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Energy & Sustainability » News

It's Frack, Baby, Frack, as Conventional Gas Drilling Declines [Infographic]

Hydraulic fracturing has offset dwindling traditional sources, but that trend may not last long

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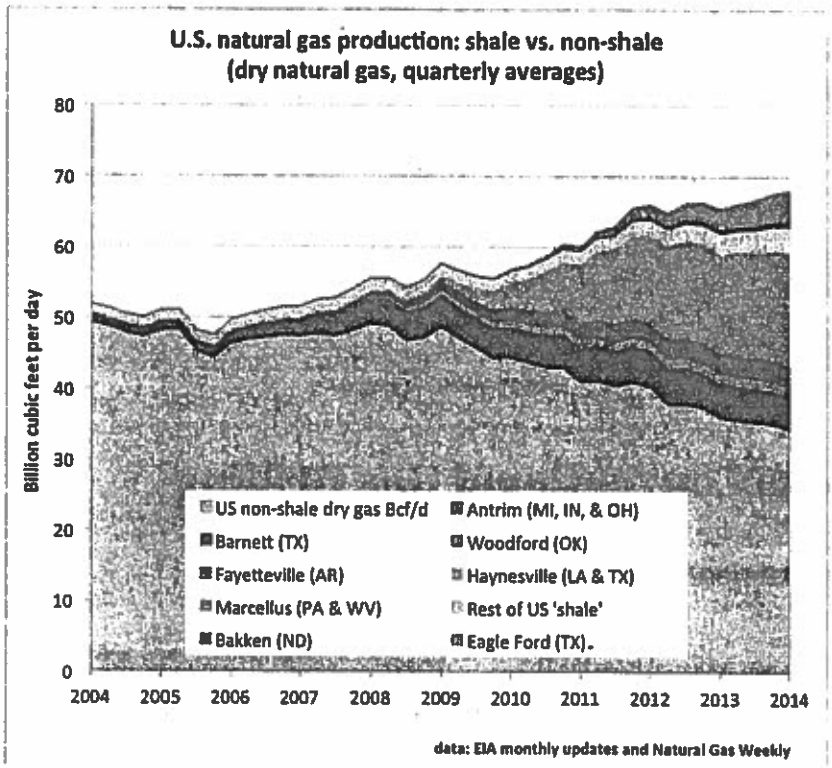
To deliver significant cuts in greenhouse gas emissions, a new proposal from the U.S. Environmental Protection Agency foresees a growing role for natural gas. But will there be enough of it at affordable prices?

The U.S. Energy Information Administration and industry sources say there's plenty that can be extracted at a reasonable price. But some experts question those estimates or say that, at least, the nation shouldn't bank on them. Hydraulic fracturing, or fracking, coupled with horizontal drilling, has unlocked large gas deposits in shale rock, which had been long recognized but weren't profitable to extract until about a decade ago. Over the past five years, with improvements in fracking, shale gas production has soared. At the same time, however, production from all other sources—such as conventional gas fields on land and offshore as well as so-called tight gas and coal-bed methane—has been declining at a rate of about 5 percent per year.

Process of mixing water with fracking fluids to be injected into the ground.
Credit: Joshua Doubek via Wikimedia Commons



Shale gas now accounts for half of all U.S. production, according to EIA statistics—a milestone that many studies expected wouldn't be reached until the mid-2020s or later. "Assuming that technology will allow ever more shale gas production at low prices—and betting energy policy and the future energy security of the country on it—is risky business," says geologist David Hughes, who retired from the Canadian Geological Survey and is now doing assessments of shale gas and oil for the nonprofit Post Carbon Institute, a California-based environmental think tank.

The EPA's proposal for cutting power plants' greenhouse gas emissions through 2030 is based partly on the expectation that natural gas will play a crucial role, especially during the next five to 10 years. The agency laid out various scenarios under which states might meet targets for cutting their emissions. Overall, all the scenarios foresee an increased reliance on natural gas; the EPA calls for switching over coal-fired power plants to burn natural gas and for more use of existing natural gas plants that are idle.

With the increased reliance on natural gas, the agency's lower-emission scenarios foresee U.S. natural gas production continuing to rise, increasing nearly 15 percent by 2020. Meanwhile, natural gas prices would rise only about 50 cents over what they otherwise would be, to about $5.50 rather than $5 per thousand cubic feet.

Further, there are hopes for relatively low-cost natural gas to revive U.S. industries—from steel to plastics—that could take advantage of current prices, which by world standards are cheap.

At the same time, there is a hope that the U.S. will be able to export large amounts of natural gas. The EIA expects the nation to be a net importer for a few more years but then for net exports to soar through the 2020s, reaching about 10 percent of the nation's production. "Certainly a couple of years back, before the Marcellus Shale added so much low-cost resource...we would have worried about the upward price pressure associated with adding that amount of new market in the gas space," says Jen Snyder, a gas analyst with the research and consulting firm Wood Mackenzie. Now, Snyder says, Wood Mackenzie's outlook is that "the resource base can handle the added demand, even with proposed LNG [liquid natural gas] export facilities, even with planned gas-intensive industrial projects."

Nevertheless, Wood Mackenzie sees some limits to the resource. For example, gas production in the Marcellus Formation, which extends across New York State, Pennsylvania and West Virginia, has soared despite relatively low gas prices, driven in large part by especially prolific wells in northeastern Pennsylvania. But there are only so many wells to drill in that core area of the state. "In our view, by 2020, that inventory of wells will be exhausted," Snyder says.

Where such limits exist and what prices would be necessary to keep production rising are still matters of debate. When starting out in assessing new shale formations, "the uncertainty is massive," says Kenneth Medlock, an economist with Rice University's Baker Institute, a think tank that receives funding from the oil and gas industry. "The uncertainty generally clears up as you drill a play."

Assessments by Medlock and colleagues have estimated there are vast resources that would be profitable to extract. "We know there's an awful lot of gas out there," agrees Jeffrey Logan, an energy market analyst at the National Renewable Energy Laboratory in Golden, Colo., part of the U.S. Department of Energy. What prices are needed for extraction to be profitable, however, is the big question—one that "people are really scratching their heads on," he adds. In 2012, when natural gas spot prices fell below $2 per thousand cubic feet, "I think people were thinking those prices were the new normal, that we were in a different world," he says. "But that's clearly not the case. Right now gas prices are well over twice what they were in 2012." Given such uncertainty, he adds, "Any smart decision maker out there will look for a properly risk-weighted portfolio of options." Otherwise, "they might get in trouble if gas prices rise above a certain point."

One of the major risks of dependence on shale gas is that wells' production drops off so sharply, Hughes says. Shale gas wells' production rates typically drop by at least half in the first year and continue to decline thereafter. The EIA expects that nearly half of all the "technically recoverable resources" of shale gas identified so far would be consumed by 2030. And at that point, shale gas production would still be increasing, with much more extracted after 2030. John Staub, leader of the EIA's Oil and Gas Exploration and Production Analysis team, says the agency's model "includes technology change," which, year after year, increases the amount of gas that can be extracted.

"The EIA apparently has unfettered faith in new technology developments to provide shale gas production to meet its projections," Hughes notes. He points out, however, that the EIA's most recent assessments of the total amount of gas that can be recovered from major shale gas areas, formations such as Marcellus and Texas's Barnett , have fallen rather than risen. Also, according to Hughes's analyses, new wells in Barnett are less productive, a sign of stagnation as "sweet spots become saturated with wells and drilling moves into lower quality rock," he says. "This is unequivocal evidence that geology in shale gas plays ultimately trumps technology."

Hughes has been a thorn in the side of those optimistic about supplies of shale oil and gas. In a 2013 report he argued that the EIA had vastly overestimated the amount of oil that could be recovered from California's Monterey Shale Formation. Earlier this month the EIA released updated figures (pdf) that dropped the amount of recoverable oil in that formation by more than 90 percent, from around 14 billion barrels to just one billion. Questions remain about how long the so-called shale gale can blow.