

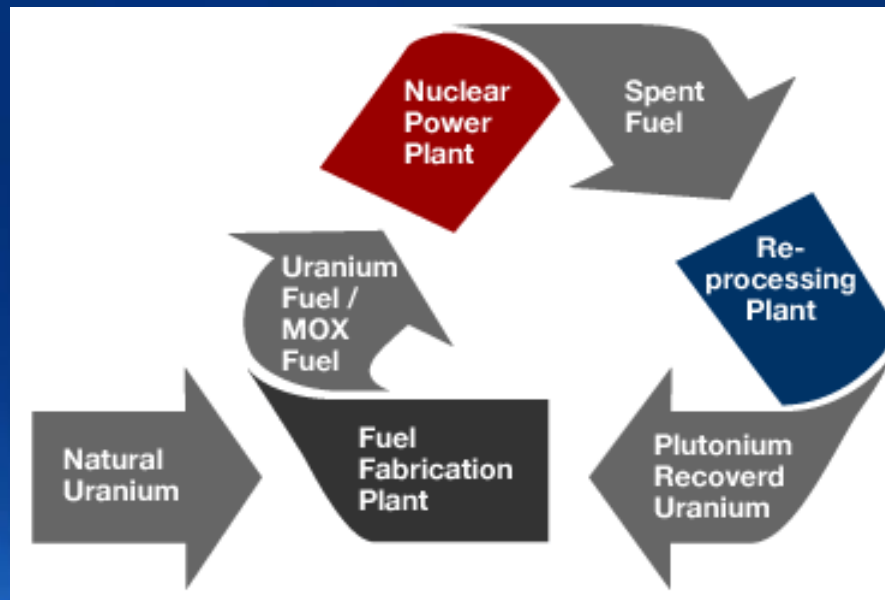
Reprocessing of Spent Nuclear Fuel: A Policy Analysis

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Definition of Reprocessing

- Reprocessing separates spent nuclear fuel into main components, much of which can be reused in reactors



<http://www.jpannuclear.com/nuclearpower/images/fuelcycleGraphic2.gif>

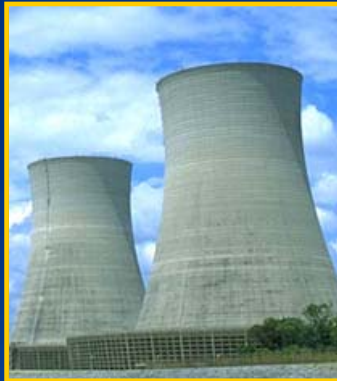
The Nuclear Waste Issue

	Current Costs	Costs with CO₂ Regulation
Coal	33-41 mill/kWh	59-90 mill/kWh
Gas	45-46 mill/kWh	43-71 mill/kWh
Once Through Nuclear	47-71 mill/kWh	47-71 mill/kWh

Note: 1 mill = 1/10 cents

Current U.S. Practice: The Once Through Fuel Cycle

Enriched Uranium Fuel



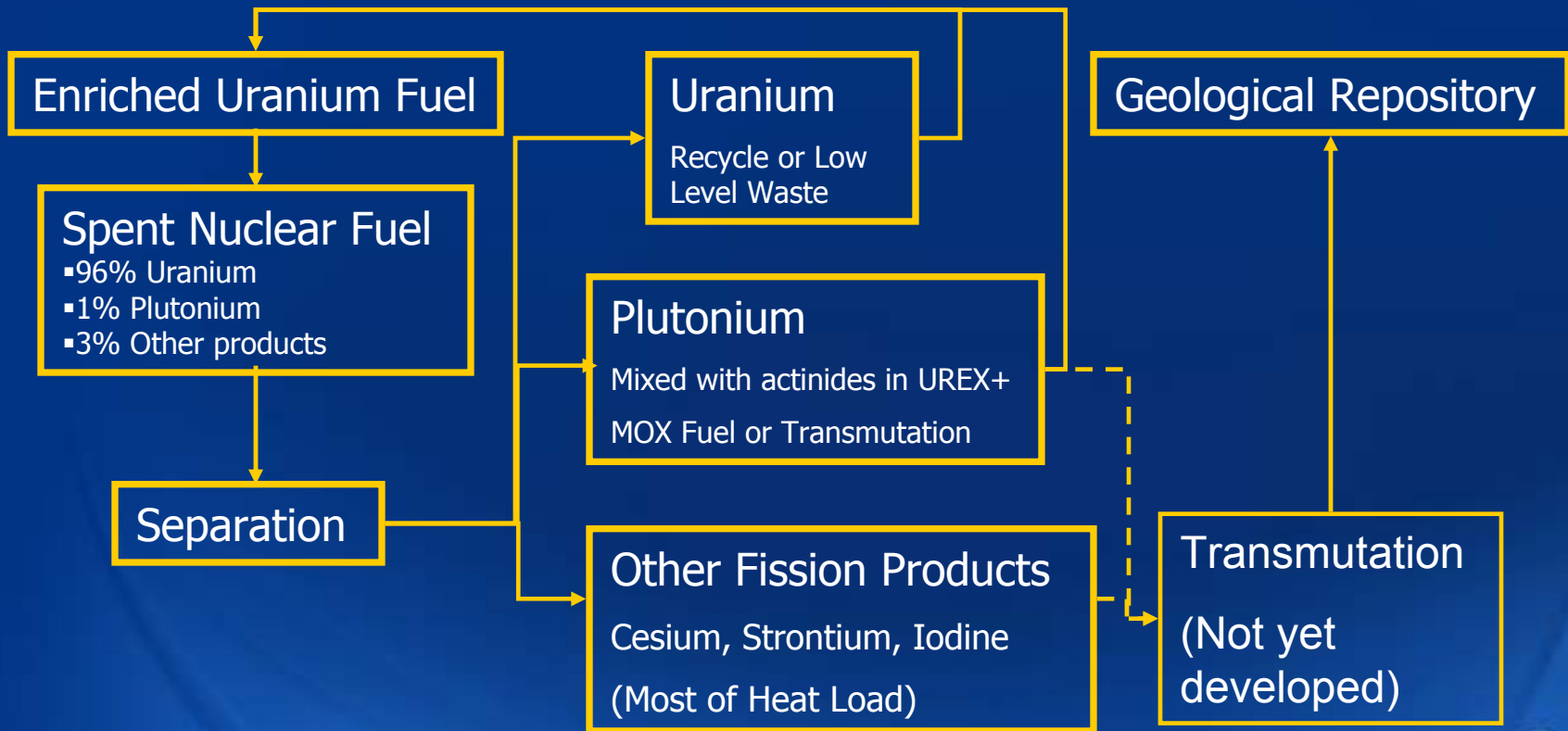
<http://www.lanl.gov/orgs/d/d5/images/sequayah.jpg>

Spent Nuclear Fuel

- 96% Uranium
- 1% Plutonium
- 3% Other products

Interim Storage/
Geological Repository

France: The Closed Fuel Cycle (PUREX)



Reprocessing Policy History

- Developed in the US during the 1950s
- 1977: President Carter deferred reprocessing
 - Proliferation risks
- 1980s: President Reagan reversed directive
 - No longer competitive

Recent Developments

- 2001: Bush Administration rethinking reprocessing policy
- House Science Energy Subcommittee
 - Held two hearings on reprocessing since June 16, 2005

Economics of Spent Fuel Reprocessing

- PUREX: 4x Volume Reduction
 - 10% repository savings
- PUREX adds 10% to electricity price
- Transmutation: 100x repository savings

Transmutation Economics

- BENEFITS

- Would severely delay need for more repositories
- Could transmute 87,000 tons of spent fuel
- Reduces spent fuel radiation hazards

- COSTS

- Estimated \$280 billion over 120 years
- Includes \$2 billion in R&D

Proliferation Risks

- PUREX Technology
 - Intermediate pure plutonium step could be exploited
- Sophisticated weapons technology needed to deploy plutonium weapon
- UREX+ Technology
 - Mixes plutonium with other actinides

Proliferation Results of 1977 Presidential Directive

- Has not stopped other nations from reprocessing
- North Korea claims to have reprocessed enough SNF to make 5-6 weapons
- By losing its edge in the technology, the U.S. lost more security

Analysis

Short Term

More expensive
Sufficient uranium
resources



Long Term

Fossil fuel prices will
increase
Uranium price increase
Waste solution must be
dealt with
Improve nonproliferation
regime

Recommendations

1. Do not immediately begin reprocessing
2. Aggressively fund reprocessing and transmutation R&D
3. Do not deploy until economic and proliferation resistant
4. Collaborate with other nations that already have reprocessing

Reprocessing Affects Everyone

- Industry
 - Disposal cost decrease
- Government
 - Provide an energy solution
- Public
 - Energy security
 - Increased proliferation security

Questions?

