

How long will the world's uranium supplies last?

Steve Fetter, dean of the University of Maryland's School of Public Policy, supplies an answer

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Credit: Courtesy of Cameco Corporation

How long will global uranium deposits fuel the world's nuclear reactors at present consumption rates?

***Steve Fetter**, dean of the University of Maryland's School of Public Policy, supplies an answer:*

If the Nuclear Energy Agency (NEA) has accurately estimated the planet's economically accessible uranium resources, reactors could run more than 200 years at current rates of consumption.

Most of the 2.8 trillion kilowatt-hours of electricity generated worldwide from nuclear

power every year is produced in light-water reactors (LWRs) using low-enriched uranium (LEU) fuel. About 10 metric tons of natural uranium go into producing a metric ton of LEU, which can then be used to generate about 400 million kilowatt-hours of electricity, so present-day reactors require about 70,000 metric tons of natural uranium a year.

According to the NEA, identified uranium resources total 5.5 million metric tons, and an additional 10.5 million metric tons remain undiscovered—a roughly 230-year supply at today's consumption rate in total. Further exploration and improvements in extraction technology are likely to at least double this estimate over time.

Using more enrichment work could reduce the uranium needs of LWRs by as much as 30 percent per metric ton of LEU. And separating plutonium and uranium from spent LEU and using them to make fresh fuel could reduce requirements by another 30 percent. Taking both steps would cut the uranium requirements of an LWR in half.

Two technologies could greatly extend the uranium supply itself. Neither is economical now, but both could be in the future if the price of uranium increases substantially. First, the extraction of uranium from seawater would make available 4.5 billion metric tons of uranium—a 60,000-year supply at present rates. Second, fuel-recycling fast-breeder reactors, which generate more fuel than they consume, would use less than 1 percent of the uranium needed for current LWRs. Breeder reactors could match today's nuclear output for 30,000 years using only the NEA-estimated supplies.

Editor's Note: This question was submitted by G. Peck of Seward, Alaska and will be printed in the March 2009 issue of Scientific American.