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TOP STORIES

The Great Shale Wall: China Struggles to Emulate U.S. Success

On a recent visit to Yan'an, a mountainous north-central city in China, analysts got a first-hand glimpse into just how tough the country's terrain could be on shale drillers.

Barclays Capital analyst James West described a harrowing trip to a work site along winding, cliff-hugging roads ridden with potholes.

"At one point, the envoy even had to dodge a hog that was being guided up the road by one of the villagers," West said.

To complete the hydraulic fracturing (fracking) of a well, oilfield-service firms would have to make the same precarious trip, truck by truck, 40 times – for each stage of the frack.

Terrain is just one of the many problems China faces in its nascent venture into shale territory. The country also faces water shortages, limited infrastructure and state-owned companies that want to keep foreign entities at arm's length.

China wants and needs to meet those challenges. The world's most populous country is also the center of the world's coal production, imports and consumption.

Coal is currently the country's main fuel, supplying 70% of China's energy and half of worldwide consumption. China's carbon-dioxide (CO_2) emissions accounted for 27% of the world total in 2012 – or some 9,620 million tonnes of CO_2, data from the U.S. Carbon Dioxide Information Analysis Center show.

Pollution is so bad in some cities that cars often collide in the smog, and people are forced to wear protective masks on the streets.

Although China has accelerated rapidly its natural gas use in recent years through imports via pipeline and liquefied natural gas (LNG), the scale of coal in the country's

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economy is simply incomparable to fuel use anywhere else on Earth.

"Replacing coal with gas in Chinese power generation would require twice the volume of all global LNG trade," said Maria van der Hoeven, executive director of the International Energy Agency.

The U.S. story has been one of retreat in the face of an energy revolution. Shale-gas prices have softened because of moderate winters, meaning coal has been supplanted by natural gas for power generation.

So it's with envy that China looks to the success of the United States' gas surplus, said Dave McCurdy, president and CEO of the American Gas Association and a former U.S. congressman.

"They think we have won the global lottery," McCurdy said.

Still, China leaders have every reason to believe they can replicate the U.S. success story. The country's resources are second to none. The U.S. Energy Information Administration (EIA) estimates that China's technically-recoverable shale-gas resources total 1,275 trillion cubic feet (Tcf).

Fundamentals in China are strong, and technology adoption is improving after years of snubbing foreign practices, West noted. Yet China is just beginning to make its plunge into the basins.

"If it's the second or third inning in the U.S. shale revolution, it's like batting practice in China," said Jason Bordoff, a professor and director of the Center on Global Energy Policy at Columbia University.

China's risked, technically-recoverable shale gas is mainly in marine- and lacustrine-deposited source rock shales in the Sichuan (626 Tcf), Tarim (216 Tcf), Junggar (36 Tcf) and Songliao (16 Tcf) basins.

Lofty Goals

China's ambitious but "probably unachievable target" for shale gas production is between 5.8 billion cubic feet per day (Bcf/d) and 9.7 Bcf/d by 2020," according to a May 2013 EIA report.

Current shale-gas leasing and exploration drilling is focused in Sichuan and the Yangtze Platform areas by PetroChina, Shell and Sinopec.

"While the country's previously stated goal … seems aggressive, we think substantial capital and outside expertise will be diverted to the challenge," West said.

Overall, the country has established a goal of boosting natural gas to 7.5% of domestic energy consumption by 2015 and to 10% by 2020 from 5% currently.

About two-thirds of the 2015 supply; however, will likely come from piped gas and LNG imports – requiring increased domestic production to cover the rest.

For all its efforts, Chinese shale is largely in a pilot phase.

Energy giant PetroChina seeks to produce nearly 53 Bcf of commercial shale gas by 2015. In contrast, the U.S. Northeast produces that amount of gas every four days.

According to West, China can significantly boost its tight-gas production in the near future, with help from service companies in the West.

But it must first let that help in the door.

Assets Control

China lacks the incentives and open-market financing that helped push the U.S. shale boom.

Private ownership of mineral rights, a vibrant E&P (exploration and production) sector and deep financial markets willing to fund pioneers such as George Mitchell all played a role.

Even then, "It took a lot of innovation, a lot of trial and error and lot of entrepreneurship before we could figure it out here," Bordoff noted.

On the surface, China's sovereign treasure, vast shale resources and desirable marine shale would seem to make its production goals feasible. Yet the country lacks the U.S. right to individuals' ownership of mineral rights.

The country has partnered with numerous foreign companies, including Chesapeake Energy, ConocoPhillips, Royal Dutch Shell plc and Total S.A. Even U.S. government agencies such as the U.S. Trade and Development Agency have tried to promote shale-gas development of n China so U.S. companies would have fresh opportunities to invest, apply their expertise and help China meet its energy needs with cleaner-burning natural gas, officials said.

But the country has shown an unwillingness to give up control of assets. For example, an October 2010 auction of six shale-gas exploration blocks was only extended to Chinese national oil companies (NOCs), according to Deloitte.

Some winning companies never drilled gas wells before, let alone shale wells, according to Jeff Layman, partner and chief representative in Baker Botts LLP's Beijing office. As of September 2012, some firms had just begun seismic imaging, he said.

And troubles getting shale drilling up-and-running are beginning to hit home. Recently, Shell became the first company to win a production-sharing contract in China.

Layman said the best prospective acreage in China is held by the NOCs, instead of international oil companies (IOCs).

"IOCs cannot hold acreage on their own," he noted. "IOCs should be given greater access to prospective acreage to enable them to have greater participation in the shale-gas development in China."

And while China needs IOCs to invest, Bordoff said the country must open itself up to increased foreign investment.

"I think that they will need international companies – particularly U.S. companies – to be involved in figuring out how to make shale work in China," Bordoff added.

The Shut Out

China's well costs are staggering by U.S. standards – roughly $19.7 million. With improvements in processes and drilling efficiencies, the costs could eventually be reduced to about $8 million per well, said Zhang Dingyu, director of the Chongqing Land and Resource Bureau, speaking at the World Shale Oil & Gas Summit in Houston last November.

Chongqing's target is to bring 150 to 200 shale-gas wells online by 2015.

But inexperience puts China behind the curve, as does its secrecy. Basic geologic and well data commonly publicly available in other countries – and essential for resource and prospect evaluation – are considered state secrets in China, EIA data shows.

Oilfield-service companies could help, but significant Chinese commercial production appears some years in the future.

Zhu Xingshan, senior director of strategy and planning for China National Petroleum Corp. (CNPC), said that since 2009, 129 shale wells have been drilled by China's Ministry of Land and Resources, national oil companies and others.

That includes 46 vertical wells for geological surveying; 55 verticals for exploration and 28 horizontal wells for evaluation.

In contrast, the Eagle Ford shale formation in South Texas, alone, operated 2,137 producing wells in 2012.

The location of the shale – in mountainous Sichuan in particular – is also more costly to explore, develop and produce, McCurdy said.

Drilling has crept along for the most part. And not all shale is created equal.

Schlumberger has noted that China basins have markedly higher levels of horizontal stress than those in the U.S. That has led to uneven results. Most Chinese shale basins are tectonically-complex with numerous faults – some seismically-active are not conducive to shale development, according to the EIA.

"China's service sector is just beginning to acquire the necessary capability for large-scale horizontal drilling combined with massive, multi-stage hydraulic stimulation," the EIA notes. "Only a small number of horizontal shale gas and oil wells have been tested thus far, with generally low but at least meaningful production rates."

The demand for services in China is apparent, West said.

Schlumberger has made deep inroads and continues to serve national oil companies, though it's not clear how large a role they will play in shale development.

"Schlumberger has been active in China for decades and they're at the forefront of trying to figure this out," Bordoff said.

Shell has developed technologies to produce unconventional gas in remote and difficult Chinese locations. The company is also working with PetroChina in Sichuan Province on tight-gas and shale-gas projects.

Chevron Corp. has expanded operations in China through subsidiaries and has a production-sharing contract with CNPC for the joint development of natural gas in the Sichuan Basin.

Some North American shale-gas operators, such as Newfield Exploration, opted out of working in China while EOG Resources has kept mum on its plans, maintaining a presence in China since it acquired rights in the Sichuan Basin in July 2008.

Despite a hunger for new technology, China's NOCs have been reluctant to accept advice, change or embrace new methods, according to Hong Kong-listed Anton Oil, an oilfield-services firm that spoke to West. The company has operations in Xi'an and Chongqing, a city where shale gas is being heavily pursued.

In 2013, Anton spent three months convincing Sinopec International Petroleum Exploration and Production Corp. to accept its coiled-tubing fracturing services. Before that, it spent at least two years winning over Sinopec to open-hole, multi-stage fracturing technology.According to West, state-owned companies typically have "smaller appetites to take on risk and to embrace change."

In the past, Halliburton tried to introduce new technology but was rebuffed, because it was considered too expensive and "unproven," West said.

China is exploring the adoption of new technologies by Halliburton and Schlumberger, Dingyu said. The Chongqing Institute of Geology & Mineral Resources is facilitating work by Schlumberger (Singapore).

Dingyu also countered that years of practices, technologies and experience in shale-gas development have been "accumulated and specialized personnel have been trained."

That is likely via billions of dollars of investment in North American shale projects.

PetroChina and Sinopec are both part of joint ventures (JVs) in North America. In early 2013, Chinese chemical

and fertilizer producer Sinochem entered into a $1.7-billion JV with Pioneer Natural Resources to acquire a stake in the Wolfcamp shale play in West Texas.

Around the same time, CNOOC invested $18 billion to acquire Canada's Nexen Inc. In mid-2013, Sinopec spent more than $1 billion to create a JV with Chesapeake Energy in its Mississippi Lime acreage.

Motivating Monopolies

During a trip to Beijing last October, McCurdy said he saw his first clear sky in the city in 20 years.

But to the north, he observed a city where visibility was just 10 meters for at least one week.

"They are choking themselves to death," he added. "People are running around with masks on their faces." Reports have also emerged of children developing lung cancer.

Meanwhile, China's state-capitalist economy doesn't view its shale reserves the same way that U.S. companies do. China is the land of massive government subsidies – awarding so much money to " strategically important" industries that about 30% of company profits come from government handouts, according to Usha Haley, a management professor at West Virginia University and author of "Subsidies to Chinese Industry: State Capitalism, Business Strategy and Trade Policy."

If China is to meet its modest 2015 production goals, it has a long way to go to cut costs and drill more efficiently. It also has numerous transportation challenges to resolve.Extraction is one problem; moving the gas is yet another.

As of March 2013, drilling 130 shale-gas wells in China required an investment of $1.2 billion, Dingyu said. The top-10 producing wells yielded around 3.5 million cubic feet per day (MMcf/d). The average Marcellus well produced about 6 MMcf/d in November 2013 alone, according to EIA data.

While some 2.4 million miles of natural gas pipeline criss-crosses the U.S., China only has around 300,000 miles of pipeline, McCurdy noted.

"The Chinese have fewer constraints on permitting – permitting doesn't seem to really stand in the way there," he added. "However, they only have one pipeline company."

The company is slow, bureaucratic and inefficient, but "they can build infrastructure, and when they decide they're going to do it, they do it," McCurdy said.

So when might they decide? In China, PetroChina, Sinopec and others are better understood as government bureaucracies than companies, Haley said.

"Their motivations are not profits," she said. "Their motivations are to grow as big as possible and to dominate the industry."

Although shale development has sparked large amounts of Chinese investment in the U.S. – mainly to acquire cutting-edge technology and top-tier energy resources – those opportunities likely won't be reciprocated for U.S. investors any time soon, Haley noted.

China "does not want foreign companies dominating domestic exploitation of shale if it can be helped, and so that will not happen within five years. Currently, Western companies offer technology and sell equipment, but the Chinese control their shale."

Still, the government has pledged to allow markets to play "a decisive role in allocating resources" which West believes will be key to transforming the tight-gas and shale-gas opportunities in China into major realities.

– Darren Barbee

Questions Linger About Mexico's Energy Reform, Transition

Sweeping energy initiatives unveiled in Mexico last month could energize petroleum investments, revive Mexico's economy and transform the country into a strategic oil supplier by 2025, according to a global energy expert David Goldwyn.

"Now the hard work begins. It's really all about implementation and execution," said Goldwyn, president of Goldwyn Global Strategies and former special envoy and coordinator of international energy affairs at the U.S. State Department.

Speaking at a recent Atlantic Council event in Washington, D.C., Goldwyn said five major accomplishments will define Mexico's energy reform:

- The introduction of private investment into the downstream, midstream and upstream sectors;
- The national separation of energy policy from industry supervision;
- The creation of a petroleum fund capping industry revenues;
- A system that if implemented correctly, could make Mexico among the most transparent oil and gas producing countries in the world; and
- A commitment to sustainability.

A number of other challenges will also determine if the energy initiatives are successful, Goldwyn noted.

"The first is managing expectations, because the ramp-up will be slow, and it will take a couple of years to get regulators [in place]," he said. "There will be a gradual but not an exponential rise in investment. Likewise in the power sector, you're going to need to develop [natural] gas