Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions
fact sheet

# Nuclear Reprocessing: Dangerous, Dirty, and Expensive
# Why Extracting Plutonium from Spent Nuclear Reactor Fuel Is a Bad Idea

*January 2006*

Background:
The Bush administration is requesting a FY2008 budget of $405 million for its major new nuclear energy initiative, the Global Nuclear Energy Partnership (GNEP), which involves "reprocessing" the used (or "spent") fuel from nuclear power reactors. Reprocessing separates plutonium and uranium from other nuclear waste contained in spent nuclear fuel. The separated plutonium can be used to fuel reactors, but also to make nuclear weapons. Nearly three decades ago, the United States decided on non-proliferation grounds not to reprocess spent fuel from U.S. power reactors, but instead to directly dispose of it in a deep underground geologic repository where it would remain isolated from the environment for at least tens of thousands of years.

While some supporters of a U.S. reprocessing program believe it would help solve the nuclear waste problem, reprocessing would not reduce the need for storage and disposal of radioactive waste. Worse, reprocessing would make it easier for terrorists to acquire nuclear weapons materials and for nations to develop nuclear weapons programs.

**Reprocessing would increase the risk of nuclear terrorism.**

Less than 20 pounds of plutonium is needed to make a nuclear weapon. If the plutonium remains bound in large, heavy, and highly radioactive spent fuel assemblies (the current standard practice), it is nearly impossible to steal. In contrast, separated plutonium is not highly radioactive and is stored in a concentrated powder form. Some claim that new reprocessing technologies that would leave the plutonium blended with other elements, such as neptunium, would result in a plutonium mixture that would be too radioactive to steal. This is incorrect; neither neptunium nor the other elements under consideration are radioactive enough to deter or preclude theft.

Moreover, commercial scale reprocessing facilities handle so much of this material that it is impossible to keep track of it accurately in a timely manner, making it feasible that the theft of enough plutonium to build several bombs could go undetected for years.

A U.S. reprocessing program would add to the worldwide stockpile of separated and vulnerable plutonium that sits in storage today, which totaled roughly 240 metric tons as of the end of 2003—enough for some 40,000 nuclear weapons. Reprocessing the U.S. spent fuel generated to date would increase this by more than 500 metric tons.

**Reprocessing would increase the ease of nuclear proliferation.**

U.S. reprocessing would undermine the U.S. goal of halting the spread of fuel cycle technologies that are permitted under the Nuclear Non-Proliferation Treaty but can be used to make nuclear weapons materials. The United States cannot credibly persuade other countries to forgo a technology it has newly embraced.

Although some reprocessing advocates claim that new reprocessing technologies under development will be "proliferation resistant," they would actually be more difficult for international inspectors to safeguard because it would be harder to make precise measurements of the weapon-usable materials during and after processing. Moreover, all reprocessing technologies are far more proliferation-prone than direct disposal.

**Reprocessing would hurt U.S. nuclear waste management efforts.**

First, there is no spent fuel storage crisis that warrants such a drastic change in course. Hardened interim storage of spent fuel in dry casks is an economically viable and secure option for at least fifty years.

Second, reprocessing does not reduce the need for storage and disposal of radioactive waste, and a geologic repository would still be required. Plutonium constitutes only about one percent of the spent fuel from U.S. reactors. After reprocessing, the remaining material will be in several different waste forms, and the total volume of nuclear waste will have been increased by a factor of twenty or more, including low-level waste and plutonium-contaminated waste. The largest component of the remaining material is uranium, which is also a waste product because it is contaminated and undesirable for reuse in reactors. Even if the uranium is classified as low-level waste, new low-level nuclear waste facilities would have to be built to dispose of it. And to make a significant reduction in the amount of high-level nuclear waste that would require disposal, the used fuel would need to be reprocessed and reused many times with an extremely high degree of efficiency—which is very expensive and would take years. For example, in 1999, the Department of Energy estimated it would cost $279 billion over a 118-year period to fully implement a reprocessing and recycling program for the entire inventory of U.S. spent fuel.[1]

Finally, reprocessing would divert focus and resources from the U.S. geologic disposal program and hurt—not help—the U.S. nuclear waste management effort. The licensing requirements for the reprocessing, fuel fabrication, and waste processing plants would dwarf those needed to license a repository, and provide additional targets for public opposition. What is most needed today is a renewed focus on secure interim storage of spent fuel and on gaining the scientific and technical consensus needed to site a geological repository.

**Reprocessing would be very expensive.**

Reprocessing and the use of plutonium as reactor fuel is also far more expensive than using uranium fuel and disposing of the spent fuel directly—even if the fuel is only reprocessed once. In the United States, some 55,000 tons of nuclear waste have already been produced, and existing reactors add some 2,000 tons of spent fuel annually. Based on the experience of other countries, a commercial scale reprocessing facility with an annual throughput of about 1,000 tons of spent fuel would cost anywhere from $5 billion to $20 billion to build. A facility with twice that capacity would be needed to process the new spent fuel produced; taking into account economies of scale, it would cost from $7.5 to $30 billion, excluding operating costs. A second facility would be needed to also reprocess the existing spent fuel over a period of some 30 years.

*For more information contact Dr. Ed Lyman, UCS Senior Staff Scientist: (202) 331-5445; elyman@ucsusa.org; UCS, 1707 H Street, NW, Washington, DC 20006*

1. "A Roadmap for Developing ATW Technology," Report of Accelerator Technical Working Group, ATW Roadmap, September 1999, LA-UR- 99-3225.