# Feeding Nuclear Power

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Will nuclear energy's progression be slowed by an inability to get uranium to feed the reactors? Some say that underutilized mines have taken a toll and will lead to hardship. Others disagree, saying that the mines can gear up and the free market can respond to changing conditions.

A recent study by the Massachusetts Institute of Technology says that the nuclear industry has lived off commercial and government uranium inventories that are nearly depleted. Globally, uranium production now meets only 65 percent of current reactor requirements, which has led to uranium prices rising from $7 a pound in 2000 to as much as $120 per pound just recently.

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"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," Thomas Neff, a research affiliate at MIT's Center for International Studies. "There has been a nuclear industry myopia; they didn't take a long-term view."

Current demand throughout the world is met by accessing mines, using utility inventories and through new fuel efficiencies that make plants more productive. It's also met by decommissioning nuclear weapons. The United States, for example, gets about half its uranium from obsolete Russian nuclear missiles under a non-proliferation nuclear treaty called Megatons-to-Megawatts. That program ends in 2013.

But fears of global warming and projected fuel shortages are propelling nuclear power forward after nearly three decades of sitting on the sidelines. Globally, the International Atomic Energy Agency is predicting as many as 100 new reactors in 20 years, causing the demand for uranium to rise 200 million pounds to 240 million pounds, annually. The agency says uranium resources are more than adequate to meet projected requirements.

At the same time, newer technologies are emerging and may allow spent fuel to be re-processed and then re-used, all of which would prolong that time frame. And advanced breeder reactors that are expected to be commercially available within two decades are able to produce as much fuel as they consume. They, furthermore, use a different type of uranium than plants today and one that is far more prevalent.

Much of the uranium used in this country is mined in Australia, Canada and Nambia while small amounts are derived in the western United States. But those foreign sources will also get fully tapped by other nations -- China, India and Russia -- with aggressive nuclear plans, says MIT. If the United States can even access those supplies, it will pay high prices. "The take-home message is that if we're going to increase the use of nuclear power, we need massive new investments in capacity to mine uranium and facilities to process it," says Neff.

**Boom Times**

There are several different forms of uranium. To start a chain reaction in a nuclear reactor, the most important one is uranium-235. But Neff points out that current enrichment tools can only utilize a fraction of the atoms in that particular kind of uranium after it is mined. He says that new technology can be used to recover slightly more, although it would not be

enough to meet expected future global demand.

The past may be catching up. Because the nuclear industry has been sidelined for nearly three decades, so too have the uranium mines used to supply its plants. That sector was not helped when recent flooding caused the "Cigar Lake" and "Ranger" mines to postpone millions of pounds of production for a period.

Now, though, nuclear power seems to be in favor. But Michael Winkler, an engineer with Schatz Energy Research Center at Humboldt State University, says it will be hard for the industry to live up to its promise. Within 50 years, he says that -- using current data -- the demand for uranium will permanently outstrip current supplies, causing prices to rise to a level not seen before. If demand spikes, that time frame could come sooner, he says.

There are larger quantities of low-grade ore that could be used to fuel nuclear reactors, he adds. But those sources would actually result in a net loss of energy. Winkler adds that the reprocessing of spent fuel and the pending breeder reactors that would upgrade to Uranium-238, which is more abundant, are both "problem plagued."

"Overall fuel supply is a serious problem for nuclear energy," says Winkler. "Whether it can be solved in the foreseeable future is not yet clear."

Others say that those concerns are unjustified. They say that simple economics will prevail. That is, higher prices will lead to more uranium production and an ever-increasing level of investment flowing in. That, in turn, will speed the development of newer and safer mining techniques along with the introduction of modern new reactors that can take advantage of other types of uranium.

In this country, developers are gearing up for a uranium boom. Thousands of drilling permits are in the works in states such as Colorado, New Mexico, South Dakota, Utah and Wyoming while the number of registered producers in recent years has increased from just a handful to several hundred. While current drilling techniques are less disruptive than prior ones, local residents oppose new mines because they say the process pollutes local drinking water supplies.

Any nuclear revival might be threatened by an inability to extract enough uranium to feed future demand. While there's disagreement as to whether current supplies of uranium are adequate to meet present production levels, there is no argument that the market will tighten. If markets can respond and commercialize new fuel and reactor technologies while perfecting mining processes, nuclear energy may rise to the occasion.

More information is available from Energy Central:

The Rebirth of Nuclear, *EnergyBiz*, May/June 2007

For more on this topic, visit the Energy Central Generation Technologies Topic Center.