Changing World Map For Nuclear Fuel

by Marsha Freeman

Dramatic changes are under way that will shape the potential for a worldwide resurgence of desperately needed civilian nuclear power. Programs are moving forward to manufacture and deploy dozens of new nuclear plants in Russia, China, India, and the United States. Fledgling nuclear nations, such as in Ibero-America, are moving, after a hiatus of decades, toward restarting nuclear plant construction. Nations in Africa, and oil-rich nations in the Persian Gulf, are seriously considering nuclear energy, as are the lesser-developed nations of Asia.

Since the beginning of the nuclear age, in the middle of the last century, the Anglo-Dutch Liberal oligarchy has dominated the production of the mineral critical as the fuel for nuclear power plants—uranium. Rio Tinto Zinc, headquartered in London and Australia, is the second-largest uranium producer in the world. Formed in 1873, with the help of the profits from Jardine Matheson's opium trade, RTZ early cornered the market on uranium reserves in prime locations in the British Empire and the Commonwealth, such as mineral-rich Australia. RTZ's Ranger mine, alone, contains 12% of the world's known recoverable reserves of uranium.

BHP Billiton, also headquarterd in London and Australia, is the fourth-largest uranium producer in the world. Formed in 1860 in the Netherlands, Billiton exploited the mineral riches of Dutch overseas possessions. It moved its headquarters to London in 1970, and merged with Broken Hill Proprietary of Australia, in 2001.

With the planned return to nuclear power, uranium has become a highly sought-after commodity. The construction of new power plants will require the development of new resources for fuel. Recently, hedge funds have been moving in to "invest" in private mining enterprises—not to produce energy, but to manipulate the market, and make a killing.

Speculators have been hoarding uranium oxide, or yellowcake, and have driven up the spot price an average of 45% in each of the past five years. As the Nuclear Energy Institute states: "The entry of investment [hedge] funds into the fuel market has driven the uranium market price even higher than might be justified by the projected supply-demand imbalance."

At the end of last year, Tudor Investment Corp. the $14+ billion hedge fund founded by Paul Tudor Jones, bought a stake in Canadian Cameco, worth $29 million. Citadel Investment Group, a $12 billion hedge fund, had an $11 million stake. According to *Nuclear Market Review,* speculators are holding about 24 million pounds of uranium oxide equivalent, which is about 22% of the global uranium produced in 2005.

About two-thirds of the total annual demand for uranium for nuclear fuel is supplied from mines. The rest, called secondary supply, comes mainly from reprocessing spent fuel, and the blending down of highly enriched uranium from Russian nuclear warheads. The Russian fuel, in the joint U.S. Megatons to Megawatts program, has been supplying half of the fuel needed by U.S. nuclear power plants. Much of this secondary supply will be exhausted by 2013, just as new plants are coming on line.

It can take ten years to start up production in a new uranium mine. Even with spent fuel reprocessing, and fast breeder reactors to produce new fuel, if nations are going to be able to fuel new nuclear plants, they must secure additional uranium resources, now. The largest nuclear nations are negotiating joint ventures, and government-to-government agreements, to maintain a secure supply of nuclear fuel, independent of the raw materials cartels that have controlled the price and political terms of the availability of nuclear fuel in the past.

Reintegrating Russia's 'Near Abroad'

Russia produces less than half of its own nuclear fuel. During the decades of the Soviet Union, and economic integration with Eastern Europe and Central Asia, Russia's nuclear industry was a partnership involving the mining of uranium in Ukraine and Kazakstan, with uranium enrichment and fuel fabrication in Russia. Ukraine would buy back prepared fuel for its nuclear plants.

Russia plans to commission two new nuclear reactors per year starting in 2010, in order to add 40 power plants by 2030, in a program estimated to cost more than $50 billion. Moscow is not going to leave the security of its fuel supplies for this strategic industry to the "markets," or the hedge funds.

In order to prepare for this economic revival of its entire nuclear enterprise, on Nov. 2, 2006, Russia merged TVEL, the state nuclear fuel producer and supplier, with nuclear materials and services exporter Teksnabexport, to form the new Uranium Mining Company. The purpose is to put under one government roof, a streamlined operation, to prospect for and mine uranium in Russia and abroad.

Kazakstan has the second-largest proven reserves of uranium in the world, with 17% of global resources (**Table 1**). Mining started there in 1948, and in 2005, it was the third-largest producer in the world (**Table 2**). As interest in nuclear energy has increased, so has interest in Kazakstan's uranium reserves.

In July 2006, Sergei Kiriyenko, the head of Russia's Federal Nuclear Energy Agency, Rosatom, visited Kazakstan and signed agreements with Prime Minister Danial Akhmetov to establish joint ventures to explore a uranium deposit with estimated reserves of 19,000 tons, near the border of neigh-

TABLE 1
Known Recoverable Resources of Uranium

	Tons of Uranium	Percentage of World
Australia	1,143,000	24%
Kazakstan	816,000	17
Canada	444,000	9
U.S.A.	342,000	7
South Africa	341,000	7
Namibia	282,000	6
Brazil	279,000	6
Niger	225,000	5
Russian Federation	172,000	4
Uzbekistan	116,000	2
Ukraine	90,000	2
Jordan	79,000	2
India	67,000	1
China	60,000	1
Other	287,000	6
World Total	**4,743,000**	

Source: *Uranium 2005: Resources, Production and Demand.*

These estimates of known recoverable resources of uranium include "reasonably assured" resources, plus "inferred resources." They are conservative figures, particularly for nations that have not done comprehensive exploration for reserves.

TABLE 2
Uranium Production of Selected Countries, 2005

	Production (Tons)
Canada	11,628
Australia	9,519
Kazakstan	4,357
Russian Federation	3,431
Namibia	3,147
Niger	3,093
Uzbekistan	2,300
United States	1,039
Ukraine	800
China	750
South Africa	674
World Total	**41,595**

Source: World Nuclear Association.

bors Uzbekistan and Kyrgyzstan.

But Kazakstan no longer wants to simply export raw materials; also under discussion are two more joint ventures—to build a nuclear power plant in Kazakstan, which would be its first, and participation in Russia's plans to enrich uranium and produce fuel for other nations' nuclear power plants.

In October 2006, Kiriyenko announced that both countries would soon celebrate the production of the first ton of uranium at the Zarechnoye mine, which joint venture had been begun in 2004, with Russia's Techsnabexport.

Kiriyenko also reported that a joint Russian-Kazak uranium enrichment center was underway, to be built at the Angarsk Electrolysis Chemical Plant in eastern Siberia, which will enrich Kazak uranium. At the same time, state-owned KazAtomProm announced it would increase the mining of its uranium fourfold by 2010, to 15,000 tons.

Feeling the competition, the European Commission sent a recommendation to European Union governments last October, urging them to support an agreement with Kazakstan for supplying uranium to European nuclear plants for ten years, at an estimated commercial value of around $630 million.

Rosatom and Uzbekistan are discussing a joint venture, which could produce 300 tons of uranium ore per year, with Russian investment estimated at $30 million. Russia will be building nuclear power plants throughout eastern Europe, with the infrastructure in place, to supply not only the power plants, but the fuel for them to operate.

At the end of October 2006, Russia's nuclear export company, Atomstroiexport, won a tender to build two 1,000 MW nuclear power plants outside Sofia, Bulgaria. Russia's Uranium Mining Company is considering carrying out an economic feasibility study with Bulgarian colleagues, to see if a joint mining project should also be launched.

New Openings in Africa

Last year, Rosatom head Kiriyenko remarked: "Today Russia is present on all continents in the sphere of atomic energy, but we had left out Africa." Not any more.

Throughout the entire multi-hundred-year rule of European empires, Africa's wealth of raw materials was looted—mined and exported—not used for internal development of that continent. That is finally changing.

It is estimated that Namibia has over 280,000 tons of uranium reserves, the sixth-largest in the world. Currently, it is the world's fifth-largest producer of uranium, at 7% of the market. Namibia has eight known uranium deposits, and two uranium mines are currently in operation. At the end of 2006, there were more than 20 mining companies prospecting there.

On Feb. 23, 2007, a high-level Russian delegation visited Namibia. Following a meeting with Namibian President Hifikepunye Pohamba, Rosatom head Kiriyenko announced that an agreement had been reached to form a joint venture to prospect for and produce uranium. The month before, the Russian Renova Group and Techsnabexport had signed an agreement to set up a joint investment project to develop uranium deposits. The later agreement with Rosatom widens the cooperation to include the export of Russian nuclear power plants to the African nation.

During the visit, Namibian Minister of Mines and Energy Erkki Nghimtina said the government hopes Russia will assist it in developing a state policy for uranium resources and nu-

clear fuel, making it possible to cancel a moratorium that had been placed on uranium production, for security reasons. The moratorium resulted from the behavior of foreign investors, who, the Minister said, "receive licenses, make money, and leave." He stressed that the uranium industry is very important for Namibia, and that a national energy policy is needed.

Prime Minister Nahas Angula told journalists after the meeting with the Russian delegation, that his nation expects a reduction in energy supplies from South Africa (which is already suffering blackouts), and forecasts an energy deficit of 300 MW. "The Russian side said there are a number of available technologies, [to help solve the problem], one of them being nuclear."

Kiriyenko offered the prospect of providing a floating nuclear power plant to Namibia: "We are ready to build one," he stated. The state-owned utility Rosenergoatom is preparing the deployment of the world's first floating plant in 2010. The two 35 MW units will be placed on a barge, and can be used for both electricity generation and desalination.

Last September, Vladimir Putin made a trip to South Africa, the first by a Russian President. Speaking at a business forum, he invited South African engineers to study at Russia's Nuclear Research Institute of the Academy of Sciences. He proposed that Russia and South Africa cooperate in the peaceful use of atomic energy, and uranium enrichment.

Kiriyenko followed up President Putin's trip, and on Feb. 21, in Pretoria, said that Russia and South Africa were discussing plans to establish a multi-faceted cooperation program in the nuclear sphere. During his visit, Russia's Renova Group and South Africa's Harmony Gold Mining signed a memorandum of understanding expressing the interest of both sides in developing gold and uranium deposits in South Africa. Kiriyenko pointed out that both Russia and South Africa plan large-scale development of nuclear power over the next two decades, and that Russia could also supply South Africa with floating nuclear plants.

South Africa, suffering blackouts from shortages of electricity, plans to build a second large commercial nuclear power plant over the next few years, while it develops its next-generation high-temperature gas-cooled pebble bed nuclear reactor (see *EIR,* Feb. 10, 2006).

There are other avenues open for nuclear cooperation between South Africa and Russia. In February, South African Mining Minister Buyelwa Sonjica said, on the sidelines of a nuclear conference in Cape Town, that Russia was courting South Africa to support its proposed international nuclear fuel center, to be located in Russia. "We can look at cooperating with them on beneficiating uranium," she said, adding that she wanted uranium processing to create fuel for South Africa's growing nuclear industry to take place at home, because "we want to have some control over it."

Other African nations are also moving to join the "nuclear club." In October of last year, China's *People's Daily* reported that the Zambian government annnounced it has set up a team of experts to advise it on how to exploit its uranium reserves and develop a national policy on the exploitation of the country's energy mineral endowment. Chinese nuclear officials have also been touring Africa, to secure joint agreements for the development of new uranium reserves.

U.S. Strategic Allies

Perhaps the most dramatic political realignment in international energy/nuclear policy is a series of initiatives between Russia and traditional U.S. allies Saudi Arabia and Japan.

In December 2006, at the 27th Gulf Cooperation Council Summit meeting, the GCC members reported that they were evaluating plans for nuclear energy in the region. In a previous time, one would have assumed they would be discussing such a plan with their ally and major arms supplier, the United States. Considering the fact that for ten years, the United States has been trying to stop Iran from completing its Bushehr nuclear power plant, *which is under the International Atomic Energy Agency (IAEA) inspection regime,* it is unlikely any Gulf country would turn to the U.S. to begin its nuclear program.

Two months later, Putin visited Saudi Arabia. At a press conference in Riyadh on Feb. 13, during Putin's visit, Saudi Foreign Minister Prince Saud al-Faisal said the six Gulf states are interested in nuclear energy with Russia's help, and that the matter had been discussed with the Russian President.

Putin offered to help Saudi Arabia develop nuclear energy as one potential area of cooperation. "We contacted the other countries in the Gulf Cooperation Council [Kuwait, Qatar, Bahrain, Oman, and the United Arab Emirates] during Putin's visit and put the Russian proposals to them," the Saudi Foreign Minister reported.

Soon after, Russian Foreign Minister Sergei Lavrov, during a visit to the U.A.E., reiterated Russia's positive response to the efforts by the Gulf countries to acquire nuclear energy. The U.A.E.'s Sheikh Abdullah briefed Lavrov on the upcoming visit by the Secretary of the GCC to Vienna to discuss regional cooperation with the IAEA. Establishing such relations with the IAEA would be prerequisite to any nuclear cooperation with Russia.

During a visit to Japan in November 2004, Academician Yevgeny Velikhov, attending the first World Scientific Forum in Kyoto, told Itar-Tass that Russia was determined to develop cooperation with Japan in nuclear energy. He noted that cooperation could include joint projects for the use of fast neutron reactors, as well as the possibility of a Russian center for the storage and processing of spent nuclear fuel.

The following year, at a round table on Russian-Japanese cooperation, Viktor Pavlyatenko, from the Far East Institute of the Russian Academy of Sciences, reported that, "Russia and Japan will cooperate to ensure the energy security in Northeast Asia, as a whole," which will include nuclear energy.

In the meantime, Japan, which produces nearly 30% of its electricity using nuclear energy, was initiating relations with uranium-rich Central Asian nations, looking toward securing its long-term nuclear fuel supplies.

In November 2005, Japan and Kazakstan agreed to cooperate in developing uranium mines to supply Japan's nuclear plants. In August 2006, Japan's electric utilities urged then-Prime Minister Junichiro Koizumi to negotiate the deals during his upcoming trip to Kazakstan, the first by a Japanese Prime Minister. "China and South Korea are aggressively courting Kazakstan for its uranium," commented Takeshi Sakata, an official at Japan Oil, Gas, & Metals National. He described the situation as "tough competition" for Japan.

On Aug. 28, 2006, in a joint press conference, Koizumi and Kazakstan President Nursultan Nazarbayev described cooperation to explore new uranium deposits as "promising." A memorandum was signed noting the two countries' intention to promote cooperation in peaceful nuclear technology, as representing "a new turn" in bilateral relations.

Koizumi continued his Central Asia trip, visiting Uzbekistan, resulting in a joint statement with President Islom Karimov, noting the "good prospects for supplying raw uranium for nuclear power plants in Japan."

In the Fall of 2006, Russian nuclear fuel producer Tekhsnabexport and Japan's Mitsui & Company announced a joint project to develop part of the Yuzhnaya zone of the Elkon uranium ore field in Russia's Arctic Far East. It is the first time that a foreign country will be directly involved in preparing a feasibility study on a uranium development project inside Russia.

In January 2007, Japanese press reported that the Russian state-run nuclear power company had approached Japan's Toshiba Corp. (which last year purchased Westinghouse Electric Company), and Ishikawajima-Harima Heavy Industries Company (IHI), concerning cooperation in the manufacture of nuclear plants. Steam turbines and generators from Japan could be supplied to Russia.

In addition, capital investment in Atomprom—a new company to be formed by consolidating all aspects of Russia's nuclear manufacturing, fuel production, and export enterprises—and the sharing of advanced technologies, could be included in the negotiations, *Yomiuri Shumbun* indicated. The newspaper observed that if cooperation by Japanese companies is combined with changes in russia's nuclear power programs, "the global nuclear power business will be greatly reconfigured."

One month later, a Russian delegation arrived in Japan, including Energy Minister Viktor Khristenko, Prime Minister Mikhail Fradkov, and Rosatom head Kiriyenko. Japanese Trade Minister Akira Amari told a press conference in Tokyo that Japan will begin talks with Russia to allow Russian companies to enrich spent nuclear fuel from Japan's nuclear power plants, for Japanese electric utilities. "Russia can be an important option for Japan for spent fuel enrichment, given that there's a limited number of providers," he said.

Japanese utilities have accumulated 6,400 tons of uranium recovered from spent fuel rods that are stored in the U.K. and France. Tokyo Electric Power Company and Japan Atomic Power are seeking Russian help to enrich the recovered uranium, to produce nuclear fuel. Kiriyenko said that Russia has enough capacity to easily reprocess the Japanese spent fuel. He said that because there is not now an intergovernmental agreement between Russia and Japan, Russia provides 10-12% of Japan's need for low enriched uranium, but "does that through intermediaries and side schemes." Talks will begin, he noted, on an intergovernmental agreement on nuclear cooperation.

On Feb. 22, the *Daily Yomiuri* reported that the Japanese side also plans to consign to Russia enrichment of natural uranium produced in mines to which Japan has obtained rights in Russia and Kazakstan. A summit meeting between the two governments is set to take place by this Summer, to move the nuclear cooperation forward. A bilateral nonprofileration accord is also on the agenda, to make the cooperation possible.

Will the U.S. be left in the dark? Electric utilities that operate nuclear power plants have already begun pressuring the government in Washington to negotiate long-term enriched uranium deals with Russia, for an assured supply of fuel for the new nuclear plants.

The nuclear energy industry of the future will look very different than the world of the past. Nations that understand that energy security depends upon the aggressive deployment of an array of nuclear technologies, independent from the global financial control over resources and raw materials that characterized the last two centuries, are re-creating the global energy map.

For Further Reading

From EIR*'s coverage of the push for nuclear power:*

Jonathan Tennenbaum, "South Africa's PBMR: World's Most Versatile Nuclear System," Feb. 10, 2006.

Marsha Freeman, "A Renaissance in Nuclear Power Is Under Way Around the World," Feb. 24, 2006.

Marsha Freeman, "Russia Embarks on Its Global Nuclear Power Plans," March 31, 2006.

Rachel Douglas, "Russian Official: Our Future Belongs To Nuclear Energy" (on a briefing by Rosatom head Sergei Kiriyenko), June 9, 2006.

Muriel Mirak-Weissbach, "Egypt's Mubarak Says: Let's Go Nuclear!" Oct. 13, 2006.