

Squeezing Oil From a Stone

Energy Quest Again

Leads to Shale, but

Challenges Remain

By BEN CASSELMAN

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The nation's frantic search for crude-oil sources is leading to one of the oldest, richest and most-elusive prizes in the petroleum industry: oil shale.

The U.S. has the largest known reserves of the coal-like rock, 80% of which lie beneath federal lands. By some estimates, U.S. oil-shale reserves could yield 800 billion barrels of oil, triple the current proven reserves of Saudi Arabia.

But tapping that potential requires heating rocks buried deep beneath the earth to hundreds of degrees Fahrenheit. Oil companies are racing to find ways to do so economically, but their solutions are years away from commercial use.



Associated Press

Oil shale rock burns on its own when lit with a torch.

President George W. Bush, who earlier this week lifted an executive ban on offshore drilling to try to spur domestic oil production, is pushing Congress to lift a moratorium on leasing government-owned land for oil-shale development. Last month, Mr. Bush touted oil shale's potential to replace a century's worth of oil imports.

That means oil shale is like many other potential solutions to the nation's energy woes: a resource of staggering potential that is a decade too far. Oil beneath the Alaskan wilderness or the California coast could add billions of barrels to U.S. production but will take years to access. Wind power is contributing to the power grid in a handful of areas, but technical and logistical hurdles must be overcome before it can play more than a bit part in the broader energy picture. Next-generation nuclear plants, cellulosic ethanol, solar power and other technologies all face similar challenges.

Such lengthy time horizons haven't stopped politicians from seizing on oil shale's potential.

But there have been a century's worth of failed efforts to tap this vast resource.

Oil shale is found across a swath of Colorado, Utah and Wyoming. In the past, companies have tried bringing the rock to the surface to heat it, but that has proved too costly.

Now the industry is trying again. Companies including [Chevron Corp.](#) and Royal Dutch Shell PLC say high prices have made the production of oil from shale feasible and are pouring cash into pilot projects. They are trying new technologies to cut the costs, including experimenting with heating the shale while it is still buried.

Oil shale's fortunes have risen and fallen before. Interest spiked in the 1920s, the 1950s and the 1970s as high oil prices made oil shale's challenges seem worth trying to overcome. When prices fell, the investments dried up.

Many in Rifle, Colo., still remember what they call Black Sunday, the day in 1982 when Exxon Corp. closed a billion-dollar oil-shale project, which cost 2,000 jobs. "There was a bad taste left in the mouths of a lot of people," says Keith Lambert, the town's current mayor.

Industry leaders argue that the price collapses that undermined previous efforts won't be repeated this time because of rising demand for oil in India and China and the increasing difficulty of finding new supplies. But they say most commercial production is a decade away.

Skeptics argue that new production techniques are too complex to be practical, that environmental concerns will drive costs up even further and that oil shale's history of failing to meet expectations are causes for caution.

"We can technically put a man on Jupiter," says Houston investment banker Matthew Simmons, a well-known proponent of the theory that global oil production may already have peaked. "Being technically practical and technically possible are two very different things."

The "oil" in oil shale is kerogen, a precursor to oil. Left alone underground at sufficient temperature and pressure, kerogen will turn into oil -- but it takes millions of years.

Geochemists can speed that process by heating the rock to several hundred degrees Fahrenheit until the kerogen turns into flowing crude oil.

Royal Dutch Shell has been working for more than 25 years on a novel technology that heats the shale in the ground. Such an "in situ" process wouldn't involve an expensive and environmentally troublesome mining operation and wouldn't create thousands of tons of waste in the form of spent shale, as the mining method does.

But Shell's process is complicated. The company plans to insert electric heaters hundreds of feet into the ground to heat the oil shale to between 650 degrees and 700 degrees for more than two years. In order to prevent groundwater from flowing into its production area -- which would raise pollution concerns and dissipate the heat -- Shell plans to create an underground wall around its site by freezing surrounding groundwater, down to 2,000 feet deep.

Shell has tested the steps individually, but never all together. "We understand there are skeptics," said Shell Vice President Terry O'Connor. The company says it won't decide whether its project is commercially viable until the middle of the next decade.

Other companies are trying different techniques. American Shale Oil Corp., a company controlled by telephone company [IDT Corp.](#), is preparing to test heating the oil shale in Colorado by injecting steam into the ground through U-shaped pipes.

Oil-services company [Schlumberger](#) Ltd. earlier this year bought technology from [Raytheon](#) Co. In the 1970s, the defense contractor drilled into the ground in Utah and inserted radio transmitters that heated rock in the same way a microwave oven heats leftovers. The tests proved the technology could heat shale to the necessary temperature, says Schlumberger Vice President Rod Nelson. But falling oil prices led Raytheon to shelve the program before it could produce any oil. Says Mr. Nelson: "It's a little bit 'Back to the Future.'"

Daniel Elcan, managing partner of Oil Shale Exploration Co., says the older method of producing oil from shale -- mining and heating on the surface -- is being used around the world.

"A lot of people say it doesn't work. That's just not true," says Mr. Elcan. In Brazil, he adds, "I can show you a process that's been working for 30 years."

His company plans to use Brazilian technology for cooking shale above ground. At a pilot project, using an existing Utah mine, the company will produce 4,000 barrels of oil a day, Mr. Elcan says. He says he hopes to be producing 50,000 barrels a day in the state by 2013.

While several countries have oil-shale industries, large-scale production is rare. Brazil's 4,600 barrels of daily oil-shale production amounts to about 19 seconds worth of U.S. consumption.

Most oil-shale production has taken place in countries with relatively few environmental restrictions, such as Estonia and China.

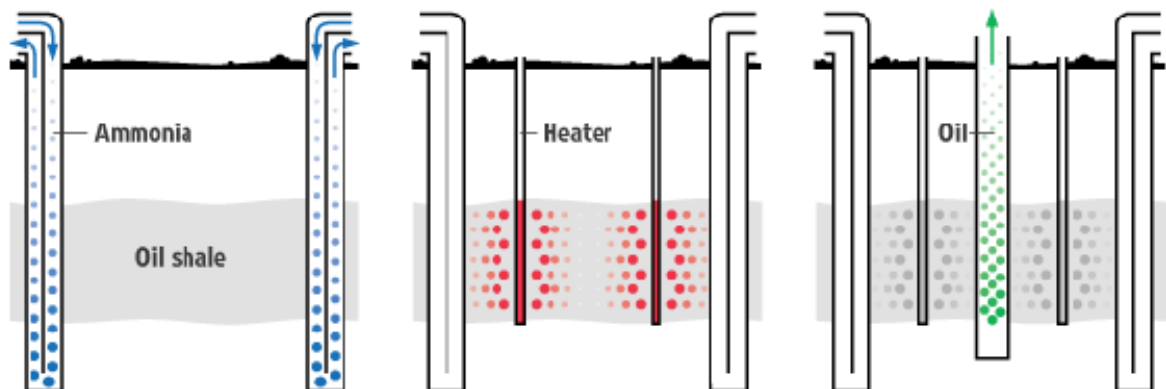
Democrats in Congress have blocked the U.S. Bureau of Land Management from opening more land to oil-shale production, arguing it could disturb pristine wilderness lands, contaminate or deplete groundwater reserves and pollute the air.

The political and scientific challenges aren't easily separated. The oil companies argue that they can only justify spending millions on experimental technologies if they know they will get access to the land.

Moreover, industry advocates argue, the clock is ticking. They point to Canada, where production of oil from tar sands -- in many ways a similar process -- has taken decades but exceeds one million barrels of oil a day.

"It's something that we need to start now so it can have a significant impact down the road," Mr. Elcan says. "It's not going to happen overnight."

Crude Boil A look at Shell's process for extracting crude oil from oil shale formations



Ammonia circulates through pipes in the ground, creating a frozen wall that protects groundwater from contamination.

Electric heaters warm the rock, converting organic matter within the shale into oil. This process takes over two years.

The oil is pumped to the surface using conventional methods.

Source: the company