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PROPRIETARY INTELLIGENCE

Coal gasification technology

Booming coal production in China's western provinces presents a risky opportunity

Chinese coal mining companies are focusing on coal gasification projects in remote provinces such as Inner Mongolia and Xinjiang instead of traditional coal producing areas in the eastern and northeast regions in Shanxi or Shandong, said Robert Rigdon, CEO of Houston, Texas-based **Synthesis Energy Systems**. Companies are attracted to projects in these remote regions because they cost less to develop and can be built on a larger scale than other areas.

"In some of China's traditional coal provinces, the mines are deep, which makes extracting the coal more expensive," he said. "They want and need to get cheaper coal."

The gasification process turns coal into synthetic gas, also known as syngas. Syngas is usually composed of carbon monoxide, hydrogen, carbon dioxide and water vapor. Most of the time syngas is processed to produce chemicals such as methanol and ammonia. **Royal Dutch Shell**'s proprietary gasification process transports pulverized coal and compressed nitrogen into a gasifier, at which point the coal mixes with oxygen at 1,400 to 1,600 degrees Celsius to produce syngas. The reaction produces byproducts, such as fly ash, sulphur and slag which are used for a variety of industrial applications. Shell's process uses a layer of water-filled pipes to keep the walls of the gasifier cool.

This trend bears opportunities for foreign exporters of gasification process technology and equipment, provided they are willing to fund projects in China's remote provinces, Rigdon said. The world's most prominent vendors of gasification technology include **General Electric**, which acquired **Texaco**'s gasification technology in 2004, Royal Dutch Shell and **Lurgi**. These companies will not shy away from projects in Inner Mongolia or Xinjiang, Rigdon said.

"It's harder for them [GE, Shell and Lurgi] to build plants near remote mines," he said. "But they'll do it."

Further, manufacturers of critically important air separation equipment used in gasification facilities such as **Linde**, **Air Liquide**, **Praxair** and **Air Products** are also likely to continue to supplying equipment to the engineering firms tasked with building gasification plants, Rigdon said.

Praxair CFO and executive vice president James Sawyer echoed Rigdon's comments two weeks ago at a at **Deutsche Bank**'s Global Industrials and Basic Materials conference. China's coal mining companies have started to build massive gasification facilities near large mines in remote provinces in an effort to encourage chemical companies to build plants near mines, which would use the resultant syngas to produce commodity chemicals. Doing so would cut down on the cost of transporting coal to the chemical companies' plants, a boon for the mining companies, Sawyer said. Additionally, such projects can be built at three or four times the scale of the ones in mainland China, he said.

However, these projects in remote areas come with a lot of risk, Sawyer said. Most of the companies building these gasification facilities are shell companies or subsidiaries of coal mining companies that have yet to be capitalized, he said. Second, it's unclear whether China will demand commodity chemicals at such a large scale in the future, he said. Therefore, long-term, take-or-pay contracts, Praxair's preferred contract structure for gasification projects, are more risky, he said. For this reason, the company is only pursuing gasification projects with "blue-chip" steelmakers and chemical manufacturers such as **Meishan** and **Baoshan** in eastern China.

Air Products is more inclined to pursue one-off projects in remote regions, Sawyer noted.

Rigdon's company, Synthesis Energy Systems, which is commercializing a new gasification technology that allows the process to run on a wide range of feed stocks, including coal with low heating value, high ash content and high moisture content, is willing to pursue projects in remote regions because 40%-45% of the coal produced in these areas is low quality. For instance, a Chinese company named **Hainan Dongfang Henghe Energy Development** recently selected the company's technology for a large-scale SNG project in Jiangxi province. They want to use low-quality coal to produce methane, Rigdon said. Additionally, Henghe plans to build at least two more gasification facilities in provinces west of Jiangxi, he said, declining to provide more information.

Rising production costs, unacceptably high death and accident rates in underground mines and rail bottlenecks in eastern and northeastern China are pushing the country's coal miners to the option of producing coal in western mines.

For instance, in 2011, Xinjiang province produced 120 million tons of coal. By 2015 and 2020 the National Development and Reform Commission (NDRC) expects the province to produce 240 million and 750 million tons per year, respectively. Further, Xinjiang's coal seams often lie shallow enough to be mined from the surface of the earth, which is much cheaper and much safer than mining for coal underground. The lion's share of China's surface coal – that is, coal reserves located 1,000 meters or

less from the surface – is in Xinjiang. A slew of power transmission and railroad projects are underway now and planned for coming years to help move Xinjiang coal into China's core coal markets.