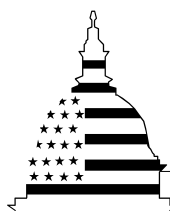


January 2007

CRUDE OIL

California Crude Oil Price Fluctuations Are Consistent with Broader Market Trends



G A O

Accountability ★ Integrity ★ Reliability



Highlights of [GAO-07-315](#), a report to congressional requesters

Why GAO Did This Study

California is the nation's fourth largest producer of crude oil and has the third largest oil refining industry (behind Texas and Louisiana). Because crude oil is a globally traded commodity, natural and geopolitical events can affect its price. These fluctuations affect state revenues because a share of the royalty payments from companies that lease state or federal lands to produce crude oil are distributed to the states.

Because there are many varieties and grades of crude oil, buyers and sellers often price their oil relative to another abundant, highly traded, and high quality crude oil called a benchmark. West Texas Intermediate (WTI), a light crude oil, is the most commonly used benchmark in the United States. The price difference between a crude oil and its benchmark is commonly expressed as a price differential. In fall 2004, crude oil price differentials between WTI and California's heavier, and generally lower valued, crude oil rose sharply.

GAO was asked to examine (1) the extent to which crude oil price differentials in California have fluctuated over the past 20 years and (2) the factors that may explain the recent changes in the price differential between California's crude oil and others. GAO analyzed historical data on California and benchmark crude oil prices and discussed market trends with state and federal government officials and crude oil experts.

www.gao.gov/cgi-bin/getrpt?GAO-07-315.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Jim Wells at (202) 512-3841 or wellsj@gao.gov.

CRUDE OIL

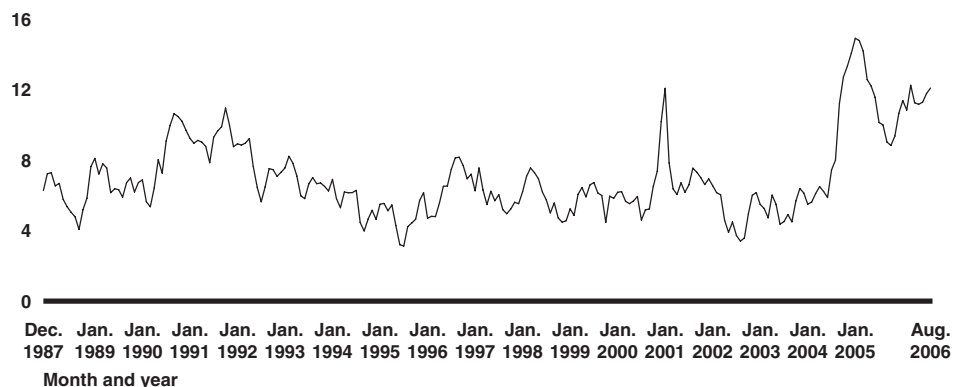
California Crude Oil Price Fluctuations Are Consistent with Broader Market Trends

What GAO Found

California crude oil price differentials have experienced numerous and large fluctuations over the past 20 years. The largest spike in the price differential began in mid-2004 and continued into 2005, during which the price differential between WTI and a California crude oil called Kern River rose from about \$6 to about \$15 per barrel. This increase in the price differential between WTI and California crude oils occurred in a period of generally increasing world oil prices during which prices for both WTI and California crude oils rose. Differentials between WTI and other oils also expanded in the same time period. The differentials have since fallen somewhat but remain relatively high by historical standards.

Recent trends in California crude oil price differentials are consistent with a number of changing market conditions. First, beginning in mid-2004, Middle East producers began to increase the supply of heavy crude oils in the world marketplace, which helped depress prices for heavy crude oils, including those produced in California, and contributed to the expanding price differential between California crude oils and WTI. Second, the price differential of California crude oils to WTI increased when the rise in global crude oil prices caused prices of light crude oils to increase faster than the prices of heavier crude oils. This occurred because the petroleum products from heavy crude oils compete against other fuels, such as coal. Third, events that only impact regional crude oil markets or individual crude oils can also affect price differentials. For example, in September 2004, Hurricane Ivan disrupted crude oil production in the U.S. Gulf Coast region, resulting in decreases in the region's crude oil supply. The resulting scarcity of crude oil in the Gulf Coast region caused the prices of WTI and other regional oils to increase relative to crude oils produced outside the region. This also would have increased the price differentials between WTI and California crude oils. Finally, manipulation of crude oil prices could also affect price differentials, but experts and officials GAO interviewed generally believed that this was not a factor during this recent period.

WTI and Kern River Crude Oil Price Differentials, December 1987 to August 2006
U.S. dollars



Source: GAO analysis of Platts data.

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Abbreviations

ANS	Alaska North Slope
API	American Petroleum Institute
bpd	barrels per day
CEC	California Energy Commission
CIPA	California Independent Petroleum Association
DOE	Department of Energy
EIA	Energy Information Administration
MMS	Minerals Management Service
NYMEX	New York Mercantile Exchange
OPEC	Organization of Petroleum Exporting Countries
WSPA	Western States Petroleum Association
WTI	West Texas Intermediate

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United States Government Accountability Office
Washington, D.C. 20548

January 19, 2007

The Honorable Henry A. Waxman
Chairman
Committee on Oversight and Government Reform
House of Representatives

The Honorable Dianne Feinstein
United States Senate

California is the nation's largest consumer of gasoline and consumes about 44 million gallons every day. California is also the nation's fourth largest producer of crude oil, behind Texas, Louisiana, and Alaska, and has the third largest oil refining industry, behind Texas and Louisiana. Despite a history of self-reliance in petroleum supplies, California crude oil production has been declining since 1996, and California increasingly relies on oil from other states and countries. California currently produces about 37 percent of the crude oil it uses, with the remainder coming largely from Alaska, Saudi Arabia, Mexico, Ecuador, and Iraq. Crude oil is a globally traded commodity, so natural and geopolitical events worldwide can affect its prices. These fluctuations can affect state revenues because a share of the royalty payments collected from companies that lease state or federal lands to produce crude oil are distributed to the states. For example, in fiscal year 2006, the Department of the Interior's Minerals Management Service (MMS), which collects royalties from federal lands, distributed more than \$303 million to the states, with California's share totaling over \$44.7 million, or roughly 15 percent of the total state disbursements. States rely on these revenues to fund education and infrastructure projects and to assist local counties where the oil production occurs. Consequently, oil producing states typically monitor crude oil price fluctuations and are interested in ensuring that the crude oil produced in their state trades at a fair price in the marketplace.

Crude oils produced from different regions and geologic structures vary in important ways that also affect each crude oil's value in the marketplace. Specifically, the value of a given crude oil is determined by its inherent quality and the amount and value of petroleum products that can be refined from it. Crude oil is commonly classified according to two parameters: density and sulfur content. Less dense crudes are known as "light," while denser crudes are known as "heavy." Crudes with relatively low sulfur content are known as "sweet," while crudes with higher sulfur content are known as "sour." In general, heavier and more sour crudes require more

complex and expensive refineries to process the oil into usable products but are less expensive to purchase than light sweet crudes. Because much of the oil produced in California is heavy and sour, California refiners have made significant investments in more technically complex equipment that enables them to process these crudes into higher value products such as gasoline, jet fuel, and diesel.

Because of the large number of grades of crude oils, buyers and sellers use benchmark crude oils as a reference in pricing crude oil. A benchmark crude oil is typically an abundantly produced and frequently traded crude oil. There are currently three widely used crude oil benchmarks—West Texas Intermediate (WTI), Brent, and Dubai. WTI is a very high quality light crude oil produced in Texas and refined in the Midwest and Gulf Coast, and it is typically the benchmark for crude oil produced in North and South America. Other oils are often priced with reference to one of these benchmark crude oils. The relationship between the prices of specific crude oils and a benchmark crude oil is commonly expressed as a price differential—calculated by subtracting the specific crude oil price from the benchmark price. For example, if WTI is selling for \$60 per barrel and Kern River (a California crude oil) for \$45 per barrel, the WTI-Kern River price differential is \$15.

Crude oil price differentials are generally not constant over time; they reflect changes in world crude oil markets, as well as more local or crude oil specific factors. When prices of the crude oil produced in a state fall to an unusual degree relative to prices of benchmark oils or similar quality oils, crude oil producers and state collectors of crude oil royalty revenues become concerned. In fall 2004, crude oil price differentials in California rose sharply when the price of WTI increased relative to California crude oils. In this context, you requested that we provide additional information on crude oil price differentials in California. As agreed with your office, this report discusses (1) the extent to which crude oil price differentials in California have fluctuated over the past 20 years and (2) the factors that may explain the recent changes in the price differential between California and other crude oils. To provide additional context for this report, we also evaluated recent increases in the price differential between WTI and crude oils produced in the Rocky Mountain region.

To determine the extent to which California crude oil price differentials have fluctuated over time, we obtained historical data on California and benchmark crude oil prices from Platts—a major provider of news and information on energy commodities. We obtained data on three California

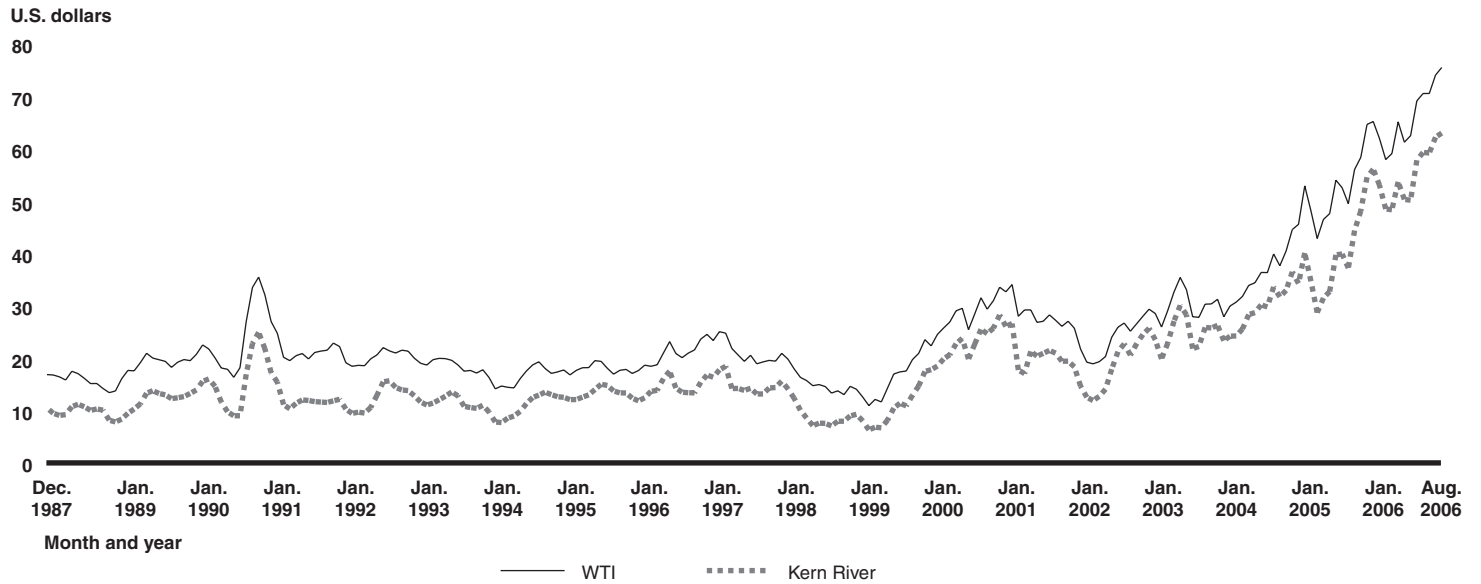
crude oils: two heavy crude oils (Kern River and Thums) and an intermediate crude oil (Line 63). We used these data to calculate price differentials by subtracting the price for California crude oils from benchmark crude oils and analyzing these differentials for trends over time. We also interviewed officials from the Energy Information Administration (EIA), MMS, and the California Energy Commission (CEC). To identify factors that may explain the recent changes in the California oil price differentials, we interviewed officials from EIA, MMS, CEC, and the California State Controller's Office. In addition, we interviewed industry experts from state, regional, and national trade organizations, such as the California Independent Petroleum Association, the Western States Petroleum Association, and the Independent Petroleum Association of America; representatives from crude oil production and refining companies in California and the Western United States; and independent energy sector consultants. We also discussed the possibility of price manipulation with numerous officials and experts to determine whether or not it was a relevant factor in explaining recent changes in crude oil price differentials. We conducted our work between May and December 2006 in accordance with generally accepted government auditing standards.

Results in Brief

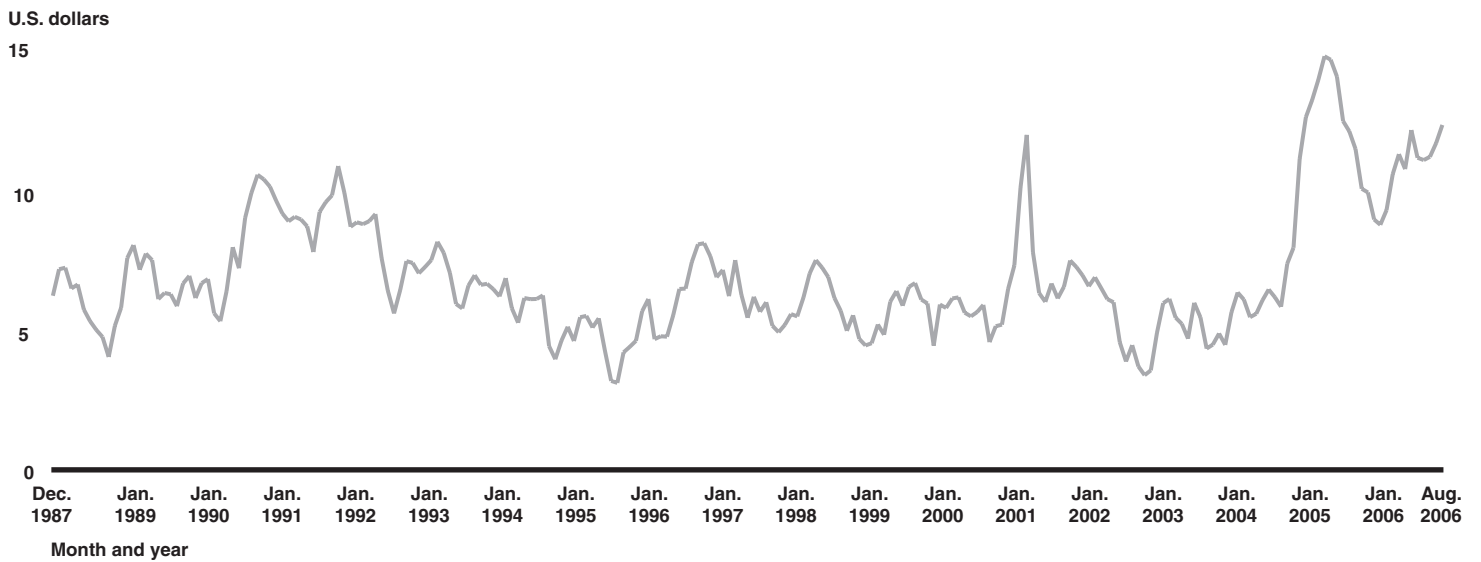
California crude oil price differentials have experienced numerous and large fluctuations over the past 20 years. The largest spike in the price differential began in mid-2004 and continued into 2005, during which the price differential between, for example, WTI and Kern River rose from about \$6 to about \$15 per barrel. This increase in the price differential between WTI and California crude oils occurred in a period of generally increasing world oil prices during which prices of both WTI and California crude oils rose. Price differentials between WTI and other oils also expanded in the same time period. Specifically, price differentials between WTI and two other California crude oils, Thums and Line 63, as well as price differentials between WTI and other non-California heavy crude oils, such as Mexican Maya and Arab Heavy, also increased. The price differentials have since fallen somewhat but remain relatively high by historical standards, while world crude oil prices and the price of crude oil in general have risen further. Figure 1 shows historic prices of WTI and Kern River, as well as the price differentials between these two crude oils.

Figure 1: WTI and Kern River Crude Oil Prices and Price Differentials, December 1987 to August 2006

Crude oil price



WTI-Kern price differential



Source: GAO analysis of Platts data.

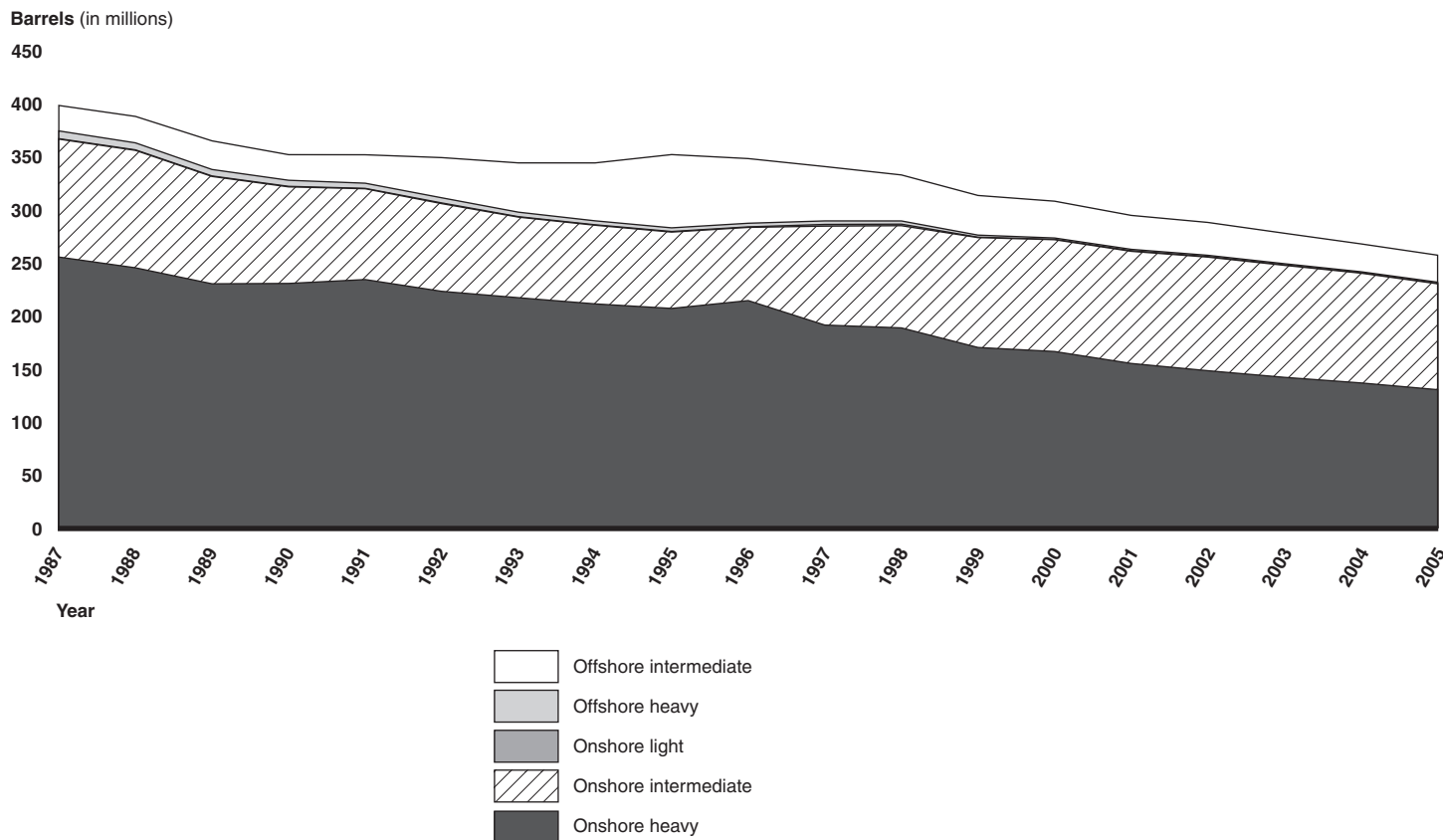
The recent trends in California crude oil price differentials are consistent with a number of changing market conditions. First, beginning in mid-2004, Middle East producers began to increase the supply of heavy crude oils in the world marketplace. This increase in supply helped depress prices for crude oils of similar quality, such as California's crude oils, and contributed to the expanding price differential between California crude oils and WTI. In addition, EIA officials told us that the recent increases in global crude oil prices caused prices of light petroleum products, such as gasoline and diesel, to increase more than the prices of heavier products, such as residual fuel oil, because these heavier products compete against other fuels, such as coal, that are not immediately affected by rising oil prices. As a result, prices for light crude oils, which produce greater amounts of lighter, higher value products, increase faster than heavy crude oils, which produce greater amounts of heavier, lower value products, and thus the price differential widens. Third, events that impact regional crude oil markets or individual crude oils can also affect price differentials. For example, in September 2004, Hurricane Ivan disrupted crude oil production in the U.S. Gulf Coast region, resulting in decreases in crude oil supply, primarily in that region. Some experts believe that the resulting scarcity of crude oil in the Gulf Coast region caused the prices of WTI and other regional oils to increase relative to crude oils produced outside the region. This also would have increased the price differentials between WTI and other crude oils, including those from California. Finally, the state of California has alleged in the past that some crude oil producers in California manipulated prices of their crude oil to reduce their royalty payments, which would, in turn, cause crude oil price differentials between WTI and California crude oils to rise. Most officials and experts we interviewed did not believe that this type of price manipulation was a factor in explaining recent changes in price differentials. However, we cannot completely rule out this possibility or other possible factors that we could not observe that could explain some of these recent changes.

Background

Two-thirds of all crude oil consumed in the United States is used by the transportation sector, with gasoline accounting for two-thirds of that total. The second largest consumer of crude oil is the industrial sector, including refineries and petrochemical industries, which account for another 25 percent of that total. In the residential and commercial sectors, crude oil consumption was as high as 15 percent of that total in 1970 but had since fallen to 6.5 percent in 2004. Similarly, the burning of crude oil to generate electricity peaked in 1975 at 8.6 percent, declining to 2.5 percent in 2004.

Crude oil is supplied through onshore and offshore domestic production and international imports. In 2005, the United States produced 6.8 million barrels per day (bpd), a 5.5 percent decrease from 2004. California is currently the fourth largest oil producer (including onshore and offshore production) in the United States, behind Louisiana, Texas, and Alaska, respectively, but its production has declined at a rate of 2.4 percent per year for the past 10 years. California produced 731,150 bpd in 2004 (the most recent year for which numbers are available). Figure 2 shows the decline in California crude oil production and the quantity of various grades of crude oil produced in California.

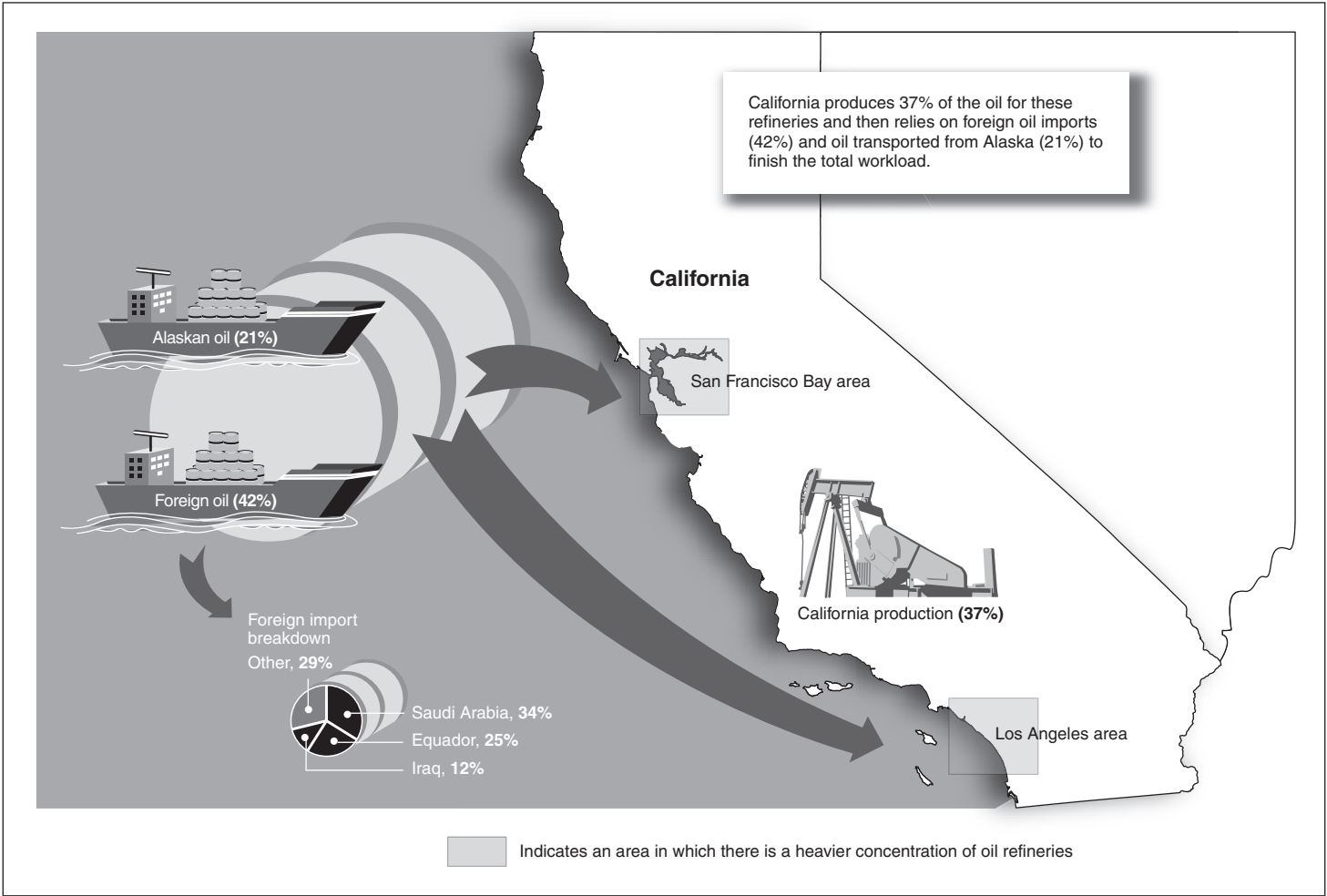
Figure 2: Quantities of Crude Oil Grades Produced in California, 1987 to 2005



Sources: CEC, California Department of Conservation, MMS.

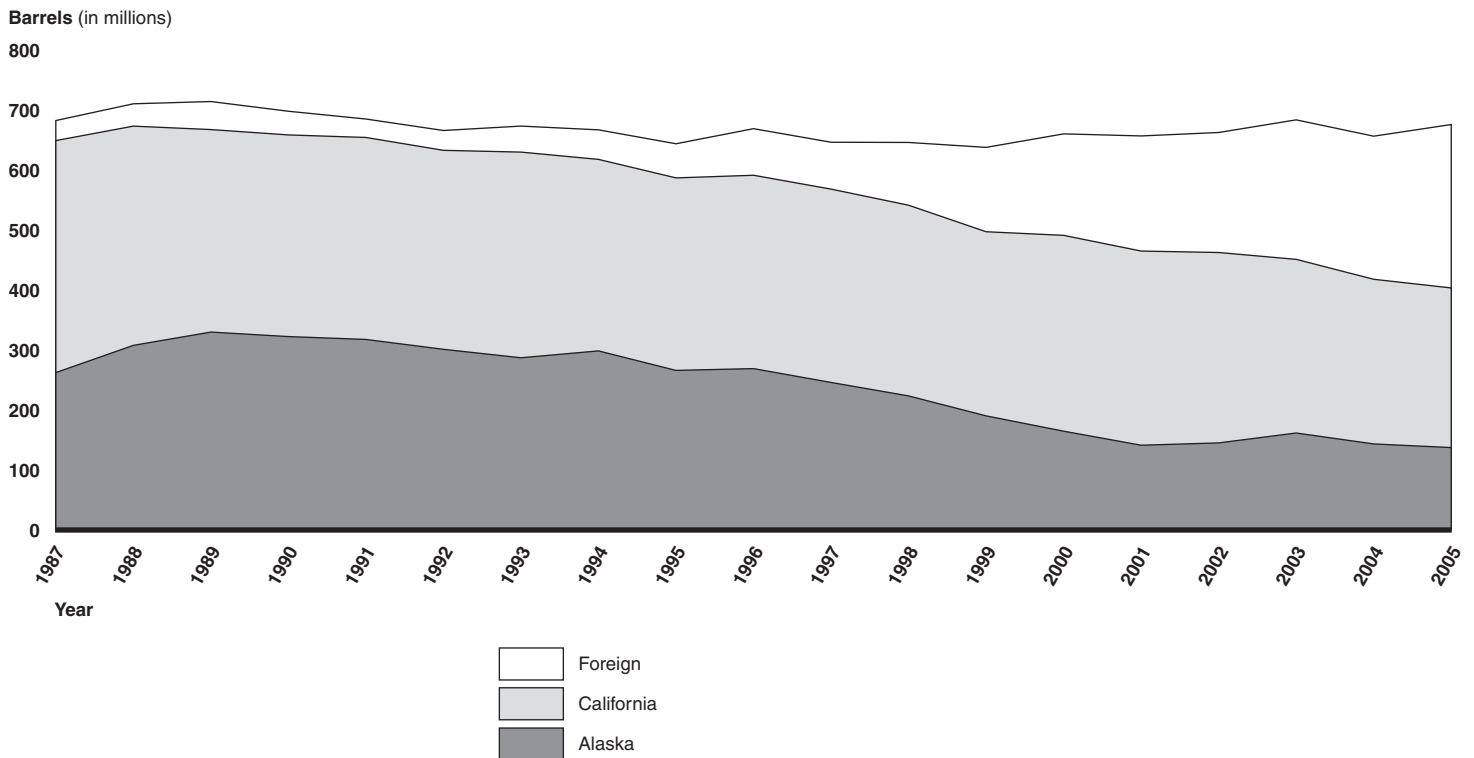
In 2005, the United States imported 13.5 million bpd, or 27.1 percent of total global oil imports. The EIA estimates that California imported 40.7 percent of all crude processed by the state's refineries, with the bulk of imports coming from Saudi Arabia, Ecuador, Iraq, and Mexico. The remainder of California's crude oil was either produced in state, or transported by tanker from Alaska. Figure 3 shows the sources of California's crude oil and the state's major refining centers as of 2005, the last full year of data available, and figure 4 shows the trend of California's crude oil supply over the past two decades.

Figure 3: Sources of California Crude Oil and Major Refining Centers, 2005



Sources: GAO, CEC, and EIA; California map, Map Resources. Images © Corel Corp. All rights reserved.

Figure 4: Quantities and Sources of Crude Oil Consumed in California, 1987 to 2005



Source: CEC.

WTI crude oil is a widely traded oil that is commonly used as a benchmark for measuring crude oil prices in the United States. Prices for WTI are collected at Cushing, Oklahoma. Crude oils delivered by pipeline generally use WTI first month delivery (WTI crude oil delivered 1 month from a specific date) as a price benchmark, and crude oils delivered by tankers use WTI second month delivery (WTI crude oil delivered 2 months from a specific date) as a price benchmark.¹

¹Crude oil is primarily transported using oil tankers and pipelines, with tankers generally providing intercontinental transport and pipelines used for transcontinental transport.

Crude oils are commonly classified by their density and sulfur content. The gravity of a crude oil is specified using the American Petroleum Institute (API) gravity standard, which measures the weight of crude oil in relation to water, which has an API gravity of 10 degrees. As shown in table 1, crude oil is generally classified as heavy (API gravity of 18 degrees or less), intermediate (API gravity greater than 18 and less than 36 degrees), and light (API gravity of 36 degrees or greater). In addition, crude oils vary by their sulfur content—crude oil is classified as sweet when its sulfur content is .5 percent or less by weight, and sour when its sulfur content is greater than 1 percent. Other natural characteristics, such as the presence of heavy metals and level of acidity, are also taken into account when classifying crude oils. In general, heavier and more sour crude oils require more complex and expensive refineries to process the oil into usable products but are less expensive to purchase than light sweet crude oils. Based on the API's classification, California crude oils are almost all in the heavy and intermediate range. WTI, on the other hand, is a very light oil with an API gravity of just under 40. Table 1 shows the API classification and the API gravity of California's three primary crude oils.

Table 1: API Crude Quality Classes and Representative California Crude Oils

Crude type	API gravity	Percentage of Calif. crude oils, 2005	Representative Calif. crude oils with API gravity in parentheses
Heavy	18 degrees or less	51%	Thums (17) Kern (13.4)
Intermediate	>18 degrees; <36 degrees	48.8%	Line 63 (29)
Light	36 degrees or greater	0.2%	
Sulfur type	Description		
Sweet	.5% or less by weight		
Sour	greater than 1% by weight		

Sources: API, CEC, Platts.

The sale of crude oil primarily occurs through one of three types of transactions: a spot transaction, a contract arrangement, or as a futures contract. Spot transactions are agreements to sell or buy one shipment of oil at a price agreed upon at the time of the arrangement. Spot transaction prices in various regional markets are available through private publishers that monitor and record market transactions and prices. Oil is often traded in long-term contracts at prices that are tied to a market indicator, such as the spot market or the futures market. While most contract prices are set in reference to a market index or a benchmark crude oil, some domestically produced crude oils are also sold using posted prices, which are usually set by buyers, refiners, and gatherers, and apply to a particular crude stream (a crude oil or blend of oils of standardized quality). International crude oils sold through contract arrangements are generally priced using a formula that includes a base price, which is referenced to a market indicator, plus or minus a quality adjustment. A futures contract is a standardized agreement that obligates the holder of the contract to make or accept delivery of a specified quantity and quality of a crude oil during a specific month at an agreed upon price. Futures contracts are bought and sold on a commodities exchange, such as the New York Mercantile Exchange (NYMEX). However, unlike spot transactions and contract arrangements, futures contracts very rarely result in the delivery of physical barrels of oil. Instead, the contract may be satisfied by a cash settlement prior to contract expiration by selling or purchasing other contracts with terms that offset the original contract or by exchanging a futures contract for the commodity.²

²Commercial interests typically use futures to hedge (or offset) unwanted price risk by shifting the risk to investors who hope to profit from taking on that risk. By hedging the risk, commercial interests seek price certainty, aiming to avoid losses due to falling prices, but at the same time willing to forgo the opportunity to make large profits from an unexpected rise in prices. A speculator may profit by accurately predicting either a rise or fall in prices.

Price Differentials between California and Other Crude Oils Have Fluctuated Significantly over the Past 20 Years but Have Risen Significantly in Recent Years

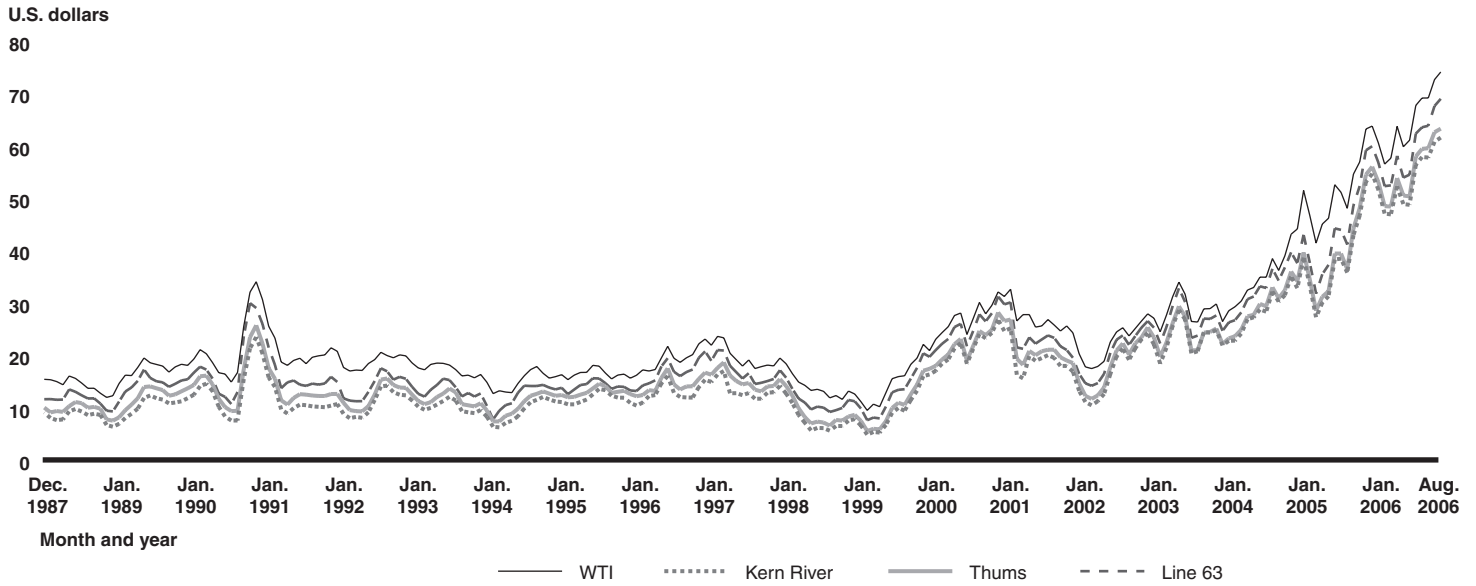
From December 1987 to August 2006, price differentials between WTI and California crude oils fluctuated significantly, generally increasing since mid-2004 and reaching a high in January 2005. This recent increase in crude oil price differentials coincided with a general increase in world crude oil prices and reflected a more rapid increase in WTI prices relative to prices of the three California crude oils we evaluated (Kern River, Thums, and Line 63).³ Large price differentials also occurred in 2004, 2005, and 2006 for heavier crude oils imported into California, such as Maya and Arab Heavy. Since January 2005, the price differentials between WTI and these heavier California and imported crude oils have fallen somewhat from their peak in 2005 but remain large by historical standards.

During the period from December 1987 through August 2006, all crude oil prices we evaluated tended to follow similar patterns, rising and falling in concert. However, the rate of increase or decrease in prices often varied by crude oil type and, consequently, the price differentials between these crude oils fluctuated. For example, California crude oil prices rose and fell in relation to WTI during the same period, with the higher quality Line 63 mirroring the price of WTI more closely than the lower grade Kern River and Thums. Specifically, the price differential between WTI and Kern River ranged from a low of \$3.20 in July 1995 to a high of \$14.99 in January 2005. Similar variable changes also occurred for the WTI-Thums price differential, which fluctuated between a low of \$2.47 in June 1995 and a high of \$13.92 in February 2005. For Line 63, the price differential was lowest in September 2000 at \$0.84 and highest in January 2005 at \$9.57. Fluctuations in prices for WTI, Kern River, Thums, and Line 63, as well as price differentials between WTI and the three California crude oils can be seen in figure 5.

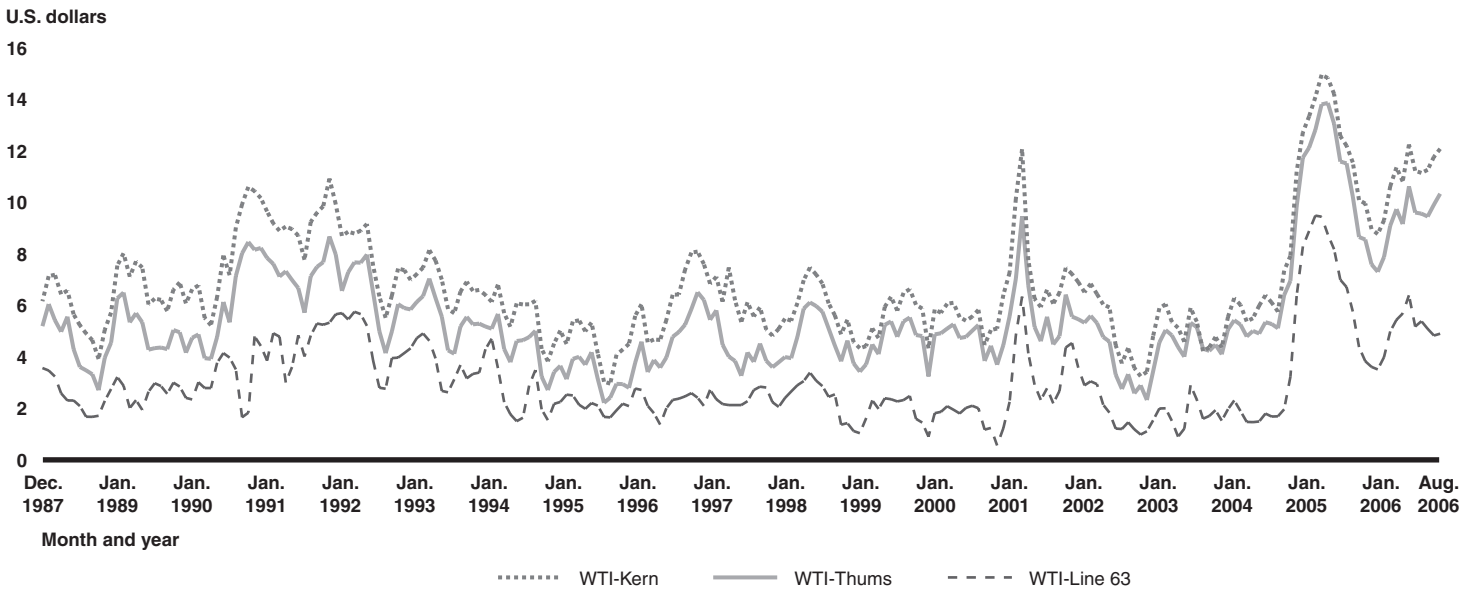
³Kern River is a heavy crude oil with an API gravity of 13 degrees and a sulfur content of 1.1 percent. Thums is also a heavy crude oil with an API gravity of 17 degrees and a sulfur content of 1.5 percent. Line 63 is an intermediate crude oil with an API gravity of 28 degrees and a sulfur content of 1.02 percent. WTI is a light crude oil with an API gravity typically between 38 to 40 degrees and a sulfur content of approximately 0.3 percent.

Figure 5: WTI, Kern River, Thums, and Line 63 Crude Oil Prices and Price Differentials, December 1987 to August 2006

Crude oil price



Price differentials



Source: GAO analysis of Platts data.

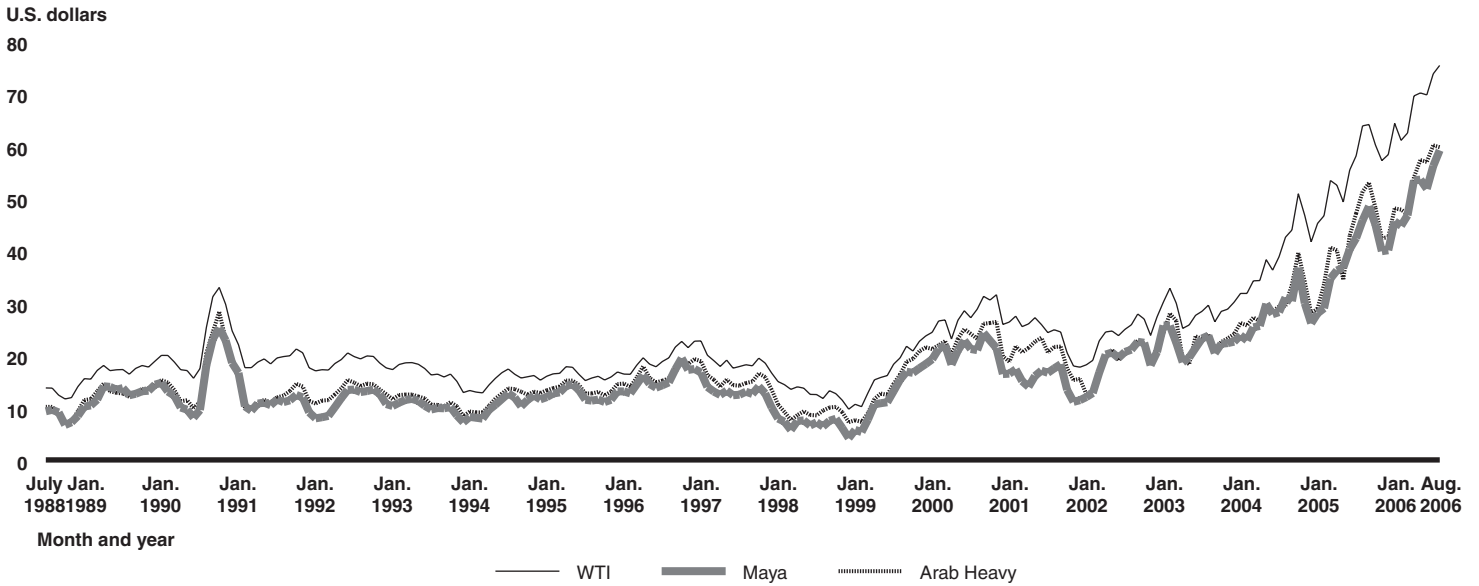
While numerous fluctuations in crude oil prices and crude oil price differentials have occurred over the 20-year period, global crude oil prices rose precipitously in mid-2004, with the price of WTI rising from \$40.79 in July 2004 to \$75.83 in August 2006—an increase of about 86 percent. This general rise in oil prices also occurred in California crudes, where prices for Line 63 rose from \$41.44 in August 2004 to \$70.72 in August 2006—an increase of about 71 percent, followed by Kern River and Thums, which rose from \$40.45 and \$41.41, respectively, in October 2004, to \$63.32 and \$65.02, respectively, in August 2006—both increases of about 57 percent. Because WTI rose faster than California crude oils, price differentials between California crude oils and WTI also increased during this period. The price differential for Line 63 rose from \$6.54 in September 2004 to a peak of \$9.61 in December 2004—an increase of about 47 percent. The price differential between Kern River and WTI rose from \$5.95 in June 2004 to a peak of \$14.99 in January 2005—an increase of about 152 percent. The price differential for Thums and WTI followed a similar pattern, rising from \$7.13 in August 2004 to a peak of \$13.92 in February 2005—an increase of about 95 percent.

Crude oils imported into California, including Arab Heavy and Maya, followed a similar pattern of fluctuating prices and increasing price differentials during the same recent period. These intermediate crude oils compete with Kern and Thums in the California marketplace because of their similar quality and characteristics.⁴ Price differentials between WTI and Arab Heavy increased from \$7.84 in June 2004 to a high of \$16.24 in January 2005—an increase of about 107 percent. Price differentials for Maya and WTI were \$8.39 in June 2004 and rose to a peak of \$18.68 in March 2005—an increase of about 123 percent. Figure 6 provides an overview of the rise in prices for WTI, Arab Heavy, and Maya and price differentials between WTI and these imported crude oils from July 1988 to August 2006.

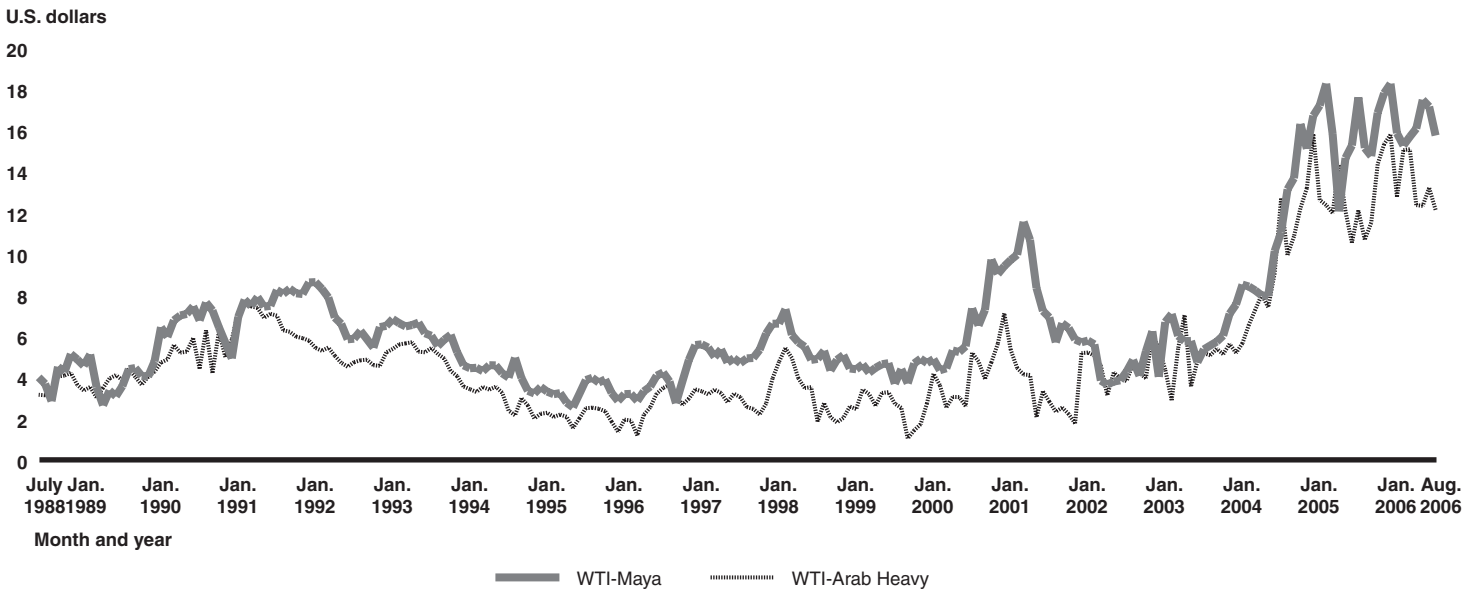
⁴Arab Heavy is produced in Saudi Arabia with a gravity of 27 degrees, and Maya is produced in Mexico with an API gravity of 22 degrees and a sulfur content of 3.3 percent.

Figure 6: WTI, Maya, and Arab Heavy Crude Oil Prices and Price Differentials, July 1988 to August 2006

Crude oil price



Price differentials



Source: GAO analysis of Platts data.

Since mid-2005, price differentials for the three California crude oils and the two imported crude oils have moderated somewhat but remain high by historical standards. For example, the price differential for Kern River fell to \$12.17 in August 2006 (the last month for which data was available), a decrease of about 19 percent from its high of \$14.99 in January 2005. For the lighter California crude oil, Line 63, the price differential fell to \$5.11 in August 2006, a decrease of about 47 percent from a peak of \$9.61 in December 2004. The price differentials for Arab Heavy and Maya followed similar patterns. For example, the WTI-Arab Heavy price differential fell to \$12.56 in August 2006, a decrease of about 23 percent from its high of \$16.24 in January 2005. Nonetheless, all the crude oil price differentials between WTI and the heavier crude oils we evaluated remain high by historical standards.

Recent Increases in California Crude Oil Price Differentials Are Consistent with Other Market-Based Factors

According to EIA officials and other crude oil market experts we interviewed, a range of market-based factors have affected recent crude oil price differentials. First, changing conditions and events in the global crude oil market influenced the relative prices of light and heavy crude oils, causing crude oil differentials between WTI and heavier crude oils to increase. Second, local and regional events that impacted specific regional crude oil markets affected crude oil prices and affected the price differential with WTI. This was particularly evident in oil production in the Rocky Mountain region in early 2006 when an increase in crude oil supplies and a lack of crude oil transportation capacity caused a decrease in prices and an increase in the price differential. In addition, the state of California has alleged in the past that crude oil producers in California manipulated prices lower to avoid making royalty payments. While most of the officials and experts we interviewed did not believe that California crude oil producers have recently engaged in this type of price manipulation, we cannot rule out this possibility or other possible factors that we could not observe that could explain some of the changes in price differentials.

Changing Conditions and Events in Global Crude Oil Markets Have Affected Price Differentials

EIA and other officials we interviewed told us that price differentials between light and heavier crude oils are driven primarily by supply and demand economics in the global crude oil and petroleum products markets and stated that these factors have influenced recent trends in price differentials between heavy California crude oils and the light crude oil benchmark WTI. For example, increases in the supply of light crude oil result in lower prices for those crude oils, which would decrease the price

differential in comparison to heavy crude oil, such as those oils typically produced in California. Conversely, an increase in the supply of heavy crude oil can result in lower prices for those crude oils, thus increasing the price differential between heavy crude oils and WTI. For example, according to EIA officials, between January 2003 and January 2005, world demand for crude oil increased substantially, in China and the United States in particular and in response, crude oil producers in the Middle East increased their production of heavy crude oil to meet the rising overall demand for crude oils. EIA officials and others stated that this caused prices of WTI to rise at a faster rate than heavy crude oils and contributed to rising price differentials between WTI and heavier crude oils such as those produced in California. EIA officials also told us that when crude oil prices increase, as they have in recent years, prices of lighter petroleum products, such as gasoline and diesel, rise faster than prices of residual fuel oils and other heavier crude oils because the latter products face greater competition from coal and natural gas, which are not initially affected by increases in crude oil prices. Because heavier crude oils typically generate a greater proportion of heavier petroleum products than do lighter crude oils, the value of the heavier crude oils falls relative to lighter crude oils. This causes the price differentials between WTI and heavier oils to rise further. Both of these factors helped push the price of heavy crude oils lower in relation to light crude oils. Specifically, between January 2003 and January 2005, the price of WTI increased by about 42 percent, while the price of Kern increased by about 16 percent. Consequently, the price differential between these two crude oils expanded from about \$6 to about \$15.

Local and Regional Events Have Affected Prices of Specific Crude Oils and Markets

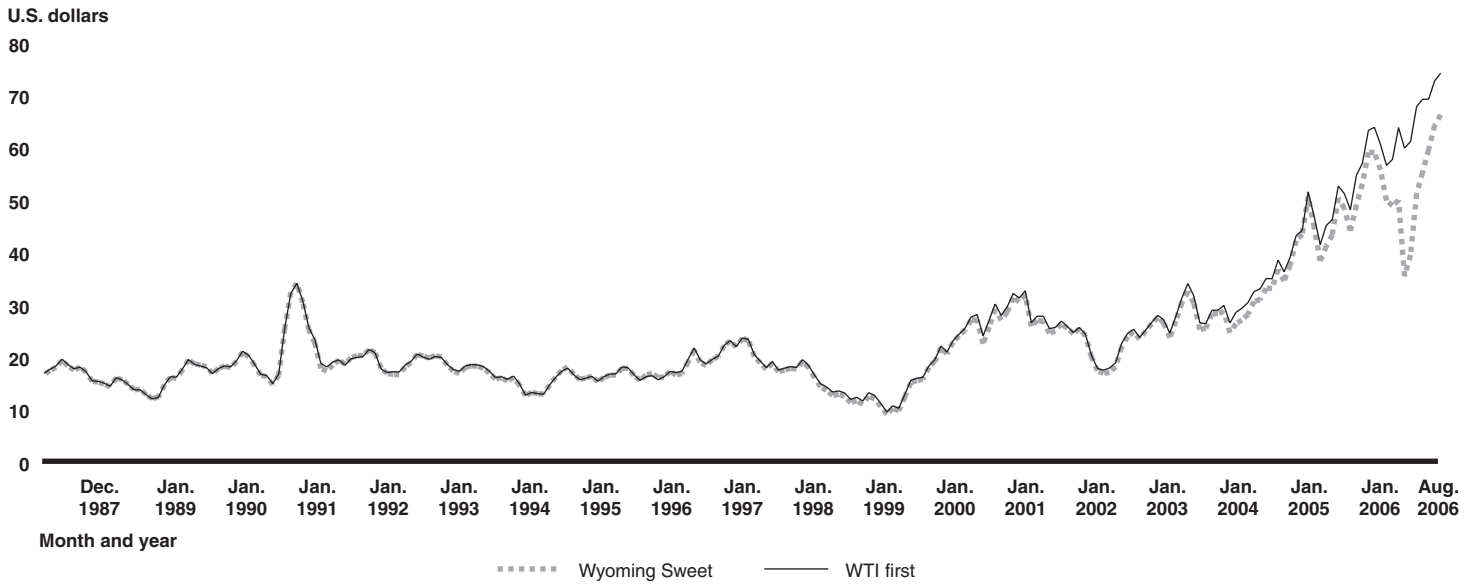
Local and regional events, such as hurricanes off the U.S. Gulf Coast and refinery outages, can cause fluctuations in the price of crude oils produced in the region and benchmark crude oils. Consequently, these events can increase or decrease price differentials. These events are tracked by analysts in the private sector crude oil markets, financial markets, and the federal government. From 1970 through the end of 2005, EIA examined 72 different events and their effects on crude oil prices, such as the Organization of Petroleum Exporting Countries oil embargo in 1973, the terrorist attacks of September 11, 2001, and the multiple hurricanes that struck the U.S. Gulf Coast in 2004 and 2005. For example, when Hurricane Ivan hit the Gulf of Mexico region in September 2004, oil tankers importing crude oil into the Gulf were delayed, and oil producers were forced to evacuate 3,000 employees from the region. MMS estimated that Hurricane Ivan caused crude oil production to decrease by 61 percent and resulted in

spikes in the price of WTI. This would have increased the price differential between WTI and other crude oils, including those California crude oils we evaluated.

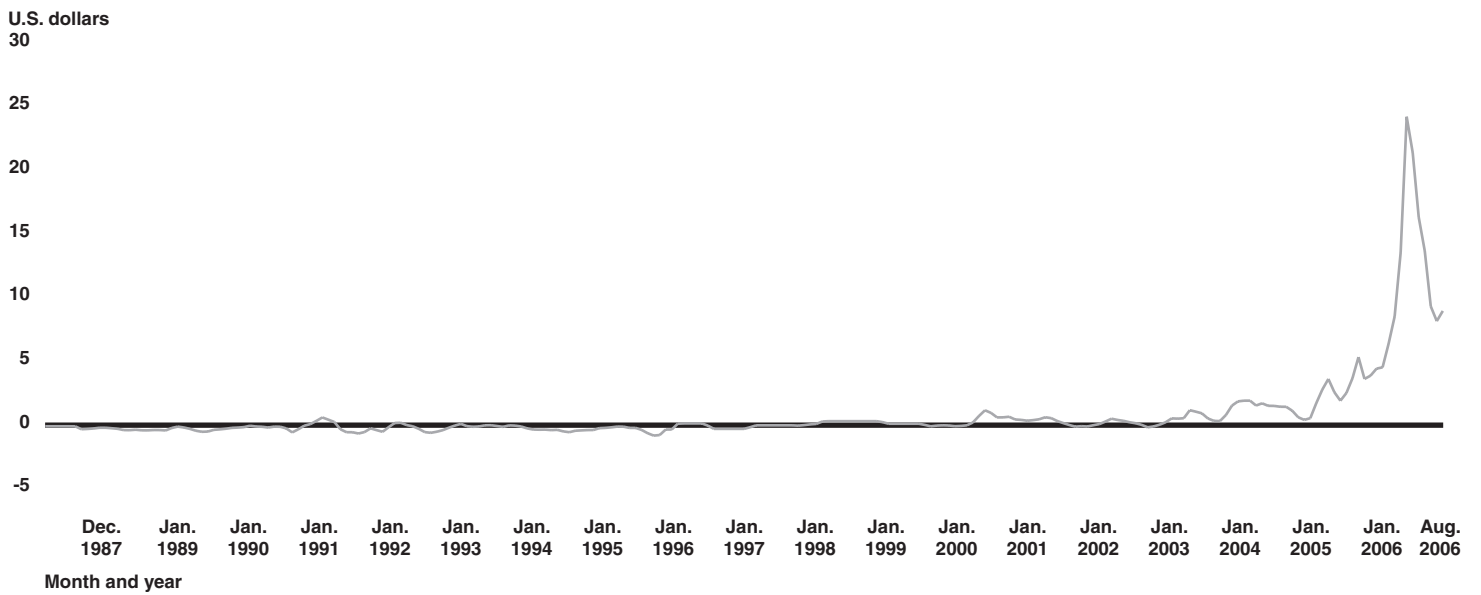
In addition, in early 2006, the price differential of local crude oils in the Rocky Mountain region rose to an unusual extent. The increase was most pronounced with the price differential between WTI and Wyoming Sweet, a regionally produced crude oil with a gravity and sulfur content very similar to WTI. From 1988 through mid-2005, the price of Wyoming Sweet was roughly equal to WTI, with price differentials ranging between zero and \$3. However, beginning in January 2006, the price of Wyoming Sweet dropped suddenly. Consequently, the price differential between Wyoming Sweet and WTI increased from about \$2 in the beginning of 2004 to over \$24 in February 2006. In contrast to California, where crude oil prices and price differentials to WTI have experienced regular fluctuations, there was no historic precedent for crude oil price differentials of this magnitude occurring in the Rocky Mountain region. Although the Wyoming Sweet price differential has since fallen to less than \$10, this is still unusually high for this region. Figure 7 shows prices for WTI and Wyoming Sweet and their price differential between December 1987 and August 2006.

Figure 7: Wyoming Sweet and WTI Crude Oil Prices and Crude Price Differentials, December 1987 to August 2006

Crude oil price



WTI-Wyoming price differential



Source: GAO analysis of Platts data.

State officials and officials representing crude oil producers in the region told us that the principal cause of the expanding Wyoming Sweet price differential was inadequate crude oil transportation infrastructure. In 2005, crude oil production in this region increased, and Canadian producers also increased imports into the region. However, the existing pipeline, railroad, and trucking infrastructure for transporting crude oil was insufficient to move this large influx of crude oil out of the Rocky Mountain region to other markets where it could have received a higher price. The resulting oversupply of crude oil in a region with comparatively low demand prevented the price of the regional crude oils from increasing similar to WTI prices, causing a large price differential. State officials we interviewed predicted that, until transportation infrastructure can be expanded, price differentials for oils produced in the Rocky Mountain region will continue to be above the historical trends.

Manipulation of Crude Oil Prices Could Affect Price Differentials

Market manipulation is a final factor that could cause crude oil price differentials to increase. In the past, the state of California alleged that crude oil companies in California manipulated crude oil prices to lower their royalty payments to the federal government. While we did not find any evidence that any market players had manipulated crude oil prices in California or elsewhere during the recent period of increasing crude oil price differentials, we cannot rule out this or other possible factors or events that we could not observe that could explain some of the changes in price differentials.

The sales price of crude oil is an important variable in the equation that determines the amount of royalties paid by oil companies who produce crude oil on federal lands. Royalty revenues are calculated using the following formula:

$$\text{Volume of Crude Oil Sold} \times \text{Sales Price} \times \text{Royalty Rate} = \text{Royalty Revenues}$$

Consequently, changes in either the sale prices or the volume sold can greatly affect the total amount of royalties oil companies pay and the states receive. Historically, posted prices were widely accepted as the true market value and the measure that should be used in determining royalty payments by crude oil producers, refiners, state governments, and the federal government.

In litigation starting in 1975 and continuing through 1995, the state of California and the city of Long Beach alleged that seven major oil producing companies had conspired to keep posted prices low and that their posted prices did not reflect the true market value of their crude oil, thus illegally reducing the amount of royalties the oil companies paid. Six of the companies eventually settled their cases, while the seventh went to trial and was exonerated. Although MMS was not a party to this litigation, it continued to independently evaluate whether posted prices reflected market value. In June 1994, MMS formed an interagency task force with some of the agencies that had previously reviewed the issue, including the Departments of Energy, Justice, and Commerce, to evaluate documents from the litigation and other data and determine whether the companies had wrongfully undervalued crude oil to avoid paying royalties. In May 1996, the task force concluded, among other things, that (1) oil companies in California typically received proceeds higher than posted prices and, therefore, royalties were underpaid and (2) much of the crude oil produced in California was not sold as contemplated in the royalty revenue formula, but rather moved through various transfers or exchanges either within a company that owned both the production and refinery operations, or between two companies for purposes of reducing transportation costs. Consequently, the reported sale price was frequently lower than actual market prices.

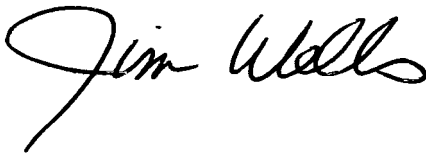
In March 2000, MMS changed its regulations for valuing crude oil from federal lands to address the conclusions of the task force. Among other things, the regulations changed for determining the value of crude oil sold in a “non-arms length” transaction—crude oil transferred within an oil company between its production and refining affiliates. Currently, royalties for these non-arms length transactions are calculated using a sales price that is imputed based on the price of Alaska North Slope (in California) or NYMEX (for the rest of the country) and adjusted for differences in quality. In arms-length transactions—sales between two separate and unaffiliated companies—the actual sale price, and not the posted price, is used to calculate royalties.

In the course of our work, most of the officials and experts we interviewed thought the new MMS regulations were effective in addressing this problem and neither believed that crude oil producers were engaging in this sort of price manipulation during the recent period of increasing crude oil price differentials, nor did they provide any evidence of such manipulation. However, we cannot rule out this or other possible factors or events that

we could not observe that could explain some of the changes in price differentials.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to interested congressional committees and Members of Congress, the Secretary of Energy, and the California State Controllers Office. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or wellsj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix II.

A handwritten signature in black ink that reads "Jim Wells". The signature is written in a cursive, flowing style.

Jim Wells
Director, Natural Resources and Environment

Objectives, Scope, and Methodology

The objectives of this review were to determine (1) the extent to which crude oil price differentials in California have fluctuated over the past 20 years and (2) the factors that may explain the recent changes in the price differential between California's crude oil and others. As part of the second objective, in order to provide additional context to the issue of price differentials in California, we also evaluated the unusually high crude oil price differentials that occurred in the Rocky Mountain region in late 2005.

To determine the extent to which California crude oil price differentials have fluctuated over time, we obtained data on the spot prices of the North American benchmark crude oil, West Texas Intermediate (WTI), and three California crude oils: two heavy crude oils (Kern River and Thums) and an intermediate crude oil (Line 63). We also obtained price data for two heavy crude oils that are imported into California in large volumes: Arab Heavy, a Saudi Arabian crude oil, and Maya, a crude oil imported from Mexico. These data included prices from December 1987 through August 2006. While most of the data we obtained listed a monthly average price, some crude streams used daily or weekly averages. In these instances, we calculated the monthly average price in order to make appropriate comparisons. We used this data to calculate price differentials by subtracting the price for the subject crude oil from the price of the benchmark crude oil and analyzing these differentials for trends over time. We interviewed officials from the Energy Information Administration (EIA), Minerals Management Service (MMS), and the California Energy Commission (CEC) to get background information on the major crude oils produced in California and imported into the region.

To identify factors that may explain the recent changes in the California price differentials, we (1) interviewed key officials and experts, (2) reviewed studies on crude oil prices and price differentials, and (3) reviewed historical studies and interviewed agency officials about the history of crude oil price manipulation in California. To better understand the key factors that affect crude oil price differentials in general and specifically in California, we interviewed federal agency officials from EIA and MMS; state agency officials from CEC and the California State Controller's Office; and experts from organizations representing crude oil producers and refiners, including the California Independent Petroleum Association (CIPA), the Western States Petroleum Association (WSPA), and the Independent Petroleum Association of America. We reviewed studies, reports, and presentations on crude oil pricing and differentials written by or produced for EIA, MMS, CEC, CIPA, and WSPA. We also reviewed a study prepared for the California State Controller's Office on crude oil price

differentials in California, written by IIC Inc., and interviewed its author. To evaluate the issue of crude oil price manipulation in California, we reviewed documents, regulations, and studies from the 1980s and 1990s regarding the history of allegations of oil producers manipulating prices to avoid making royalty payments. We also interviewed officials with the California State Controller's Office, MMS, CIPA, and WSPA, regarding the history of manipulation in California, and whether they believed or had evidence that such price manipulation might have occurred in the recent period of unusually high price differentials. We did not seek to acquire proprietary records on the prices received for sales of crude oil from crude oil producers or their buyers for this engagement.

To evaluate the unusually high price differentials in the Rocky Mountain region, we obtained data on the spot price of Wyoming Sweet, a light sweet crude oil similar in quality to WTI. We used this data to calculate price differentials by subtracting the monthly average price for Wyoming Sweet from the monthly average price of the WTI and analyzed these differentials for trends over time. To understand the causes of the high price differential in the Rocky Mountain region and to learn what stakeholders in the region are doing to address the issue, we interviewed officials with the Wyoming Pipeline Authority, the North Dakota Petroleum Council, the Interstate Oil and Gas Commission, the Colorado Oil and Gas Commission, and oil producers and refiners in the region.

We conducted our work between May and December 2006 in accordance with generally accepted government auditing standards.

GAO Contact and Staff Acknowledgments

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Staff Acknowledgments

In addition to the individual listed above, Frank Rusco, Assistant Director; Jeffrey Barron; Casey Brown; Alison O'Neill; Kim Raheb; Barbara Timmerman; and Wilda Wong made key contributions to this report.

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