

PETROLEUM WATCH

CALIFORNIA ENERGY COMMISSION

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REFINERY NEWS

Phillips 66 Rodeo/Santa Maria:

On August 12, the company announced plans to shut down its Santa Maria facility in 2023. The remaining Rodeo facility will be converted into a renewable fuels plant. The plant will produce renewable diesel, renewable gasoline, and sustainable jet fuel from used cooking oils, fats, greases, and soybean oils ([Phillips 66](#)).

Marathon Los Angeles: On

August 19, emergency flaring took place at the Carson section of the facility according to the South Coast Air Quality Management District ([SCAQMD](#)).

CALIFORNIA GASOLINE RETAIL PRICES BY BRAND

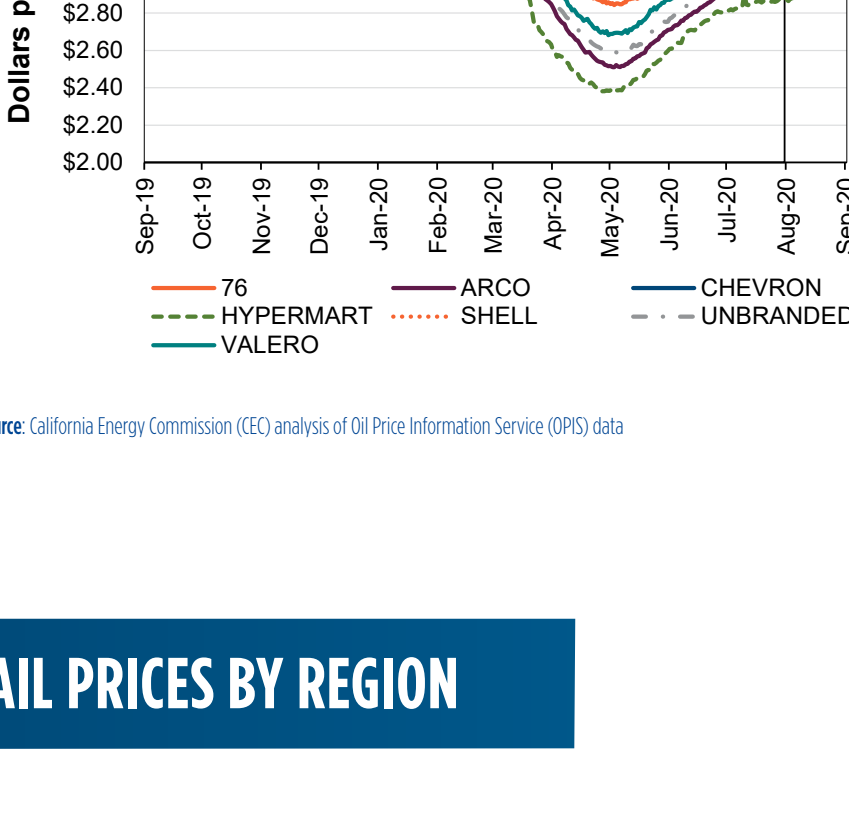
August 2020 vs. 2019

(Percentage Change)

76	12% lower
ARCO	12% lower
Chevron	10% lower
Hypermart	12% lower
Shell	11% lower
Unbranded	12% lower
Valero	11% lower

August 2020 Averages

76	\$3.26
ARCO	\$3.00
Chevron	\$3.40
Hypermart	\$2.90
Shell	\$3.33
Unbranded	\$3.08
Valero	\$3.20



Source: California Energy Commission (CEC) analysis of Oil Price Information Service (OPIS) data

CALIFORNIA DIESEL RETAIL PRICES BY REGION

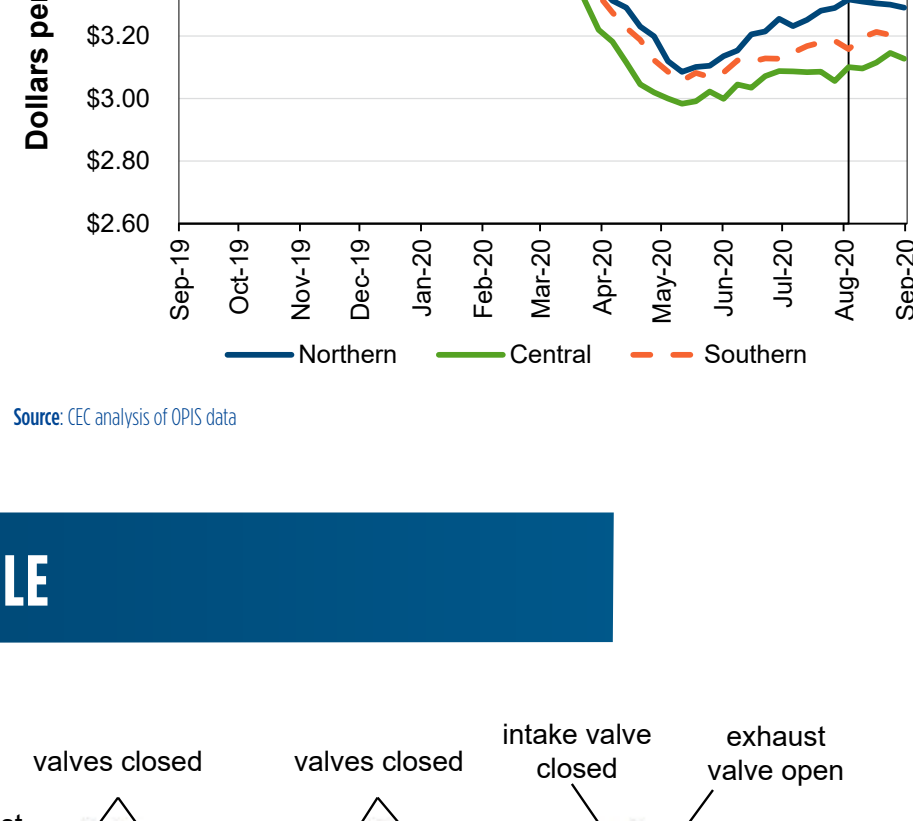
August 2020 vs. 2019

(Percentage Change)

Northern CA	14% lower
Central CA	18% lower
Southern CA	16% lower

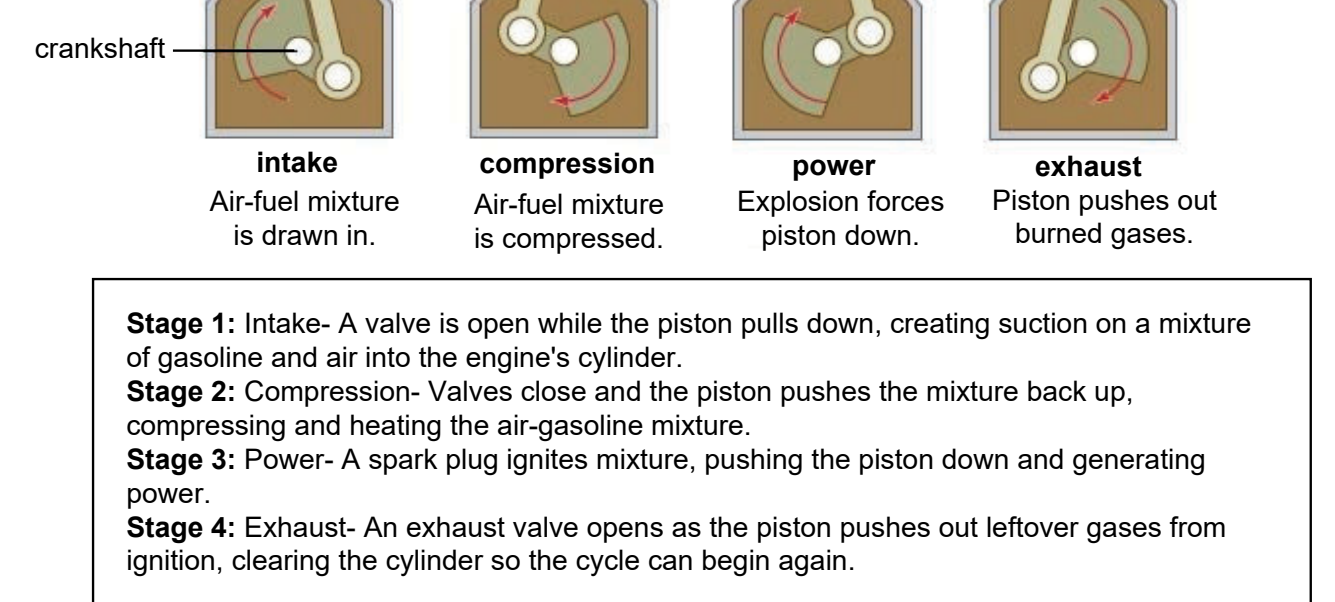
August 2020 Averages

Northern CA	\$3.31
Central CA	\$3.11
Southern CA	\$3.19



Source: CEC analysis of OPIS data

4-STROKE ENGINE CYCLE



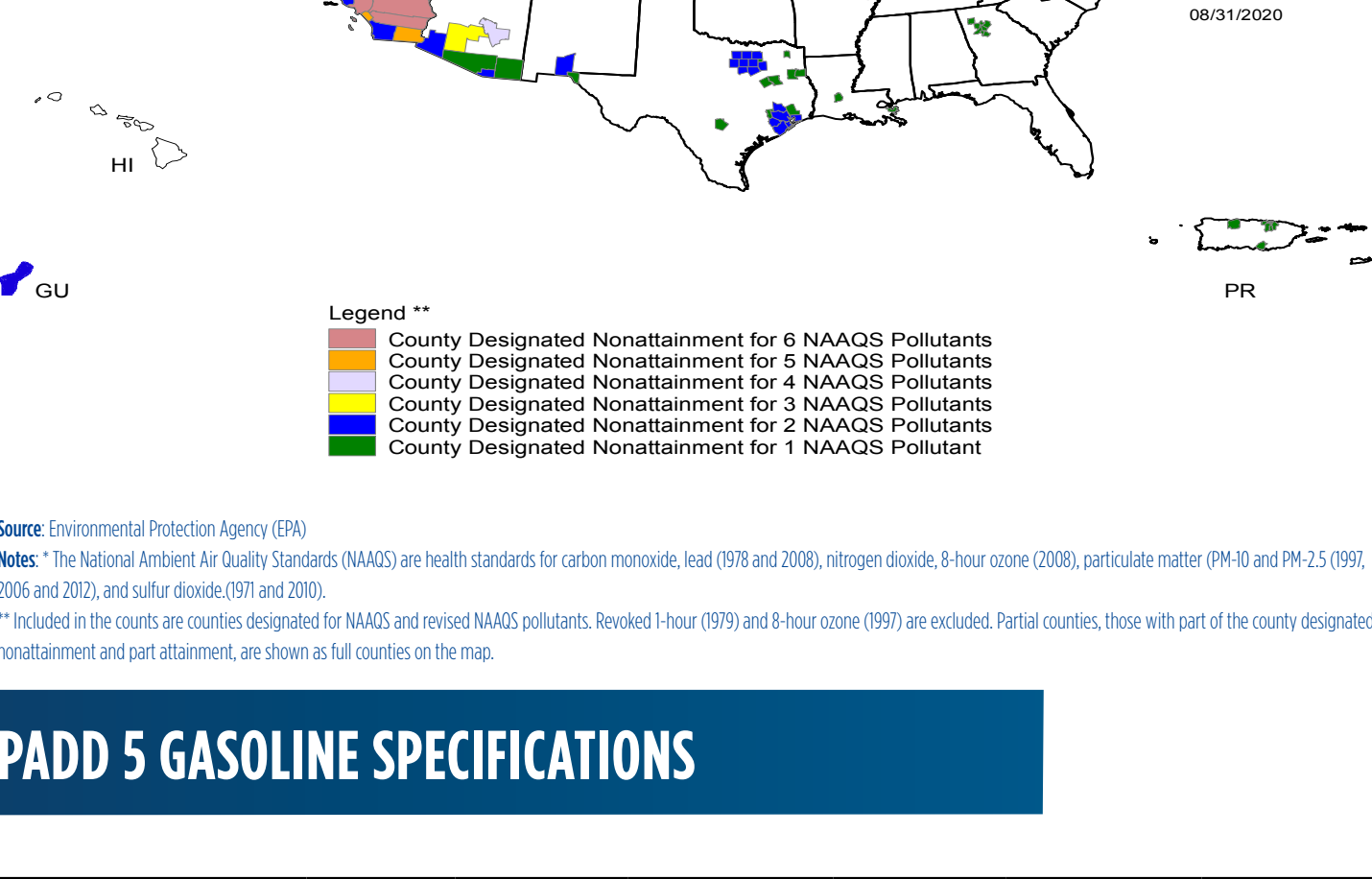
- Stage 1: Intake-** A valve is open while the piston pulls down, creating suction on a mixture of gasoline and air into the engine's cylinder.
- Stage 2: Compression-** Valves close and the piston pushes the mixture back up, compressing and heating the air-gasoline mixture.
- Stage 3: Power-** A spark plug ignites mixture, pushing the piston down and generating power.
- Stage 4: Exhaust-** An exhaust valve opens as the piston pushes out leftover gases from ignition, clearing the cylinder so the cycle can begin again.

Source: 2007 Encyclopedia Britannica, Inc.

FEDERAL NONATTAINMENT COUNTIES

Counties Designated "Nonattainment"

for Clean Air Act's National Ambient Air Quality Standards (NAAQS) *



Source: Environmental Protection Agency (EPA)

Notes: * The National Ambient Air Quality Standards (NAAQS) are health standards for carbon monoxide, lead (1978 and 2008), nitrogen dioxide, 8-hour ozone (2008), particulate matter (PM-10 and PM-2.5 (1997, 2006 and 2012), and sulfur dioxide (1971 and 2010).

** Included in the counts are counties designated for NAAQS and revised NAAQS pollutants. Revoked 1-hour (1979) and 8-hour ozone (1997) are excluded. Partial counties, those with part of the county designated nonattainment and part attainment, are shown as full counties on the map.

PADD 5 GASOLINE SPECIFICATIONS

Specification	California Summer CARBOB Regular Grade	Nevada Summer CBOB Regular Grade	Arizona Summer AZBOB Regular Grade	Sub-Octane Conventional Regular Grade	Federal Reformulated RBOB Regular Grade ⁶	Conventional Regular Grade
Summer Reid Vapor Pressure (psi max) ¹	5.99	9.0/7.8	5.7	8.0 ²	Varies ³	9.0
Distillation T90 (deg. F) ⁴	232	170 min	E200 (25-65%)	170 min	E200 (30-70%)	250
Distillation T50 (deg. F, max) ⁴	335	-	E300 (65-100%)	-	E300 (70-100%)	374
Benzene (vol % max) ⁴	1.22	-	-	-	-	3.8
Aromatics (vol % max) ⁴	38.7	25	55	-	50	-
Olefins (vol % max) ⁴	11.1	-	27.5	-	-	-
Sulfur (PPM wt% max) ^{1,4}	21	80	89	80	80	80
Road Octane (R+M/2) ⁵	87	87	87	87	87	87

Source: Energy Information Administration (EIA), West Coast Transportation Fuels Market Report

Note: Petroleum Administration for Defense Districts (PADD) 5 includes the states of California, Arizona, Nevada, Oregon, Washington, Alaska, and Hawaii.

Notes: Southern includes the following terminals: Orange, Mission Valley, Imperial, Colton, and Barstow. Northern includes the following terminals: Bradshaw, Brisbane, Chicago, Fresno, Sacramento, San Jose, and Stockton.

1. These values are caps. These properties as well as others are inputs into the California Air Resources Board (CARB) and Federal Complex models.

2. If RVP waiver applies, this is 9 psi max.

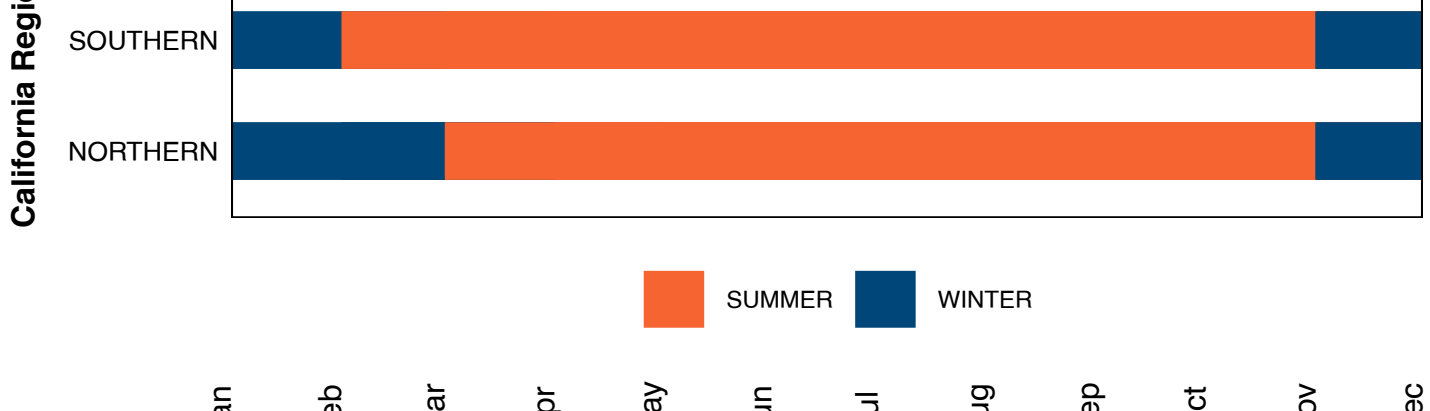
3. Varies by state or local requirements and whether RVP waiver applies.

4. Benzene and sulfur are subject to annual averaging requirements. Annual averages are 1% and 30 ppm maximum for benzene and sulfur respectively.

5. Octane after blending with 10% ethanol (E10).

6. Specifications generally used for exports.

KINDER MORGAN PRODUCT SCHEDULE



Source: CEC analysis of Kinder Morgan, Pacific Operations Specification Manual and CARB data

Notes: Southern includes the following terminals: Orange, Mission Valley, Imperial, Colton, and Barstow. Northern includes the following terminals: Bradshaw, Brisbane, Chicago, Fresno, Sacramento, San Jose, and Stockton.

FEATURED TOPIC

PRIMER ON DIFFERENT BLENDS OF GASOLINE

On September 30, half of California's gas stations begin selling winter blend gasoline. Every year refineries across California switch to producing summer blend gasoline in the spring, then winter blend gasoline in the fall. This switch changes the Reid Vapor Pressure (RVP) of California's gasoline. RVP is a measure of the evaporation rate, or volatility, of gasoline.

Gasoline with high volatility evaporates faster than gasoline with lower volatility at a given temperature.

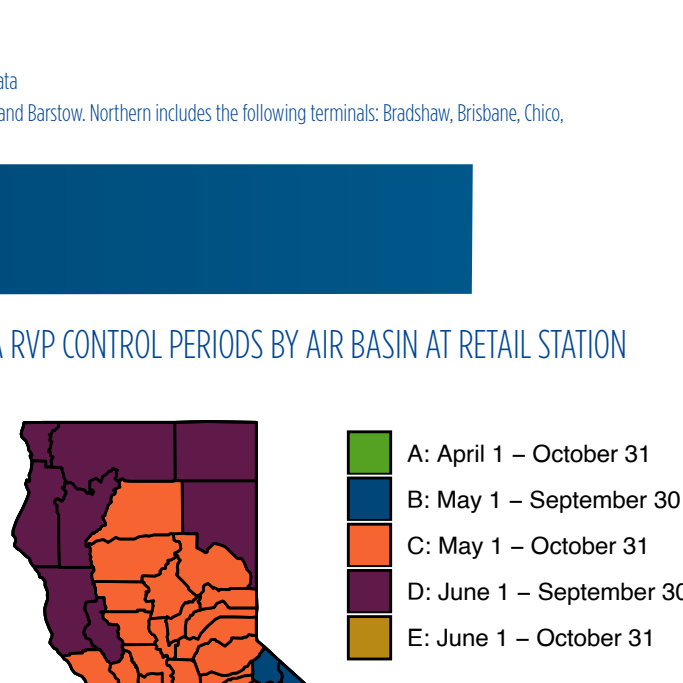
When gasoline evaporates from the gas tank or fuel lines too quickly, bubbles of vaporized gasoline form in the fuel line, lowering the pressure and amount of injectable fuel. This leads to a poor mixture of gasoline and air in an engine's intake stage as shown in the [4-Stroke Engine Cycle](#). This is like drinking soda with a straw and reaching the bottom of the cup. As you continue drinking the remaining soda, large gaps of air are made with liquid following behind it. This issue is known as vapor lock and causes less efficient ignition or no ignition at all. Gasoline with a lower RVP helps prevent this issue from occurring. Modern engines can prevent this problem with mechanical solutions; however, car engines in cold temperatures have a harder time starting with low RVP gasolines. The winter blend's high RVP makes it easier to mix air and gasoline together which helps the engine start in colder temperatures.

FEDERAL GASOLINE STANDARDS

California gasoline's lower RVP has been a major reason for smog reductions since 1990. The RVP standards in California's gasoline switch stem from the Clean Air Act of 1963 requiring the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS). The NAAQS currently sets standards for six pollutants: ground-level ozone, particulate matter, carbon monoxide, lead, nitrogen dioxide, and sulfur dioxide. The EPA designates a geographic area as meeting (attainment) or failing (nonattainment) NAAQS levels.

The [Federal Nonattainment Counties](#) map shows counties designated nonattainment throughout the United States. California has numerous counties designated as such for many reasons; among them is ground-level ozone. Motor vehicles account for about one half of the emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx), contributing to ground-level ozone formation, the main ingredient in smog. Congress amended the Clean Air Act to introduce the [Reformulated Gasoline \(RFG\) program](#) in 1990 as a way for states to meet NAAQS ground-level ozone levels. RFG is required in areas with high smog levels, like California. California produces reformulated gasoline that meets specifications defined by the California Air Resources Board (CARB). Nevada and Arizona use reformulated gasoline specific to each area as defined by the EPA. Other areas of Petroleum

CALIFORNIA RVP CONTROL PERIODS BY AIR BASIN AT RETAIL STATION



Source: CARB

Administration for Defense Districts (PADD) 5 that are less prone to air pollution use conventional gasoline.

STATE GASOLINE STANDARDS

Unhealthy air quality in California has been a problem for decades. California developed its own stringent air quality standards, apart from the EPA, enforced by CARB. RVP standards were first implemented in 1992. CARB passed [California Phase 3 Gasoline Regulations](#) in 2007, setting the RVP limit to 7.0 pounds per square inch (psi) for oxygenated fuels and 6.9 psi for non-oxygenated fuels. The lower the psi in gasoline, the less evaporative emissions will occur. [PADD 5 Gasoline Specifications](#) lists the summer RVP standards of California, Nevada, Arizona, sub-octane conventional, federal reformulated, and conventional gasoline. Nevada has certain areas (cities) where a lower RVP gasoline is required. California and Arizona have the lowest RVP standards at 5.99 psi and 5.7 psi respectively. The specialty blend of gasoline in these states tends to be more expensive due to the concentrations of lower RVP additives to meet air quality standards.

BLENDED GASOLINE FOR LOWER RVP

In the winter months gasoline has a higher RVP because it contains higher concentrations of butane, a cheap blending component with good octane ratings, but with a high RVP. Refiners reduce butane levels and increase amounts of alkylates and reformates to produce a low RVP summer blend gasoline. Alkylates and reformates are gasoline blending components with lower RVP that combine to produce high-octane gasoline.

Refineries still have to maintain octane levels without butane, relying more on their rearranging units (alkylation, polymerization, and reforming units) adding delay and cost to gasoline production. Since the winter blend is cheaper and more efficient to produce, refineries prefer to switch back to the higher RVP blends as soon as possible to help fulfill supply needs.

GASOLINE RVP SCHEDULE

The federal summer [RVP standard](#) compliance dates are given by the EPA by state and month, usually beginning in May and lasting through September.

During this summer period, gasoline sold at retail outlets are not allowed to go above the specified RVP value for that state or county. California uses a different standard set by CARB that can vary depending on which [air basin](#) a county resides in. A map of the counties and the date ranges for their RVP control period is shown in the [California Reid Vapor Pressure Control Periods by Air Basin](#).

Southern California counties such as Los Angeles and San Diego begin their control periods in April, which is the earliest in the state. Northern and Central counties begin in May and some coastal areas like Monterey and San Luis Obispo have until June. The date ranges vary because some counties experience summer temperatures earlier than others, differences in average ozone levels, and differences in the air quality index.

Pipeline schedules are a major factor for what refineries decide to produce and when. Gasoline takes time to move through the supply chain from the refinery to the terminals and then to the retail stations via tanker trucks. Refiners stockpile inventories in anticipation of the switch, maintaining amounts of whichever blend is in season while facilities undergo maintenance and downtime.

To ensure the correct specification of RVP is available at the retail sites in time with the compliance dates, products with the lower RVP begin to cycle through the pipelines up to two months before the CARB's control date. For instance, the Kinder Morgan pipelines cycle for southern California terminals delivers summer blend gasoline in February in order to meet the earlier April control period for that region. [Kinder Morgan Product Schedule](#) shows a regional cycle of the winter blend (over 6 RVP) and summer blend (5.99 RVP) based on the winter blend (over 6 RVP) control period.

Kinder Morgan requires California summer blends to be about 1 RVP lower than the CARB limit to account for a 1 psi increase once ethanol is added at the terminals. Some areas only maintain the RVP specification through September, while most of the state keeps the summer blend through the end of October. This explains why Kinder Morgan keeps the summer blend gasoline throughout October at all terminal locations.

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