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

(report on www.fissilematerials.org)]

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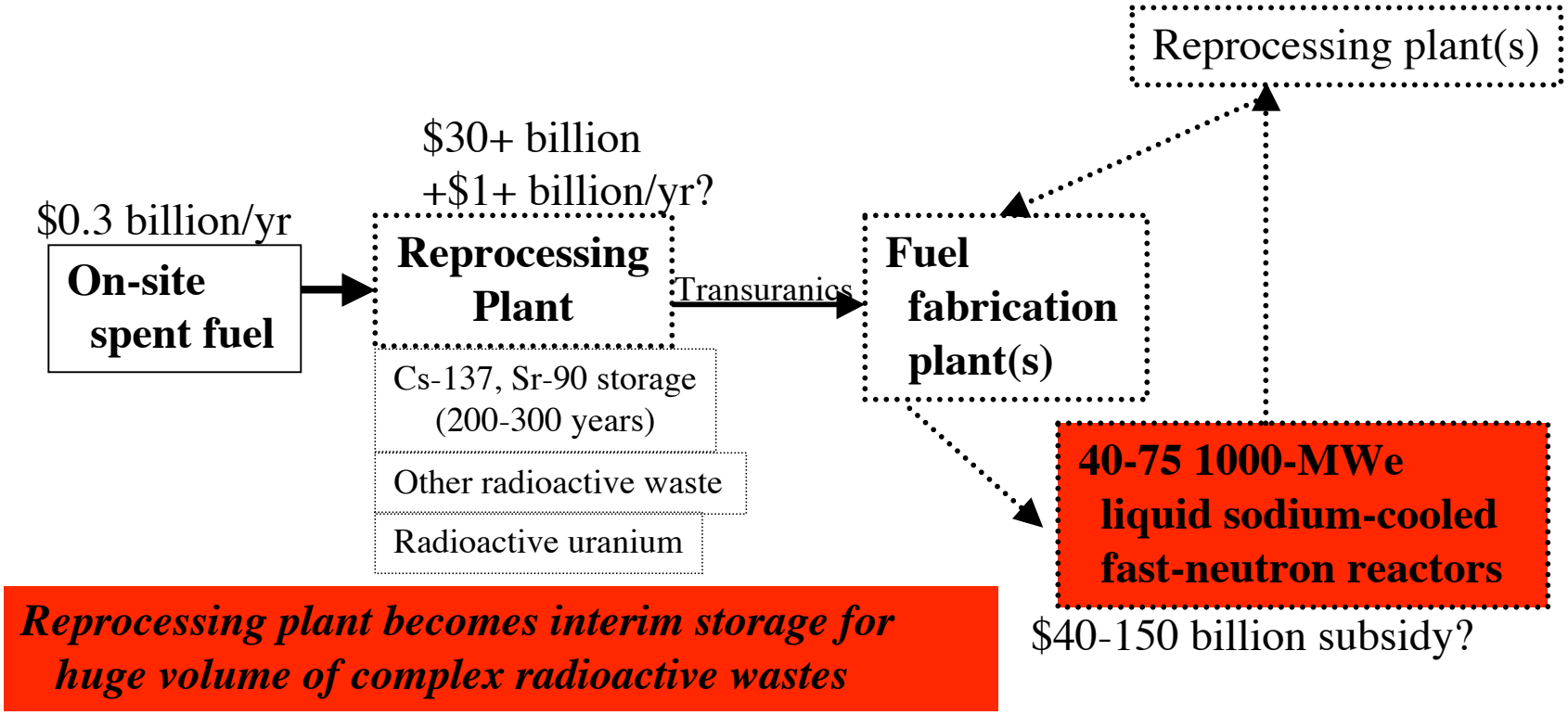
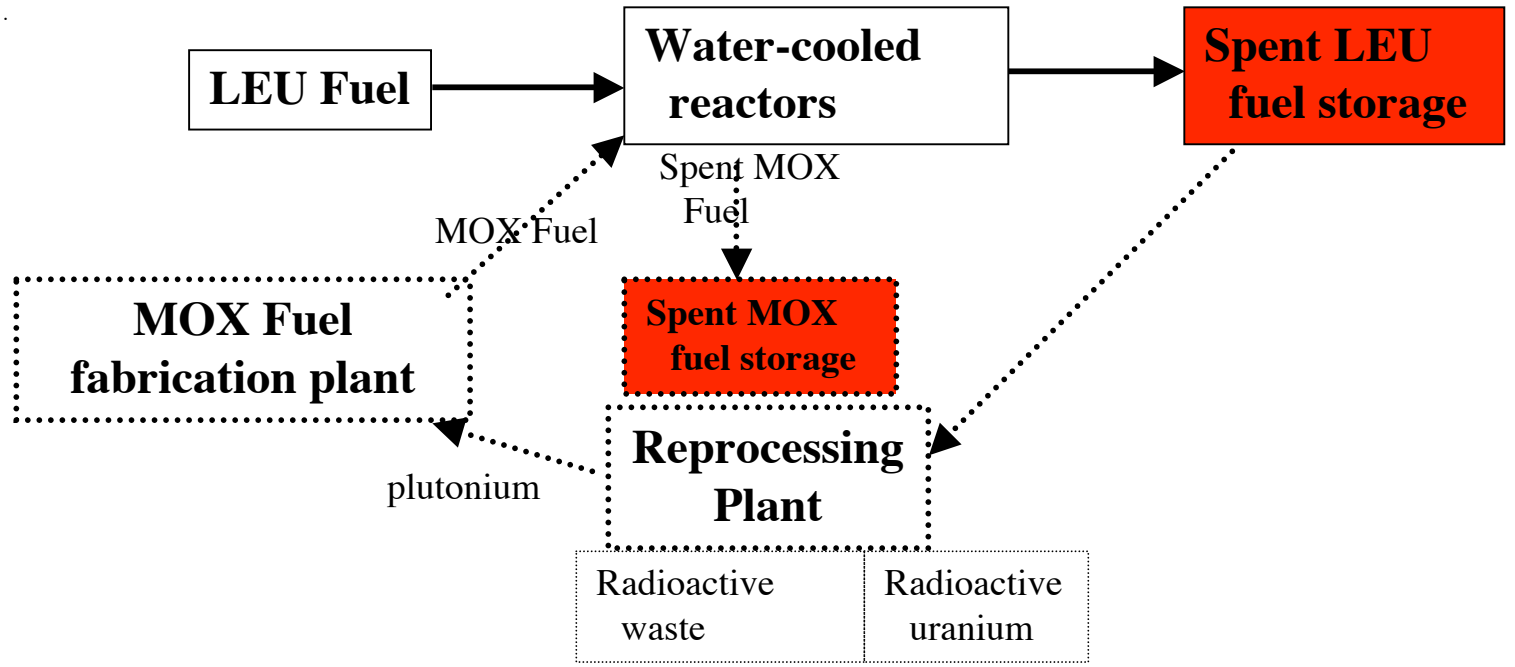
Nuclear utilities want DOE to start removing spent fuel from reactor sites

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



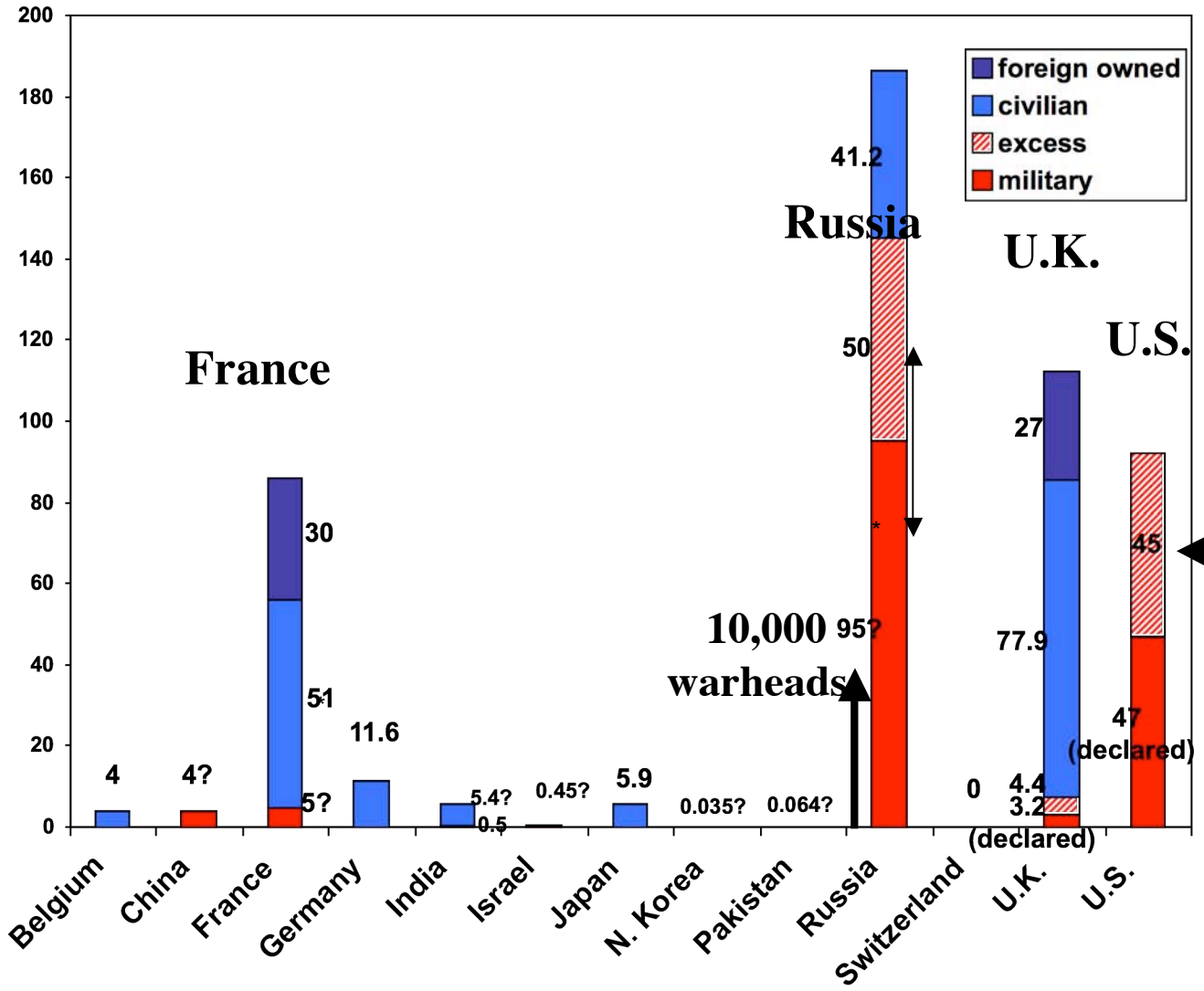
Transforming interim LEU spent fuel into MOX spent fuel doubles the cost of disposal. (Report to France's Prime Minister, 2000.)

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

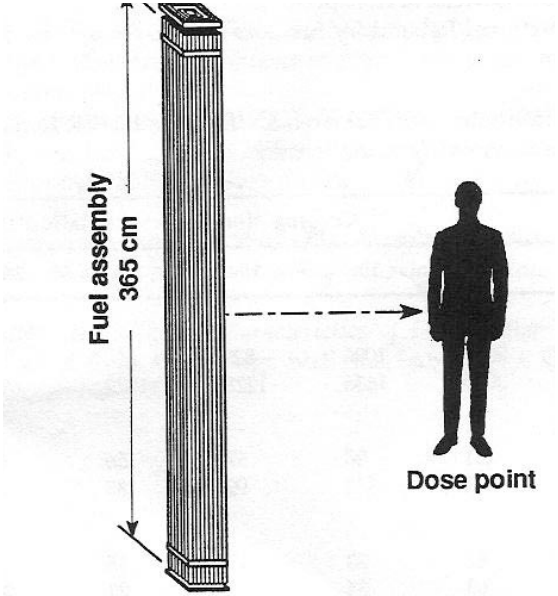
Separated plutonium can be carried away easily.
Spent fuel is self-protecting for more than a century.

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)



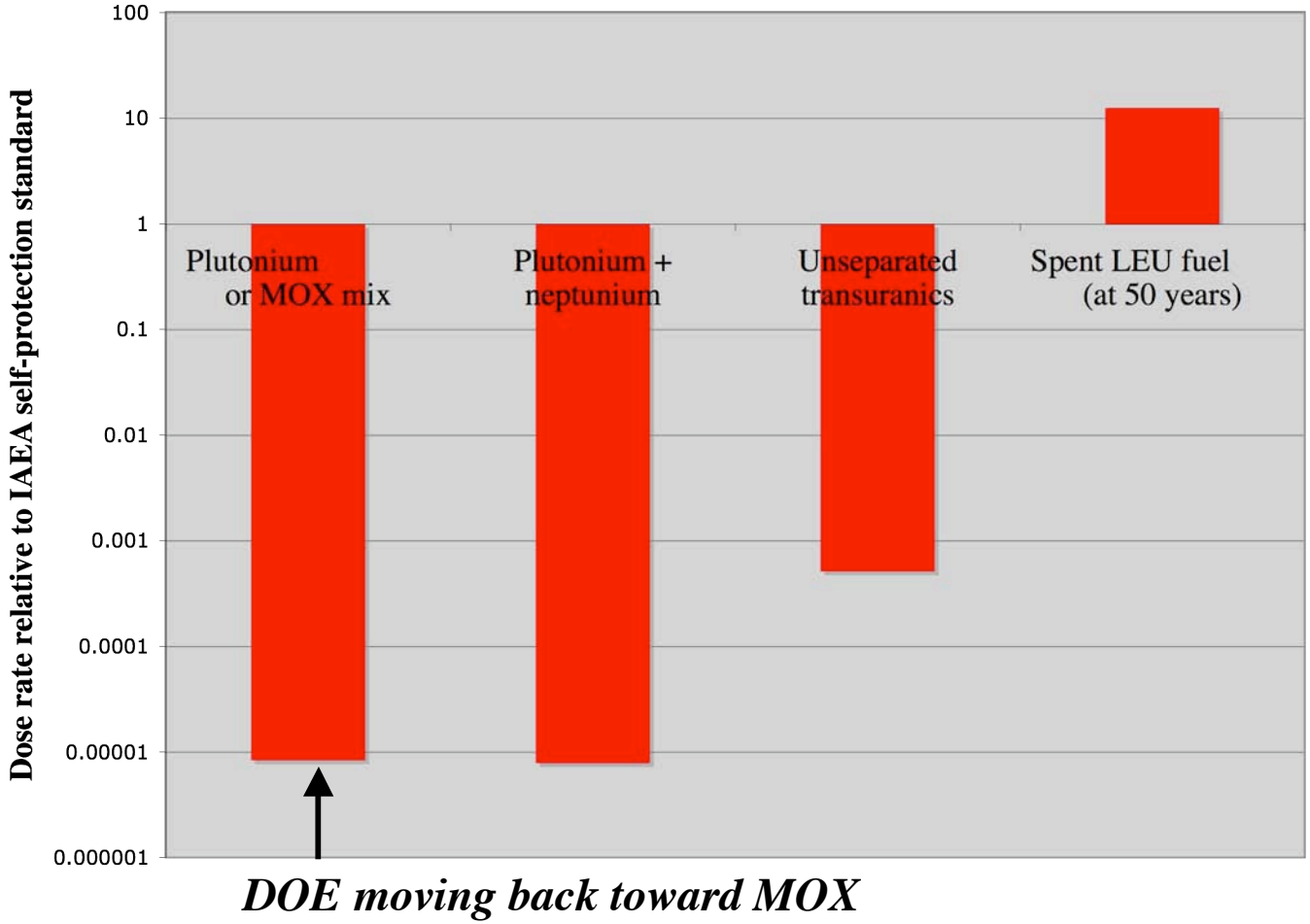
igure 1. Dose rate from a PWR fuel assembly.

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.