



The U.S. Department of Energy’s Office of Fossil Energy (FE) supports research and development of technologies that can reduce the volume of natural gas (e.g., methane) flared or vented (released) into the atmosphere during crude oil and natural gas exploration, production, processing, transportation, and storage operations. This fact sheet was created by FE to inform stakeholders on state-level production and regulatory activity regarding natural gas flaring and venting. FE’s research portfolio includes efforts to reduce methane (and other hydrocarbon) flaring through the application of improved technologies to capture and utilize small volumes of natural gas at remote locations, as well as technologies to reduce (primarily) methane release during midstream gas processing and transportation. Intermittent flaring that occurs as a result of routine well testing, production facility process shutdowns, or facility and pipeline infrastructure maintenance, are normal aspects of safe oil and natural gas production. Increases in domestic oil and natural gas production have resulted in significant infrastructure buildouts, however, natural gas pipeline capacity constraints have led to regional increases in the flaring of associated gas in some unconventional plays (e.g., Permian Basin in Texas and New Mexico and Bakken Shale in North Dakota) in order to enable oil production.

California Producing Plays and Basins

While California is a large state in terms of geographical area, oil and gas production is largely limited to a group of sedimentary basins in the south: the San Joaquin Basin and the cluster of Santa Maria-Ventura-Los Angeles Basins ([Figure 1](#)). [California oil production has been declining since 1985](#) and relies on steam flooding to produce much of the region’s heavy oil. Relatively small volumes of associated gas and even smaller amounts of non-associated gas are produced. According to the U.S. Energy Information Administration (EIA), California’s proved reserves are [2.2 billion barrels of oil](#) and [1.66 trillion cubic feet \(Tcf\) of natural gas](#) (2017).



Figure 1: California basins and major unconventional oil and gas plays outlined.
Source: EIA

The Monterey Shale is considered to be both a conventional and unconventional formation, depending on location and rock characteristics, with primarily crude oil production potential at depths between 8,000–14,000 feet. The [U.S. Geological Survey’s 2003 conventional resources assessment](#) estimated there to be a mean of 121 million barrels of technically recoverable oil in the portion of the Monterey Shale located within the San Joaquin Basin. A [2015 USGS estimate](#) for the Monterey Shale in the deep parts of the San Joaquin Basin—what would be considered unconventional resource—is only 21 million barrels of oil, 27 billion cubic feet (Bcf) of natural gas, and 1 million barrels of natural gas liquids. In [2014](#), [EIA](#) downgraded previous optimistic estimates of recoverable oil

California Oil and Natural Gas Statistics (EIA)

	2013	2014	2015	2016	2017	2018
Crude Oil Production (Average Thousand Barrels/Day)	545	561	552	508	477	463
Natural Gas Gross Withdrawals and Production (Average MMcf/Day)	691	655	649	560	573	546
Natural Gas Gross Withdrawals and Production (Vented and Flared) (MMcf/Day)	N/A	N/A	N/A	N/A	N/A	N/A
Natural Gas Gross Withdrawals and Production (Oil Wells) (Mcf/Day)	191	193	190	157	158	N/A
Natural Gas and Gas Producing Oil Wells (Thousands)	30.7	31.0	31.3	29.0	28.0	N/A

MMcf – million cubic feet
Mcf – thousand cubic feet

2017 ranking among 32 U.S. oil and natural gas producing states — Oil: 4 Natural Gas: 15

from the Monterey to a total of 600 million barrels from all areas. However, efforts to find a way to commercially solve its geological and well performance challenges have not yet been successful. The [2016 Potential Gas Committee report](#) estimates a total “most likely” technically recoverable gas resource of 13.15 Tcf for the San Joaquin Basin, and only 2.85 Tcf for all other onshore California coastal basins.

California Key Regulations Associated with Flaring and Venting

California has a historic precedent of not allowing the release of natural gas. This precedent dates back to 1939, when the state enacted statutes entitled *Wasting of Natural Gas*, as part of Chapter 2, Section 3500-3503 of the Public Resources Code. This regulation restricts flaring and venting implicitly with the statement that, “All persons, firms, corporations, and associations are prohibited from willfully permitting natural gas wastefully to escape into the atmosphere,” (Chapter 2, Section 3500). Section 3502 explains that this regulation is classified as a misdemeanor infraction punishable by fine or imprisonment, and Section 3500 states that each day that natural gas is wasted is considered a separate violation.

Adopted in March 2017, as part of the California Code of Regulations, [the *Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities*](#) regulation is designed to reduce methane emissions (Title 17, Division 3, Chapter 1, Subchapter 10 Climate Change, Article 4, Subarticle 13). Under this rule, oil and gas facilities on private, state, and federal land and offshore property are required to limit vented gas, as well as unintentional leaked or fugitive emissions. Tribal land is the one property exemption. In cooperation with the local air districts, the enforcing

entity is the California Air Resources Board (CARB), which is responsible for protecting the public from air pollution and for developing programs and actions to address climate change.

California is divided into [local air districts](#) that have primary responsibility for controlling air pollution from stationary sources. Many air districts with significant oil and gas production have rules, available in the [District Rules Database](#), that have been in place for decades designed to reduce criteria pollutant emissions from the oil and gas sector. According to CARB (via a staff interview), the air district rules control emissions of volatile organic compounds (VOCs), but some methane reductions are achieved as a co-benefit since both VOCs and methane are found in field gas in oil and gas operations. In general, district rules prevent uncontrolled venting of produced field gas. In addition, district rules limit combustion pollutants from flaring. The *Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities* regulation was intended to build upon existing district rules by covering methane-specific sources not already controlled by the districts.

The [Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities](#) regulation includes provisions that aim to reduce fugitive and vented emissions of methane from both new and existing oil and gas facilities. This regulation enforces standards for: separator and tank systems; circulation tanks for well stimulations; leak detection and repair; underground natural gas storage monitoring; natural gas compressors; and pneumatic devices and pumps. Implementation depends upon both CARB and the local air districts, with most districts responsible for enforcement, as outlined in individual [Memoranda of Agreement](#). The [timeline for implementation](#) spans two years and

includes deadlines for planning, testing, installing upgraded equipment, and reporting.

California State Points of Contact

California Air Resources Board: Oil and Natural Gas, Production, Processing, and Storage

Contact CARB for more information regarding regulations, production, storage, and transmission.

Website: <https://ww2.arb.ca.gov/our-work/programs/oil-and-natural-gas-production-processing-and-storage>

Email: oilandgas@arb.ca.gov

Phone: 916-322-8273

California Department of Conservation: Division of Oil, Gas, and Geothermal Resources (DOGGR)

Contact DOGGR for information about regulation of oil and gas and drilling processes based on the most up-to-date science.

Website: <https://www.conservation.ca.gov/dog/Pages/Oil-and-Gas.aspx>

Email: doggrwebmaster@conservation.ca.gov

Phone: 916-445-9686

Visit energy.gov/fe/state-natural-gas-flaring-and-venting-regulations for a digital version of this fact sheet that includes hyperlinks to information sources.