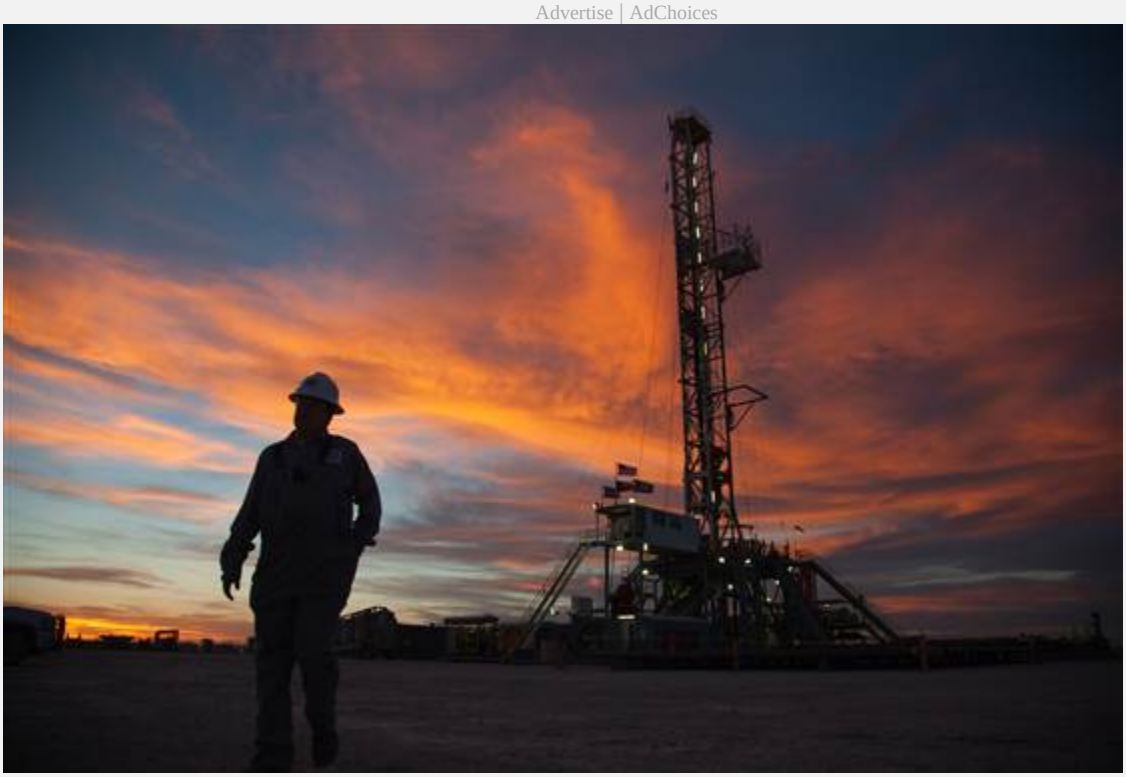
Power shift: Energy boom dawning in America



Jim Seida / NBC News

A worker walks from a 161-foot-tall oil rig to retrieve a tool from a nearby shed outside Garden City in West Texas. When this picture was made on March 3, there were 1,752 rigs exploring for oil and natural gas in the US; 835 of them were in Texas. (Jim Seida / NBC News)

Randy Foutch calls it a renaissance, but when you listen to the veteran Texas oilman and others describe America's nascent energy boom, it sounds more like a miracle.

Politicians have been warning for decades that the U.S. must wean itself from foreign energy, but just a few years ago their words seemed like so much wishful thinking: The U.S. was facing what seemed like ever-rising oil prices and was importing about 60 percent of its supply. Natural gas inventories were shrinking, and the country was considering importing a liquified form from the Middle East.

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America's drive toward energy independence

But in a turnaround that industry insiders describe as nothing short of amazing, the picture has drastically changed. Oil and natural gas drilling is now booming in places like Eagle Ford, Texas, and the Bakken formation in North Dakota, bringing jobs and prosperity to those regions. And believers say the newfound resource is so much bigger than anticipated that it can help drive economic growth nationwide for years to come.

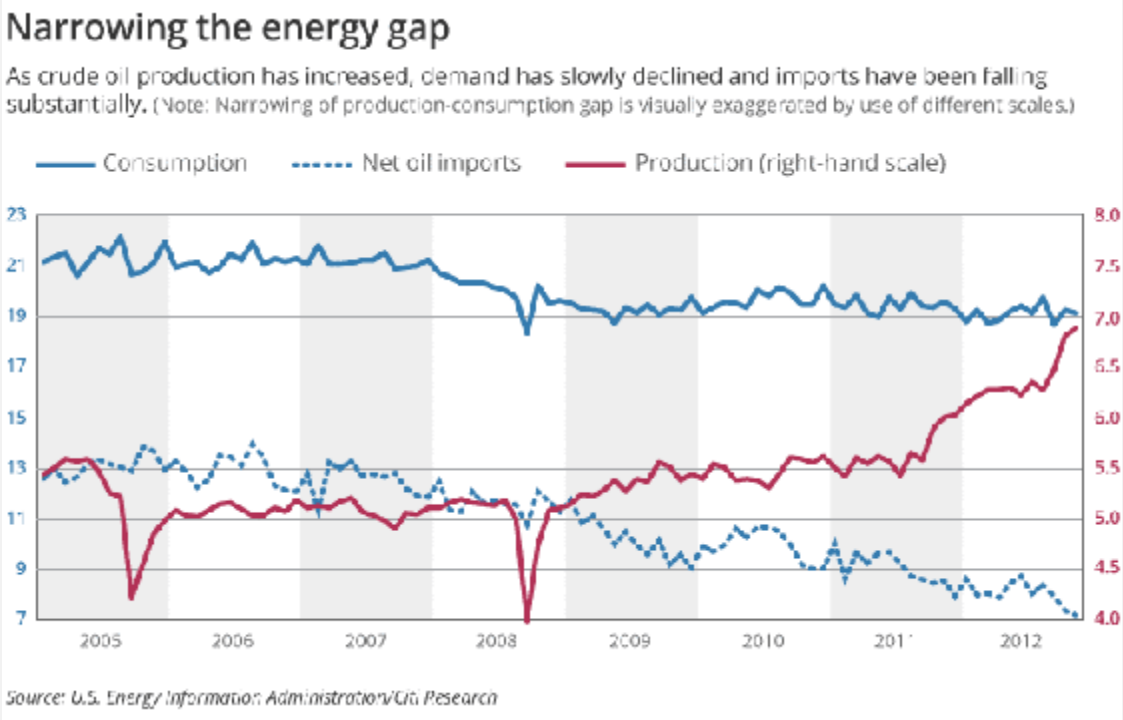
“For the first time in my career, we actually have the ability to talk about real energy security or independence,” said Foutch, 61, a burly Texas native with four decades experience in the oil business.

Technological innovation – primarily the growth of horizontal drilling and hydraulic fracturing, or “fracking” as it’s commonly known – is driving the new production, enabling oil and gas to be extracted from geological formations once considered impregnable.

Infographic: How 'fracking' works

“The ability to drill these long-reach horizontal wells into reservoirs we could never reach before was a big change for the industry,” said Foutch, head of Oklahoma-based Laredo Petroleum.

As a result, U.S. oil and gas production is growing so rapidly - and demand dropping so quickly - that in just five years the U.S. may no longer need to import oil from any source but Canada, according to Citigroup. And the International Energy Agency projects the U.S. could leapfrog Saudi Arabia and Russia to become the world’s biggest oil producer by 2020. IEA sees the U.S. becoming a net oil exporter by 2030.



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In a four-part series starting Monday and continuing over the next three weeks, NBC News and CNBC will examine how this boom occurred almost overnight and look at the implications that U.S. energy independence would have for the U.S. economy, other types of energy, foreign policy and the environment.

Horizontal drilling is not new but the widespread application of it is. When combined with fracking, which uses highly pressurized water and sand to break through rock formations, usually shale, and "stimulate" the movement of hydrocarbons, it has made recoverable billions of more barrels of oil and vast stores of natural gas.

“The key year was 2003,” said Daniel Yergin, vice chairman of the energy consulting company IHS, referring to the first use of horizontal drilling combined with fracking. “That was when it was proof of concept. So for five years, it unfolded quietly with the independents. In 2008, that’s when the majors got interested.”

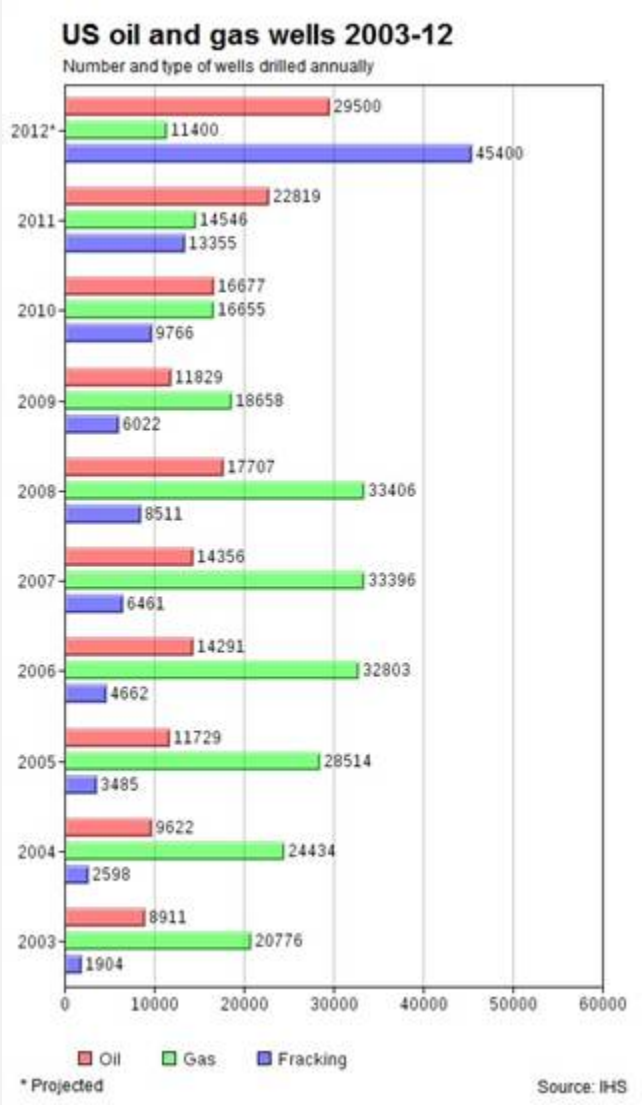
In 2003, there were 1,900 horizontal wells operating in the U.S. IHS estimates there were closer to 45,500 in 2012.

That has led to forecasts that once sounded far-fetched becoming reality: U.S. oil wells produced 6.4 million barrels of oil per day last year – the highest domestic production level in 20 years -- and are expected to yield 7.3 million barrels per day this year, according to the U.S. Energy Information Administration. The EIA recently increased its forecast for U.S. oil production to 8 million barrels a day by the end of next year.

“One thing I can say with absolute certainty…is that our long-term forecasts are going to be wrong,” Adam Sieminski, EIA administrator, said in a recent speech. “It looks like the direction we’re going ... on oil is there’s going to be more of it.”

At the same time, the U.S. imported about 7.6 million barrels per day in February, a decline of 1.3 million barrels per day from the same time last year. And in 2012, U.S. oil demand – 18.56 million barrels per day -- was down 2 percent from the previous year and at its lowest level since 1996, the EIA said.

If those trends continue, Yergin said, the U.S. will largely be able to wean itself off non-North American oil sources within a decade.



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“The view I have is the U.S. will be a lot less dependent with Canada,” said Yergin, who also is CNBC's global energy analyst. “That will really reduce imports, combined with more fuel-efficient cars, reduce exports from outside North America. We’ll still be importing some but it’s certainly a rebalancing of global oil. That oil that was coming to the United States will go somewhere else and that somewhere else would be Asia.”

Canadian production is expected to increase to 6.5 million barrels per day, and even Mexico is now expected to join the North America energy renaissance under a new government interested in exploiting its resources, according to Citigroup research.

Since 2006, U.S. oil field production of crude, plus natural gas liquids and bio-fuels has grown by 3 million barrels a day, about the same as the total output of Iran, Iraq, or Venezuela. In the same period, Canadian production has grown by 510,000 barrels a day.

Citigroup analyst Edward Morse said in an interview that the U.S. could in theory need to import only from Canada within five years.

Is this for real?
Reports on the new oil and gas bounty have met with considerable skepticism. Some energy analysts are concerned that the new “unconventional” supply is limited and will be quickly tapped because some of the impacts of the new drilling are unknown and the history is so new.

The Oil Producing Export Countries, or OPEC, may have a competitive ax to grind, but in a recent release it questioned the U.S. forecast.

Others are worried that the drilling, most of which is occurring on private land, will create environmental problems and be blocked or stymied by new regulation. Still others fear that the phenomenon could lead the U.S. to export oil and gas, driving prices higher and squandering a rich resource.

But those with the most insight into production figures from what are known in the industry as “tight” oil and gas resources -- a term derived from the difficulty in recovering them from the rock formations -- say the critics fail to appreciate just how rich these fields are turning out to be.

Slideshow: Drilling down and out in Texas

“There’s a great expression in the oil business: ‘Oil’s been found where it’s been found before,’” said Scott Tinker, director of the Bureau of Economic Geology at the University of Texas. “These big oil- and gas-rich basins already are producing from the conventional reservoirs that leaked off of the shale. Most of these big basins … have rich source rocks."

"The source rocks are the kitchen where the oil and gas are cooked before they leaked out into the conventional reservoir," he added. "We’ve drilled the conventional reservoir. There’s still some to be drilled, but the kitchen is what we’re drilling now, and it contains a lot more oil and gas than what was leaked.”

Tinker leads a group that just completed a comprehensive survey of a major natural gas field, the Barnett Shale in Texas, and is now studying the Fayetteville Shale in Arkansas, the Haynesville-Bossier field on the Gulf Coast and beginning to look at the Marcellus, which extends through Ohio, Pennsylvania and New York.

He said that after the Barnett survey, which showed a cumulative 44 trillion cubic feet of recoverable natural gas reserves with production extending through the year 2030, he was more confident than ever about the supply.

The U.S. consumed 24 trillion cubic feet of natural gas in 2011 and Barnett supplied about 10 percent of that, the study said.

“It gives us tremendous confidence,” he said. “It’s real.”

That confidence is reflected in the most recent estimates of U.S. oil and gas reserves.

Interactive map: Where US energy is produced

Thanks to the new drilling techniques, an estimated 2,200 trillion cubic feet of recoverable natural gas in the U.S. – or a century’s worth -- and billions of barrels of oil are now believed to be locked in rock formations, spanning from California to Pennsylvania, according to the EIA.

The U.S. government estimated in 2010 that the U.S. had proven reserves of just 25.2 billion barrels of oil – or about four years’ worth at recent consumption rates. The “tight oil,” or unconventional oil supply, is believed to be double that amount, or about 58 billion barrels, according to John Staub, an analyst with the EIA.

That means the U.S. now is estimated to have total technically recoverable resources equaling 223 billion barrels when all potential offshore oil and in tight oil zones are taken into account, he said.

“In 2006, we were a little under 150 billion barrels, and it’s kind of just slowly grown over time,” said Staub of the technically recoverable oil. “The technology improves and changes our understanding of how much of the resource can be accessed.”

And that figure is likely to continue to grow, said Bob Dudley, CEO of the global energy giant BP, which in the last year has begun exploring in Ohio.

Complete coverage: Power Shift: America's drive for energy independence

"At current consumption rates, the data suggests the world has 54 years' worth of proved oil reserves and 64 years' worth of proved gas reserves in place, and more will be found," he said in a recent speech.

While oil drilling is booming, the industry has reined in domestic natural gas production in recent years because the price is depressed, trading as low as about $3.60 per million BTUs on

the NYMEX recently, way below its record high of more than $15 per million BTUs in 2005. But many experts say that will change quickly if the price starts ticking back upward or the costs of drilling decline, as anticipated by some industry forecasts.

Meantime, companies are benefiting from the abundance of oil and liquids found in some areas where they were looking for gas, and from being the global leaders in the use of new technologies that have made oil recovery a changed business.

Pete Stark, senior research director and adviser with IHS, said the new techniques already enable outfits to cut costs, save on logistics and reduce surface impact, and are continuing to evolve.

“The plan is that they’ll have one central drilling pad location for 3 square miles, and from that central drilling pad, they will drill six to eight horizontal wells in up to four different reservoir zones, going a mile and a half north, and the same thing a mile and a half south,” he said, projecting how new drilling techniques are likely to be extended. “In the future, if the maximum number of wells ... possible are drilled, you could have 64 wells from one pad covering 3 square miles.”

Stark, like others in the industry, said it's difficult for drillers to know just what they’re going to find. But in many cases, he said, wells are producing more than anticipated. For example, Stark noted, he estimated last year that the Three Forks area in the northern Bakken Shale had one reservoir. “Now it looks like an additional two or [three] lower reservoirs are also yielding commercial production,” he said, noting that could mean an additional 5 billion or 6 billion barrels.

Morse, head of global commodities research at Citigroup, credited independent oil and gas drilling companies with pioneering the rapid growth of the industry in the U.S. and Canada.

“The cost of entry is unbelievably low,” he said. “... What distinguishes this kind of drilling from drilling in deep water is a combination of factors, including the cost of the well. So the well, instead of being a $100 million, may be as little as a million, or as much as $10 million. If you’re looking at an offshore circumstance, development requires $50 to $60 dollars a barrel of oil, but (these operators’) costs are very low -- $10 or $15 a barrel.”

Morse was co-author of a report last month on the U.S. drive for energy independence, which predicted that the glut of domestic oil will lead the U.S. to move away from imports, a trend that could start with declining demand for West African crude as early as this summer.

He believes the shift could sharply reduce the price of oil, and therefore limit the revenues of the producing nations. Brent crude oil, the international benchmark, could trade in a new lower range of $70 to $90 per barrel by the end of the decade, down from its recent range of $90 to $120 per barrel, according to Morse.

Implications for U.S.

The already-low natural gas prices and anticipated decline in oil prices have many analysts projecting a ripple effect that will energize the long-moribund U.S. manufacturing sector. The

Citigroup report, for examples, lists more than 30 companies expanding capacity in the U.S. because of cheaper energy.

Dow Chemical is on the list, and the company's CEO, Andrew Liveris, is outspoken about his belief that cheaper energy can bring manufacturing back to U.S. shores. Yergin, the energy analyst, said the industry supports 1.7 million jobs, a number that he says could grow to 3 million by 2020.

Such rosy estimates rely on the industry being able to surmount both logistical challenges and concerns among environmentalists, particularly fears of water contamination, seismic activity and methane gas release from fracking.

The biggest logistical hurdle is that the U.S. has insufficient pipelines to handle the growing supply. The industry has turned to rail shipping to help transport its oil to refineries, and more than half the oil in North Dakota travels out of the state by train.

"Our logistical system needs to catch up with these new supplies," said Yergin. "Five years ago, no one would have thought that North Dakota would be supplying oil to a refinery in Philadelphia."

But efforts to build new pipelines invariably run into opposition from environmentalists and residents whose homes and property they would bisect.

The most high-profile battle recently has been over the Keystone XL pipeline, which would move crude from the Canadian sands to the Gulf Coast refineries. The plan to build the 1,700-plus-mile pipeline has drawn fierce opposition from environmentalists and some elected officials in the upper Midwest out of fears that a spill could contaminate the Ogallala Aquifer, which provides drinking water to 1.9 million people, according to the U.S. Geological Survey.

The fact that the dilute bitumen oil obtained from the so-called Canadian oil sands also requires additional energy to process has added to the outcry, said energy analyst John Kilduff of Again Capital.

"The extraction method utilizes natural gas so it's a crude oil that has a much higher carbon footprint than normal and it's the most corrosive type of crude oil, so the environmentalists do have some more arrows in their quiver to fight this, more than normal," he said.

Kilduff said he expects the pipeline to eventually gain approval from the White House after the State Department on March 1 said it found no major environmental reason to block it.

But such concerns have some in the oil and gas industry urging caution as domestic production ramps up.

Tinker, who leads the group studying the obtainable natural gas reserves in the various shale areas, said the growth of hydrocarbon energy supply should accompany growth in alternative energies and be used in conjunction with wind, solar and nuclear.

“It’s part of a sensible energy portfolio,” he said of drilling shale wells. “...You look at nuclear, renewables, you look at hydro. It makes sense to keep your portfolio diversified. I think it’s important for policy makers and regulators and people investing in the industrial process to keep these things in mind.”

Foutch, the CEO of Laredo Petroleum, has the kind of brash optimism you’d expect from a Texan with a master’s degree in petroleum engineering from the University of Houston and a background as an amateur rodeo cowboy.

He said the horizontal drilling era presents the country with an important opportunity, and is one reason he’s still at the helm of Laredo after selling off two other drilling companies he founded, including one called Lariat.

“We thought we had two or three years of drilling opportunity captures in front of us, maybe four or five and that was a premium that other people would pay for and we sold the company,” he said. “At Laredo, we’ve captured, depending on how you want to look at the numbers, 20 years or 25 years of drilling inventory of what appears to be high-quality drilling potential.”

That’s not to say that America shouldn’t develop other forms of energy, he said, but it can’t afford to turn its back on one that is crucial to its future.

“The long-term answer is the most critical one,” he said. “We as a nation, we just won’t recognize that hydrocarbons are here to stay as an energy source and it’s a very high-quality energy source, and we can do all we want with wind, solar and algae. I hope all that stuff works. … The fact of the matter is we are going to be using hydrocarbons for some time to come.”

Patti Domm is CNBC Executive News Editor.