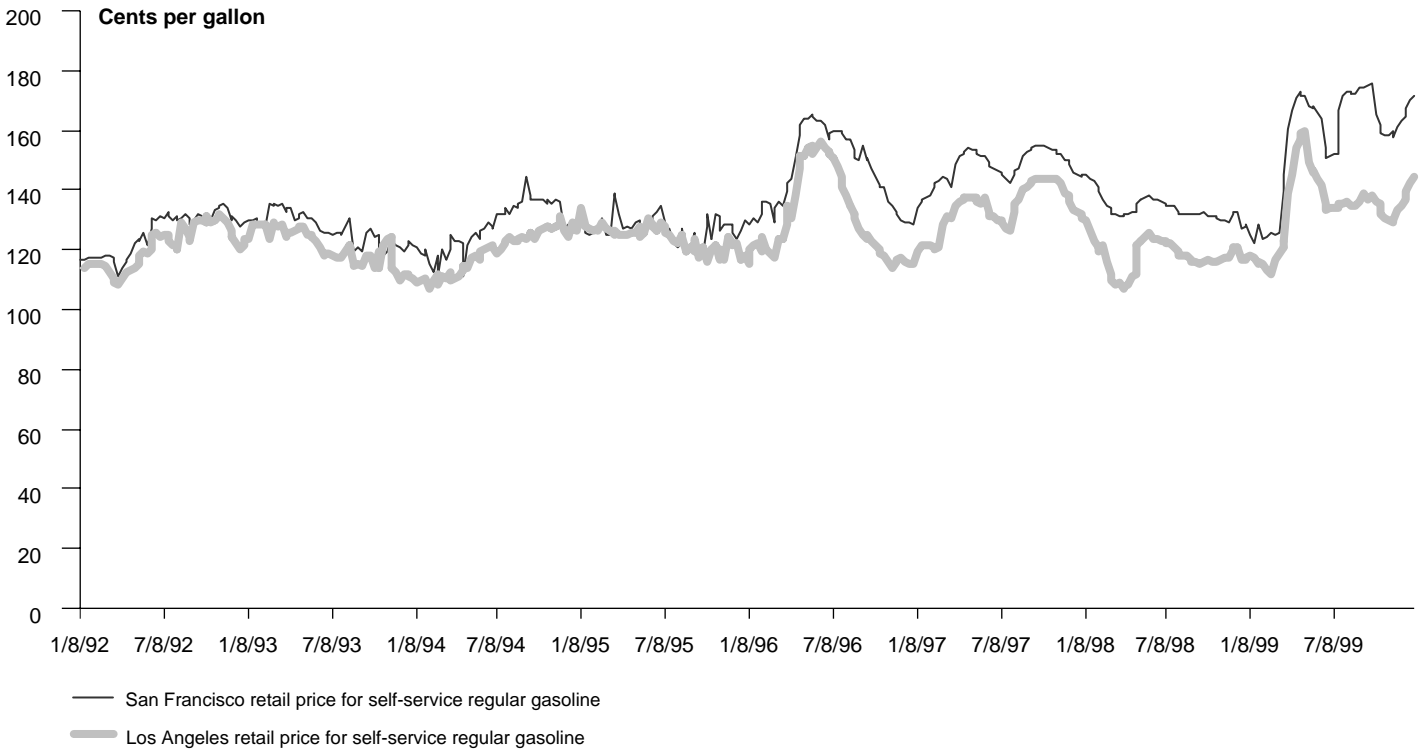
We examined retail gasoline prices from January 1992 through December 1999 and found that with few exceptions, San Francisco had higher prices than Los Angeles.<sup>7</sup> According to data from the *Oil and Gas Journal*, the average difference was about 11 cents over the entire period. Moreover, as discussed below, the average difference grew larger in the second half of the period, from March 1996 through 1999, and grew still further in 1999.<sup>8</sup> Figure 6 shows retail gasoline prices in the two cities from January 1992 through December 1999.

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<sup>7</sup>We chose the period from 1992 through 1999 so that we could examine the price differences between San Francisco and Los Angeles before and after CARB gasoline was introduced.

<sup>8</sup>We used data from the *Oil and Gas Journal* to calculate the differences in retail gasoline prices between San Francisco and Los Angeles. We compared these data with data from the Lundberg survey that we received from an industry source. The Lundberg data showed a similar pattern of price differences between San Francisco and Los Angeles, but the differences were about 3 cents per gallon smaller. For example, the average difference between prices from Jan. 1992 through Feb. 2000 was about 8 cents using Lundberg data compared with 11 cents using *Oil and Gas Journal* data. Similarly, according to Lundberg data, the average differences before and after CARB were about 3 cents and 14 cents, respectively, compared with 6 cents and 17 cents using *Oil and Gas Journal* data.

Figure 6: Retail Gasoline Prices in San Francisco and Los Angeles



Source: *Oil and Gas Journal*.

From January 1992 through February 1996, the retail price of regular gasoline was, on average, about 6 cents higher in San Francisco than in Los Angeles, but this difference increased to about 17 cents over the period from March 1996 through December 1999. In addition, refinery shutdowns in the Bay Area in the summer of 1999 further increased the price difference between the two cities to about 38 cents in August and September—the highest difference between 1992 and 1999. The price difference remained above 26 cents through December 1999.

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## Supply and Demand Conditions Help Explain Price Differences Between San Francisco and Los Angeles

In general, local supply and demand factors help explain why retail gasoline prices are higher in San Francisco than in Los Angeles. On the supply side, according to some experts and industry officials we interviewed, one key factor explaining the price differences is that consumers have fewer places to buy gasoline in San Francisco than in Los Angeles. In 1996, for example, there were about 19 gasoline stations in San Francisco for every 100,000 people, compared with about 25 stations in Los Angeles. One explanation for why there are fewer gasoline stations per capita in San Francisco than in Los Angeles is that land is relatively more developed in San Francisco, which raises the cost of acquiring a site for a gasoline station. For example, according to a recent study, gasoline station development costs—real estate and construction costs—are about 50 percent higher in San Francisco than in Los Angeles.<sup>9</sup> In addition, zoning and other regulations make it harder for station owners in San Francisco to operate convenience stores on the same property as gasoline stations and therefore eliminate profitable secondary sales. Being unable to spread high land costs over gasoline and convenience store sales would tend to make the costs of selling gasoline and also its price higher in San Francisco than in Los Angeles.

On the demand side, the annual per-capita consumption of gasoline is higher in San Francisco than in Los Angeles—in 1996, about 520 and 390 gallons, respectively. Tourists consume part of the gasoline, and on a per-capita basis, more tourists visit San Francisco than Los Angeles. For example, according to a survey done in 1998 for the California Department of Commerce, San Francisco County—with a population of around 783,000—was host to about 10 million leisure visitors, or about 13 per capita. In contrast, Los Angeles County—with a population of about 9,587,000—had about 24 million visitors, or about 2.5 per capita. Travelers to San Francisco County were also more likely to rent cars—about 12 percent of the leisure visitors to San Francisco rented cars compared with about 8 percent for Los Angeles. Besides increasing the total demand for gasoline, tourists may be less inclined than residents to search for low prices, enabling gasoline stations in areas with high tourist traffic to charge higher prices. Per-capita incomes are also higher in San Francisco than in Los Angeles, which may make the demand for gasoline in San Francisco less sensitive to price. Finally, the market structure of the two areas may play a role in explaining the price differences. For example, ARCO—a self-

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<sup>9</sup>*Gasoline Station Development Issues in San Francisco*, prepared for the Western States Petroleum Association by Kosmont & Associates, Inc. (Jan. 1998).

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declared and commonly recognized seller of low-priced gasoline at the retail level—has a bigger market share in southern California than in northern California, potentially contributing to the lower prices in Los Angeles.

The local supply and demand conditions that led to generally higher prices in San Francisco than in Los Angeles may also explain why these price differences rose when CARB gasoline was introduced in 1996 and why they rose further during refinery outages in 1999. The introduction of CARB gasoline in March 1996 caused prices to rise in California relative to the rest of the United States, in part by raising the cost of refining gasoline. At the same time, the supply of gasoline in California became more sensitive to supply disruptions because no outside source of CARB gasoline is readily available. When the cost of producing gasoline rose, refiners would have passed at least some of the cost on to retailers in the form of higher wholesale gasoline prices, in turn causing retail prices to rise. However, both wholesale and retail prices apparently increased more in San Francisco than in Los Angeles—the gasoline spot price (a wholesale price) rose about 2 cents more in San Francisco, and the difference in retail prices between the two cities increased from 6 cents to 17 cents, an increase of 11 cents.<sup>10</sup> There is no consensus among experts and industry officials as to why higher price increases occurred in San Francisco. One explanation offered is that higher refining costs are easier to pass on to consumers in San Francisco because of its local supply and demand conditions. Another is that the new fuel requirements might have tightened the gasoline supply and demand balance more in the northern part of the state than in the southern part. Consensus is also lacking as to why the refinery shutdowns in 1999 caused such a large increase in the retail price difference between the two cities, particularly since gasoline can be shipped by barge between San Francisco and Los Angeles for between 2 and 4 cents per gallon. However, as noted, local supply and demand conditions may make it easier to pass on refinery costs and wholesale price increases in San Francisco than in Los Angeles.

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<sup>10</sup>We were unable to gather data on the two other principal wholesale prices—“rack” and “dealer tank wagon”—so we cannot determine the extent to which wholesale prices in general changed when CARB gasoline was introduced.

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## Other Factors May Play a Role in Explaining Differences in Gasoline Prices

The 1999 preliminary report on California gasoline prices for the California attorney general concluded that there is less competition at the refiner level in California than in the rest of the United States. The report stated that refiners engage in the practice of zone pricing, which enables them to charge different wholesale prices to different retail dealers according to what the market will bear. The report stated that retail dealers pay higher wholesale prices in San Francisco (17 cents higher for the first 9 months of 1999) than in Los Angeles and that these differences in wholesale prices explain most of the differences in retail prices between the two cities. Although zone pricing is not unique to California, this practice could be a significant cause of retail price differences between San Francisco and Los Angeles. However, we were unable to obtain proprietary data on the actual wholesale prices paid by specific retail dealers, and without this information, we could not explore this possibility. Moreover, the ability of refiners to engage in and benefit from zone pricing depends to a large extent on other factors we have addressed in this report. For example, refiners may not be able to charge higher wholesale prices for gasoline if competition among retail dealers will preclude them from passing the higher prices on to consumers.

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## Agency Comments

We provided a draft of this report to the Department of Energy and EIA for review and comment. We discussed the report with EIA officials, including the Director, Petroleum Division. EIA agreed with the report and provided clarifying comments that we incorporated, where appropriate.

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## Scope and Methodology

To determine the extent to which retail gasoline prices spike more frequently and higher in California than in the rest of the United States, we obtained and analyzed average weekly price data from EIA for selected retail regular gasoline markets for the period from January 1, 1995, through December 31, 1999. Specifically, we compared price data for California reformulated gasoline with price data for all formulations of U.S. gasoline (excluding California). We also compared price data for California reformulated gasoline with price data for all formulations of Texas gasoline, using Texas as a benchmark state for U.S. prices. Specifically, we calculated the differences between the low and high gasoline prices in California, Texas, and the rest of the United States during the periods we identified as spikes—when the California and U.S. prices increased at least 6 cents per gallon in a 4- to 21-week period. To ascertain the reasons for the differences, we reviewed expert studies and relevant federal and state



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records, and we interviewed officials and experts in the oil industry (selected oil companies, consulting firms, and trade organizations) and at EIA and the Federal Trade Commission, the California Energy Commission and CARB, and the University of California at Berkley and Purdue University.

To determine whether California retail gasoline prices rise faster than they fall in response to changes in wholesale gasoline prices, we worked with EIA to develop and interpret an econometric model. This type of model is generally used by energy analysts to determine whether the prices of petroleum products, such as gasoline and home-heating oil, rise at a different rate than they fall in response to wholesale or even crude oil price changes—a phenomenon commonly referred to by analysts as price asymmetry. We used this model to analyze the response of retail prices to wholesale price changes from April 1996 through July 1999. To the extent possible, we used data in EIA's database, which we supplemented with data purchased from the Oil Price Information Service (a private vendor). However, these purchased data were not available at the level of detail needed to fully explain price behavior. To determine the reasons for the gasoline price asymmetry, we interviewed officials and experts in the oil industry, EIA, state agencies, and academia. We also reviewed existing studies and economic literature on gasoline markets.

To determine the extent to which gasoline prices were higher in San Francisco than in Los Angeles, we analyzed data on retail and wholesale gasoline prices for the San Francisco/Bay Area and Los Angeles. To determine the reasons for the differences in the gasoline prices for these two areas, we assessed the potential effects on gasoline prices of such factors as geographical characteristics, barriers to market entry, and cost differences. A lack of data prevented us from fully describing the importance of all these variables. We also interviewed officials from the oil industry, EIA, the California Energy Commission, and academia.

We conducted our work between June 1999 and March 2000 in accordance with generally accepted government auditing standards.

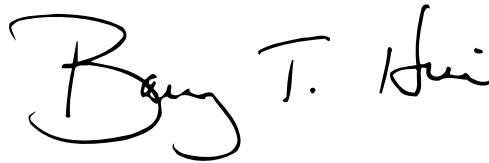
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If you have any questions about this report or need additional information, please call me at (202) 512-3841. Key contributors to this report included Daniel Haas, Godwin Agbara, Byron Galloway, and Frank Rusco.

Sincerely yours,

A handwritten signature in black ink that reads "Barry T. Hill". The signature is written in a cursive style with a large, looped "B" and a distinct "Hill" at the end.

Barry T. Hill  
Associate Director, Energy,  
Resources, and Science Issues

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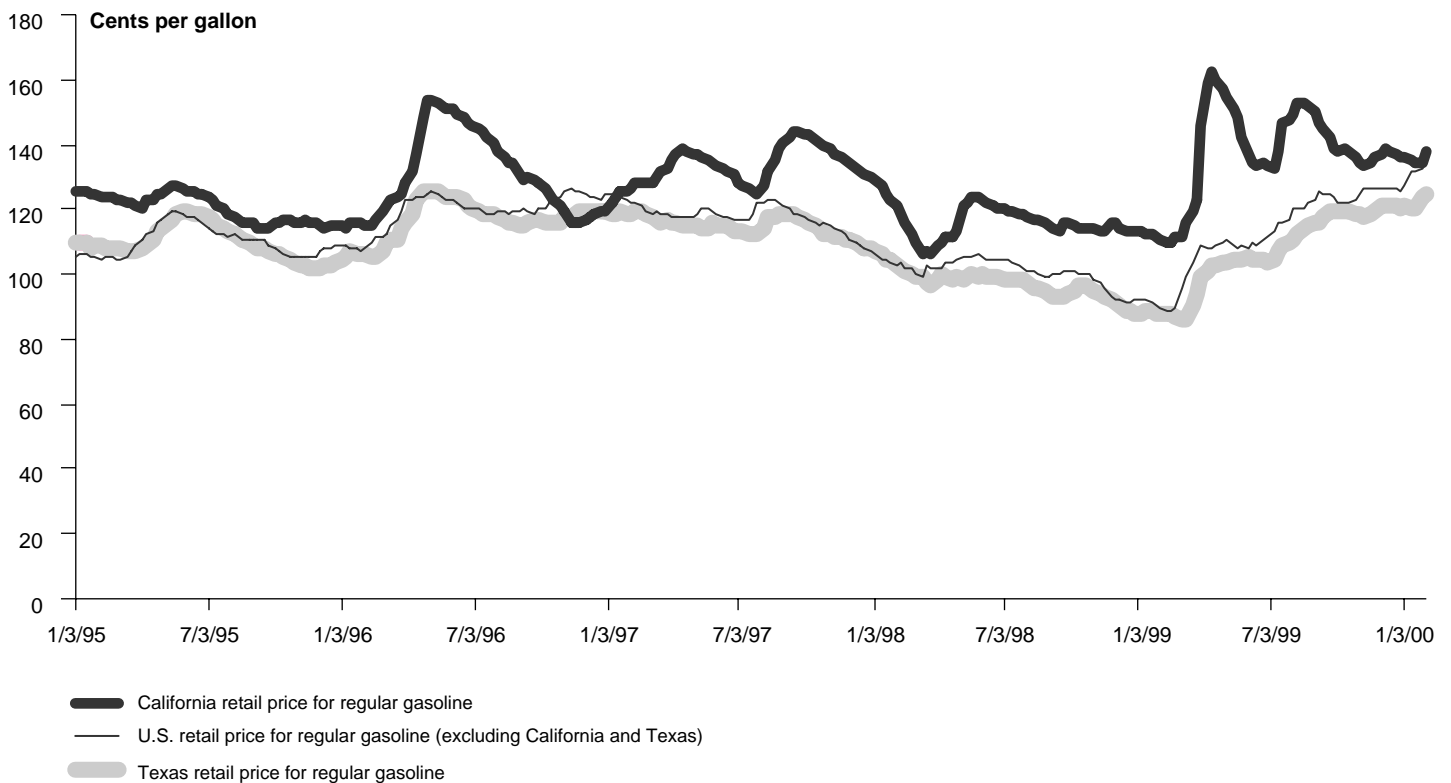
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# Comparison of Retail Gasoline Prices in California and Texas, a Benchmark for the U.S. Gasoline Market

We compared gasoline prices in California and Texas to determine whether California prices were different from prices in the rest of the United States. We selected Texas as a benchmark for the comparison because Texas, like California, played a major role in the U.S. gasoline market from January 1, 1995, through December 31, 1999. Texas and California, respectively, were the first and third largest refining states and the second and first largest consuming states.

Gasoline prices in Texas followed a pattern similar to prices in the rest of the United States (excluding California and Texas), increasing seven times, as shown in figure 7. However, two Texas price increases, which averaged less than 6 cents per gallon in the fall of 1996 and the spring of 1998, did not meet the criteria for a spike that we applied to California price increases.

**Figure 7: California, Texas, and U.S. Retail Gasoline Prices, Jan. 1, 1995, Through Dec. 31, 1999**



Source: Energy Information Administration.

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**Appendix I  
Comparison of Retail Gasoline Prices in  
California and Texas, a Benchmark for the  
U.S. Gasoline Market**

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The size of the retail gasoline price spikes was greater in California than in Texas. Six of the seven California price spikes were between 4 and 34 cents per gallon higher than the corresponding Texas price spikes or increases. The smallest difference occurred the summer of 1999 (20 cents per gallon in California versus 16 cents per gallon in Texas), and the largest difference occurred in the spring of 1999 (53 cents per gallon in California versus 19 cents per gallon in Texas). Once, in the spring of 1995, Texas prices spiked 6 cents per gallon higher than California prices (13 cents versus 7 cents per gallon).

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