Lack of fuel may limit US nuclear power expansion

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Limited supplies of fuel for nuclear power plants may thwart the renewed and growing interest in nuclear energy in the United States and other nations, says an MIT expert on the industry.

Over the past 20 years, safety concerns dampened all aspects of development of nuclear energy: No new reactors were ordered and there was investment neither in new uranium mines nor in building facilities to produce fuel for existing reactors. Instead, the industry lived off commercial and government inventories, which are now nearly gone. Worldwide, uranium production meets only about 65 percent of current reactor requirements.

That shortage of uranium and of processing facilities worldwide leaves a gap between the potential increase in demand for nuclear energy and the ability to supply fuel for it, said Dr. Thomas Neff, a research affiliate at MIT's Center for International Studies.

"Just as large numbers of new reactors are being planned, we are only starting to emerge from 20 years of underinvestment in the production capacity for the nuclear fuel to operate them. There has been a nuclear industry myopia; they didn't take a long-term view," Neff said. For example, only a few years ago uranium inventories were being sold at $10 per pound; the current price is $85 per pound.

Neff has been giving a series of talks at industry meetings and investment conferences around the world about the nature of the fuel

supply problem and its implications for the so-called "nuclear renaissance," pointing out both the sharply rising cost of nuclear fuel and the lack of capacity to produce it.

Currently, much of the uranium used by the United States is coming from mines in such countries as Australia, Canada, Namibia, and, most recently, Kazakhstan. Small amounts are mined in the western United States, but the United States is largely reliant on overseas supplies. The United States also relies for half its fuel on Russia under a "swords to ploughshares" deal that Neff originated in 1991. This deal is converting about 20,000 Russian nuclear weapons to fuel for U.S. nuclear power plants, but it ends in 2013, leaving a substantial supply gap for the United States.

Further, China, India, and even Russia have plans for massive deployments of nuclear power and are trying to lock up supplies from countries on which the United States has traditionally relied. As a result, the United States could be the "last one to buy, and it could pay the highest prices, if it can get uranium at all," Neff said. "The take-home message is that if we're going to increase use of nuclear power, we need massive new investments in capacity to mine uranium and facilities to process it."

Mined uranium comes in several forms, or isotopes. For starting a nuclear chain reaction in a reactor, the only important isotope is uranium-235, which accounts for JUST 7 out of 1000 atoms in the mined product. To fuel a nuclear reactor, the concentration of uranium-235 has to be increased to 40 to 50 out of 1000 atoms. This is done by separating isotopes in an enrichment plant to achieve the higher concentration.

As Neff points out, reactor operators could increase the amount of fuel made from a given amount of natural uranium by buying more

enrichment services to recover more uranium-235 atoms. Current enrichment capacity is enough to recover only about 4 out of 7 uranium-235 atoms. Limited uranium supplies could be stretched if industry could recover 5 or 6 of these atoms, but there is not enough processing capacity worldwide to do so.

Source: MIT