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"Recycling" Nuclear Power Plant Waste: Technical Difficulties and Proliferation Concerns

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One of the most vexing problems associated with nuclear energy is the inability to find a technically and politically viable solution for the disposal of long-lived radioactive waste. The U.S. plan to develop a geologic repository for spent nuclear fuel at Yucca Mountain in Nevada is in jeopardy, as a result of managerial incompetence, political opposition and regulatory standards that may be impossible to meet. As a result, there is growing interest in technologies that are claimed to have the potential to drastically reduce the amount of waste that would require geologic burial and the length of time that the waste would require containment. A scenario for such a vision was presented in the December 2005 Scientific American. While details differ, these technologies share a common approach: they require chemical processing of spent fuel to extract plutonium and other long-lived actinide elements, which would then be "recycled" into fresh fuel for advanced reactors and "transmuted" into shorter-lived fission products. Such a scheme is the basis for the "Global Nuclear Energy Partnership," a major program unveiled by the Department of Energy (DOE) in early 2006. This concept is not new, but has been studied for decades. Major obstacles include fundamental safety issues, engineering feasibility and cost. Perhaps the most important consideration in the post-9/11 era is that these technologies involve the separation of plutonium and other nuclear weapon-usable materials from highly radioactive fission products, providing opportunities for terrorists seeking to obtain nuclear weapons. While DOE claims that it will only utilize processes that do not produce "separated plutonium," it has offered no evidence that such technologies would effectively deter theft. It is doubtful that DOE's scheme can be implemented without an unacceptable increase in the risk of nuclear terrorism.