

Statistical realism -- David Hughes crunches unpopular numbers for the shale oil boom.

Jeremy Miller, High County News, 2-16-15

I first met energy analyst David Hughes last July in a miasma of diesel and gasoline fumes. It had taken me a three-hour drive and three ferryboats to arrive at beautiful and remote Cortes Island, one of dozens of islets wedged like ice floes in the Strait of Georgia, off the west coast of British Columbia.

Hughes, waiting in the cab of his Toyota pickup, surveyed the new arrivals as they disembarked the boat. Many were in their early 20s and, judging by their enormous backpacks and heavy boots, determined to experience this northern island paradise properly. Hughes swung a beckoning arm out the window. “You made it,” he said, in a tone that suggested that he’d had his doubts. “Are you ready for the whirlwind tour?”

I’d come in hopes of learning something about this reclusive man, who has stirred up debate among energy watchers over the last few years, mainly by the statistical thrashing he’s been giving to the so-called U.S. shale revolution. At the time, after all, domestic oil production was surging, as it still is — with U.S. fields coughing up 7.4 million barrels of oil per day, up 64 percent since 2008 — and energy prices had not yet begun their sharp plunge. Together, North Dakota’s Bakken and Texas’s Eagle Ford fields were producing 2.8 million barrels per day, or 15 percent of the U.S.’s daily demand. The uptick is largely the result of hydraulic fracturing, a technique that has unlocked hydrocarbons from formations once technically and financially impractical. Continental Oil executive Harold Hamm believes U.S. shale plays hold a century or more worth of oil and gas and the key to American “energy independence.”

Hughes does not deny the short-term figures. But he insists that the long-term projections of Hamm and others are dangerously overstated. A former geologist with the Geological Survey of Canada, David Hughes does not preach about the environmental evils of fossil fuels or the moral imperative of protecting the planet for future generations. Instead, he argues with the math — especially the reserve numbers released by industry or federal agencies, the same sort of estimates he spent three decades calculating for the Canadian government.

His work for the California-based Post Carbon Institute, where he’s been a fellow since 2006, has drawn praise from environmentalists and angered pro-shale advocates. David Blackmon, a *Forbes Magazine* energy writer, denounced Hughes’ estimates as “hyperbolic,” “fallacious” and “pure invention.”

But many energy experts don’t think Hughes’ ideas can be so easily dismissed. For example, in *Drilling California*, a report published in December 2013 by the Post Carbon Institute, he calculated that the amount of oil that can be extracted from California’s Monterey shale formation had been vastly overstated. His report preceded by several months a major downward revision by the U.S. Department of Energy of its official estimates of Monterey reserves. Until that revision last June, the Monterey was projected by the energy department to be the nation’s largest shale oil play.

Hughes is not an anti-fossil fuels activist; rather, he is, he says, a “statistical realist.” And though his client list includes oil companies as well as outfits like the Post Carbon Institute, he understands why many energy executives have been reluctant to embrace his findings. Oil companies, he says, will not be deterred from expensive-to-extract fossil fuel sources such as shale oil and tar sands as long as the per barrel price is high enough. But every year that unconventional energy sources remain at the center of our

energy portfolio, he says, is a year lost from the inevitable transition that must be made away from them. “My view is that the U.S. should take the shale revolution as a blessing in disguise,” he says, “and begin thinking longer-term about a strategy to manage what will inevitably be scarcity.”

Now there are signs that the shale oil party may end sooner than anyone expected, though not for the reasons Hughes has cited. In late November, the Saudi Arabian oil minister announced plans to wage economic war on the U.S. shale industry by maintaining production in spite of falling global demand, flooding the world market with oil. Though other OPEC members protested, the Saudi plan was carried out — and apparently to its desired effect. By mid-January, the per-barrel price of oil had fallen below \$50 for the first time in a decade. While consumers laud lower prices, this does not bode well for the U.S. shale oil industry, which many believe requires a per-barrel price of at least \$60 to \$100 to remain viable. Nonetheless, at the beginning of January, the Energy Information Administration projected that production would continue apace.

Despite the uncertain geopolitics, Hughes remains fixed on what he sees as the geological limitations of U.S. shale and the need for the public to recognize the scenario that something now abundant could become scarce in the not-so-distant future. “Industry is concerned with the next couple months, the next couple quarters, so there is more and more hype about the short term,” says Hughes. “If we as a society begin believing that hype and thinking we’re OK in the long term, we’re in trouble.”

After we left the ferry slip on my July visit, we drove to a beach on the island’s southern flank and walked over clam and oyster shells that clattered like broken porcelain underfoot. Hughes, 63, had a tousled mop of light-brown hair and wore a tattered beige T-shirt showing wolves howling at the moon. “The ferries are definitely the fossil fuel Achilles’ heel of this place,” said Hughes, who first came to Cortes in the 1970s. “But once you’re here, you’re here.”

I visited his headquarters, located in his rustic home on a hill overlooking Vancouver Island. Inside, a tattered recliner sat before a high-efficiency woodstove, near a dated-looking PC. After retiring from the Canadian government in 2008, Hughes became an energy consultant, working for clients from energy companies to environmental think tanks.

Though his home is isolated, he is by no means a hermit. He travels often and has given talks with the likes of Tom Steyer, the California billionaire and renewable energy activist, on the pitfalls of depending on shale oil to address the country’s energy needs. But he’s most at home nosing through obscure reports and industry databases, comparing projections with what is actually being produced. *Drilling California* excoriates the Energy Information Administration and its 2011 estimate of California’s Monterey shale — a vast formation underlying California’s Central Valley as well as Santa Barbara and Los Angeles counties — projecting it holds 15.4 billion barrels of recoverable oil. (For comparison, in the same report the Bakken field is projected to contain roughly 4 billion barrels of recoverable oil.)

Such numbers are apt to make executives and investors salivate. But to Hughes they threw up immediate red flags. “The Monterey shale is not exactly a new find,” Hughes told me. “It has seen decades of intensive exploration.” The Bakken has a uniform “Oreo cookie” geology, Hughes explained, whereas the Monterey is warped and fractured by tectonic activity, making its oil much harder to extract.

Moreover, he added, much of the oil that has been recovered in the Central Valley has migrated from deeper parts of the Monterey shale. Ostensibly “new” finds north of Bakersfield, he said, are vestiges of fields exploited for more than a century.

Probing for the source of the EIA's 15.4 billion barrel estimate, Hughes found it was calculated by INTEK using well production data supplied by the oil company Occidental Energy, one of the largest players in the Monterey. He double-checked the numbers using a database called DrillingInfo and found INTEK's estimate to be highly inflated — by more than 90 percent.

Within months of Hughes' report, the U.S. Energy Information also back-pedaled on its estimates for the Monterey — dropping its projections from 15.4 billion to 600 million barrels, a 95 percent downgrade. Phil Budzik, an EIA analyst involved in issuing the downgrade, said the similarity between the agency's downgrade and Hughes' figures is purely coincidental. "It's like two guys getting up in the morning and both seeing that there are heavy clouds in the sky," he told me. "They can both pretty much see that it's going to rain."

However, Hitesh Mohan, lead author of the INTEK report, stands behind the 15.4 billion barrel figure, with one important caveat: The numbers, he told me, are a best guess of what theoretically could be recoverable at some point in the future, rather than a projection of what's actually recoverable now.

Hughes has also given rough statistical treatment to North Dakota's Bakken and Texas' Eagle Ford. He has found that the output of the average well drilled in the Bakken slumps by 85 percent over the first three years of production. After that, the decline rate tends to level off, he said, but with daily output a small fraction of what was produced when the well was first drilled. (The EIA's Budzik concurs with Hughes' assessment.) By comparison, the production decline at Ghawar, the world's largest conventional oil field in Saudi Arabia, is about 5 percent per year. "The problem is that all shale plays ramp down much faster than conventional oil fields," said Hughes, pointing out that steep decline curves are inherent with shale oil fields and yet rarely mentioned in breathless discussions of the riches of the Bakken and Eagle Ford.

It's possible, of course, that technology will eventually prolong the brief lifespan of the average well, but for now, the decline rate in the Bakken is being offset by a blistering drilling pace. Roughly 1,400 wells per year are needed to maintain present production levels; last year, the industry drilled around 2,000 wells. The continual drilling means that companies that have gone "all in" on the Bakken are on shaky financial footing, says Art Berman, a Houston-based energy analyst. In an analysis of a cross-section of 25 energy companies heavily invested in domestic shale oil plays, Berman found a cumulative negative cash flow of about \$67 billion over the last four years. "I'm not going to take away from the fact that all this activity has been good for the economy," says Berman. "The problem is that these companies are not making money."

There's also a geographical dimension to North Dakota's boom, Hughes told me. According to his research, 85 percent of the oil comes from just four of the 15 counties comprising the field. As drilling continues, oil companies will inevitably be forced into lower-quality parts of the field outside this "sweet spot." But the cost of drilling remains the same, between \$8 million and \$10 million per well, so companies will have to drill more to offset the steep production decline — and prices will need to increase dramatically to justify the expenditures.

In his latest Post Carbon Institute report, in October, Hughes predicted that Bakken and Eagle Ford oil production will peak before the end of the decade, likely by 2017. By 2040, he said, production in these two fields — which account for about one-fourth of U.S. domestic production — will have plummeted to about 100,000 barrels a day, or 5 percent of their current output.

Though Hughes was eager to talk about the shortcomings of the shale oil "revolution" and the rapid

dwindling of the world's hydrocarbons, he became far more measured, even somber, when it came to solutions. Of course, energy consumption must be curbed in the developed world, he said. ("If you want to solve the energy problem, get rid of an American — or a Canadian," he likes to say.) But that's only the half of it. "Population is a big problem," said Hughes. "If you ramp down energy throughput by 40 percent but you grow population by the same percentage, you're not actually doing anything to bring down consumption."

Renewables can play a much larger role in the world energy mix but are far from a perfect solution, he said. "If you include biofuels, renewables account for about 2.2 percent of energy generation globally, not counting large hydro."

Hughes' house on the hill, it turns out, may be his most powerful statement on the latter stages of the petroleum age. Take his water supply, for example, drawn from a well a quarter-mile from his house by an ingenious solar-powered pump. A power inverter and battery system can supply up to three days of energy during outages. He and his wife, Diane, grow much of their own food, including tomatoes, peppers, corn and onions, and they harvest oysters and clams from a nearby lagoon.

I asked Hughes if the numbers had convinced him to make a strategic retreat to this fertile and remote island outpost. He leaned back slightly in his old recliner. "We have a choice between one of two extremes — a forward-looking, managed infrastructure creation project to give people alternatives," he said. "Or we just keep going until the wheels fall off. Which of those two scenarios seems most plausible to you?"

The answer, it seems, came shortly after my return home, in the form of a telegraph-like dispatch:
Incredible weather here — exceptional summer. Record sockeye salmon run also. Maybe you'll make it up here again one day — great place to watch the downwind unraveling of the petroleum age!