The American Nuclear Society President's Special Committee on Used Nuclear Fuel Management Options

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“What about the waste?”

ANS President Tom Sanders formed an ANS Special Committee in 2010 to explore the options

A comprehensive report

- **For citizens who want to understand the issue**
- **For policymakers who must choose a path**

ANS President's Special Committee Members

Lake Barrett
Yoon Chang
Margaret Chu
Michael Corradini
Audeen Fentiman
W. Kenneth Hughey
Donna Jacobs
Kathryn McCarthy
Craig Piercy
Dana Powers
Daniel Stout

Three options for ultimate disposition of used nuclear fuel

- Once-through fuel cycle
  (USA today)
- Limited reprocessing and recycling
  (Japan & France)
- Full recycling
  (goal of the ALMR program)

Factors Special Committee considered

- Economics
- Resource utilization
- Environmental concerns and impacts
- Nonproliferation
- Retrievability
- Public acceptance
- Ethical issues

The report's two bounding scenarios

- **No growth**

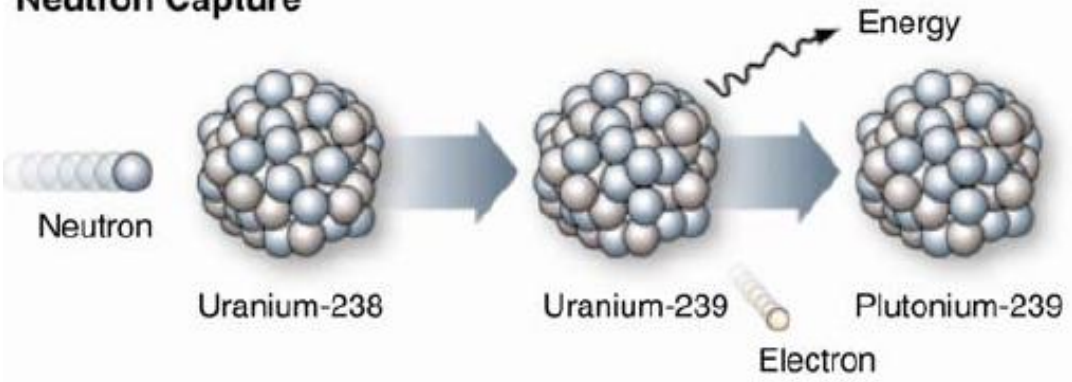
existing plants operate 60 years & no new nuclear builds

- **Growth**

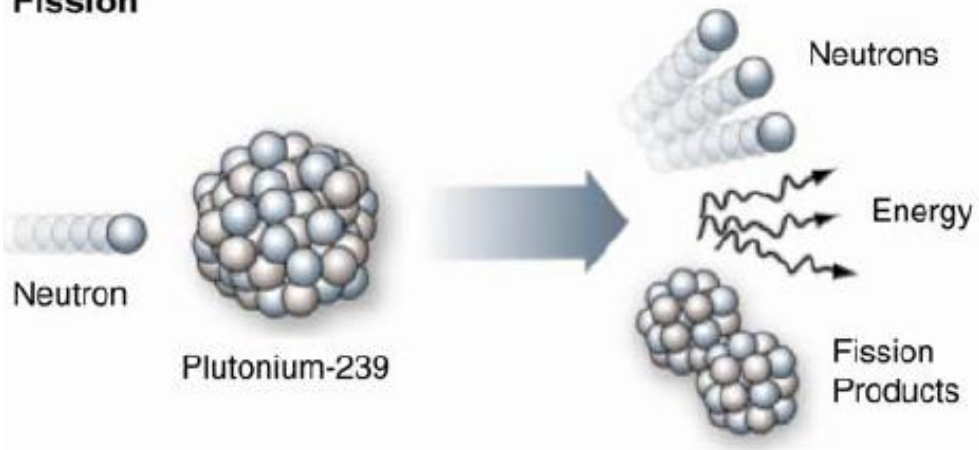
half the growth in electricity demand this century is supplied by nuclear

What is Transmutation?

Neutron Capture

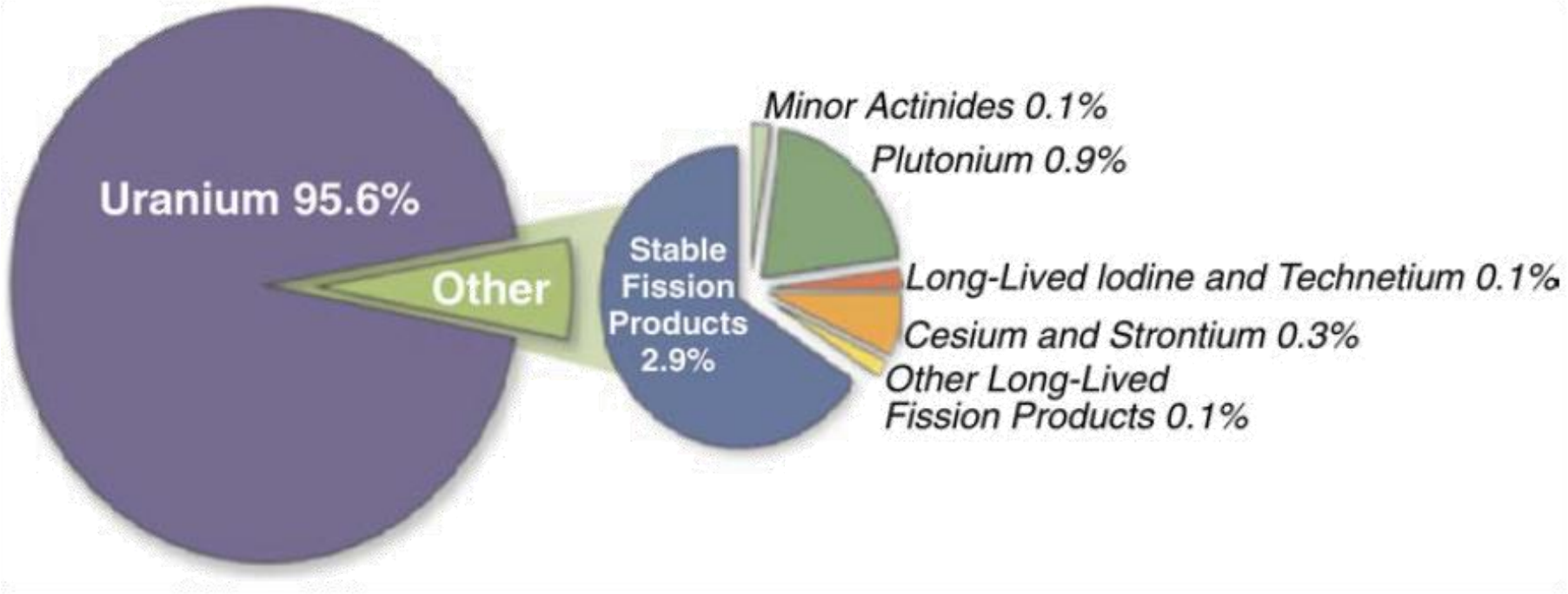


Fission

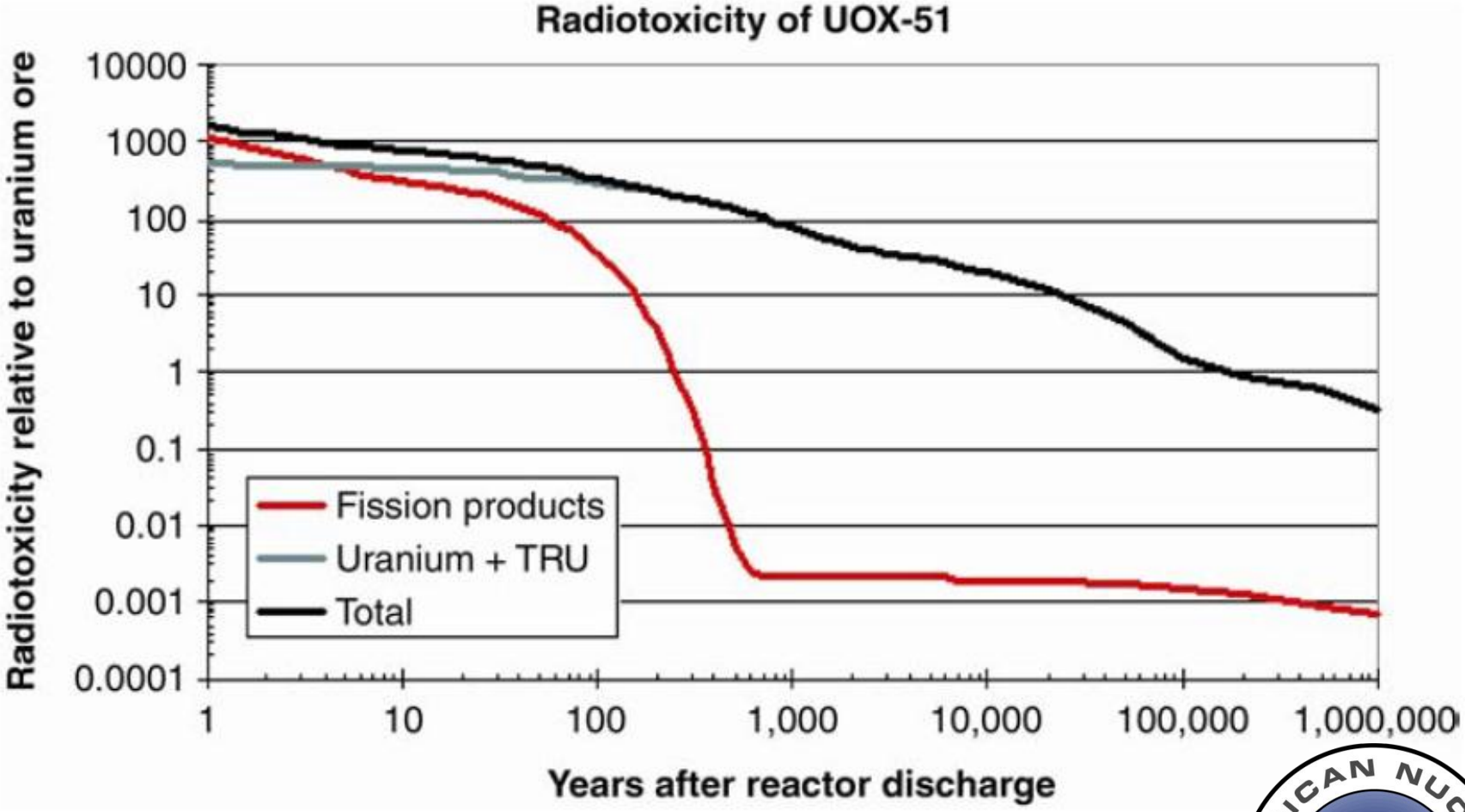


Transmutation is the conversion of one isotope into another by changing its structure.

Constituents of used nuclear fuel

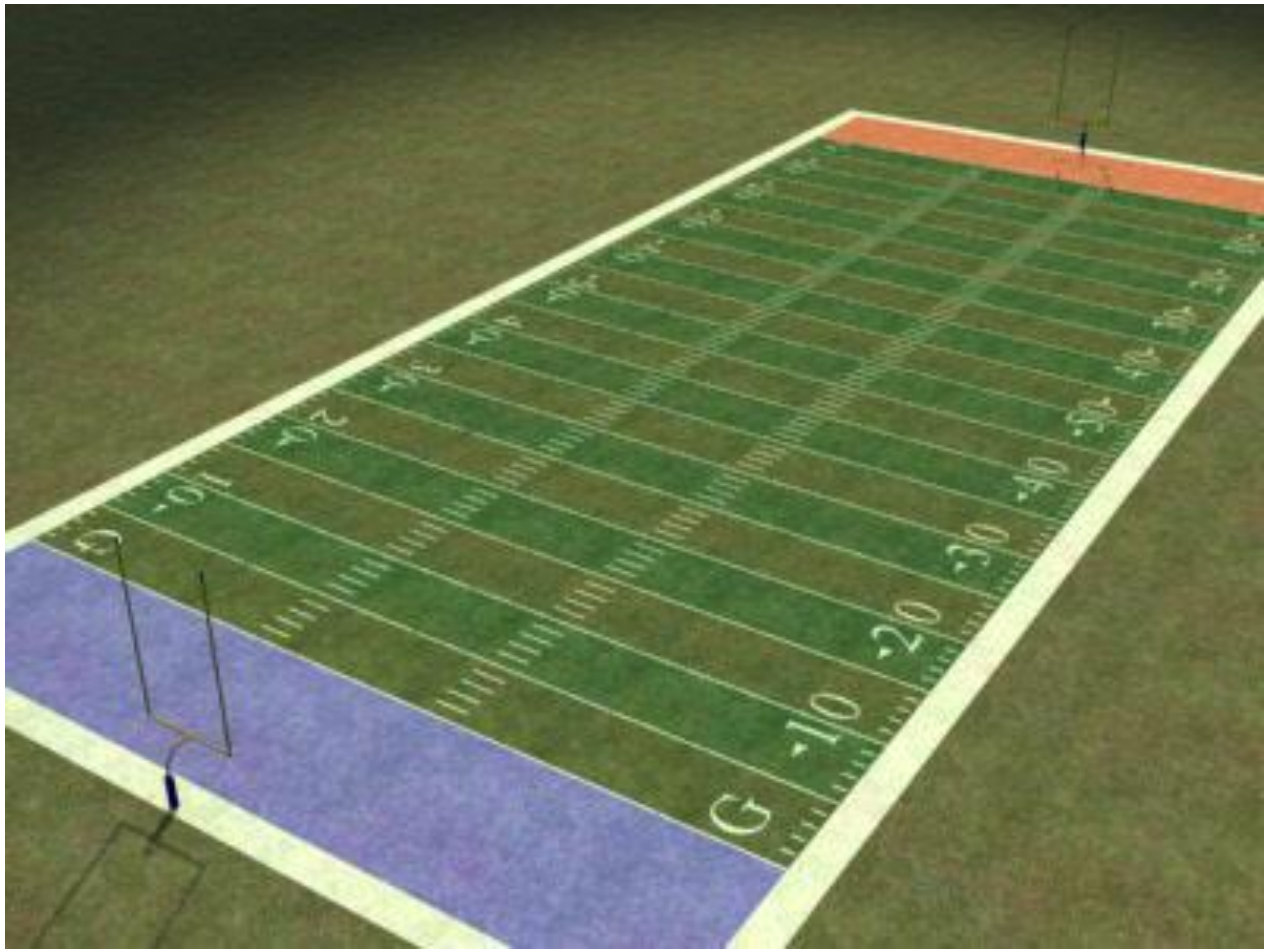


How radiotoxicity decreases with time

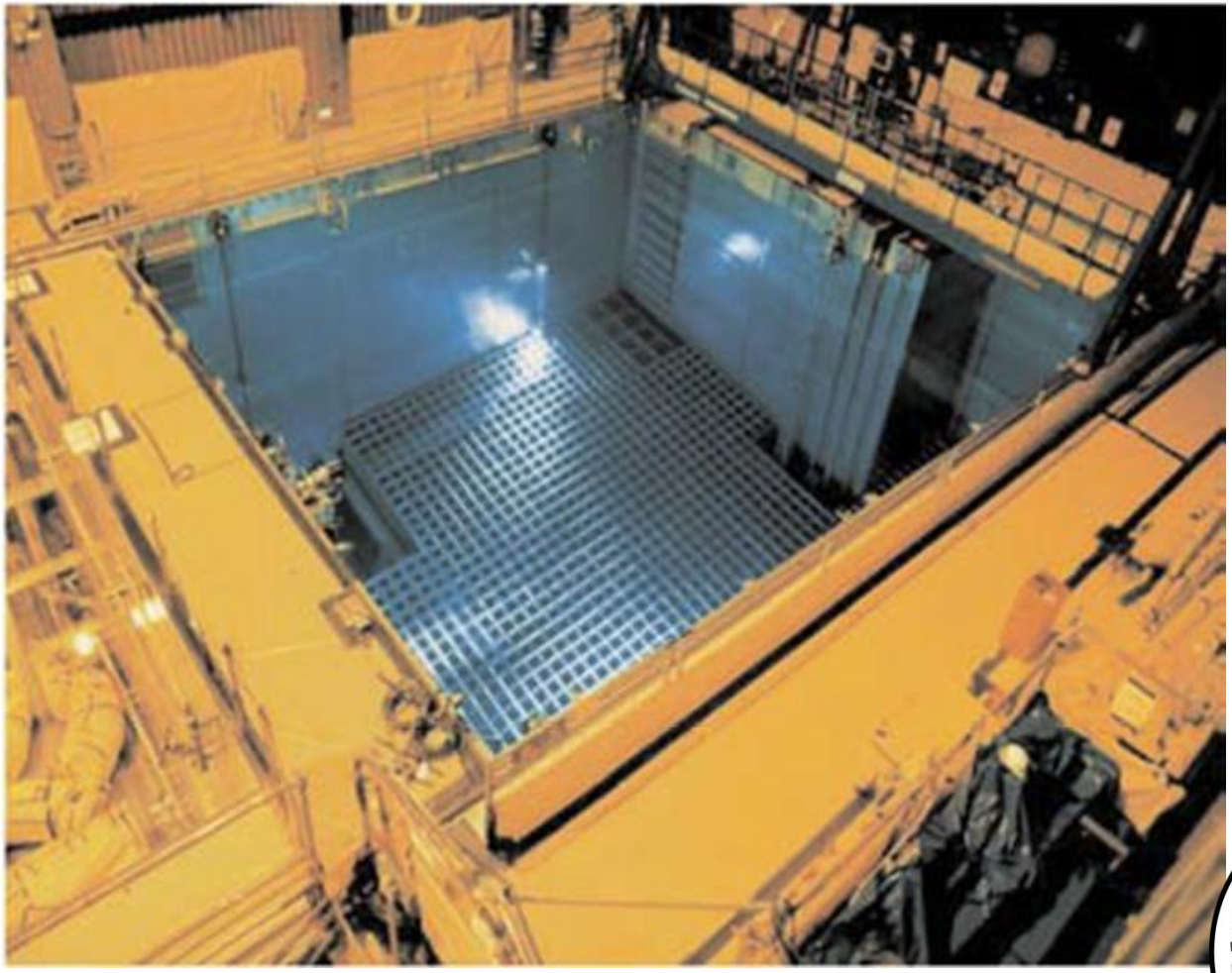


How much used nuclear fuel exists?

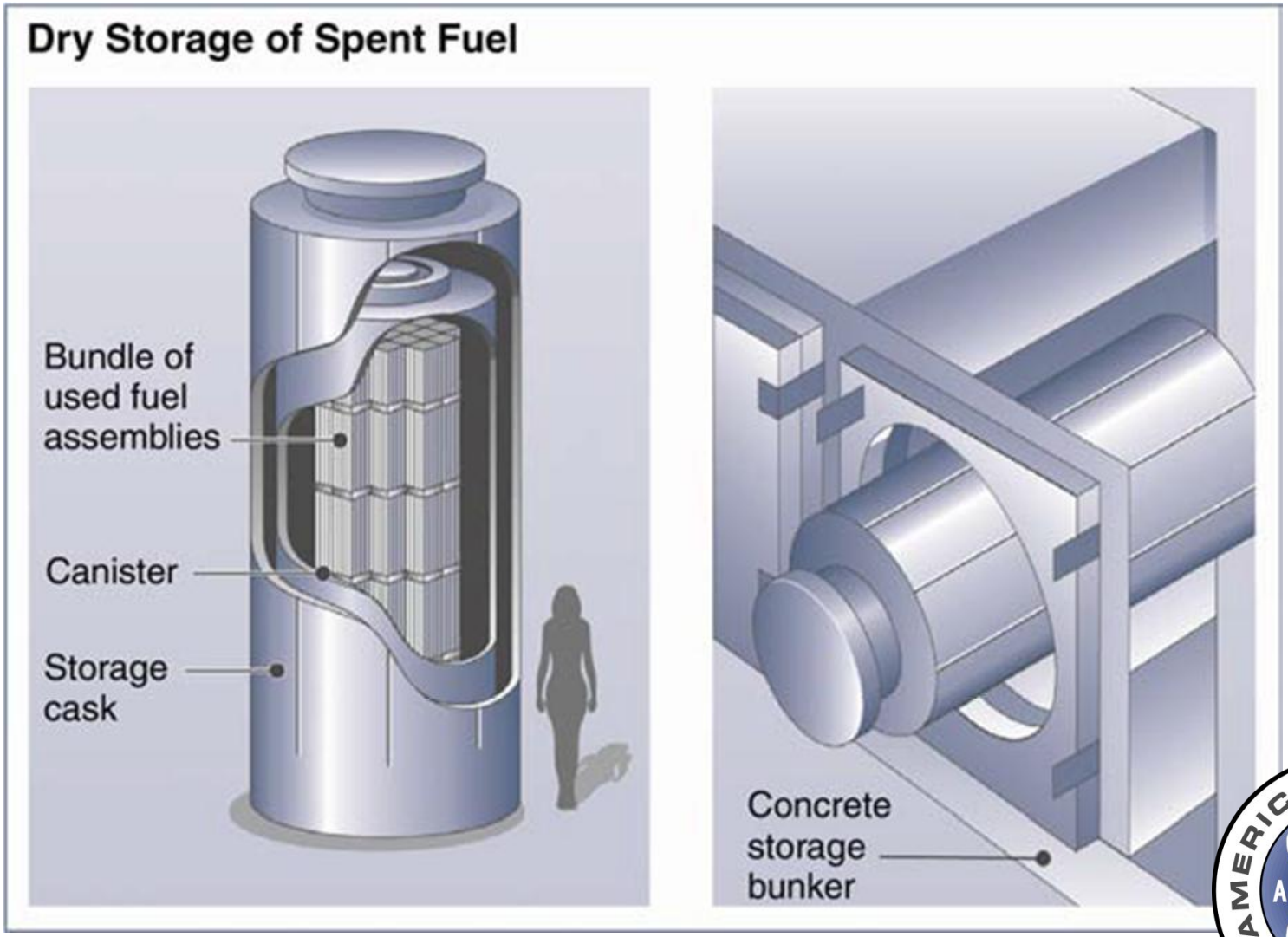
After 50 years: ~ 62,500 tons



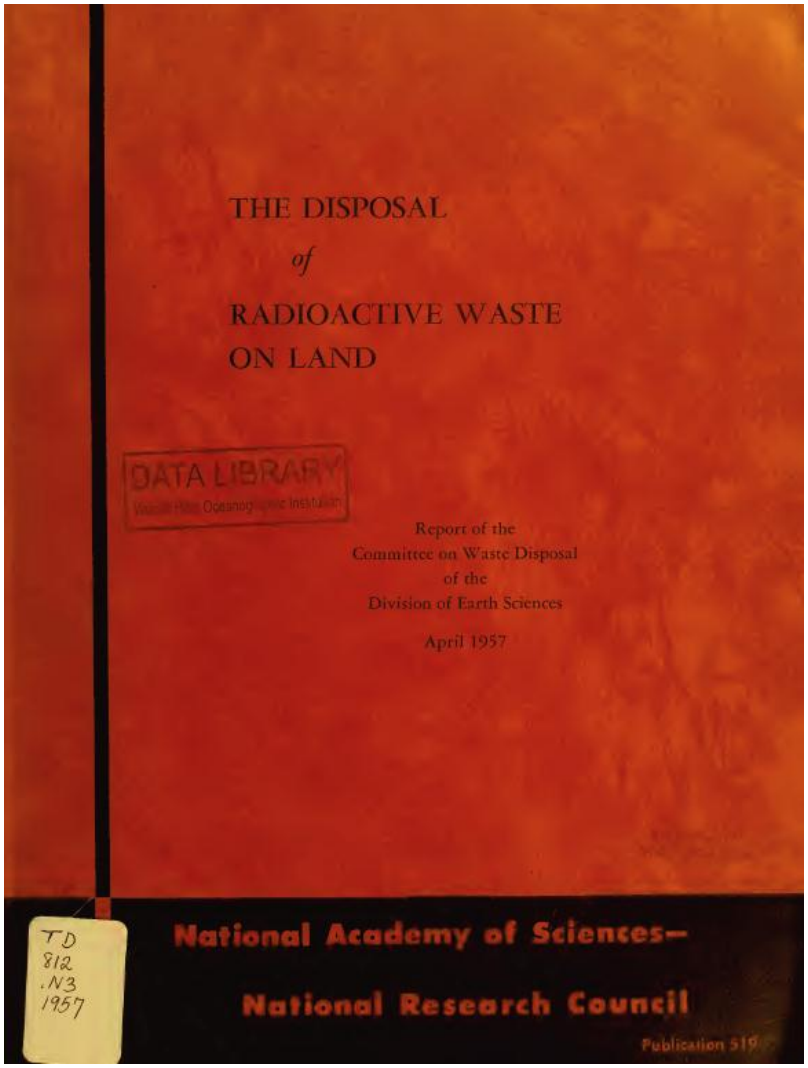
Where and how is used nuclear fuel stored?



Where and how is used nuclear fuel stored? (cont.)



"…radioactive waste can be disposed of safely in a variety of ways and at a large number of sites in the United States."



April 1957

"…the most promising method of disposal of high-level waste…is in salt deposits"

NUCLEAR WASTE POLICY ACT OF 1982 [1]

An Act to provide for the development of repositories for the disposal of high-level radioactive waste and spent nuclear fuel, to establish a program of research, development, and demonstration regarding the disposal of high-level radioactive waste and spent nuclear fuel, and for other purposes.

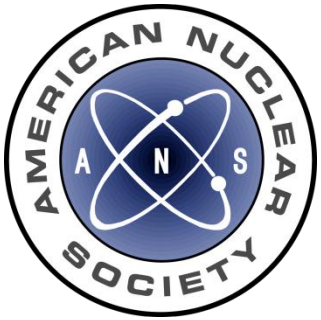
Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE AND TABLE OF CONTENTS

SECTION 1. This Act may be cited as the "Nuclear Waste Policy Act of 1982".

[42 U.S.C. 10101 note]

TABLE OF CONTENTS



President Reagan

President Reagan Approved

- **Yucca Mountain, NV**
- **Deaf Smith County, TX**
- **Hanford Site, WA**

Entrance to Yucca Mountain

NWPA of 1982 was amended in 1987, selecting only Yucca Mountain

ANS Position Statement #22

CREATION OF AN INDEPENDENT ENTITY TO MANAGE U.S. USED NUCLEAR FUEL

Position Statement
November 2009

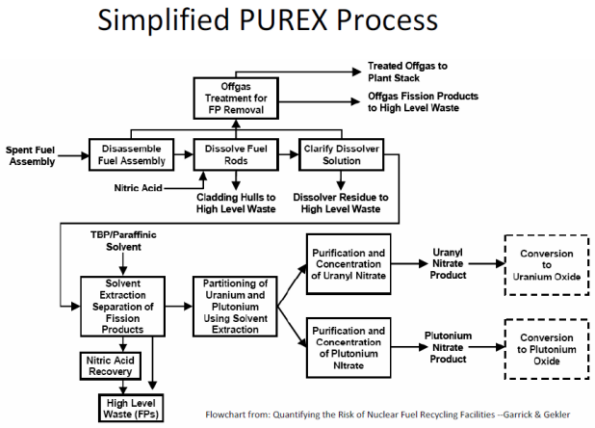
- access to nuclear waste fees, not subject to annual congressional appropriations;
- governance that promotes long-range planning and continuity of leadership;
- authority to provide consolidated interim storage, nuclear fuel recycling, and geologic disposal consistent with laws, policies, and regulations;
- authority to support U.S. national security and nonproliferation objectives on a full-cost reimbursement basis;
- fully subject to U.S. Nuclear Regulatory Commission and U.S. Environmental Protection Agency regulations.

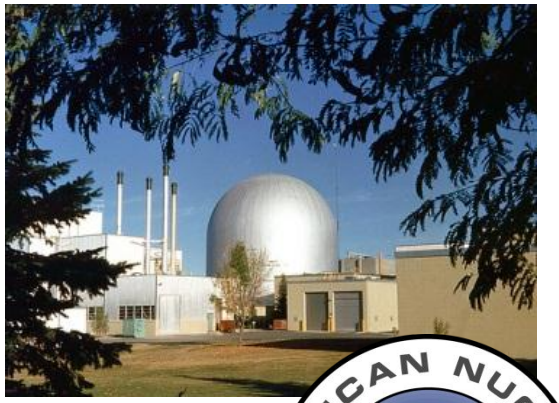
Important characteristics of disposed materials in a geologic repository

- Radiotoxicity
- Mass and volume
- Heat-generating characteristics

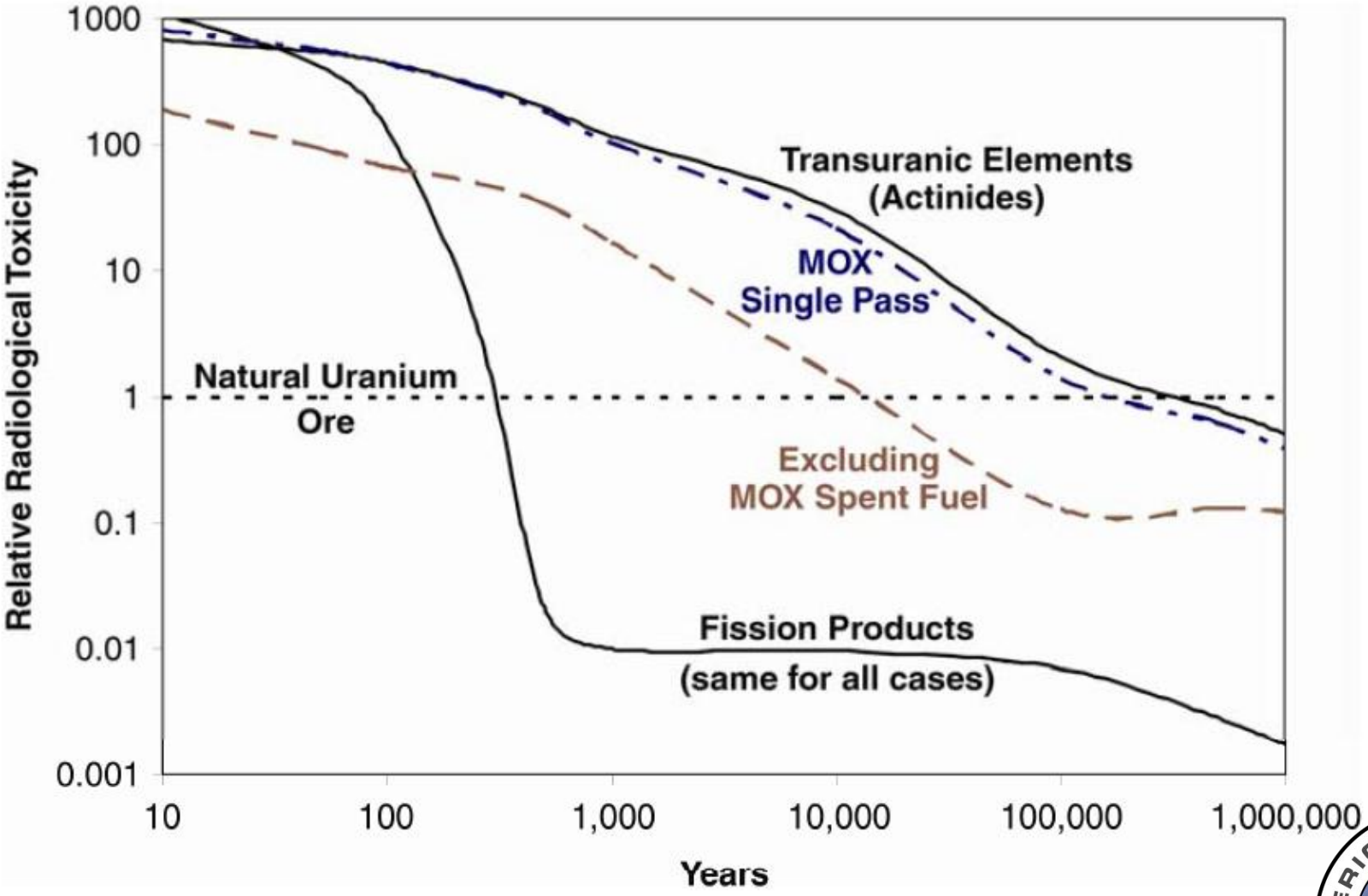
Fuel cycle options: Full actinide recycling

- PUREX
- Advanced aqueous reprocessing technologies
- Pyroprocessing





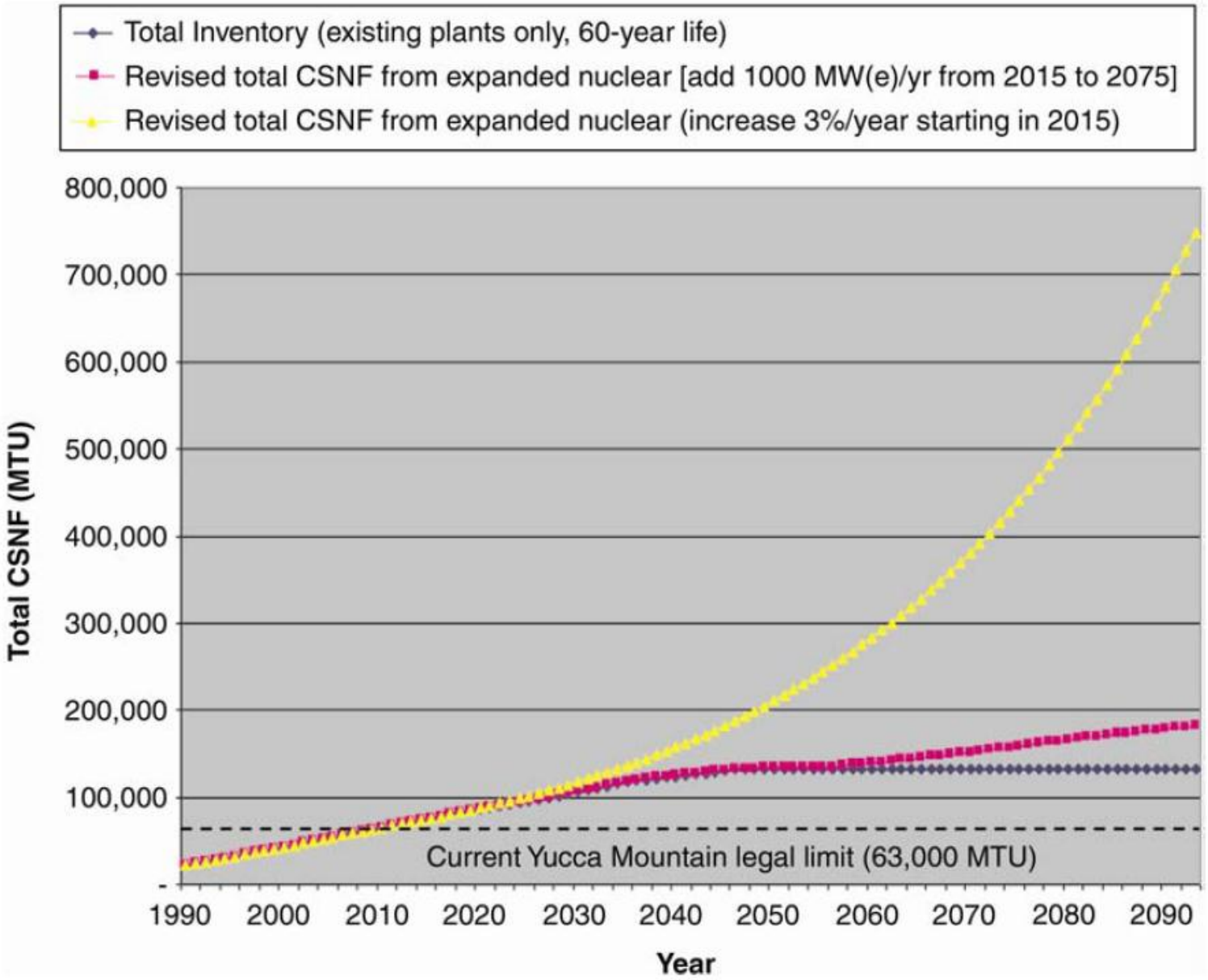
Relative radiological toxicity of used nuclear fuel constituents



Ethical considerations

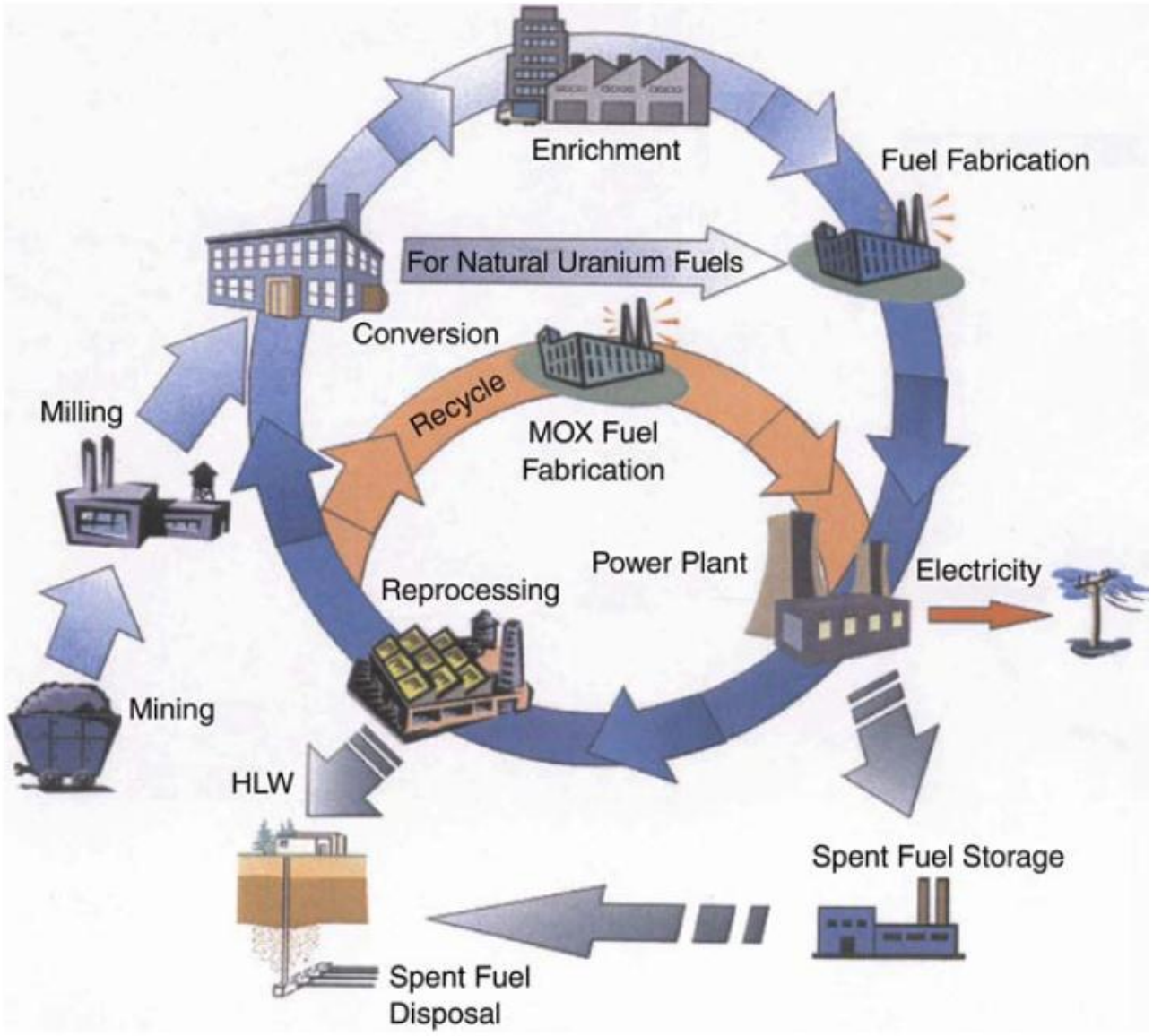
- Is the current generation obligated to dispose of used nuclear fuel?
- or Wait for scientific and technological advance?

Estimate of commercial spent nuclear fuel inventory

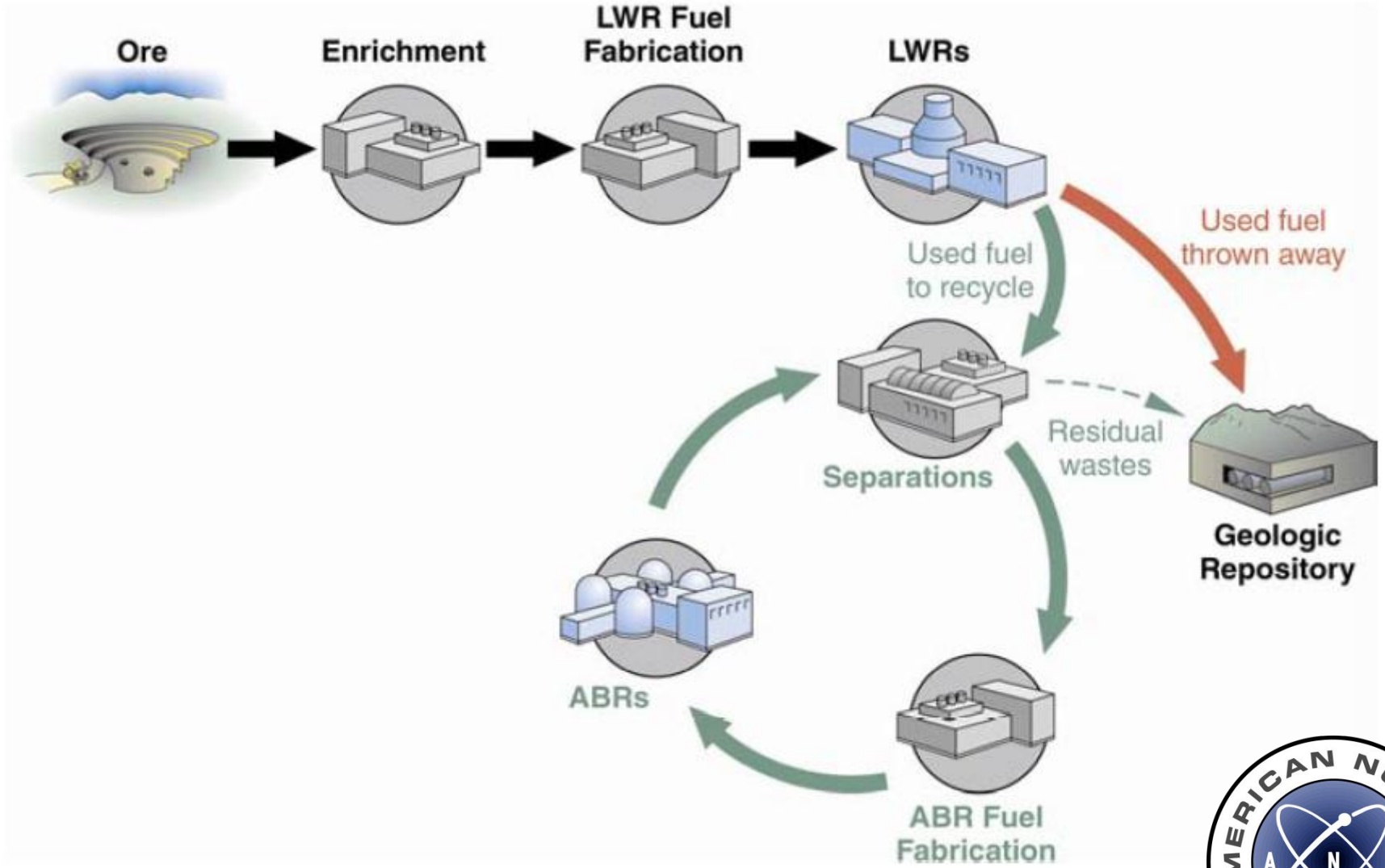


Electric Power Research Institute

Light water reactor fuel cycle options: Once-through and partial recycling



Light water reactor fast reactor fuel cycle



Concluding remarks

- Interim storage facility (or facilities)
- Deep geologic repository (or repositories)
- Transportation system

Used nuclear fuel recycling and nonproliferation

Long-term nuclear energy policy

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