

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

(report on www.fissilematerials.org)]

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Panel on “The U.S. and the Future of Reprocessing”

2007 Carnegie International Nonproliferation Conference

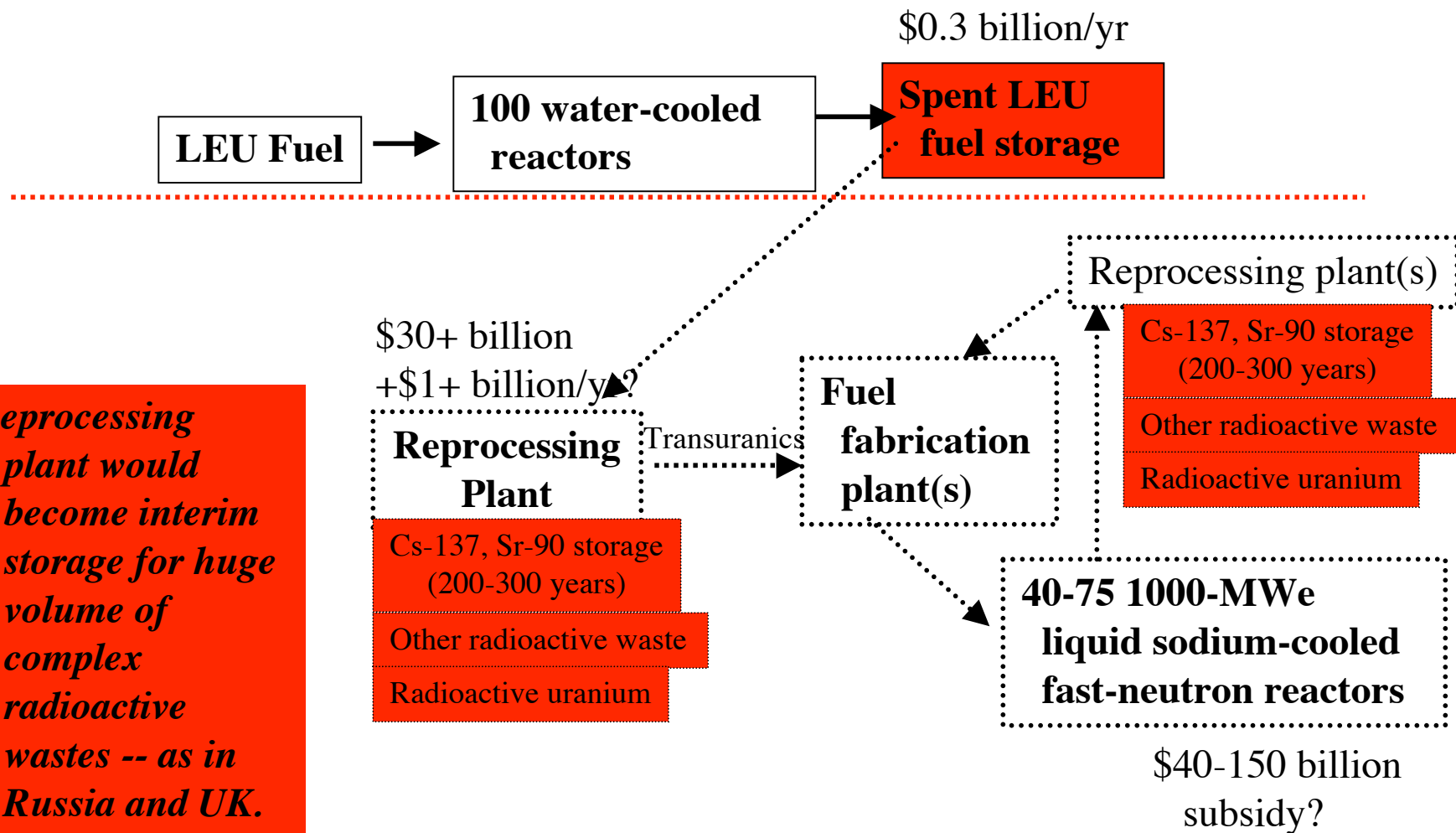
June 26, Ronald Reagan International Trade Center, Washington, DC.

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



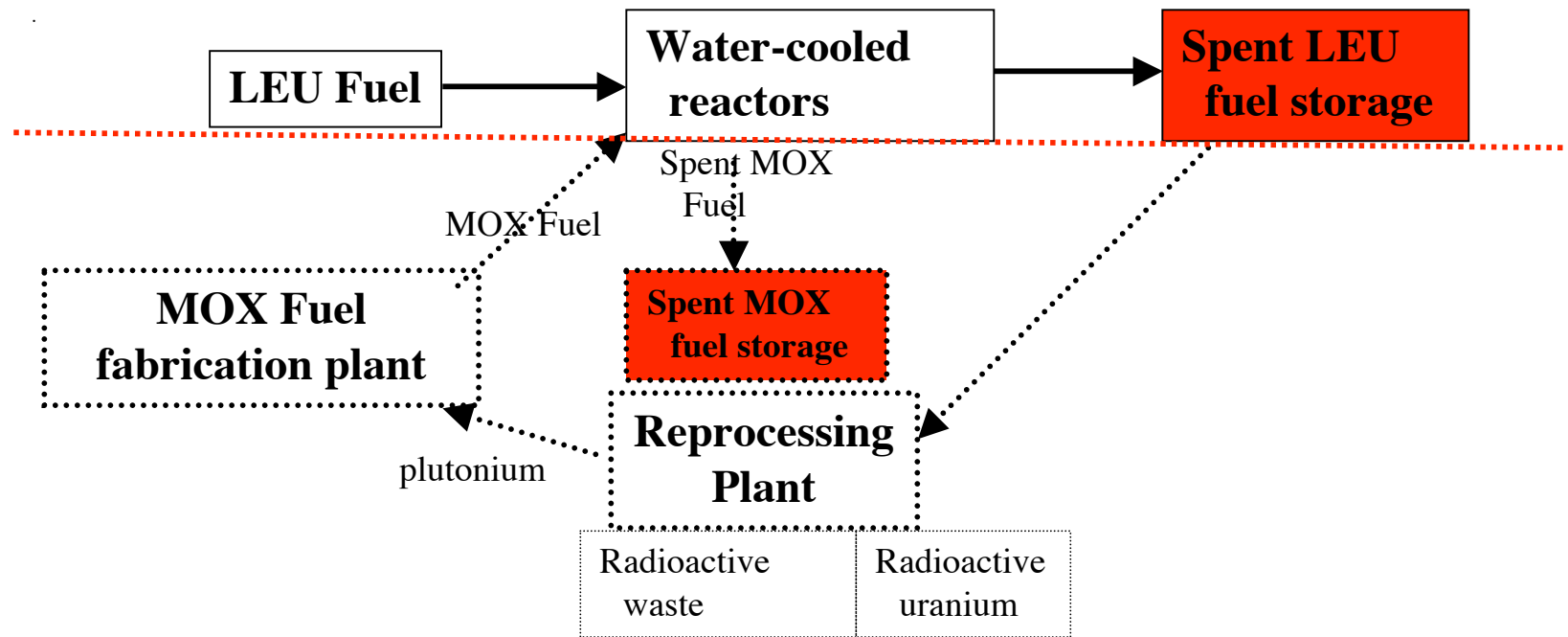
DOE proposes to build a reprocessing plant first and hopes that Congress will fund the construction of 40-75 fast-neutron reactors to fission the transuranics (mostly plutonium)

(Assessed unfavorably in DOE-funded National Academy of Sciences study, 1996)



Reprocessing plant would become interim storage for huge volume of complex radioactive wastes -- as in Russia and UK.

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.)

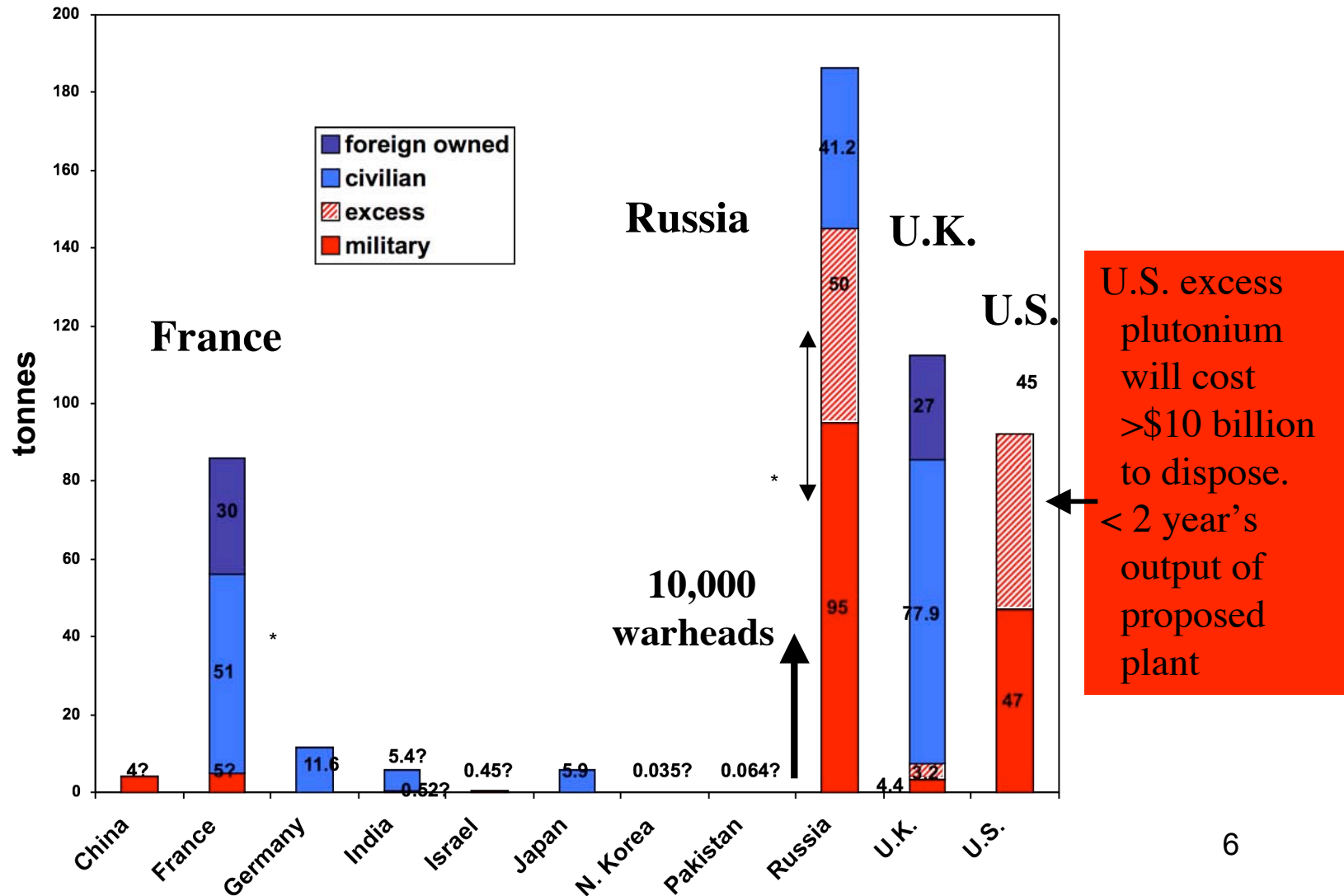
Why reprocessing costs so much more than storage

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*)



**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 (500 kg)

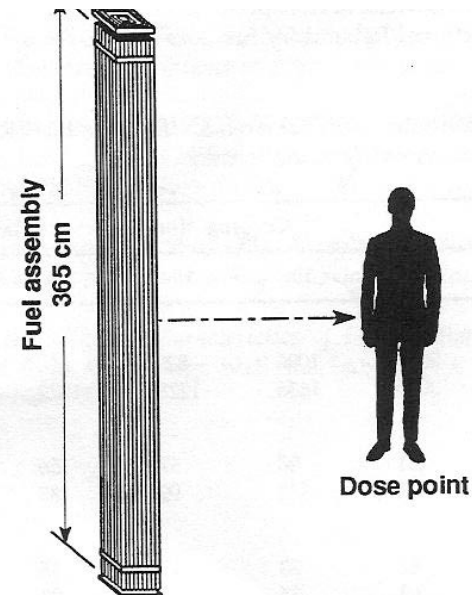


figure 1. Dose rate from a PWR fuel assembly.

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.

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, encouraged by DOE, wants to reprocess and
- AREVA, emboldened by the DOE claims of proliferation resistance, wants to export reprocessing plants.

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.”

The world is becoming skeptical

Countries that reprocess or plan to (billions of Watts)	Countries that have abandoned or have decided to abandon reprocessing (billions of Watts)	Countries that have never reprocessed (billions of Watts)
China (pilot plant) 6.4	Armenia (in Russia) 0.4	Argentina 0.9
France (75%) 63.4	Belgium (France) 5.8	Brazil 1.9
India (50%) 3.1	Bulgaria (Russia) 2.7	Canada 12.9
Japan 44.3	Czech Repub (Russia) 2.6	Lithuania 1.3
Netherlands (in France) 0.5	Finland (Russia) 2.7	Mexico 1.4
Russia (10%) 21.7	Germany (France/UK) 20.3	Pakistan 0.4
	Hungary (Russia) 1.7	Romania 0.6
	Slovak Repub (Russia) 2.5	Slovenia 0.7
	Spain (UK) 7.6	South Africa 1.8
	Sweden(France) 8.9	South Korea 16.8
	Switzerland (France/UK) 3.2	Taiwan 4.9
	United Kingdom 11.8	
	Ukraine (Russia) 13.1	
	United States 97.4	
Total (70%) 139.4	Total 180.7	Total 1243.6