

THE SINGLE MOST IMPORTANT ENABLER OF A NUCLEAR POWER
RENAISSANCE: ALLOWING COMPETITIVE, COMMERCIAL, MINED
GEOLOGICAL REPOSITORIES

by

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In recent years there have been many proposals for assured supply of low-enriched uranium for fuel for normal power reactors in states that agree not to have their own enrichment capabilities. I support these approaches and note also that a state can simply “buy ahead” and stockpile 8-10 years of needed replacement fuel at affordable costs.¹ However, the spent fuel from nuclear plants contains enough plutonium to fabricate about 30 nuclear weapons from a single year of operation of each power reactor. Despite the fact that this “civil plutonium” is not the preferred material for such implosion weapons, weapons so produced might have a “fizzle yield” no lower than one or two kilotons of TNT equivalent, and with improved skill could have the full yield of normal weapons made from “military plutonium”².

Under current custom and laws, each country is responsible for the disposal of spent fuel within its borders—ultimately in a mined geological repository for the packaged spent fuel or for the vitrified fission products that result from the removal of plutonium for nuclear weapons or for recycle into ordinary reactors. Note that reprocessing and recycle into LWRs, as practiced in France, can save no more than 20% of the feed uranium; furthermore, the required mined, geologic repository capacity would be reduced by only about 10%.³ Many tens of thousands of tons of

¹ “National Fuel Stockpile: An Alternative to a Proliferation of National Enrichment Plants?”, by F.N. von Hippel, ARMS CONTROL TODAY, September 2008, pp. 20-24.

² See full discussion at <http://www.fas.org/rlg/980826-pu.htm>, with pointer to the two pages of the National Academy of Sciences CISAC report that address this question specifically.

³ “GNEP: Leap before looking,” by R.L. Garwin. Presented at session NUCL 61, American Chemical Society annual meeting, Chicago, Illinois, March 27, 2007.

(http://www.fas.org/rlg/031907_GNEP_and_Plutonium_Recycle1N.pdf), quoting referenced documents and presentation by Phillip J. Finck, a specialist who has worked in both the French and U.S. nuclear power programs.

spent fuel and vitrified fission products now exist; clearly it is necessary to make available repositories for both. My own strong preference is to put packaged spent fuel into the repository; this will allow authorized recovery and extraction of plutonium to fuel breeder reactors if they and their necessary fuel cycle are developed to attractive levels of safety and economic performance.

From the viewpoint of a state or energy sector that simply wants to achieve the social benefits of reliable electrical power from nuclear reactors, the supply of fresh fuel and the disposal of spent fuel are absolutely required—the first before the reactors can begin to supply power and the second within decades afterwards. Well-established storage of spent fuel in water pools at the reactors and in “dry casks” after a decade or so can provide temporary and affordable care of spent fuel, but no society wants to be committed to 10,000 or 100,000 years or more of essential maintenance and rebuilding of these dry casks—hence the universal commitment to a permanent mined geological repository in each sovereign state. Not a single repository for raw or processed spent fuel is operating; the Yucca Mountain repository in the United States is most developed but will not be available for spent fuel loading until at least 2015.

In many states, the uncertain status of the repository is a bar to the installation or expansion of nuclear power. But in both Finland and Sweden two localities have competed to house the repository, and I have long advocated a change in national laws and customs to permit the use of competitive, commercial, mined geological repositories that would be certified by the IAEA to store spent fuel or vitrified fission products in packages also certified by the IAEA. No state would be required to host such a repository—it would be a business venture subject to international and national regulation and with perhaps a limited ceding of sovereignty to allow international forces to provide backup security as necessary.

I can see no downside risk to an effort quickly to modify the laws to permit such competitive, commercial, mined geological repositories for the storage of spent fuel or vitrified fission products. Of course, provision would need to be made to support the IAEA in such an expanded role—ultimately from fees associated with the operation of the repositories.