



PETROLEUM WATCH

California Energy Commission

February 2018

Recent Petroleum News

Hot Topic Supplement (page 11)

Petroleum Watch continues to look at changes in California's gasoline markets. These supplemental articles have detailed the rising price level in California's wholesale markets and retail markets. This February supplement focuses on changes in ownership of refineries and explores price changes from economic factors such as unemployment and inventory levels.

Prices

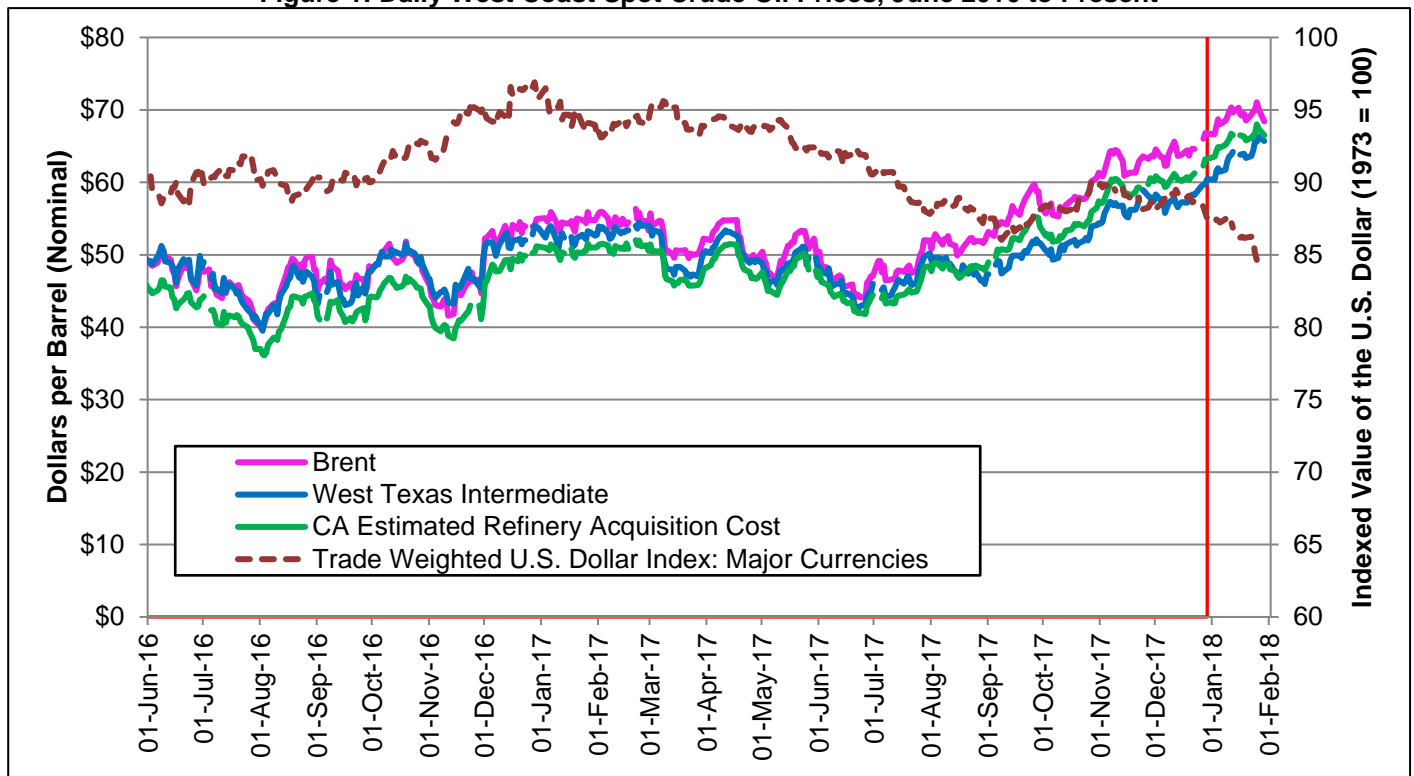
- **Crude Oil Prices:** Brent and West Texas Intermediate (WTI) crude prices closed at \$68.41 and \$65.71, respectively, on January 29 (**page 2**).
- **California Retail Gasoline Prices:** On January 29, prices reached \$3.30, an increase of \$0.15 since the end of December. Through January, California prices averaged \$0.65 higher than the national average (**page 4**).
- **California Retail Diesel Prices:** On January 29, prices reached \$3.58, an increase of \$0.09 from the end of December. Through January, California prices averaged \$0.62 higher than the national average (**page 5**).

Refining News

- **Andeavor Wilmington Refinery:** On January 3, the refinery underwent planned maintenance on the reforming and hydrotreating units. This work was completed on February 1.
- **Chevron El Segundo Refinery:** On January 15, the refinery underwent planned maintenance on the alkylation and fluid catalytic cracking units.
- **Phillips 66 Wilmington Refinery:** On January 22, the refinery conducted unplanned maintenance on a coking unit. This unit was restarted on January 28.
- **Valero Wilmington Refinery:** On January 10, the refinery underwent planned maintenance on the distillation, hydrotreating, coking, and reforming units. The refinery restarted units on February 6.

Crude Oil Prices

Figure 1: Daily West Coast Spot Crude Oil Prices, June 2016 to Present



Source: U.S. Energy Information Administration (EIA), Oil Price Information Service (OPIS), and Federal Reserve Bank of St. Louis.
 Note: Red lines on all graphs indicate end of previous *Petroleum Watch* data. Areas to the right indicate new data since last month.

Crude oil prices continued to increase in January (Figure 1). Since July 2017, crude oil prices have increased an average of 6 percent per month for Brent, 5 percent per month for WTI, and 6 percent per month for the California Estimated Refiner Acquisition Cost (CA-RAC).¹ Brent crude oil prices averaged \$69 in January, with four days in that month finishing trading above \$70 a barrel, before returning to below \$70 a barrel by the end of the month. The Brent crude oil price has increased more than the WTI over the July-to-January period. In January, WTI prices caught up with Brent, going from a \$6 gap at the beginning of the month and finishing the month below \$3.

The extension of oil production quotas by the Organization of Petroleum Exporting Countries' (OPEC) were seen as a driver of crude oil price increases from August to December. But January price increases are likely a result of a weakening U.S. dollar. The U.S. dollar weakened 3 percent in January, forcing buyers to convert more U.S. dollars to international currencies to buy crude oil. Recent reductions in the gap between WTI and Brent prices could be a signal of increased U.S. demand for crude oil, which would continue to put upward pressure on international crude oil prices.

<u>Crude Oil Prices</u>	
<u>January 2018 vs 2017</u>	
<u>(Percent Change)</u>	
Brent	27% higher
WTI	21% higher
CA-RAC	31% higher
<u>January 2018 Averages</u>	
Brent	\$69.21
WTI	\$63.59
CA-RAC	\$65.99
<u>January 29, 2018</u>	
Brent	\$68.41
WTI	\$65.71
CA-RAC	\$66.51

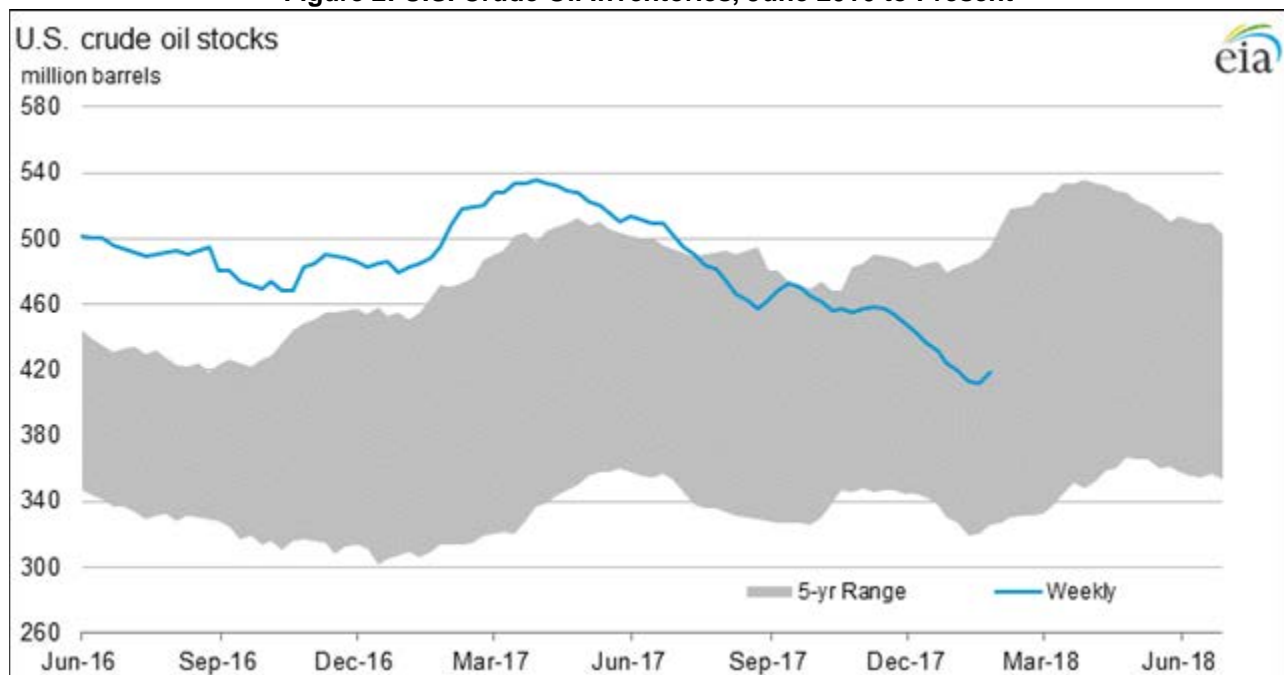
¹ CA-RAC is a weighted average of the prices of California (San Joaquin Valley) crude, Alaskan crude, and foreign crude.

Crude Oil Production and Storage

Monthly crude oil production and imports increased, while crude inventories and refinery input levels decreased since January's *Petroleum Watch* (Figure 2).

- U.S. crude oil production for January was estimated at 9.95 million barrels per day (bpd), 174,000 bpd higher than December's monthly average of 9.77 million bpd and the highest production rate as recorded by EIA. This is a 1 million bpd increase from a year ago, when production levels were 8.95 million bpd.
- Crude oil imports increased by 289,000 bpd to 8.08 million bpd in January. Compared to import levels from January 2017, this is a decrease of 38,000 bpd.
- U.S. crude oil refinery inputs increased by 713,000 bpd since December's *Petroleum Watch*, finishing January at an average 16.5 million bpd. Refinery inputs are 713,000 bpd lower than year-ago levels.
- Crude oil inventories in the United States decreased by 4.2 million barrels during January to 420.3 million barrels. Current inventories are 88.3 million barrels lower than one year ago.

Figure 2: U.S. Crude Oil Inventories, June 2016 to Present



Source: U.S. Energy Information Administration

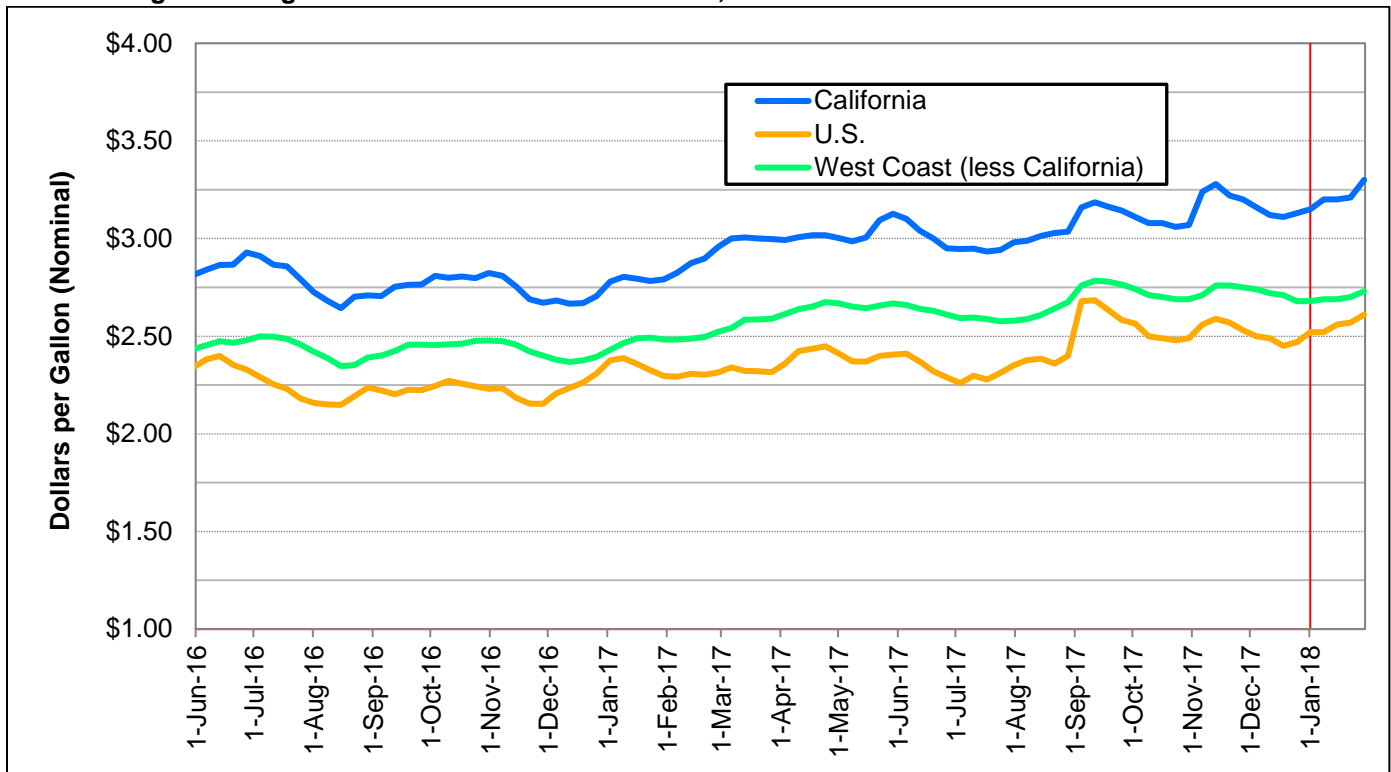
U.S. crude oil production is still increasing and reaching historical highs as recorded by the U.S. Energy Information Administration (U.S. EIA). Crude oil inventories increased over the last two weeks of January but are at the lowest levels seen since March 2015. All indicators imply rising demand for products and crude oil.

According to OPEC's December *Monthly Oil Market Report*, total December OPEC production increased by 42,400 bpd to 32.4 million bpd. OPEC's crude oil estimate for the rest of 2018 is 33.1 million bpd, "about 0.2 million bpd higher than in the previous year."²

² OPEC January Monthly Oil Monthly Report, page i, page 56: http://www.opec.org/opec_web/en/publications/338.htm.

Gasoline and Diesel Retail Prices

Figure 3: Regular Grade Gasoline Retail Prices, California vs. West Coast vs. United States



Source: U.S. Energy Information Administration

Gasoline retail prices increased an average \$0.15 in January, with a \$0.09 increase on January 29 to \$3.30 per gallon (Figure 3). U.S. gasoline prices followed a similar trend, as U.S. prices increased \$0.09 from \$2.52 on January 1 to \$2.61 on January 29. West Coast (less California) retail gasoline prices had the smallest increase in January, rising \$0.04 from \$2.69 on January 1 to \$2.73 on January 29. Both West Coast and U.S. prices remained 9 percent higher compared to January 2017, while California is 15 percent higher or \$0.42 above last year price. Since 2014, California retail gasoline prices increased an average of \$0.30 throughout the first quarter of the year.

The January increases in gasoline for both California and the U.S. prices roughly match increases in crude oil prices. An increase of \$0.15 per gallon (the increase in California) is equal to \$6.30 when expressed in barrel terms.³ This increase is similar in price to the change between the Brent prices of \$65 on January 5 to the January 25 peak of \$71. Brent prices fell after that peak to finish the month at \$68, yet retail prices are often slow to respond to downward movements in crude oil price while quick to react to upward movements. February marks a transition to summer gasoline blend specifications.

Gasoline Prices

January 2018 vs 2017 (Percent Change)

California	15% higher
U.S.	9% higher
West Coast	9% higher

January 2018 Averages

California	\$3.21
U.S.	\$2.56
West Coast	\$2.70

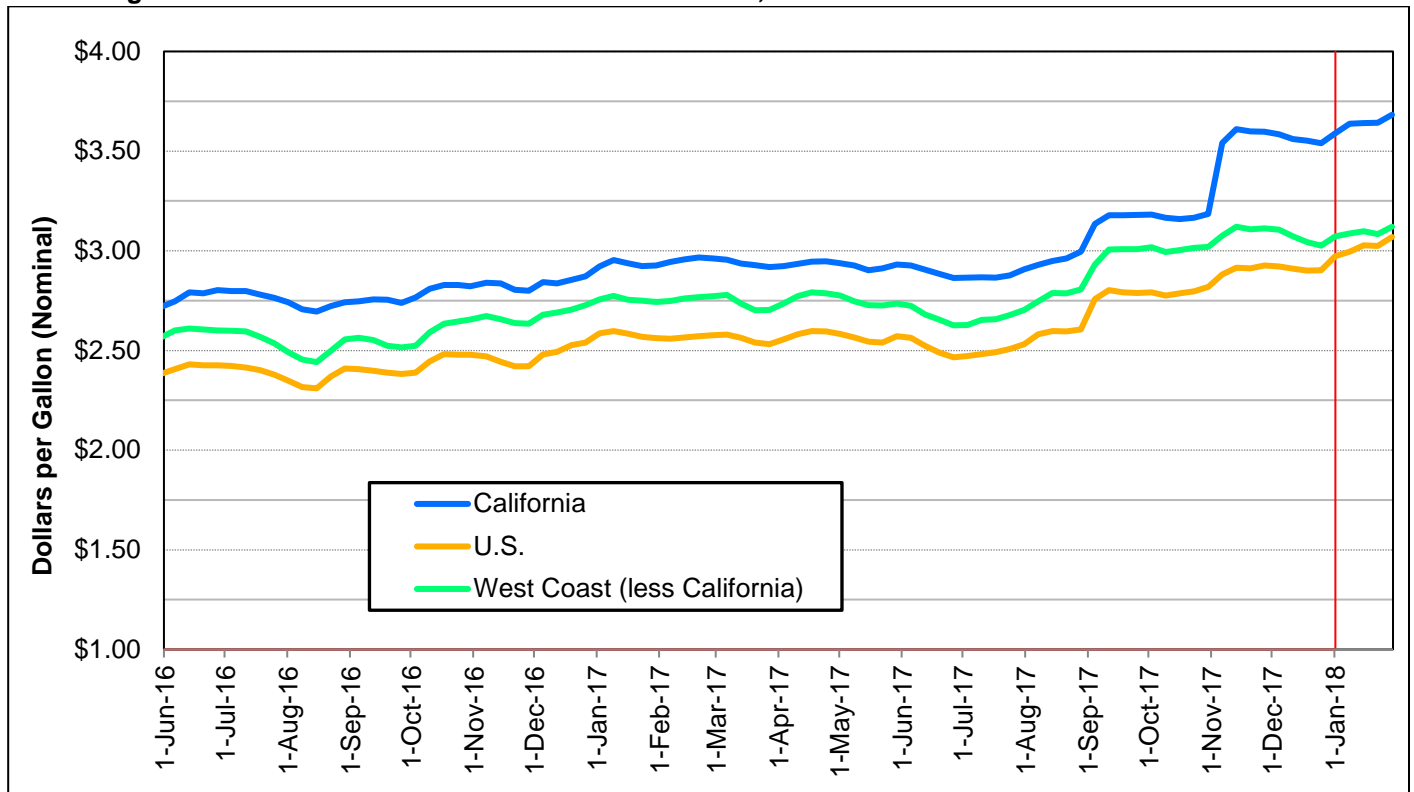
Week of January 29, 2018

California	\$3.30
U.S.	\$2.61
West Coast	\$2.73

³ Oil barrels are units equal to 42 gallons. [https://en.wikipedia.org/wiki/Barrel_\(unit\)](https://en.wikipedia.org/wiki/Barrel_(unit)).

The Reid Vapor Pressure requirement of the specification calls for a decrease from 14 to 12.5 pounds per square inch (psi) before moving to 5.99 psi in March. This change reduces supply by limiting the blending components refiners can use and will increase retail prices.

Figure 4: No. 2 Diesel Ultra-Low-Sulfur Retail Prices, California vs. West Coast vs. United States



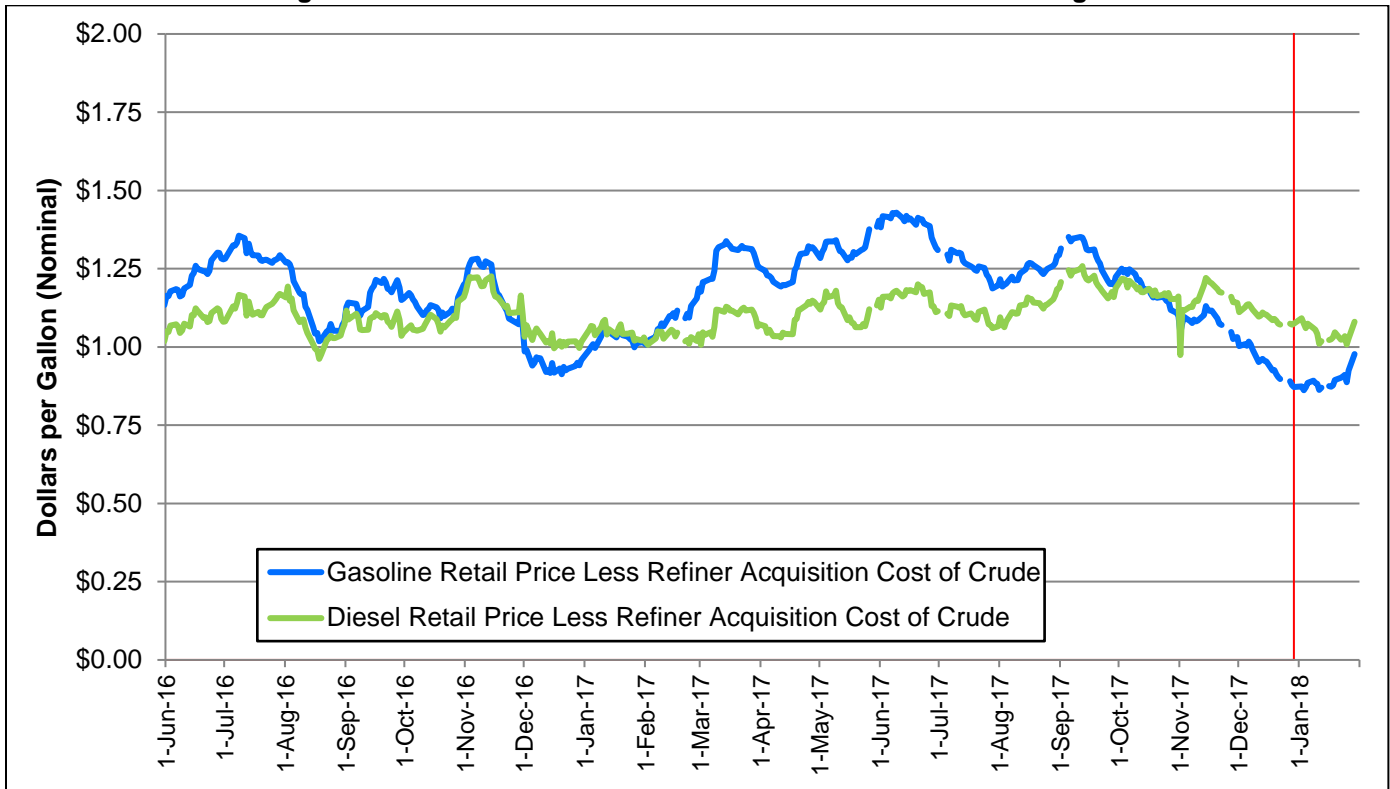
Source: U.S. Energy Information Administration

California retail diesel prices increased \$0.09 from \$3.59 on January 1 to \$3.68 on January 29, averaging \$3.64 for January (sidebar). U.S. retail diesel prices increased \$0.10 from \$2.97 on January 1 to \$3.07 on January 29. West Coast (less California) retail diesel prices increased \$0.05. California retail diesel prices averaged \$0.62 higher than U.S. monthly average retail price of \$3.02. The last time U.S. prices started a year above \$3.00 a gallon of diesel was January 2015 at \$3.00.

Diesel prices, like gasoline prices, appear to have responded to the increase in crude oil prices. The \$0.09 per gallon increase in diesel prices is equal to a \$3.78 per barrel increase. This increase closely matches January's \$65 to \$68 rise in crude oil prices. Unlike gasoline, diesel does not have a seasonal specification change that places additional upward pressure on prices, likely contributing to the associated smaller increase relative to gasoline prices.

<u>Diesel Prices</u>	
<u>January 2018 vs 2017</u>	
(Percent Change)	
California	24% higher
U.S.	17% higher
West Coast	12% higher
<u>January 2018 Averages</u>	
California	\$3.64
U.S.	\$3.02
West Coast	\$3.09
<u>Week of January 29, 2018</u>	
California	\$3.68
U.S.	\$3.07
West Coast	\$3.12

Figure 5: CA-RAC to Ex-Tax California Gasoline and Diesel Margins



Source: U.S. Energy Information Administration and OPIIS

CA-RAC-to-ex-tax retail gasoline and diesel margins reversed a four-month decline in January 2018 (Figure 5). Gasoline margins rose from \$0.86 to \$0.96 from mid- to late January. Diesel margins also rose from \$1.01 to \$1.08 over the same period. California retail gasoline prices increased \$0.19 by the end of January 2018, and retail diesel prices increased \$0.07. Over the same time, crude oil prices (CA-RAC) increased \$2.97 dollars per barrel, translating to an increase of \$0.07 dollars per gallon. Crude oil cost increases were equal to diesel retail margin increases, but gasoline retail prices rose by more than twice the increases in crude oil price, causing gasoline margins to rise.

California’s gasoline margin continues to weaken as retail margins shrunk by \$0.47 per gallon from the September 2017 peak. Meanwhile, diesel demand and diesel margins are remaining firm, losing only \$0.23 dollars per gallon from the September peak. Over the past 15 years California’s increased foreign imports of crude oil, from 29 percent to 54 percent, has made product margins more sensitive to the recent price rises in Brent crude prices than in past years.

Crude to Retail Margins

January 2018 vs 2017
(Percent Change)

Gasoline	5% lower
Diesel	7% higher

January 2018 Averages

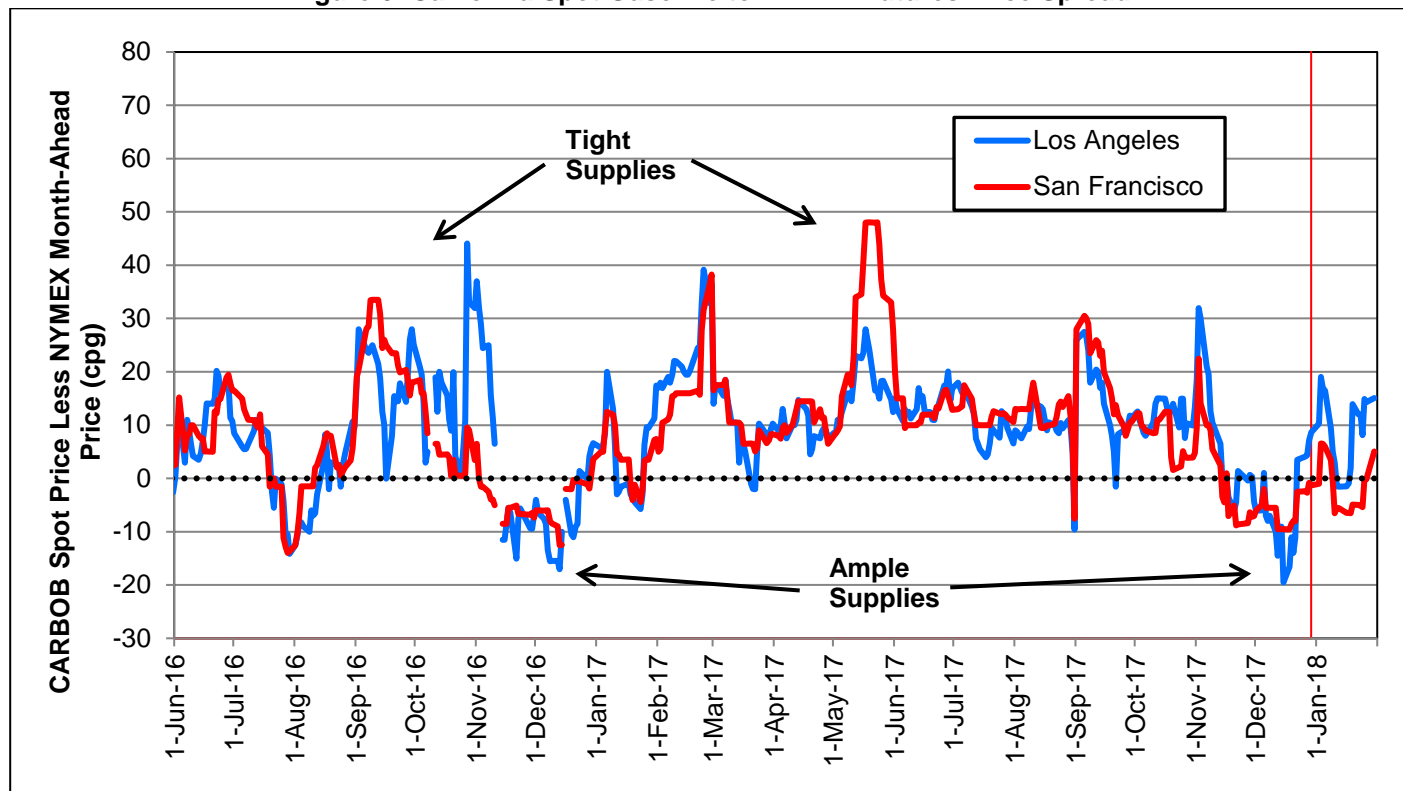
Gasoline	\$0.97
Diesel	\$1.12

January 29, 2018

Gasoline	\$0.98
Diesel	\$1.08

Yet, product margins are following a typical winter pattern, a gentle decline from October through January with a strong uptick starting in late January. Margins followed a similar pattern in winter 2016-2017 as well, with gasoline margins falling below diesel margins. If this winter pattern holds, then gasoline margins should continue increasing in February as driving season comes back for 2018.

Figure 6: California Spot Gasoline to NYMEX Futures Price Spread



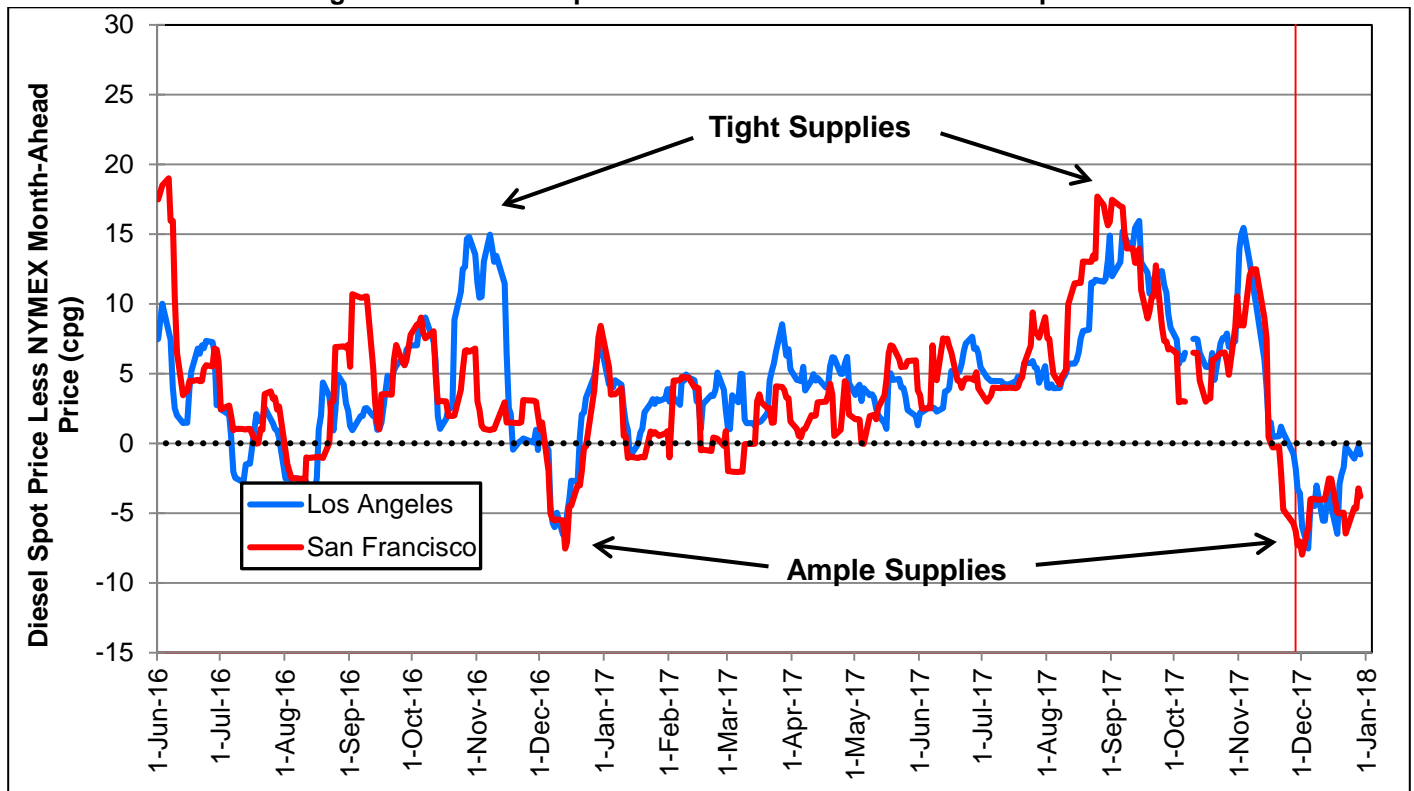
Source: U.S. Energy Information Administration and OPIs

Los Angeles (LA) and San Francisco (SF) gasoline spot market less New York Mercantile Exchange (NYMEX) futures price differentials decreased through the first half of January. Both differentials reached a monthly peak on January 3, with the LA-less-NYMEX differential increasing to \$0.19 and the SF-less-NYMEX differential to \$0.07. These increases appear to correspond to rumors of unplanned refinery maintenance and instances of refinery flaring.

Both differentials spent time at a discount (negative/below) to the NYMEX, before climbing back to a premium during the second half of December. The LA-less-NYMEX differential increased \$0.17 from January 16 to January 30, with \$0.16 of that increase occurring on January 19. The SF-less-NYMEX differential underwent a less pronounced increase, moving from the January 18 low of -\$0.07 to \$0.05 at the end of the month (a \$0.12 increase). The largest day increase occurred on January 30, increasing \$0.05. Both increases in the California differentials seem linked to major refinery maintenance. On January 3, only one refinery underwent planned maintenance, but as January progressed, more refineries began planned maintenance (**Refining News, page 1**). The majority of the planned maintenance occurred in Southern California, which pushed LA-less-NYMEX differentials higher.

Gasoline Spot-Futures Spread	
January 2018 vs 2017	
Los Angeles	5¢ higher
San Francisco	6¢ lower
January 2018 Averages	
Los Angeles	9¢
San Francisco	-2¢
January 30, 2018	
Los Angeles	15¢
San Francisco	5¢

Figure 7: California Spot Diesel to NYMEX Futures Price Spread



Source: U.S. Energy Information Administration and OPIS

The LA-less-NYMEX diesel differential remained negative for much of January before reaching price parity (equal/even) with NYMEX. LA spot prices traded at a discount of -\$0.07 on January 5 before climbing to \$0.01 on January 30. LA spot prices averaged -\$0.02 below the NYMEX throughout January 2018 and -\$0.05 lower than January 2017. High production numbers initially kept the differential low, until maintenance at refineries in Southern California began to decrease diesel production in the region.⁴ This has caused heavy draws on inventory levels and increased the LA spot price.

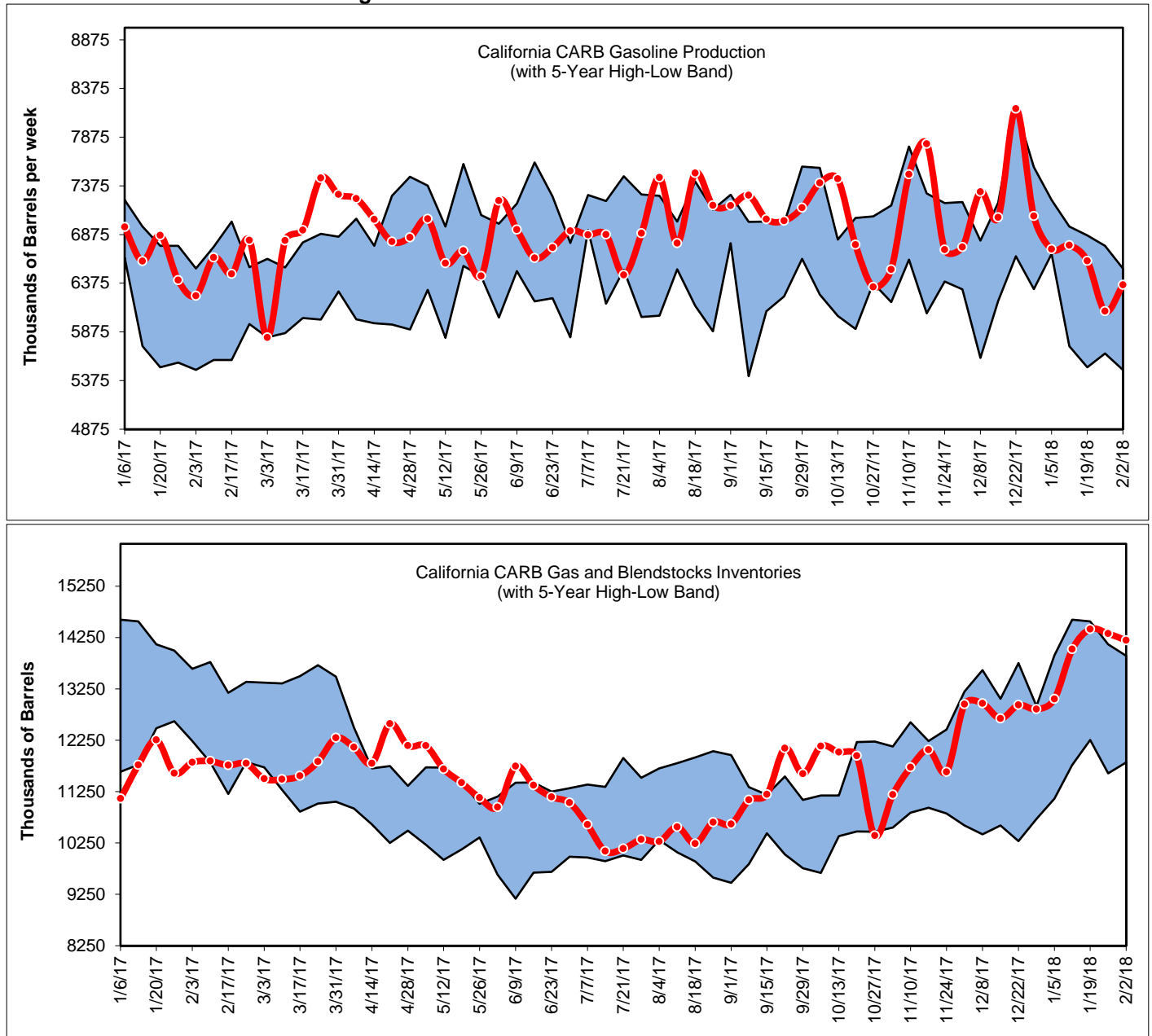
The SF-less-NYMEX diesel differential has been under -\$0.03 for two months, with spot prices averaging -\$0.07 throughout January. SF-less NYMEX started January 2 at -\$0.02 before reaching -\$0.10 on January 18, which is the lowest differential seen since February 2014. Prices recovered with SF-less-NYMEX closing at -\$0.05 on January 30. While LA spot prices are being pulled up because of refinery maintenance hindering production, SF prices are being pulled down by high production rates and increasing inventory levels.⁴ Northern California diesel production reached the highest levels over the past five years, and because of this, inventory levels have hit a five-year high.

<u>Diesel Spot-Futures Spread</u>	
<u>January 2018 vs 2017</u>	
Los Angeles	5¢ lower
San Francisco	8¢ lower
<u>January 2018 Averages</u>	
Los Angeles	-2¢
San Francisco	-7¢
<u>January 30, 2018</u>	
Los Angeles	1¢
San Francisco	-5¢

⁴ Weekly Fuels Watch Report http://www.energy.ca.gov/almanac/petroleum_data/fuels_watch/.

California Gasoline and Diesel Production and Inventories

Figure 8: Gasoline Production and Inventories

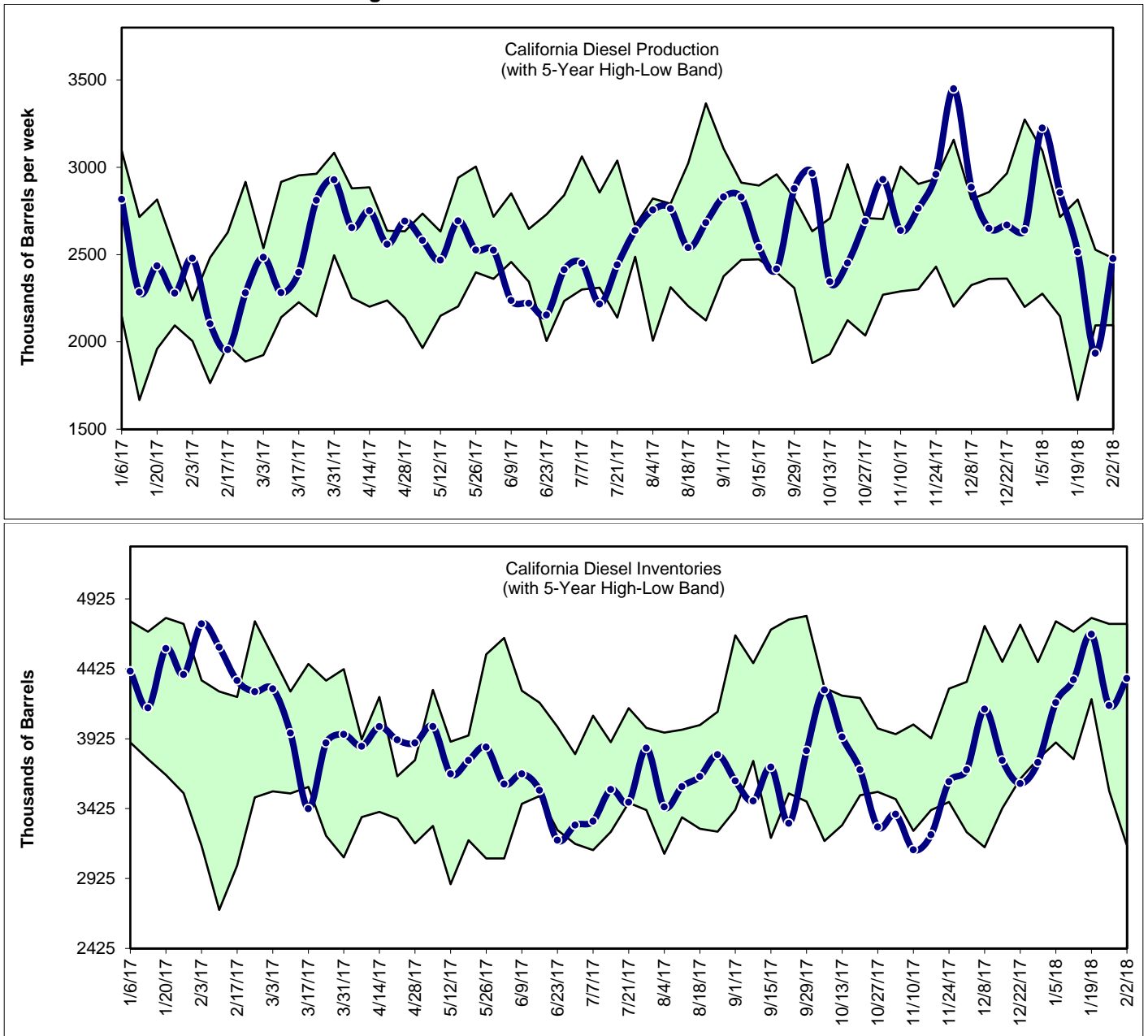


Source: PIIRA data

California gasoline production fell in January. Weekly production through February 2 averaged 6.5 million barrels per week (bpw), 0.6 million bpd lower than December 2017. Refiners reached a production low of 6.1 million bpw on January 26, with production recovering to 6.3 million bpw the following week. Compared to previous years, California production is slightly weaker as production in January 2017 maintained a 6.6 million bpw average.

California gasoline inventories strengthened in January. Peak inventory levels reached 14.4 million barrels on January 19. Since then, inventory levels have decreased only 300,000 barrels, to 14.1 million barrels on February 2, the highest level in the past five years. This year's inventory levels are stronger than 2017 as peak inventory levels in January 2017 reached 12.2 million barrels on January 20, 2017, 1.9 million barrels less than the levels reported on February 2, 2018.

Figure 9: Diesel Production and Inventories



Source: PIIRA data

California diesel production fell through most of January before recovering to the top of the five-year high-low band on February 2 (**Figure 9**). On January 5, production was measured at 3.2 million bpw. In the following weeks, several refineries in Southern California underwent maintenance, and production dropped to 1.9 million bpw on January 26, the lowest seen in past five years. Production rebounded to 2.3 million bpw by February 2 and moved closer to the January 2017 average of 2.9 million bpw.

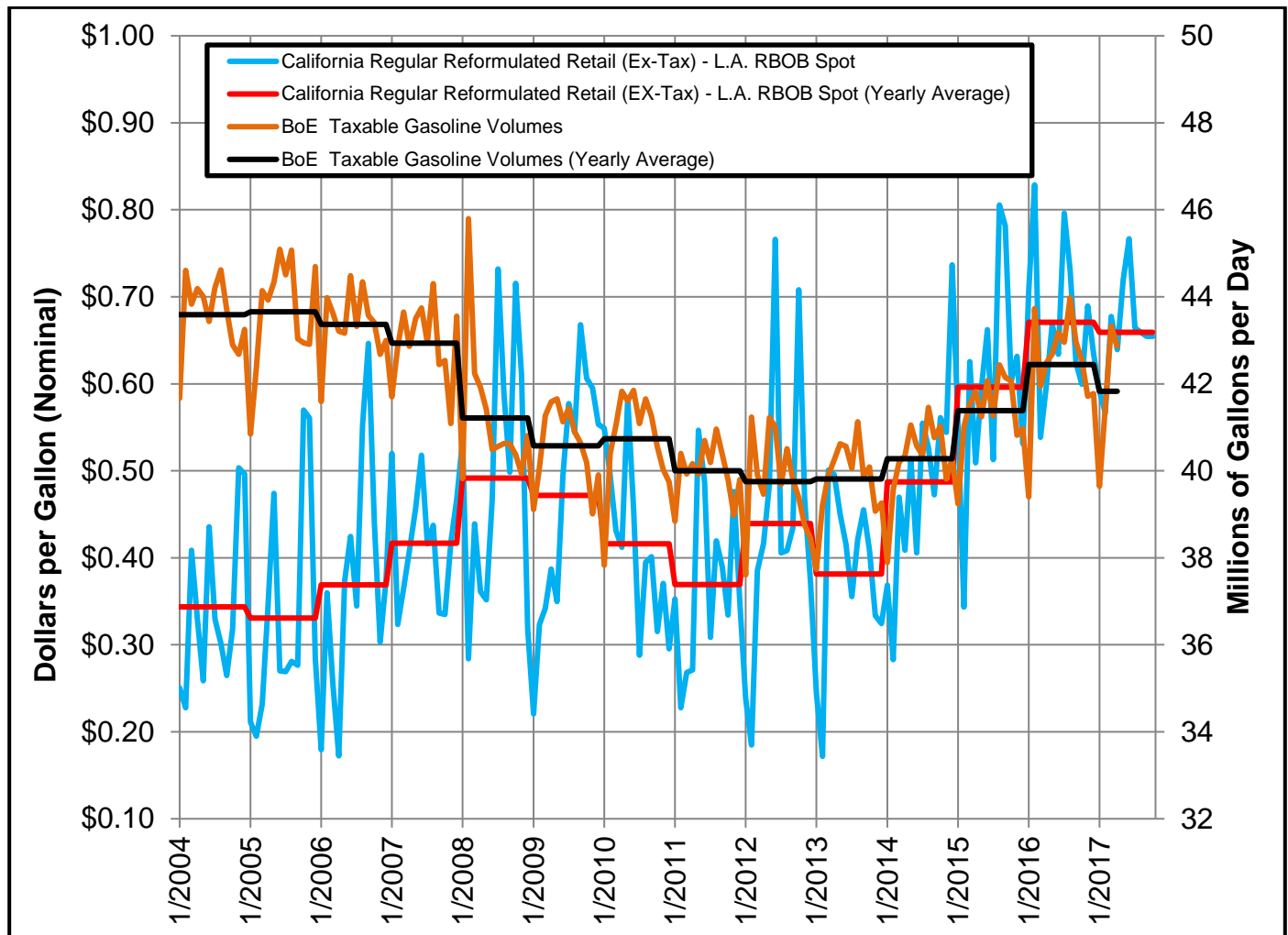
Diesel inventory levels began January at 4.1 million barrels on January 5. Inventory levels peaked at 4.6 million barrels on January 19 and fell to 4.1 million barrels the next week. California diesel inventories averaged 4.1 million barrels through January 2018. This is 0.1 million barrels less than the January 2017 average.

Hot Topic Supplement – California Gasoline Prices Compared Californian Market Fundamentals

The January *Petroleum Watch* Hot Topic Supplement found that the California gasoline spot-to-retail differential was increasingly independent of other regional averages in the United States. Earlier *Petroleum Watch* Supplements showed that California’s gasoline retail prices were separating into two groups, with average annual differences between retailers reaching as high as \$0.44. Energy Commission staff has looked at several gasoline market indicators to see if any reasons for this change can be found, as this appears to be a California phenomenon.

Figure 10 compares California gasoline prices (blue and red lines) to California gasoline consumption (orange and black lines). Gasoline consumption in California had been steadily declining from a high in 2005 until 2013. In 2014, gasoline consumption began to rise again. In 2016 California consumed an average of 42.5 million gallons per day. While the retail gasoline prices rose with the recent increases in consumption and fell during the reduction in consumption during the recent recession (2007-2009), this relationship between consumption and prices appears to break down between 2004 and 2008 as consumption falls, but prices increase.

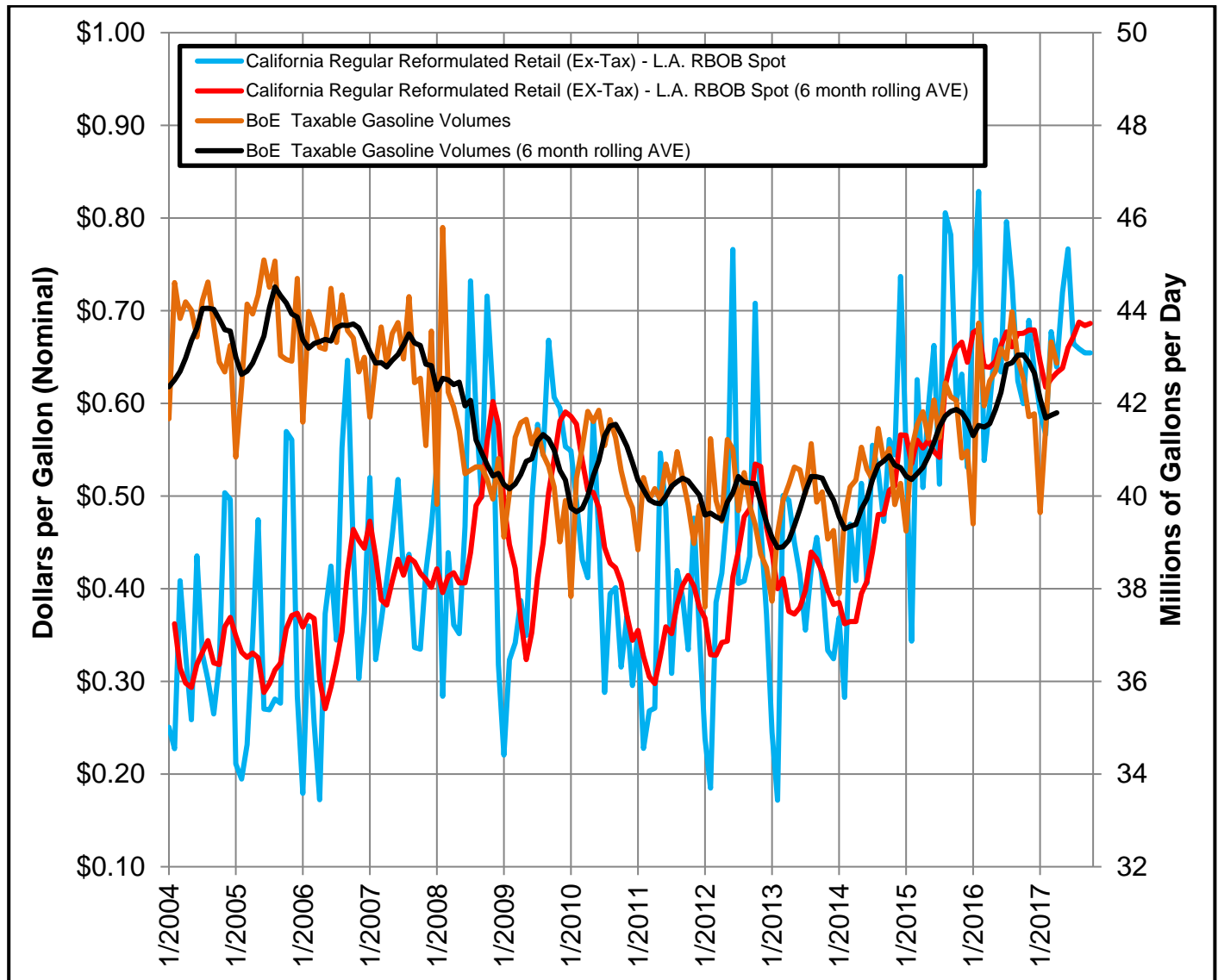
Figure 10: California Spot to Retail Gasoline Price Differential and Board of Equalization California Taxable Gasoline Sales (With Annual Averages, 2004 to 2017)



Source: U.S. Energy Information Administration and Board of Equalization

Figure 11 has the same monthly information as **Figure 10** but uses a six-month rolling average instead of an annual average to smooth the data. **Figure 11** shows that the difference between the California retail gasoline prices and the LA spot price was extremely volatile in late 2008 into 2009, moving from \$0.60 to \$0.32 and back to \$0.60, even with the six-month rolling average smoothing. From the beginning of 2010 to early 2011, the six-month rolling average once again fell to \$0.30 before spending 2012 and 2013 at relatively steady levels around \$0.40. Like the annual averages in **Figure 10**, the six-month rolling average differential in **Figure 11** begins rising from 2014 onward, to current levels just under \$0.70.

Figure 11: California Spot to Retail Gasoline Price Differential and Board of Equalization California Taxable Gasoline Sales (With Six-Month Rolling Averages, 2004 to 2017)

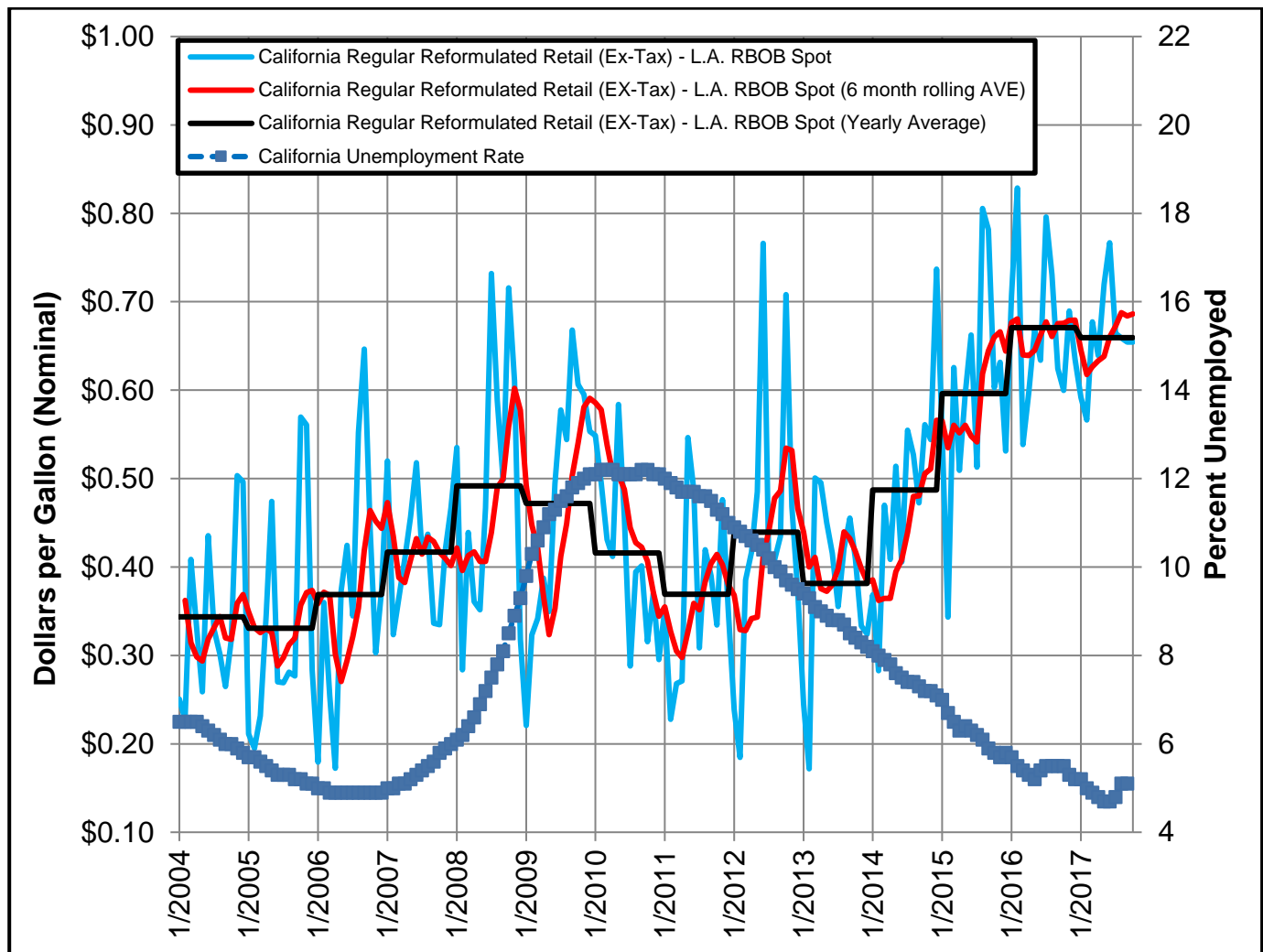


Source: U.S. Energy Information Administration and Board of Equalization

Consumption of a product alone is not an accurate measurement of demand, as consumption is the result of the intersection between supply and demand of a given product. With this understanding, another way to judge demand would be to look at California unemployment rates to see what connection they have with changes in California retail prices. Here, lower unemployment would mean more individuals needing to commute to work and California having greater overall income to support fuel demand.

Figure 12 displays California retail gasoline prices with the California unemployment rate reported by the U.S. Bureau of Labor Statistics. **Figure 12** shows California's unemployment rate falling from 6.5 percent in January 2004 to a low of 4.9 percent in the second half of 2006. The average annual difference between retail and spot gasoline prices rose between 2004 and 2009 (black line), while the six-month rolling average shows a leveling between 2007 and mid-2008 (red line). During this period, unemployment accelerates in 2008 and 2009 to a peak of 12.2 percent in February 2010. The differential between retail and spot gasoline prices become increasingly volatile in 2008, going from an average of \$0.36 in April, to \$0.73 in July, to \$0.50 in September, back up to \$0.72 in October, and then down to \$0.22 in January 2009. In 2009, the differential rose from \$0.22 to a monthly average peak of \$0.67 in September 2009, falling from that peak to a low of \$0.23 in February 2011. Overall, relationships seen within the spot-to-retail differential seemed confused. The differential does increase when unemployment rates are decreasing below 8 percent, but high unemployment rates appear to create only increased volatility in the differential, while low unemployment created nonsymmetrical increases. Lastly, despite the usually high unemployment rates between 2008 and 2013, the annual averages of the differential did not drop below 2004 to 2007 levels that saw decreasing and low unemployment rates.

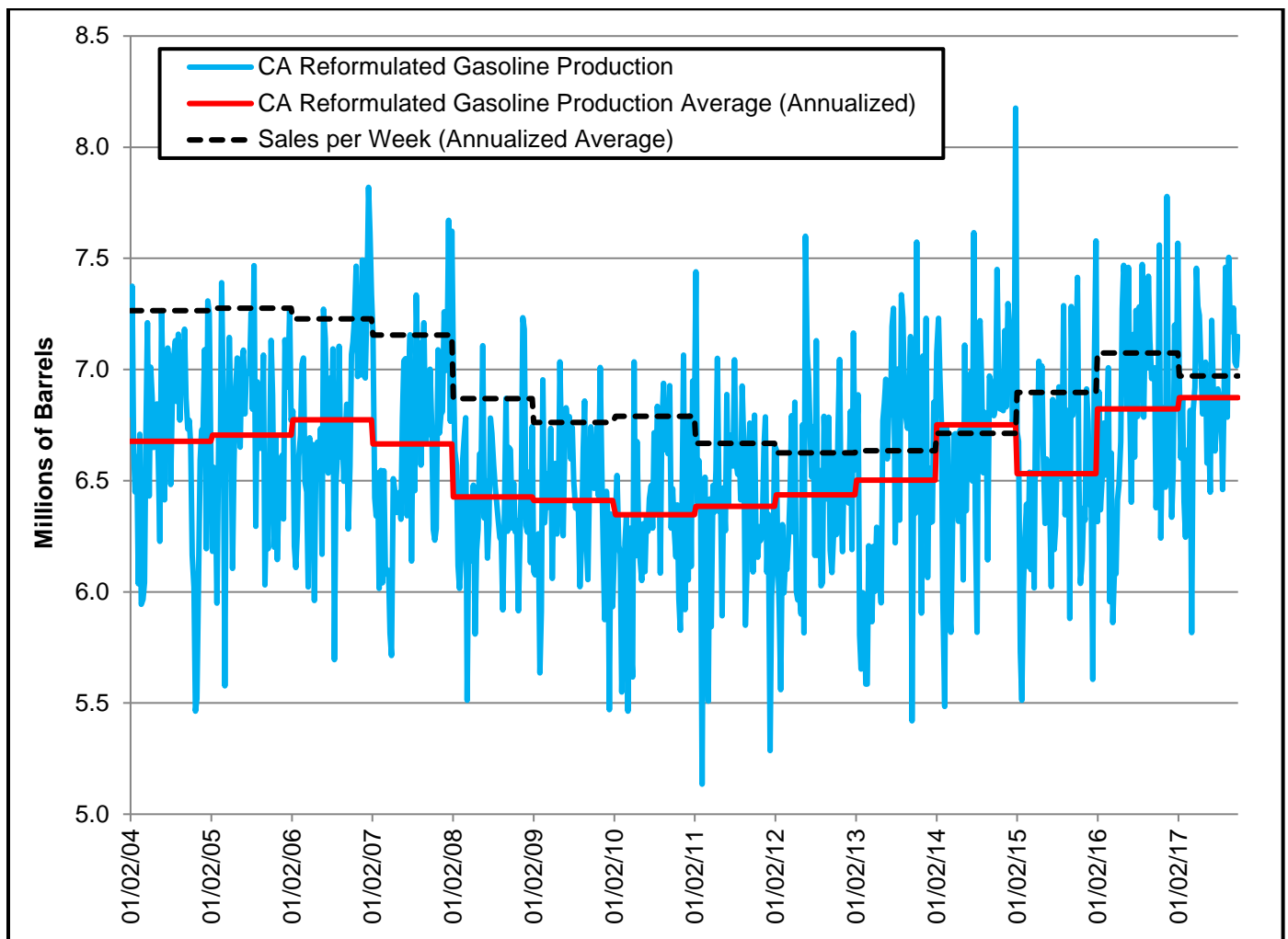
Figure 12: California Spot to Retail Gasoline Price Differential and California Unemployment Rate (With Six-Month Rolling and Annual Averages, 2004 to 2017)



Source: U.S. Energy Information Administration and Bureau of Labor Statistics

Figure 13 displays total California production figures from 2004 to 2017 as reported by the Energy Commission's *Weekly Fuels Watch*, and California gasoline sales numbers from the Board of Equalization (BOE). Over this period, California-specific reformulated gasoline production has averaged 6.3 million and 6.9 million barrels per week of gasoline production annually (13.7 billion to 15 billion gallons a year). The lowest weekly production figure recorded over that period was 5.1 million barrels, which occurred on the week of February 4, 2011. The largest weekly production figure of that period occurred December 26, 2014, at 8.2 million barrels. All production figures listed likely include gasoline and gasoline blendstocks imported by refiners into California as the U.S. Energy Information Administration and Energy Commission reports ask for information on product that leaves a refinery gate. Any difference between California gasoline sales and production would be made up by increased imports from nonrefinery gasoline importers (for example, gasoline trading companies). Importantly, the gap between California production and sales has been slowly shrinking from 2004 to 2014, before increasing in 2015, and decreasing in 2016 and 2017. This shrinking of the gap could mean at least two possibilities: there is less nonrefinery trading company participation in the California market (as California has less supply shortfall), or these traders are selling direct to refiners rather than the open market.

Figure 13: California Gasoline Sales and Weekly Refinery Production (2004 to 2017)

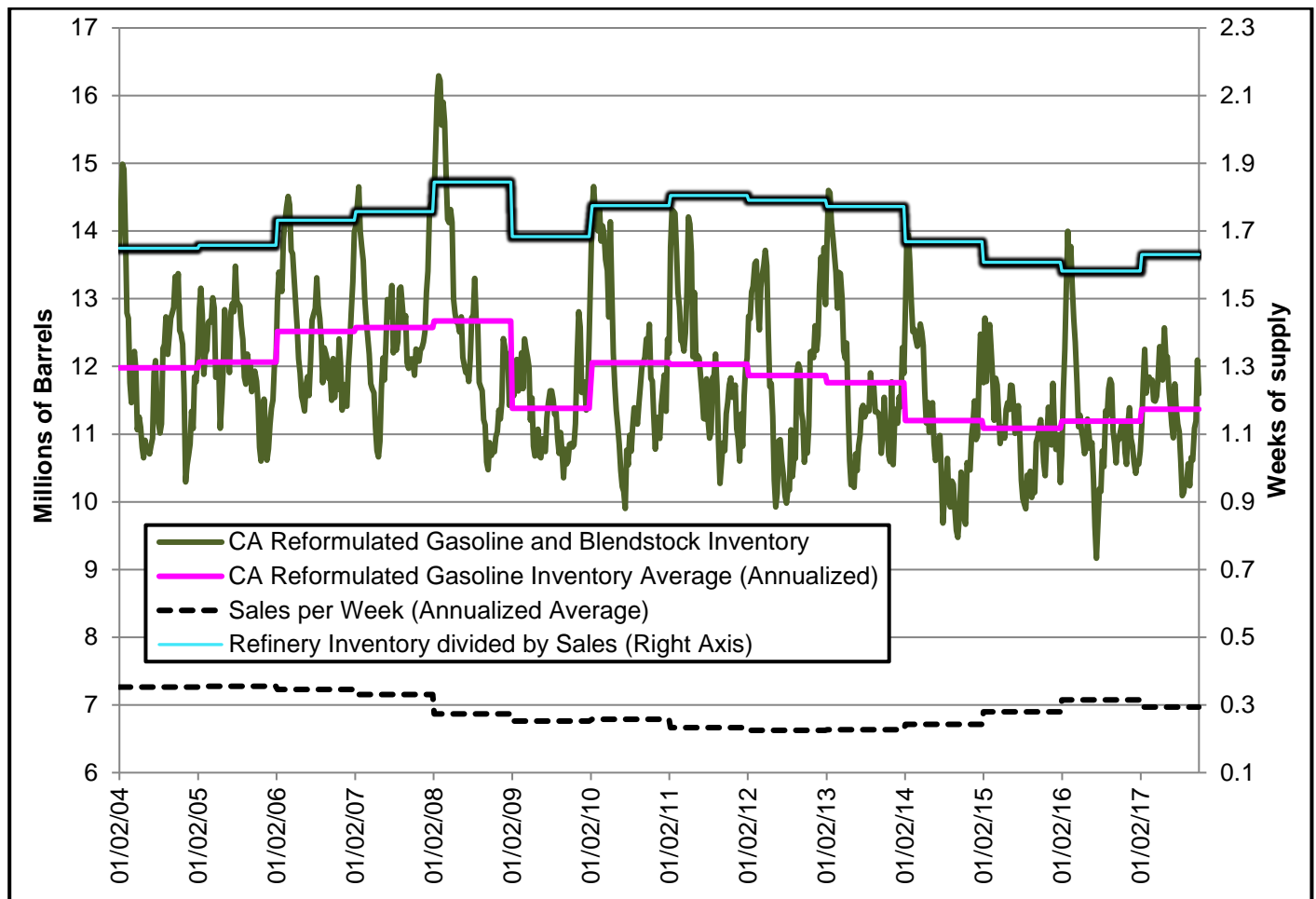


Source: U.S. Energy Information Administration, Board of Equalization, and Petroleum Industry Information Reporting Act data

Figure 14 displays inventory figures for California specification gasoline and blendstocks with the sales figures from **Figure 13**. Inventories in California are more volatile than production, with annual averages of

inventories fluctuating between 11 million and 12.7 million barrels. The weekly inventory high for this period was 16.3 million barrels the week of January 25, 2008, with the low occurring June 10, 2016, at 9.2 million barrels. Overall, inventories in California have been steadily declining, averaging 12 million in 2010 and 2011, falling to 11.1 million in 2015, before increasing to 11.4 million in 2017. This drop in inventories occurred despite recent increases in gasoline sales and with current gasoline sales levels similar to 2007 and 2008, but with inventories 1.3 million barrels below the 2008 average of 12.7 million barrels. In **Figure 14**, an alternate metric of California’s relative weeks of gasoline supply, calculated by dividing weekly inventory by annual average weekly sales (black dotted-line), shows how inventories have decreased from an average of 1.8 weeks of supply in 2008 to 1.6 weeks in 2017.

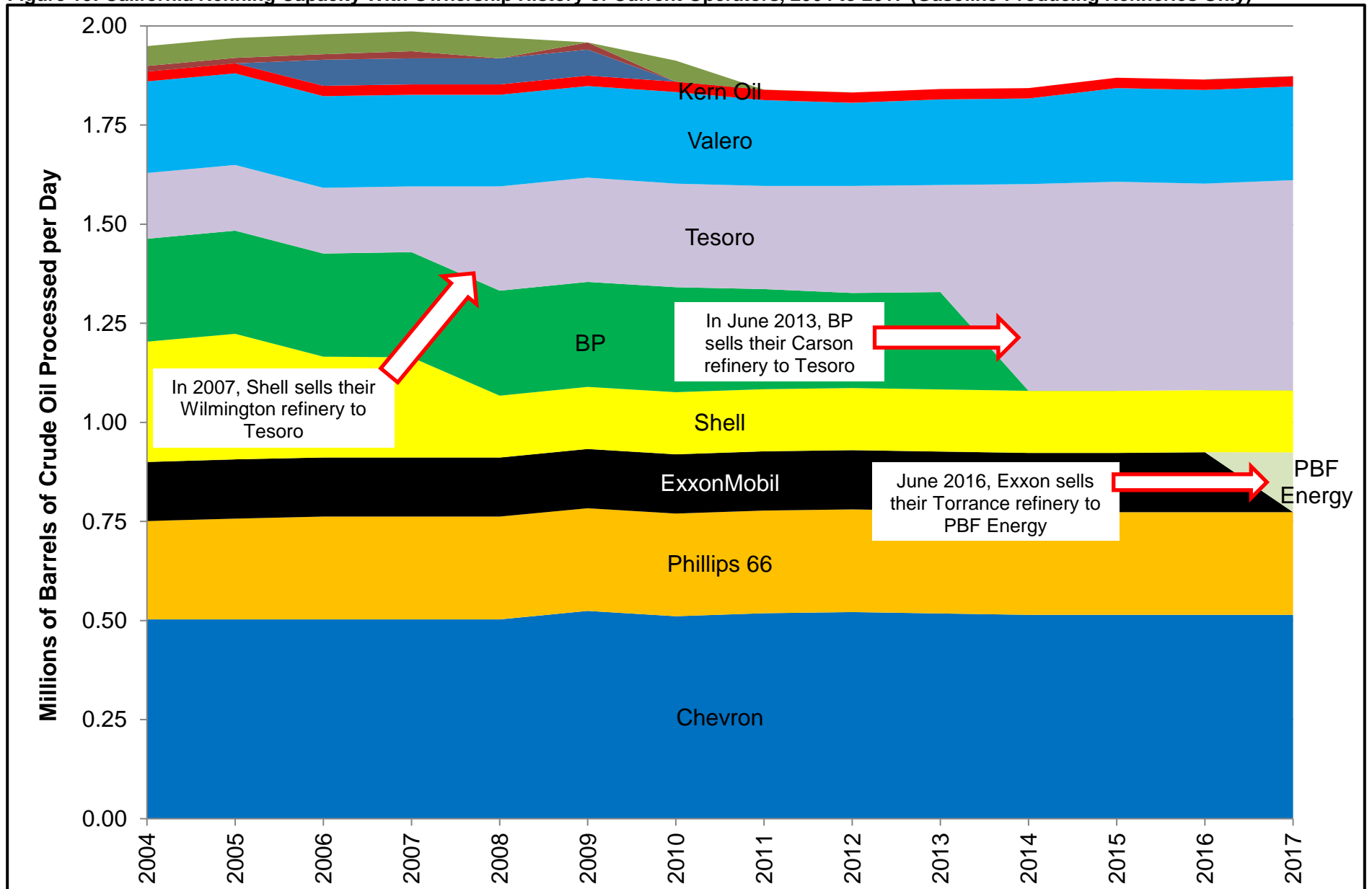
Figure 14: California Gasoline Sales and Weekly Refinery Inventory (2004 to 2017)



Source: U.S. Energy Information Administration, Board of Equalization, and Petroleum Industry Information Reporting Act data

Other factors in gasoline supply are changes to refinery ownership in the California market and production capacity. **Figure 15** displays California’s total refining capacity as measured by crude oil processing rates for gasoline producing refineries. From 2004 to 2017, California’s total capacity maintained a core capacity of 1.85 million barrels per day, while smaller refineries idled or shut down. This core capacity is made up of refineries that remained in constant operation but have changed ownership over that time. For example, Andeavor (formerly known as Tesoro) was one of the smaller refining companies in California in 2004 but in 2007 acquired Shell’s Wilmington refinery and British Petroleum’s (BP) Carson refinery in 2013. Andeavor now accounts for 28.3 percent of California’s gasoline producing refinery capacity and is California’s largest refinery company by reported capacity.

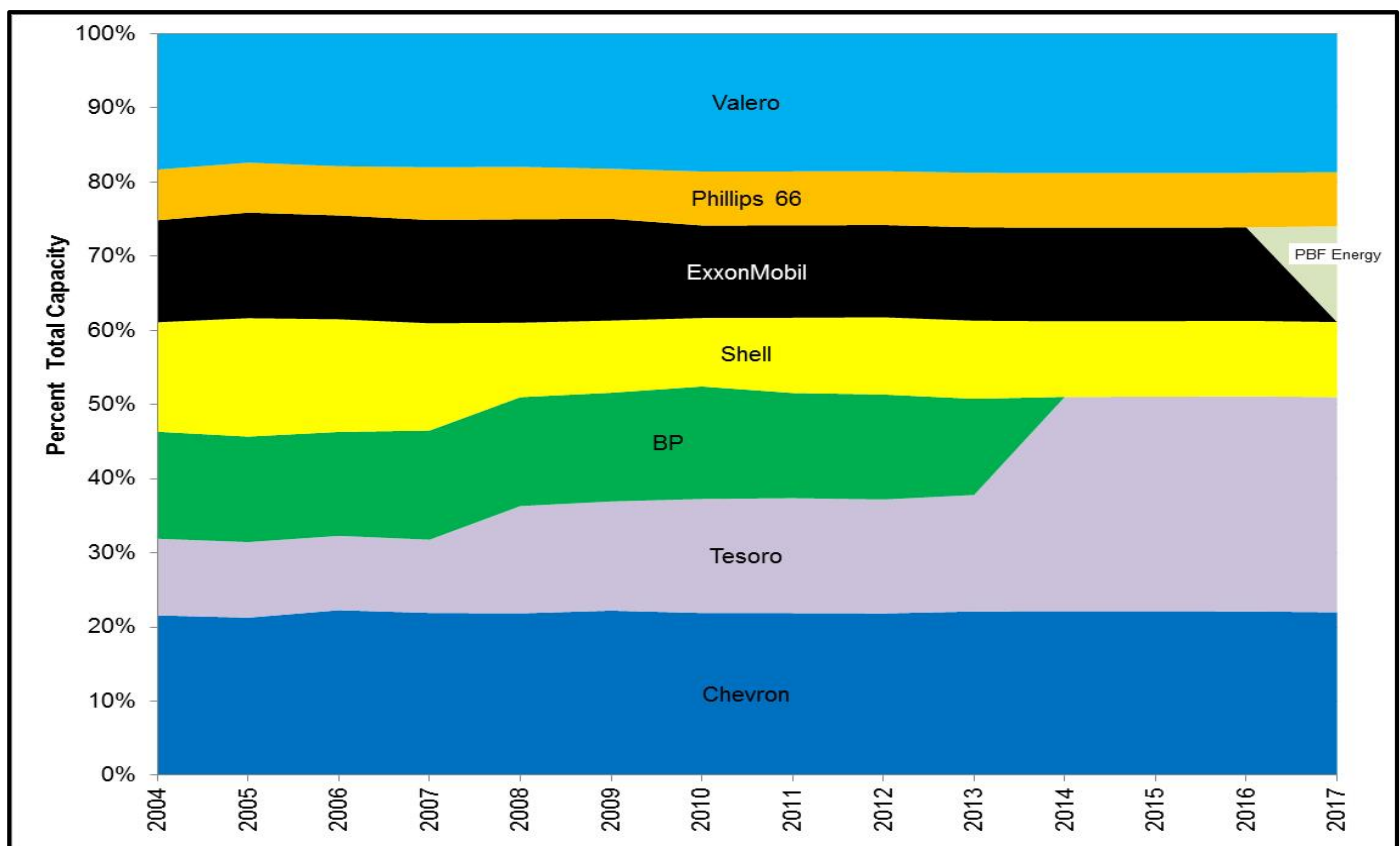
Figure 15: California Refining Capacity With Ownership History of Current Operators, 2004 to 2017 (Gasoline-Producing Refineries Only)



Source: U.S. Energy Information Administration

An alternate measurement of gasoline-producing capacity is fluid catalytic cracking unit (FCCU) capacity. **Figure 16** displays California refinery FCCU capacity as a percentage of total capacity from 2004 to 2017. Over that period, with the acquisition of the above-mentioned two refineries, Tesoro has gone from having roughly 10 percent of FCCU capacity of California to 29 percent of total FCCU capacity. Combined with Chevron, these two companies now control 51 percent of California’s total FCCU processing capability and 55 percent of California’s crude oil processing capability for gasoline-producing refineries. Also of note, **Figure 16** shows that in 2004 there were seven companies that had FCCU processing equipment, with five of them being vertically integrated with crude oil exploration. While the number of companies with FCCU processing equipment has only shrunk to six in 2017, the number of companies that are also vertically integrated has shrunk to two, as Phillips 66 was spun off from ConocoPhillips in 2012 and became a refining and product marketing company (retail), BP left the California market in 2014 with the sale of the Carson refinery to Tesoro in 2014, and ExxonMobil sold the Torrance refinery to PBF Energy in June 2016.

Figure 16: Ownership of Fluid Catalytic Cracking Unit Capacity in California (2004 to 2017)



Source: U.S. Energy Information Administration

In conclusion, California’s demand-side influences appear to have had little or confusing influence on California’s gasoline spot-to-retail differential. On the supply side, California’s shrinking differential between gasoline sales and production (**Figure 13**), shrinking inventory levels (**Figure 14**), and increased market concentration (**Figure 15** and **Figure 16**) all appear to correspond to an overall increase in that differential. Whether these changes have actually reduced the number of participants (concentrating market power in the area) or have tightened the availability of gasoline is still unclear.