

PETROLEUM WATCH

CALIFORNIA ENERGY COMMISSION

INSIDE

[Gasoline Retail Prices by Brand](#)

[Diesel Retail Prices by Region](#)

[Refining Capacity and Associated](#)

[Combined Heat and Power \(CHP\)](#)

[Generator Capacity](#)

[Utility Sales to Petroleum](#)

[Refining Sector](#)

[CHP Generation by](#)

[Refinery Region](#)

[CHP Generation by Facility](#)

[Featured Topic:](#)

[CHP Generation at](#)

[Petroleum Refineries](#)

REFINERY NEWS

- PBF Torrance:** On December 16, planned maintenance took place at the refinery causing flaring according to regulatory filings with the [South Coast Air Quality Management District \(AQMD\)](#) and [California Governor's Office of Emergency Services \(Cal OES\)](#).

CALIFORNIA GASOLINE RETAIL PRICES BY BRAND

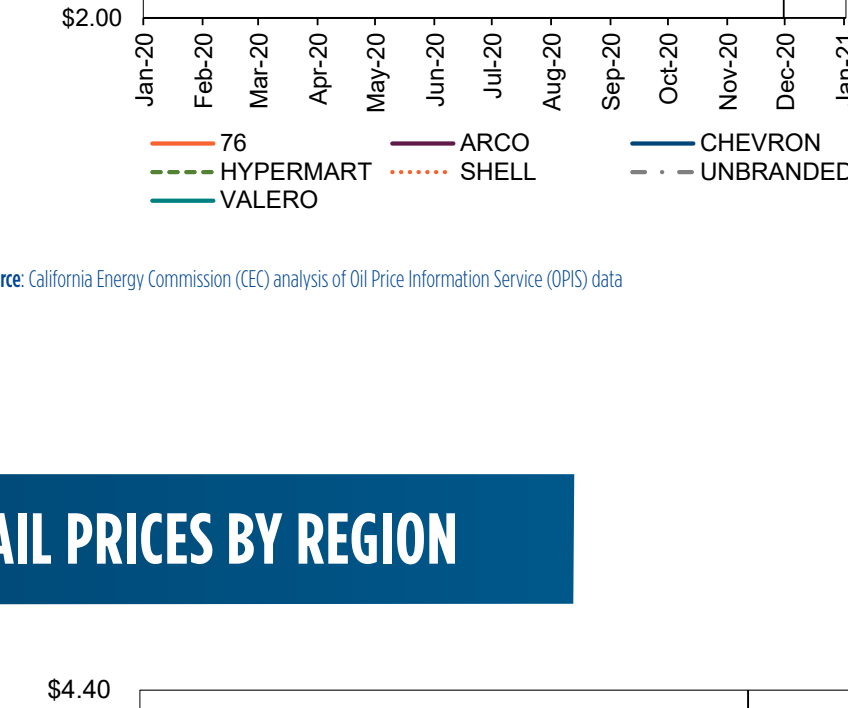
December 2020 vs. 2019

(Percentage Change)

76	13% lower
ARCO	14% lower
Chevron	10% lower
Hypermart	14% lower
Shell	11% lower
Unbranded	14% lower
Valero	13% lower

December 2020 Averages

76	\$3.25
ARCO	\$2.97
Chevron	\$3.40
Hypermart	\$2.86
Shell	\$3.33
Unbranded	\$3.06
Valero	\$3.18



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

CALIFORNIA DIESEL RETAIL PRICES BY REGION

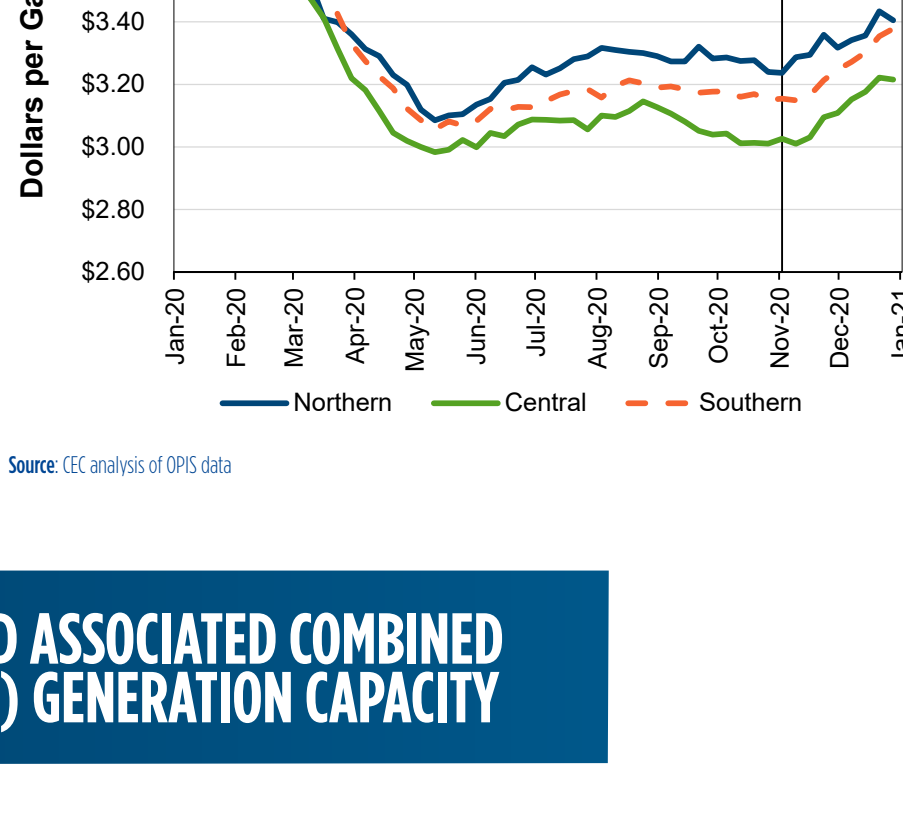
December 2020 vs. 2019

(Percentage Change)

Northern CA	11% lower
Central CA	14% lower
Southern CA	14% lower

December 2020 Averages

Northern CA	\$3.37
Central CA	\$3.18
Southern CA	\$3.31



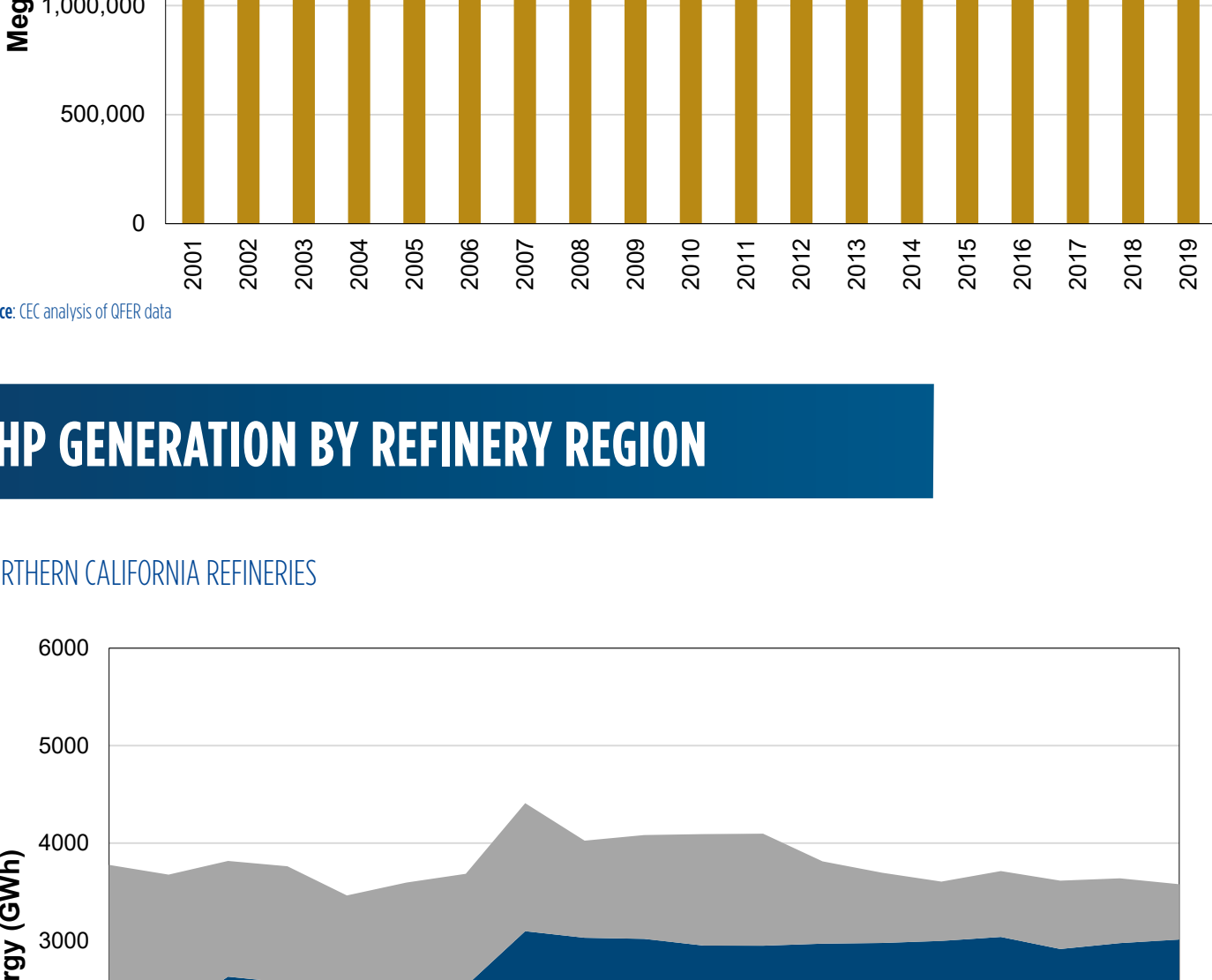
Source: CEC analysis of OPIS data

REFINING CAPACITY AND ASSOCIATED COMBINED HEAT AND POWER (CHP) GENERATION CAPACITY

Refinery	Refining Capacity (Barrels Per Day)	Associated CHP Generation Capacity (Megawatts)
Northern California	886,871	503
Chevron, Richmond	245,271	155.7
Kern Oil & Refining	26,000	4.5
Marathon, Golden Eagle	166,000	115.2
PBF, Martinez	156,400	100
Phillips 66, Rodeo	78,400	78.3
Phillips 66, Santa Maria	41,800	0
San Joaquin Refining	15,000	0
Valero, Benicia	158,000	49.3
Southern California	1,005,770	815.6
Chevron, El Segundo	269,000	137.1
Marathon Refining Complex, Los Angeles Refining and Calciner	355,170	528.8
PBF, Torrance	151,300	49.3
Phillips 66, Wilmington Refinery	139,000	68.5
Valero, Wilmington Refinery and Asphalt	91,300	31.9
Total	1,892,641	1,318.6

Source: CEC analysis of Quarterly Fuel and Energy Report (QFER) and Petroleum Industry Information Reporting Act (PIIRA) data

UTILITY SALES TO PETROLEUM REFINING SECTOR



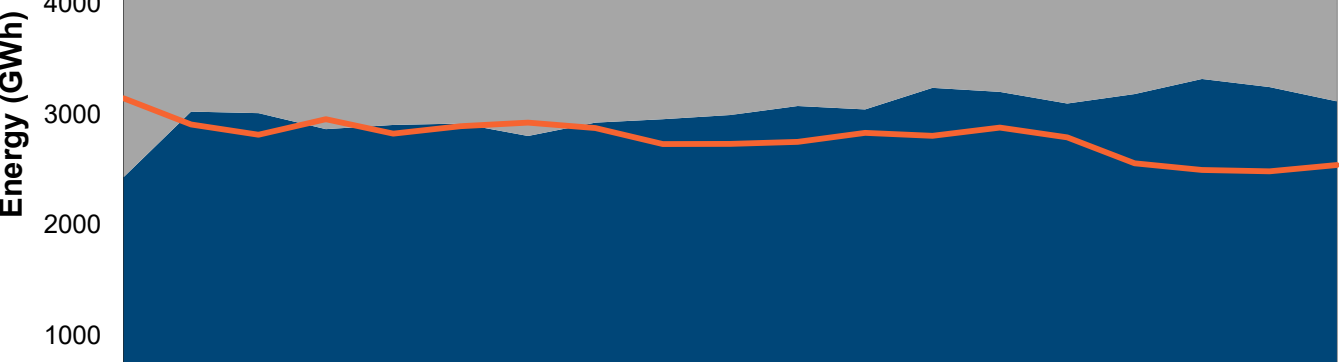
Source: CEC analysis of QFER data

CHP GENERATION BY REFINERY REGION

NORTHERN CALIFORNIA REFINERIES

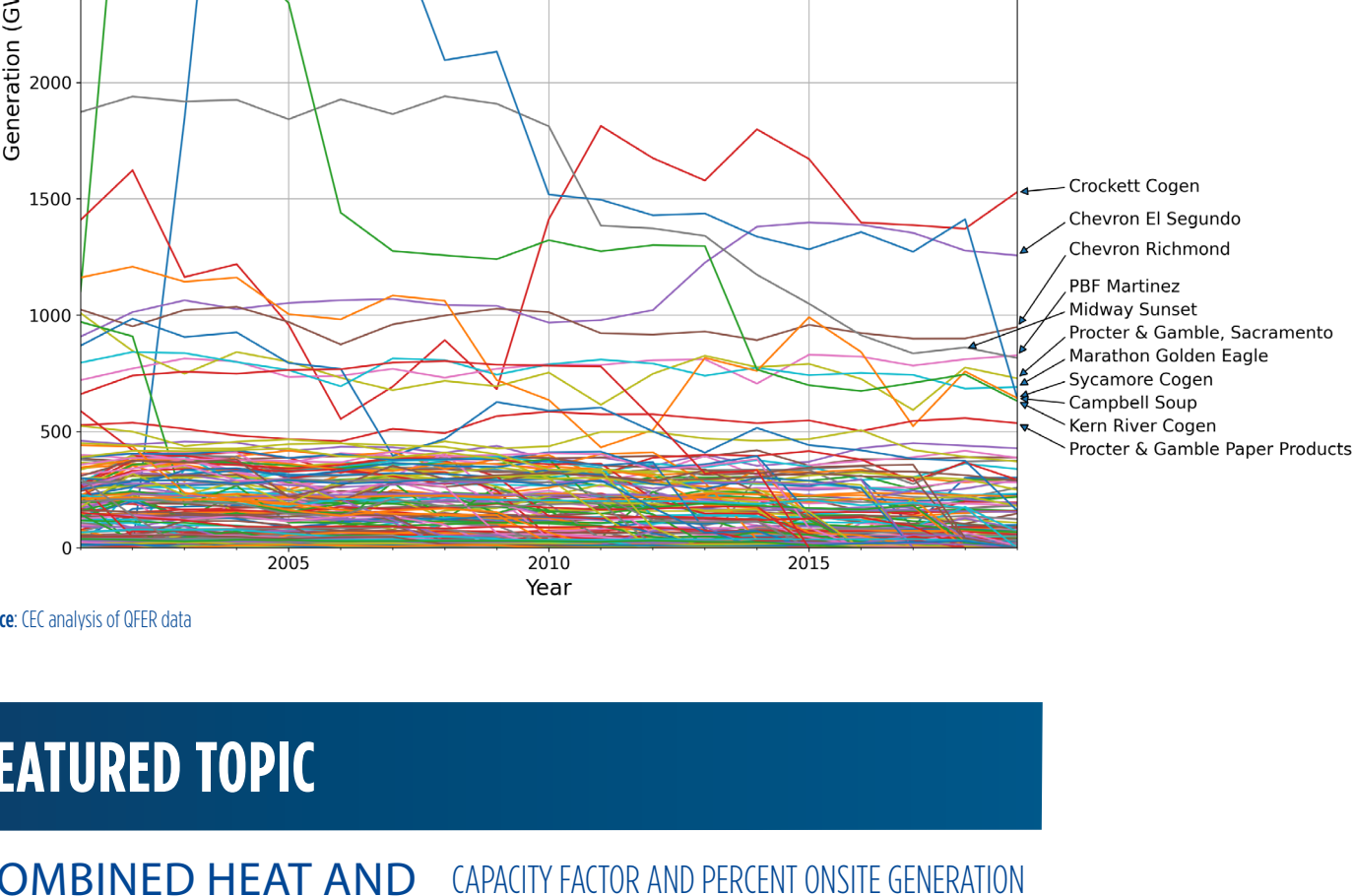


SOUTHERN CALIFORNIA REFINERIES



Source: CEC analysis of QFER and PIIRA data

CHP GENERATION BY FACILITY



Source: CEC analysis of QFER data

FEATURED TOPIC

COMBINED HEAT AND POWER GENERATION AT PETROLEUM REFINERIES

Petroleum refinery operations require large amounts of heat to break down crude oil into marketable products. Refineries use electricity to run and control pumps that move product within the facility. The high use of both electricity and heat make combined heat and power (CHP) an economic choice for refinery operators. CHP, also known as cogeneration, is when combustion turbine generators and steam turbine generators produce electricity and thermal energy for useful purposes.

The [Energy Information Administration \(EIA\)](#) forecasts a 1.5 percent annual increase in electric generation from CHP at industrial facilities across the United States, including refineries. The top 10 largest refineries in California use CHP. Chevron El Segundo refinery built its CHP facility in 1987, making it the oldest in California's current fleet. The newest one was installed in 2002 by Valero at its [Benicia refinery](#).

The CEC collects operational data about electric generators, including CHP, in its Quarterly Fuel and Energy Report (QFER). Power plants of one megawatt or greater must report monthly data including electric generation, fuel use, onsite electricity use, sales to end users, and electricity for resale.

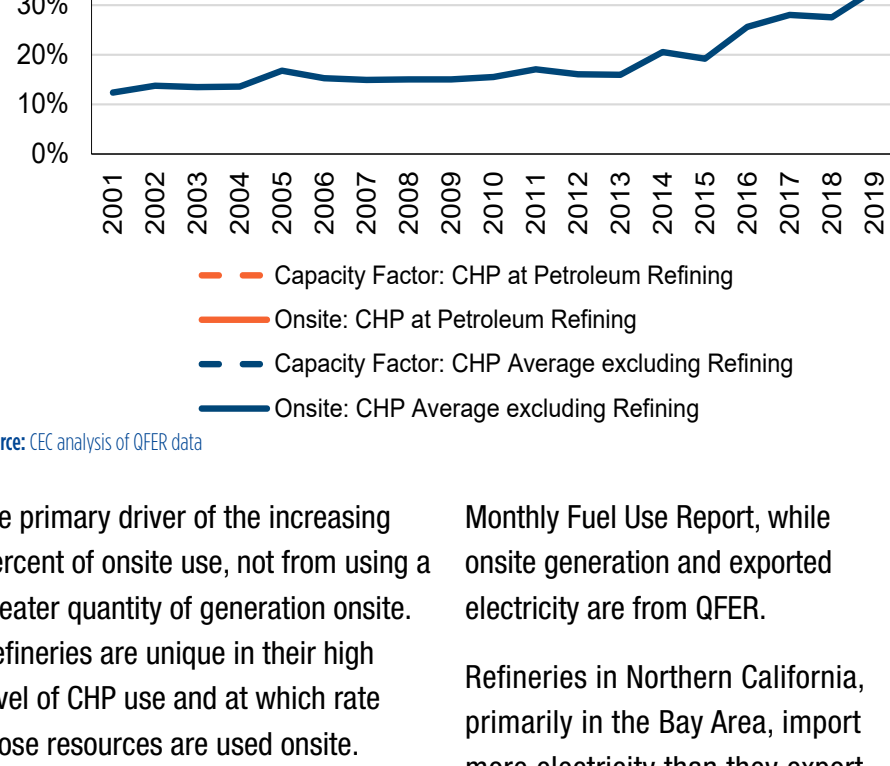
In 2019, electric generators in California generated 200,475 gigawatt-hours (GWh). CHP produced about 15 percent of that total at 29,873 GWh. CHP associated with refineries generated 8,941 GWh, [about 4.5 percent of the in-state total](#).

CHP USE AT REFINERIES

Metrics using generation and sales data from QFER allow for comparison of different electric generation resources. Capacity factor is the ratio, expressed as a percentage, of the actual output of a power plant to the maximum available output over a given period of time. Percent onsite generation is the ratio of electricity used onsite or through direct sales to an end user over total generation. The [Capacity Factor and Percent Onsite Generation](#) chart compares these two metrics for CHP relating the refining sector to all other CHP sectors.

Refineries have higher capacity factors and onsite use of their CHP than the rest of the state's CHP fleet. Refineries are maintaining their high level of CHP generation and using even more of that electricity onsite. While other industries that use CHP began the turn of the century using a larger percentage of their generation onsite, their total generation has decreased roughly 20 percent since the mid-2000s. The decrease in overall generation from those resources is

CAPACITY FACTOR AND PERCENT ONSITE GENERATION



Source: CEC analysis of QFER data

the primary driver of the increasing percent of onsite use, not from using a greater quantity of generation onsite. Refineries are unique in their high level of CHP use and at which rate those resources are used onsite.

REFINERY ELECTRICITY PURCHASES

While CHP generates most of the electricity consumed at refineries, refineries still purchase electricity from California's electric grid. Another QFER form requires utility distribution companies to report the quantity of electricity delivered monthly by utility distribution companies to end-use customers identified by the North American Industry Classification System (NAICS) codes. Electricity sales to the refinery sector may then be separated using the NAICS codes for the refining sector. [Utility sales to the refining sector](#) have remained steady over the past two decades.

The California Refinery Monthly Fuel Use Report is another data set of energy use data at refineries reported to the CEC. Refinery reporting requirements include monthly fuel use by fuel type, electricity purchases, and steam purchases. Combining the electricity purchase data with the QFER electricity data provides a more complete picture of refinery operations from an electricity consumption perspective.

In 2019, refineries purchased 2,359 GWh of electricity from the grid, but also sold 2,811 GWh of electricity to electricity resellers, such as thermal utilities. This implies electric utilities drive CHP operation. Refineries balance their electricity needs by buying or selling electricity to the grid. Many refineries report having both sales and purchases during the same month.

REGIONAL DIFFERENCES

The [CHP Generation charts](#) combine electricity generation and electricity purchase data. The two charts separate the data into Northern California and Southern California. Information on purchased electricity comes from the California Refinery

Monthly Fuel Use Report, while onsite generation and exported electricity are from QFER.

Refineries in Northern California, primarily in the Bay Area, import more electricity than they export annually. Refineries in Southern California, mostly located in the southwest region of Los Angeles, export more electricity than they import. Three quarters of that export comes from the largest refinery in the state and home to the largest amount of cogeneration located at a refinery, including the Watson Cogeneration facility.

Two refineries in Northern California, [Marathon Golden Eagle](#) and [Phillips 66 Rodeo](#), have announced plans to transition their refineries to process renewable diesel and plan on maintaining their CHP at those facilities. As part of this transition, Phillips 66 plans to close its Santa Maria refining facility, the state's largest refinery without an associated CHP facility.

For more information on CHP, visit the [CEC website](#).

LARGEST CHP FACILITIES BY GENERATION

[CHP Generation by Facility](#) shows the annual total generation of individual CHP resources and identifies the top 14 of 146 producing facilities in 2019. These top 14 CHP facilities accounted for 63 percent of all CHP generation in the state. Generation of CHP at refineries is the largest individual sector with half of the top 10 CHP facilities by production located at refineries (Watson Cogen, Chevron El Segundo, Chevron Richmond, PBF Martinez, and Marathon Golden Eagle). In addition, CHP for enhanced oil recovery are also large CHP users (Occidental Elk Hills, Midway Sunset, Sycamore Cogen, and Kern River Cogen). While the majority of CHP facilities are smaller and more diverse in their application, these large CHP facilities at refineries and oil fields heavily influence trends in the state's CHP fleet.

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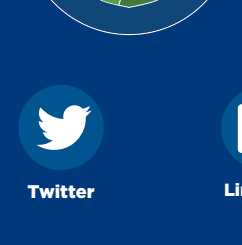
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