

***Managing spent fuel in the United States:  
The illogic of reprocessing***

(report on [www.fissilematerials.org](http://www.fissilematerials.org))]

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Nuclear Regulatory Commission sponsored

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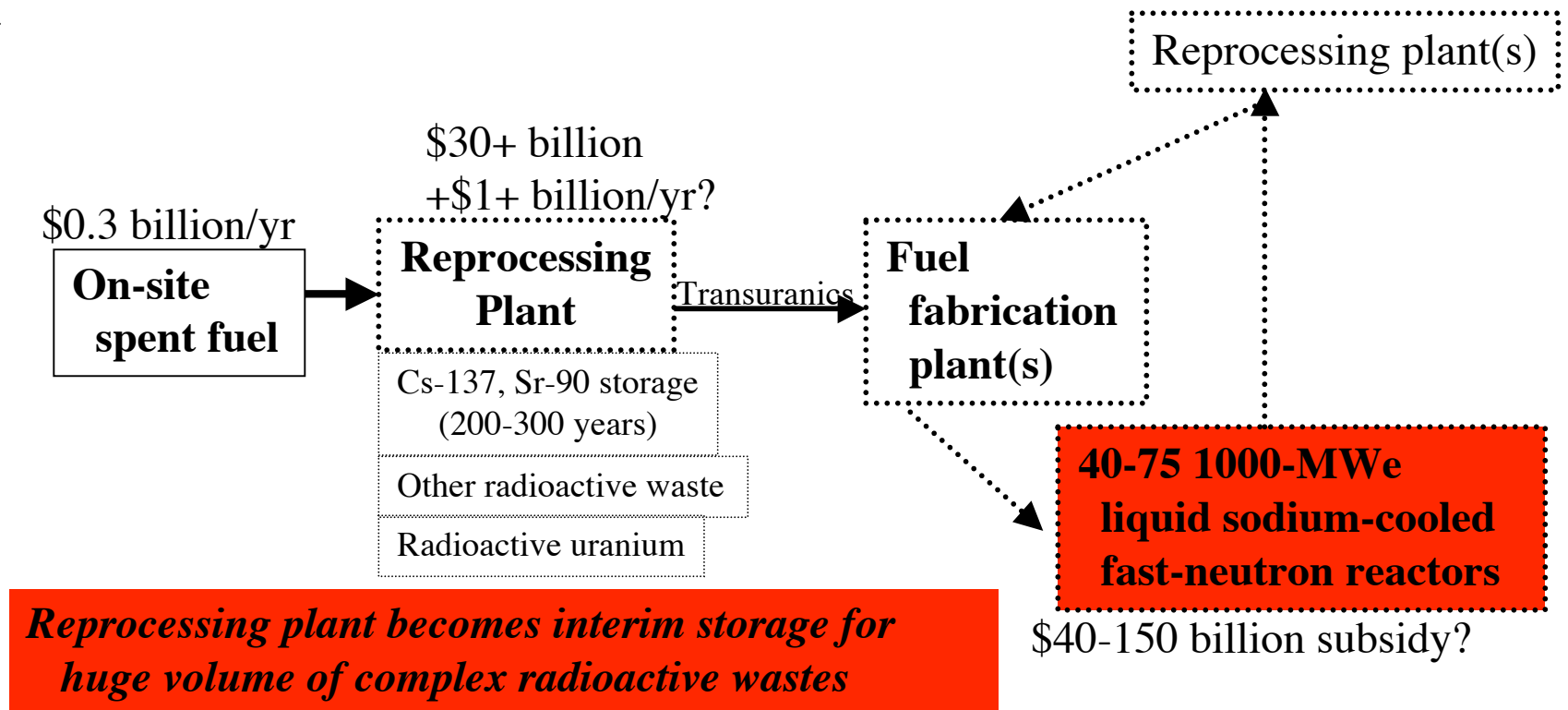
Universities at Shady Grove, Rockville, MD, June 12, 2007, 1 PM

## **Nuclear utilities want DOE to start removing spent fuel from reactor sites**

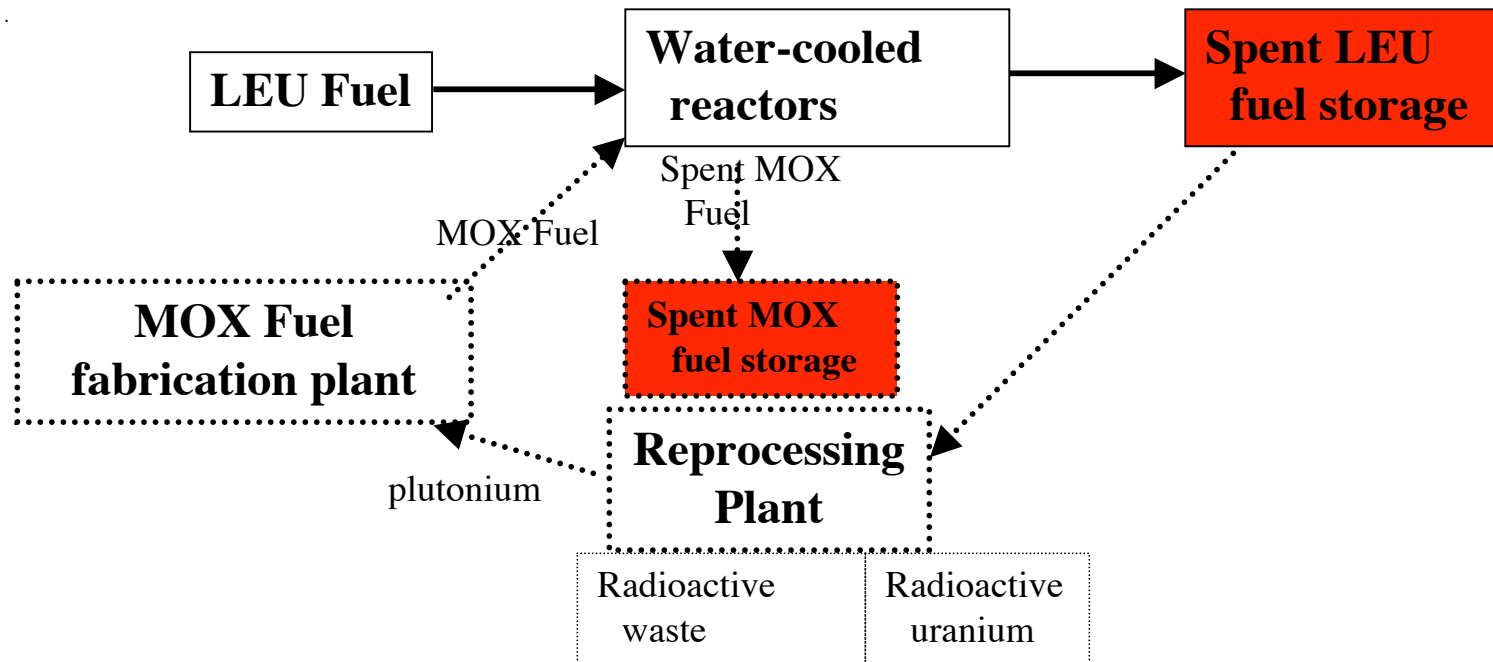


# DOE proposes to reprocess the spent fuel and use fast-neutron reactors to fission the transuranics (mostly Pu)

(Assessed unfavorably by DOE-funded National Academy of Sciences study, *Nuclear Wastes: Technologies for Separation and Transmutation*, 1996)



**AREVA urges U.S. to separate & recycle plutonium once in “mixed oxide” (MOX) fuel and store spent MOX fuel at the reprocessing plant -- as in France**



***Transforming interim LEU spent fuel into MOX spent fuel doubles the cost of disposal. (Report to France’s Prime Minister, 2000.)***

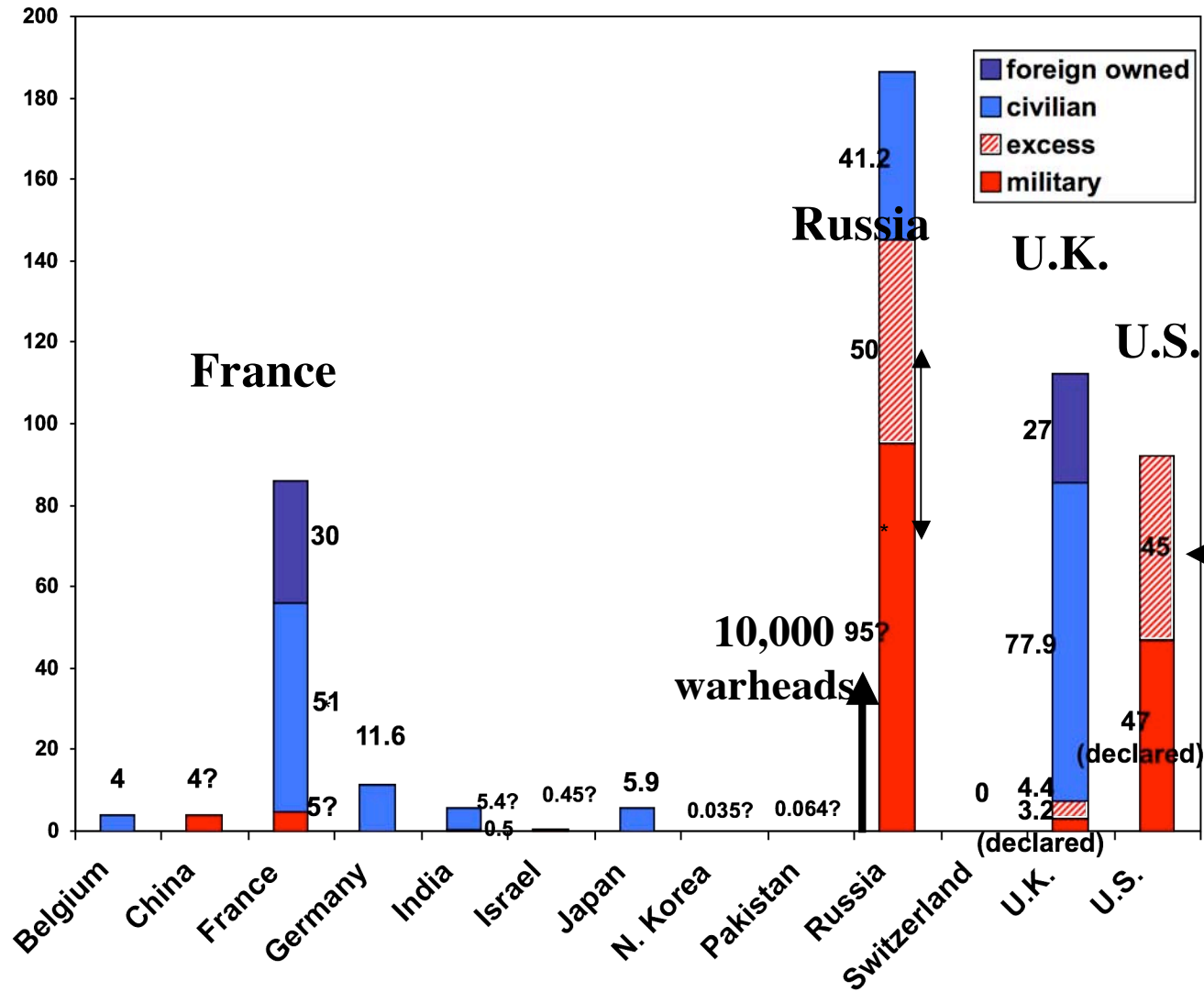
## **Why reprocessing costs so much more than storage**

**La Hague reprocessing plant** (1 square mile, \$20 billion capital cost, \$1 billion/yr operational cost, vs \$0.4 billion/yr total cost for spent fuel storage)



# *Challenge is to reduce stocks of hundreds of tons of separated plutonium -- not separate more!*

(Global stocks of separated plutonium, metric tons, end 2005, ? est., *Global Fissile Material Report, 2006, updated*)



U.S. excess plutonium will cost >\$10 billion to dispose. < 2 year's output of proposed plant

**Separated plutonium can be carried away easily.  
Spent fuel is self-protecting for more than a century.**

### Separated plutonium



2.5 kg Pu in light-weight container.  
Can be processed in a glove box.  
Four cans enough for Nagasaki bomb.

### Spent fuel assembly (1000 pounds and 12 feet long)

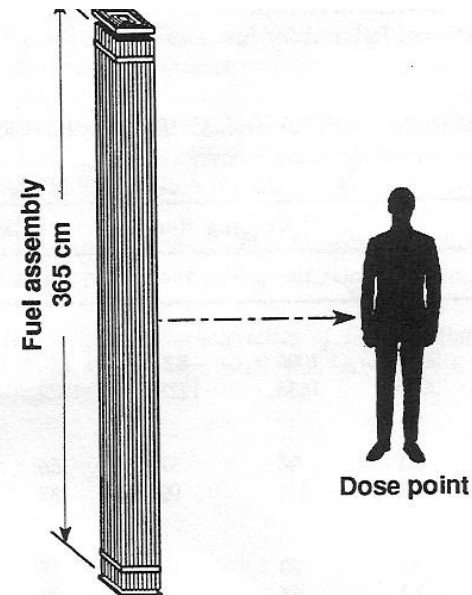
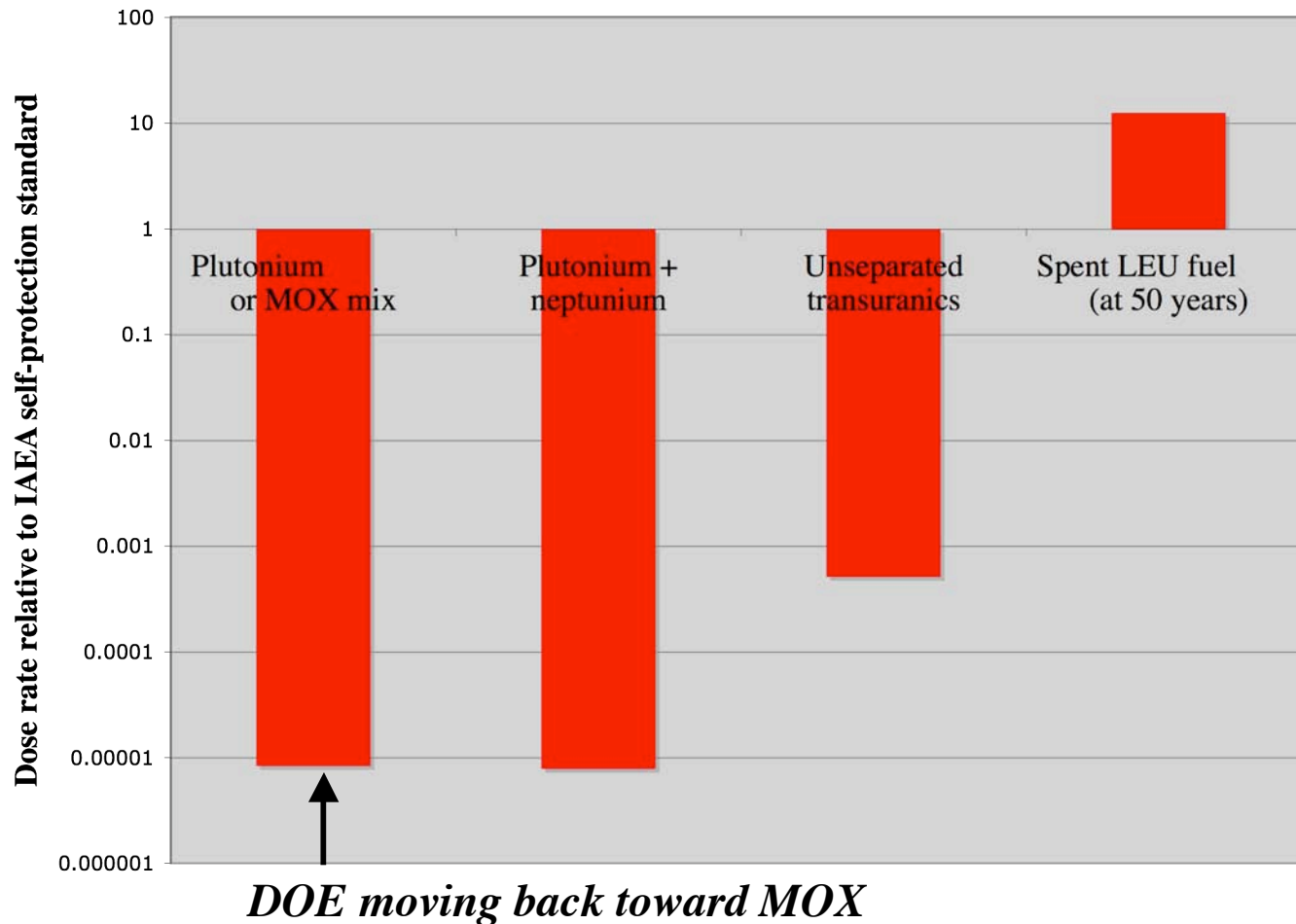


figure 1. Dose rate from a PWR fuel assembly.

5 kg Pu. Lethal gamma dose in 20 minutes  
50 years after discharge. Requires 20-ton  
container to transport & remote handling  
behind thick walls to recover.

# DOE's "proliferation resistant" transuranic mixes not much more self protecting than separated plutonium

(Dose rate from 1 kg of transuranics: fraction of IAEA self-protection standard;  
"Limited Proliferation Resistance Benefits from Recycling Unseparated Transuranics and Lanthanides from Light-Water Reactor Spent Fuel" by J.Kang and FvH, *Science and Global Security*, 2005 )





## **U.S. nonproliferation policy on reprocessing**

Since India used its first separated civilian plutonium to make a bomb in 1974, U.S. policy has been: ***“We don’t reprocess. You don’t need to either.”***

Very successful: No additional countries have launched “civilian” reprocessing in the past 30 years and several have stopped.

Bush Administration proposes new policy, ***“Do as we say, not as we do.”***

Already counterproductive:

- South Korean nuclear establishment wants to reprocess (encouraged by the DOE) and
- France wants to export reprocessing plants (emboldened by the DOE claims of proliferation resistance).

## **What is the matter with interim on-site dry-cask storage?**

- Accident/terrorism risks from fuel in dry-cask storage orders of magnitude less than from fuel in reactors or storage pools at an operating nuclear power plant.
- All U.S. nuclear power plant sites can accommodate spent fuel from 60 years of operation.
- Anti-nuclear groups no longer oppose interim on-site dry-cask storage if it is “hardened.”

Spent fuel will have to be removed from the sites eventually.  
But no reason to panic.

***GNEP is a panic “solution.”***

# Conclusions

## Reprocessing:

- Exchanges interim, on-site storage of self-protecting spent-fuel for interim stockpiling of material which is easily transportable and from which plutonium could easily be separated.
- Costs two (LWR recycle) to ten (fast-reactor recycle) times more than on-site storage.
- Provides cover for other countries to develop nuclear-weapon options.

## **Congress is becoming skeptical**

(Excerpts from U.S. House Appropriations Committee Report on its proposed Energy and Water Development Appropriations Bill, June 2006)

- “The aggressive program proposed by the Department is at best premature.”
- “The Department has failed to convince the Committee that advanced separations technologies coupled with fast reactors is a viable, comprehensive approach to recycling spent fuel.”
- “Embarking on a costly process leading to major new construction projects is unwise, particularly where there is no urgency.”
- “before the Department can expect the Committee to support funding for a major new initiative, the Department must provide a complete and credible estimate of the life-cycle costs of the program.”