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KAZATOMPROM LOOKS EAST

By Gregory Gleason (12/14/2011 issue of the CACI Analyst)

In 2009, Kazakhstan emerged as the world's leading producer of uranium ore, outpacing long-time leaders Canada and Australia. Kazakhstan will probably close 2011 with a production of uranium ore reaching 20,000 tons, roughly a third of the world's production. Kazakhstan's state-run producer of uranium, Kazatomprom, has its sights set on moving beyond Kazakhstan's historical role of being a raw materials supplier by transitioning into the more advanced role of processing uranium and selling nuclear reactor fuel. Kazatomprom's business model is focused on winning a major share of the growing nuclear fuel market in Asia. However, a newly emergent form of uranium enrichment technology threatens to undermine Kazakhstan's ability to compete in the high-tech market.

BACKGROUND: Kazakhstan's uranium industry is a key part of the country's diversification and modernization strategy. Kazakhstan played an important role in the Soviet nuclear industry with major mining, processing, fabricating and industrial facilities. Kazakhstan was the home of the Soviet Union's major experimenting and testing facilities. The end of the Soviet Union brought the Soviet-era nuclear complex to a standstill. The first decree signed by Nursultan Nazarbayev, Kazakhstan's first president, was to immediately close the Soviet nuclear weapons test range. Kazakhstan's government moved quickly to eliminate the Soviet-era nuclear weapons and weapons facilities, and the country signed on to the basic principles of the Nuclear Non-proliferation treaty by rejecting nuclear armaments while endorsing peaceful use of the atom. Due to Kazakhstan's large uranium mineral reserves, the development of the uranium industry for peaceful uses became one of Kazakhstan's economic policy priorities.

Kazakhstan's industrial privatization program in the mid-1990s gave rise to numerous industrial enterprises but the uranium industry, because of its dual role as a commercial as well as a strategic resource, was retained under government control. In 1997, the Kazakhstani government formed Kazatomprom, a state-run mineral and industrial complex with direct responsibility for the uranium industry as well as for some other specialized industrial metals such as beryllium and tantalum. In a very short period of time Kazatomprom brilliantly succeeded in cobbling together Kazakhstan's remnants of the Soviet-era uranium complex to build an industrial juggernaut in the uranium business. Kazatomprom surpassed its competitors in 2009 by emerging as the world's largest producer of uranium ore.

Kazatomprom's success was achieved through a business model which linked Kazakhstan's upstream mineral extraction with the downstream industrial facilities located elsewhere. Kazatomprom turned first to the Russian uranium industry, drawing on long-standing relations with Russia's state-run nuclear complex under the control of Rosatom and with Russia's related nuclear industry commercial firms. Later Kazatomprom moved outside the connections of the former Soviet space to forge business connections with foreign partners, forming joint ventures with leading technological partners such as France's Areva and Canada's Cameco. But Russia's nuclear industry remained the locomotive driving Kazakhstan's nuclear sector as it moved from the role of primary commodity supplier to the role of an integrated transnational industrial enterprise. Working in parallel, driven by state-financed enterprises and focused on jointly gaining a position to capture the expanding nuclear services market, Russia's Rosatom and Kazakhstan's Kazatomprom made major investments in a coordinated effort to corner the future nuclear reactor fuel supply market in Asia, focusing on China, India, Japan and Korea.

IMPLICATIONS: Kazatomprom is interested in continuing uranium mining while gradually gaining capacity to move into ore conversion, enrichment and then fabrication processes. Ultimately, Kazatomprom is planning to shift to the higher value stages of fuel assembly fabrication and nuclear fuel services. Kazatomprom in particular has sought to expand these capacities in the Ulba metallurgical plant located in eastern Kazakhstan, near the China border. China, with only 14 currently operating nuclear power reactors, is a relative late-comer to the nuclear power field. But with 27 reactors under construction and another 50 slated for construction, China is emerging as the big future market. Looking further ahead, Chinese sources refer to an additional 120 proposed reactors. The market prospects are clear; China offers a vast market for Kazakhstan's nuclear industry. Other Separate deals are also on the horizon regarding India's rapidly developing nuclear market as well as with the already developed nuclear power markets in Japan and South Korea.

But volatile energy markets and dynamic changes in technology are now raising questions about the commercial viability of the Russian-Kazakh nuclear business model. Global competition has been profoundly affected by the public reaction to the Fukushima-Daiichi accident in Japan. Public attitudes in Germany, Italy, Switzerland and even France have shifted in a significant way against nuclear power.

Public fears over nuclear safety are contributing to the volatility of the nuclear fuel market. But even more important is a change in nuclear technology. For decades the most cost effective technology for producing low enriched uranium for use as fuel in nuclear reactors was centrifuge enrichment. The U.S., which currently has 104 operating nuclear power stations, making it the largest market for reactor fuel, was slow to adopt centrifuge enrichment technology. As the supplies of enriched fuel produced during the Cold War period began to draw down, the U.S. market shifted and producers began going back into nuclear fuel production using centrifuge technology. Since 2007, three new facilities for producing nuclear fuel through the centrifuge process were licensed by the U.S. Nuclear Regulatory Commission (NRC). But this transformation of the nuclear fuel market is on the verge of an even more profound transformation by yet a new technology. GE-Hitachi has announced it acquired rights to use the new Australian "SILEX" laser nuclear enrichment technology. GE-Hitachi is now awaiting approval from the NRC to construct a laser enrichment facility in North Carolina. Laser technology, in the view of some specialists, may render centrifuge technology obsolete.

The new laser enrichment technology has major implications for Kazakhstan's uranium industry. Presently much of Kazakhstan's uranium ore is being shipped to Russia for conversion to uranium hexafluoride, the compound used for isotopic enrichment. The uranium product is then fabricated in the form of nuclear reactor fuel assemblies. Russia's four major uranium enrichment facilities, all operating on relatively old centrifuge technology, produce about 45 percent of the world's low-enriched uranium. The new laser enrichment technology implies a new level of volatility so severe that it may call into question Kazakhstan's uranium business model. Laser enrichment technology is closely held as a proprietary trade secret. It is also subject to national security restrictions. But the "secret" of advanced technology has less to do with the specifics of the process than it has to do with knowledge that a commercializable path exists. Once a physical process that can bring a product to market is known to exist, researchers at competing firms will go to great lengths to master it.

CONCLUSIONS: Laser enrichment technology may be a game-changer for Kazakhstan's uranium business model. The technology may be picked up by China, India, and others through license. Or it may be reverse engineered through domestic innovation. If so, the Chinese nuclear industry in this early stage of expansion can be expected to quickly move into the enrichment business itself at a great cost savings. Kazakhstan's uranium will remain under great demand, but uranium processing and fuel assembly fabrication could be done in China more cheaply using the new technology. Kazakhstan has made a great national investment in the uranium industry, seeking to break away from the role of a primary commodity supplier, shifting to high-value technologically advanced industry, and diversifying the country away from excessive reliance on the oil and gas sector. But Kazakhstan's business model is based heavily on the Rosatom-Kazatomprom technological alliance, which relies exclusively on centrifuge technology. New technological advances and market forces will thus greatly complicate the Kazakh-Russian partnership in the nuclear power sector.

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