

A New California Oil Boom?

Drilling the Monterey Shale

A Next Generation Series



Part 3: The Climate Conundrum: Can California Boost its Oil Output and Meet Emissions Goals?

Robert Collier

September 2013



Next Generation

Part 3: The Climate Conundrum: Can California Boost its Oil Output and Meet Emissions Goals?

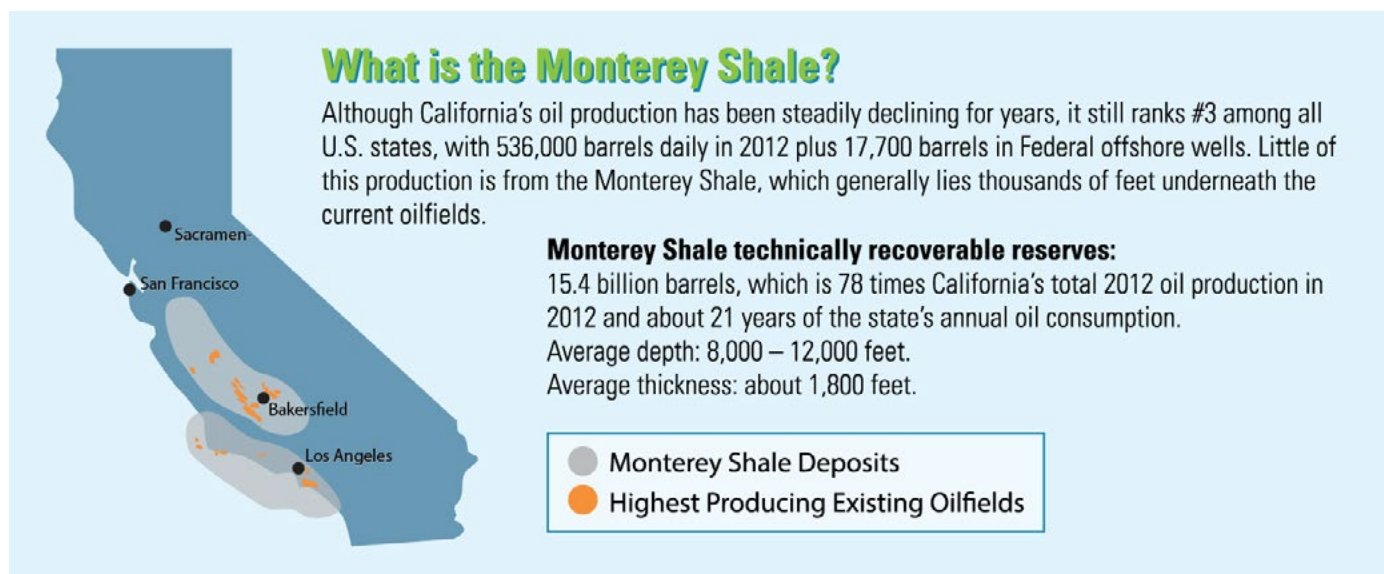
Editor's note: In [Part 1](#) of our series on the Monterey Shale, Next Generation researcher Robert Collier outlined the technical challenges of developing the Monterey Shale oil field—and how a technique known as “matrix acidizing,” which uses hydrofluoric acid to dissolve underground rock formations, may be the key to its development. In [Part 2](#) we explored the risks of widespread HF use. Here in Part 3, we are taking a look at the potential impacts of Monterey Shale development on California’s emissions goals.

With elected officials and energy experts buzzing about the potential for a major boom in oil production from California’s Monterey Shale, little attention has been given to the risk that a new oil boom could undermine the state’s plans for addressing climate change. If the as-yet unrealized surge in Central and Southern California’s Monterey Shale were to materialize, it could boost the state’s climate pollution, just as the state grabs the mantle as a global leader in reducing greenhouse gas emissions.

Public discussions of the climate impact of an oil boom have been limited by lack of information about potential rates of growth in oil production or greenhouse gas emissions. The key questions revolve around scale and speed: How much of the oil would be produced, and over what time period? Would oil production grow at the same speed as shale oil booms in North Dakota and Texas? Or would technical difficulties slow any increase to a modest, manageable crawl? Or, perhaps as likely as any other scenario, would the oil mirage turn into just another over-hyped, Western bust?

Predicting a boom: At what speed?

The mother lode of California’s potential oil bonanza is expected to be the Monterey Shale, a deep layer of rocks stretching from the southern edges of the San Francisco Bay Area all the way to Orange County. Geologists believe the Monterey Shale may hold 15.4 billion barrels of technically recoverable oil, or [more than twice the shale oil deposits of all other states combined](#).



Around the United States, new drilling techniques have upended conventional wisdom, causing unprecedented surges in production from oil and gas reserves that had previously been inaccessible. This rapid shift in potential – from reserves that were believed to be off limits – has yet to fully arrive in California, where the geological complexity of the Monterey Shale has so far stymied oil companies' attempts to unlock its secrets. Petroleum engineers are feverishly trying new drilling techniques that they hope will solve these riddles. If and when there is a "breakthrough" moment, the pace of development could take off like a rocket.

Many existing factors could help accelerate Monterey Shale production growth:

- **Size.** The Monterey's reserves dwarf those of other, more established U.S. shale plays, with estimates showing twice the amount of oil of North Dakota's [Bakken field](#) and Texas's [Eagle Ford field](#) combined.
- **Location.** The Monterey's deposits are located in a densely populated state with a huge market for oil conveniently located a short distance away. In some cases, such as the Los Angeles oil basin, the market is literally overhead.
- **Property holdings.** Because the Monterey generally lies directly underneath the state's existing oilfields, oil companies could take advantage of their existing properties and facilities to speed development.
- **Transport.** According to the California Energy Commission, the state's pipelines and rail networks have enough capacity to absorb at least a doubling of the state's total oil production, and probably much more.¹
- **Refinery capacity.** In-state oil production only provides about one-quarter of the [state's oil refinery consumption](#) of about 2 million barrels per day; because of the U.S. [near-total ban on crude exports](#), California could probably absorb a major boost of oil output with no need to seek expansion of existing refineries.

All these factors contrast markedly from conditions in the Alberta tar sands, where huge amounts of crude are thousands of miles from any market – and

could wind up stranded unless the Keystone XL or other export pipelines are built.

Many economists who study the oil industry say that if the Monterey's technical problems are resolved, market and political factors would lead oil companies to try to maximize their output, just as they have done in North Dakota and Texas.

"The economic stakes make the development of Monterey energy inevitable," said David Roland-Holst, professor of economics at UC Berkeley. "Institutional constraints, including refinery regulation and both de jure and de facto environmental oversight, will be tempered by two forces: The first is the state's fiscal situation, for which these resources will be seen by some as a panacea," he said. "In other words, public tax revenues from oil-related economic activity are truly additional and would represent a very big bag of political candy."

Although California is the only major oil producing state that does not charge a severance tax, the oil industry gains considerable political clout through its claims that it generates billions of dollars in indirect tax revenue. A coming report by Next Generation will take a close look at the veracity of these claims.

Roland-Holst said a Monterey boom is unlikely to be slowed significantly by political concerns: "The second factor moderating environmental concerns/objections could be the history of fracking in California. A variety of these methods have already been in use here for over 20 years, without documentation of significant adverse effects," he said.²

Other experts noted that California's oil prices are thoroughly integrated with the world market, so with the international Brent benchmark at roughly \$110 per barrel and futures prices predicting no significant decrease, the market's appetites will be powerful.

"No firm will make a field development decision based on that field's impact on the global market, because no single field is large enough for it to matter on its own," said Kenneth Medlock, senior director of the Center for Energy Studies at Rice University.³ A similar view came from Severin Boreinstein, co-director of the Energy Institute at the Haas School of Business at UC Berkeley: "The effect of Monterey shale on the world oil price will be minimal so that won't be a constraint on rampup. I think rampup constraints will be more technical than economic."⁴

Production scenarios: an informed guessing game

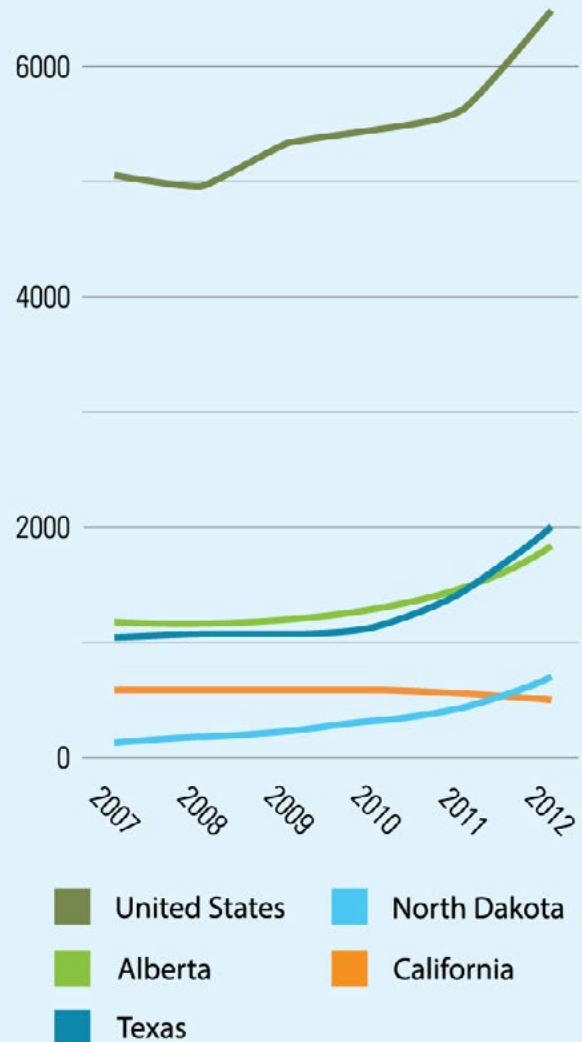
Based on recent history, a wide range of scenarios is possible:

- California's production from conventional oil wells [has slid gradually over the years](#), from about 1.1 million barrels per day at its high in 1985 to 536,000 barrels in 2012. From 2007-2012, the **rate of decline was 3 percent annually**. This decline stopped in 2012 and output is expected to remain flat in the next two or three years, as high oil prices cause companies to eke out extra production in their decades-old fields. The Monterey provides little of California's current production.
- After years of decline, U.S. [total oil production is now rising rapidly](#), fueled by sudden increases in North Dakota and Texas. Nationwide oil **production rose 5.1 percent annually** from 2007-2012 and is [projected to increase by 13 percent annually during 2012-2014](#), according to the Energy Information Administration.
- Alberta's tar sands reserves are far larger than those of the Monterey, with an estimated 168 billion barrels recoverable. But [tar sands production](#) has grown at a slower pace than shale plays south of the border, rising from 1.1 million barrels per day in 2007 to 1.9 million in 2012, or **11 percent annually**.
- [Texas' oil production](#) has doubled since 2007, to about 2.3 million barrels per day, for an increase of **14 percent annually**.
- [North Dakota's daily oil output](#) has soared by more than 500 percent since 2007, to about 750,000 barrels per day in early 2013, or **40 percent annually**.

Academic and industry experts say they are unsure what sort of growth projections could be realistic for the Monterey.

Richard Behl, professor of Geology at California State University at Long Beach, points out that the Monterey Shale is still relatively unexplored, and its extremely complex geological structure presents

Crude Oil Production 2007–2012 (Thousand Barrels / Day)



Sources: US Energy Information Administration, Alberta Energy

challenges that have never been solved at other oilfields.⁵ Unlike the state's traditional oilfields, where companies focus on the convex folds known as "anticlines" in which oil has collected over the millennia, the Monterey's oil is believed to be more dispersed underground.

"We don't know a lot about the deeper structures of existing oilfields. No one ever drilled into those, and it's expensive to drill deep," Behl said. "Everyone has been drilling into anticlinal folds and traps, and that's where production has been for the past century, so the oil companies know that well. But the Monterey is different."

Behl, who has extensively studied the Monterey Shale and is widely viewed as the state's chief academic expert on the subject, admitted he was of two minds about its potential.

Asked whether California could ramp up at the speed of North Dakota, he said that scenario was "too speculative." But he also volunteered that once oil company geologists figure out the Monterey's secrets, growth could be rapid.

"California could ramp up just as fast as North Dakota or Texas," he said. "It's possible. But there are too many variables to know for sure."

"A lot of hype"

Other experts are more skeptical of California's ability to rapidly ramp up shale oil production. "There's a lot of hype in this issue," said Robert Garrison, a professor emeritus of geology at UC Santa Cruz. "Assuming exponential rates of growth in the Monterey seems very risky to me, and not necessarily substantiated by much."⁶

Oil companies and their supporters promise explosive job growth from a Monterey oil boom, citing a bullish, oil industry-funded [2013 report by the University of Southern California](#). That study predicted even faster rates of growth in California oil production than those of North Dakota. But industry spokespeople now demur when asked about specific production levels. "Gosh, we have no idea about where the production levels could go," said Tupper Hull, vice president of the Western States Petroleum Association. "We're hard at work on solving the technical issues."⁷

In sum, the scenarios are varied. What is clear, however, is that any net increase in California oil production would cause a corresponding increase in greenhouse gas emissions. Evaluating those emissions scenarios is the key task for state leaders focused on achieving their aggressive climate goals.

Notes

¹ Email to author, July 25, 2013, from Alison apRoberts, information officer, California Energy Commission: "California onshore crude oil production peaked in 1985 at 354.8 million barrels. Onshore production last year tallied 182.2 million barrels. So one could say that there was a system in place of pipeline connections to handle 172.6 million barrels more than today. What portion of that 1985 distribution capacity may have been retired or mothballed is unknown but likely only a modest portion. In addition, refiners and other parties in California are continuing to pursue rail-by-crude projects to take advantage of less expensive crude oil opportunities like Bakken and Canadian crude oils. This means that new crude oil production in California could be loaded onto rail cars for delivery to refineries that have rail receipt capability. This trend in conjunction with the state's spare pipeline capacity can therefore negate the need to build additional pipeline capacity over the near to mid-term."

² Email to author, Aug. 10, 2013.

³ Email to author, Aug. 13, 2013. Medlock continued: "Firms will, however, make an assessment of the direction of the market before actively developing a field. But, there are many factors that go into such an assessment, such as global economic health and demand growth (China demand is a huge issue at the moment), and trends in various things that effect global supply (such as growth in Iraqi production, what is happening in West Africa, what is happening generally with light tight oil production across the US, what is happening with Canadian oil sands, etc.)."

⁴ Email to author, Aug. 10, 2013.

⁵ Telephone interview, May 13, 2013

⁶ Telephone interview, May 10, 2013.

⁷ Interview, May 14, 2013.

NEXT IN THE SERIES: A USA worth of emissions? Or two keystones?