

The background of the entire page is a repeating pattern of white, cylindrical oil barrels, viewed from a slightly elevated angle, creating a textured, grid-like appearance.

TRANSPORTING CRUDE

U.S. faces hurdles in getting oil supply to market



Crude oil production in the United States declined steadily for more than 20 years until recent innovations in drilling and natural resource extraction created a boom reminiscent of the oil discoveries of the 19th and 20th centuries.

“From early 2010, when the current surge started, to the end of 2013, U.S. production of crude oil rose nearly 40 percent,” according to Chad Wilkerson, a Kansas City Fed economist and Oklahoma City Branch executive, and Nida Cakir Melek, also an economist.

The Energy Information Administration (EIA) expects production to increase another 25 percent, which would make the United States the world’s largest oil producer by 2016, surpassing Saudi Arabia and Russia. The country’s aging oil infrastructure, especially its pipelines, however, can’t handle the volume.

“The bottleneck both pushed down central U.S. crude prices relative to world prices and significantly increased the use of alternate modes of oil transport,” Wilkerson and Melek said.

Surge in production

For years, industry analysts suggested U.S. crude oil production was in a decades-long decline. According to the EIA, U.S. crude oil production dropped steadily from 1985 to 2008, from almost 30 billion barrels to 21 billion barrels annually. A number of reasons contributed to the decline, such as exhausted oil fields and the lack of domestic investment in oil exploration.

The decline pushed the United States out as the world’s No. 1 oil producer—a distinction it had for half of the 19th and most of the 20th centuries—and ushered in Saudi Arabia and Russia as the world’s oil giants.

Although the United States has imported foreign oil since after World War I, slowing U.S. production in the 1980s accelerated the dependency on foreign oil ahead of the recent production decline.

In the intervening years, U.S. energy companies worked on technology enhancements in natural gas extraction, which led to a boom in 2002 and opened the door to the current windfall in domestic crude oil.

Mitchell Energy & Development Corp. experimented for 20 years to develop hydraulic fracturing, commonly known as fracking, after the company discovered in the early 1980s that shale contained vast amounts of natural gas that normal drilling practices could not extract. Hydraulic fracturing consists of shooting a mixture of water, chemicals and sand into drilled wells to create fissures in rock formations to free trapped gas.

Devon Energy Corp. of Oklahoma City, among others, developed horizontal drilling techniques, which allow operators to drill to a certain depth, then drill further at an angle or even sideways to expose more of a reservoir and extract greater amounts of natural gas.

Devon acquired Mitchell Energy for \$3.5 billion in 2002, making it one of the largest oil and gas producers in the United States. The company combined the two technologies, allowing greater extraction of the once inaccessible natural gas.

By 2011, U.S. natural gas production

grew 30 percent to 24.6 trillion cubic feet annually, creating a 70-year supply. When natural gas production was at its zenith, energy companies, using the new technologies, turned to crude oil, drilling at sites once considered played out and exploring the country's untapped shale deposits.

Between 2009 and 2011, the United States experienced three consecutive years of crude oil production increases for the first time since 1983-85, as well as the largest surge in output within a three-year period since the late 1960s, Wilkerson and Melek said. And by 2012, the United States' use of imported petroleum decreased from 60 percent to about 40 percent—the lowest level since 1991.

The most recent productive oil plays—the Eagle Ford Shale in south Texas and the Bakken Shale in North Dakota—account for more than three-quarters of the overall increase. Other plays in the midcontinent region—including the Permian Basin in West Texas and New Mexico, the Niobrara Shale in

THE U.S. CRUDE OIL PRODUCTION SURGE has led to a glut in reserves, which has exposed the country's outdated oil pipeline, storage and refining infrastructure.



Colorado and Wyoming, and smaller plays in Oklahoma and Kansas—account for another third of the increase in U.S. oil production, offsetting some production declines in Alaska and U.S. offshore wells.

The production surge has led to a glut of oil, which has exposed the country's outdated oil pipeline, storage and refining infrastructure and problems with the oil pricing system.

This is especially true at Cushing, Okla., where most central U.S. oil pipelines meet and the price is set for U.S. benchmark West Texas Intermediate (WTI) crude.

Market price and the pump

The increase in oil produced a spread between two oil price benchmarks. WTI has been trading at a considerable discount as opposed to a slight premium historically. From 1990 to 2010, WTI averaged \$1.38 more per barrel than Brent North Sea Oil, the international benchmark, and only traded below Brent 10 percent of the time and never by as much as \$5. But since January 2011, WTI has averaged nearly \$15 less per barrel than Brent.

The discount, however, has not benefited consumers in the central United States at the pump. Gasoline prices remain near national levels and continue to follow Brent oil rather than WTI prices.

“Despite lower oil prices in the region, recent studies have shown Midwest gasoline prices have not varied from other regions because some gasoline in the Midwest is still imported from refineries on the coasts,” Wilkerson and Melek said.

The market price spread also was due to the nation's inadequate pipeline capacity. Production companies in the central states amassed large inventories of crude oil that they could not get to market.

An inadequate infrastructure

Bonnie Petersen says innovations in natural resource extraction have turned western Colorado into an “energy haven,” where companies extract a mix of uranium, coal,

natural gas, oil shale, shale oil and crude oil from the Niobrara Shale and Green River formation.

Petersen is executive director of Club 20, a coalition of individuals, businesses and governments from 22 counties in western Colorado. Club 20 lobbies for energy policies its membership supports at the state and federal levels.

Transportation, Petersen said, is recognized by public officials in western Colorado as important to capitalizing on the economic opportunities energy represents.

“All of our communities are having discussions about transportation and transportation infrastructure,” she said. “You don't have natural resources like we do without looking into the future and trying to address some of those issues.”

But finding the funding to meet those infrastructure needs is difficult, she said, because it involves more than pipelines. Oil production involves many entities that need electricity, water, wastewater treatment, adequate roadways and new technology.

Pipeline and trucking capacities are adequate to handle current oil production levels in the state, Petersen said, but the transportation outlook could quickly change should oil production continue to increase.

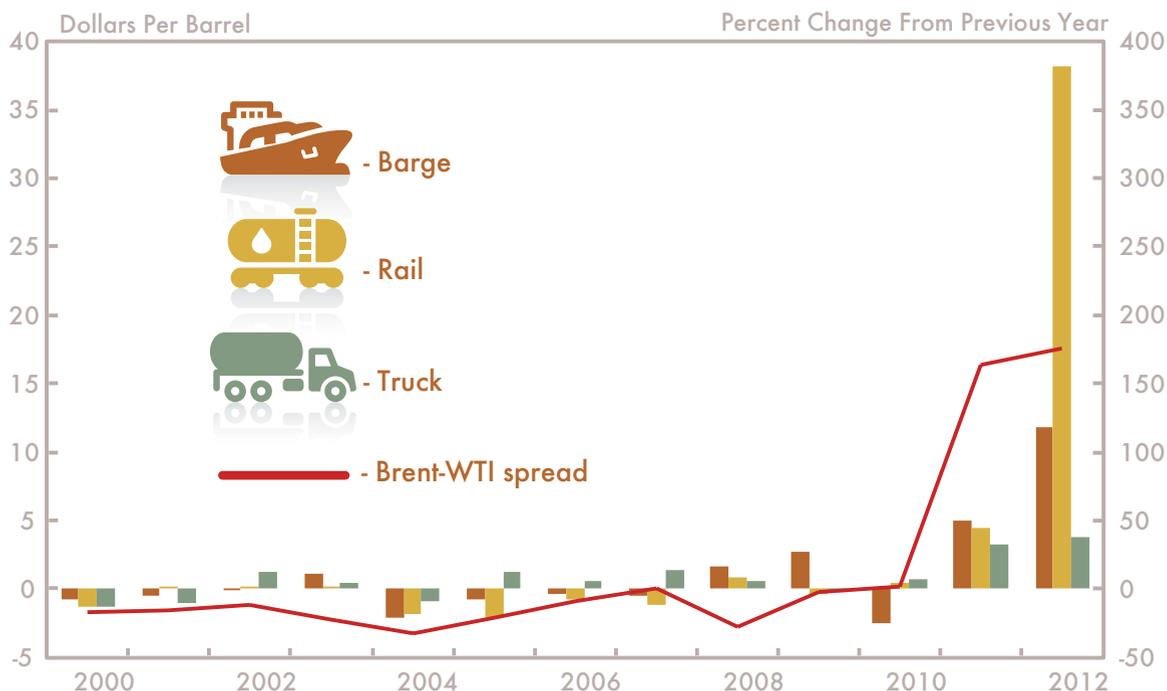
The Keystone XL Pipeline, which Wilkerson and Melek say is receiving “significant scrutiny” nationally and resistance from residents in northern central states, such as Nebraska, is not proposed to cross into Colorado.

Club 20 Energy Committee Chairman David Ludlam said Colorado officials are watching the pipeline's development because it's a good measure of how federal and state officials across the country will address increased production needs.

Canadian government representatives recently made a presentation on the pipeline to Club 20's Energy Committee.

“Symbolically, what the controversy over this pipeline indicates is we have a huge level of uncertainty about the ability to permit projects large or small through the federal government

OIL PRICE SPREAD AND ALTERNATE MODES OF OIL TRANSPORTATION



Source: Energy Information Agency

because of shifting priorities, policies and politics,” Ludlam said.

To address infrastructure needs, companies and governments have spent or plan to spend billions on construction projects—primarily pipelines and storage. According to Wilkerson and Melek, 2,597 miles of oil pipeline and related projects are scheduled for completion in the United States in 2014 and an additional 1,734 miles of pipeline construction is planned to start this year and finish in 2015.

Expense and lack of guaranteed profit, however, are the biggest roadblocks to improving the infrastructure. Investment in pipelines and expansion of refineries is a risk, because shale oil productions start and end quickly, unlike traditional oil wells.

Because of that difference, Wilkerson and Melek found, companies have sought alternative modes of oil transportation. Barge transportation has the least expensive operating

cost and was one of the fastest-growing modes in 2011. Barge transport of crude oil—usually from the Plains or Texas to Gulf Coast refineries—tripled in 2011 and doubled again in 2012. Barge use, however, is limited to fixed waterways that cannot be expanded easily.

Oil transport by truck has the lowest startup cost and can cover the largest geographic area. Trucks’ expensive operating costs, shipment capacity limits and labor intensity make it a short-term solution to the growing need, according to Wilkerson and Melek.

Transportation by railroad is the fastest-growing alternative method. Rail grew much faster than truck or barge transportation in 2012 and growth continued in 2013, according to industry data. Trains, however, are more expensive than barges and less flexible than trucks. There’s also concern about safety and the railroads’ ability to transport large amounts of oil without putting the public at

risk. For example, in February 2014, a 120-car Norfolk Southern Corp. train carrying heavy Canadian crude oil derailed and spilled in western Pennsylvania. The Norfolk derailment is one of many recent train accidents involving crude oil that have prompted residents, local governments and environmental and safety organizations to seek stronger safety standards.

Planning for the future

As each mode of transportation has grown, so have environmental concerns. The southern leg of the Keystone XL Pipeline, which runs from Oklahoma to the Gulf Coast, is now operational, and has helped ease some of the glut at Cushing. But the northern portion of the project, which would extend from Canada's tar sands through the Plain states to Oklahoma, remains incomplete because of concerns about the type of oil transported, the route and possible oil spills.

Farmers in Nebraska have fought the project. They are concerned about leaks and spills contaminating water, crops and livestock, and have put pressure on state and federal representatives. Because the pipeline crosses international borders, it requires a presidential signature.

Other pipelines in the country have met similar resistance, as residents and local governments worry about the effect oil transportation could have on the environment, public safety and local infrastructure.

With U.S. crude oil production expected to increase another 25 percent in the next two years, many people in government, the oil industry and the related business sectors want a measured approach to development with oil shale.

"We believe in order for us to become energy secure in the United States ... we need to utilize traditional energy sources, renewable energy sources and other new potential energy sources we might see come about," Petersen said.

It's important to have everyone at the table. Club 20 wants to see what economically feasible, environmentally responsible technology can be

developed for specific resources, such as shale crude extraction and transportation.

"As that work is being done, then our members want to work with industry to figure out how to deal with impacts that a breakthrough might bring to the area," she said.

Petersen and Ludlam agree on one potential stumbling block to Colorado's oil shale development.

"One of the things we're concerned about, and one of the things all of the sectors have in common in western Colorado ... is that we suffer from a (lack of a) coherent, clear national energy strategy as it's related to public lands," Ludlam said.

"Something that's rather disheartening in western Colorado around oil shale opportunity is the fact that government policies have essentially limited the ability for research and development to be done on that technology," Petersen added.

Strategy shortcomings, Ludlam said, could hinder natural resource transportation.

"As a result of that, when you don't have certainties on being able to permit future transportation mechanisms, be it utility lines for alternatives or pipelines for traditional oil and gas, whatever it may be, (development) becomes very difficult," he said.

Ludlam says the nation needs an energy policy that is clear, coherent and predictable.



KEVIN WRIGHT, EDITOR

FURTHER RESOURCES

"Getting Crude to Market: Central U.S. Oil Transportation Challenges," By Chad Wilkerson and Nida Cakir Melek, www.kansascityfed.org/publicat/mse/MSE_0114.pdf.

COMMENTS/QUESTIONS are welcome and should be sent to teneditors@kc.frb.org.