Report of the ANTT Subcommittee of NERAC

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- Last meeting of the subcommittee: February 25-26, 2002.

- Comprehensive review of the status of the program.

- This report defines the three-phase program:

  - Proof of potential utility.
  - Proof of technical feasibility.
  - Proof of demonstration project operability.

Phase I

- **Cost**

  About $60 million for the first two and a half years.

  About $80 million to the end of FY2002

- **Criteria 1– Radiological Impact: less than ore in**

  < 10,000 years for 1% “leakage.”

  < lifetime of pyramids for ½%.

- **Criteria 2 – Repository: Yucca Mountain full with spent fuel produced by 2015**

  Transmutation reduces volume by four times and the weight by twenty times. Continue nuclear power and save the cost of three Yucca Mountains.

- **Criteria 3 – Proliferation: Once through implies continuous buildup of Pu inventory.**

  Transmutation stabilizes Pu at lower level.

Isotopic Mix

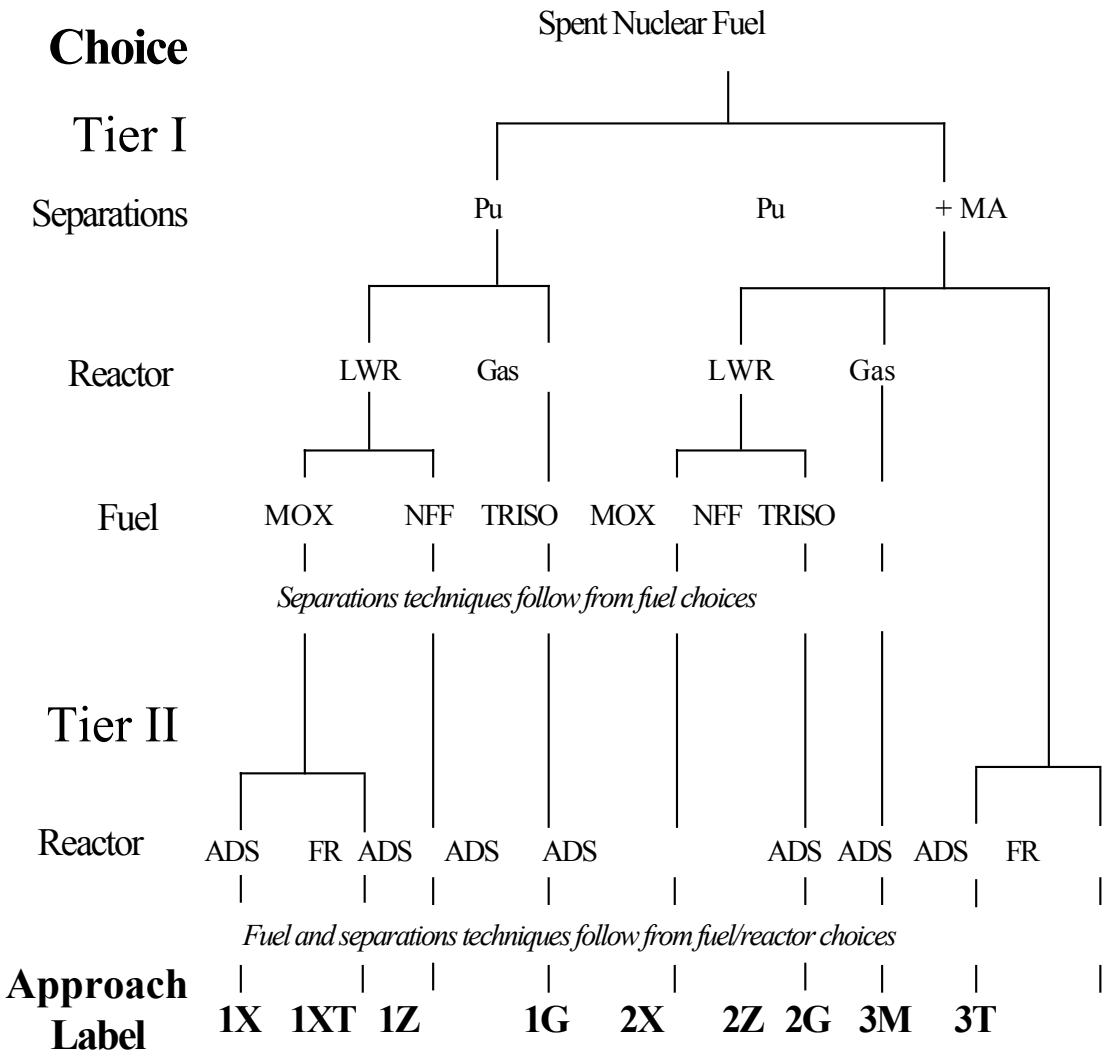
Isotope	Weapons Grade (%)	LWR Output (%)	STD.MOX Output (%)	Multicycle 70% Burn (%)	Lifetime Years
Pu-238	0	2	4	9	82
Pu-239	94	59	40	8	24,000
Pu-240	6	24	33	36	6,500
Pu-241	0	11	13	21	14
Pu-242	0	5	9	26	400,000

- Criteria 4 – Benefits to nuclear power:

  Reduction of concern re spent fuel.

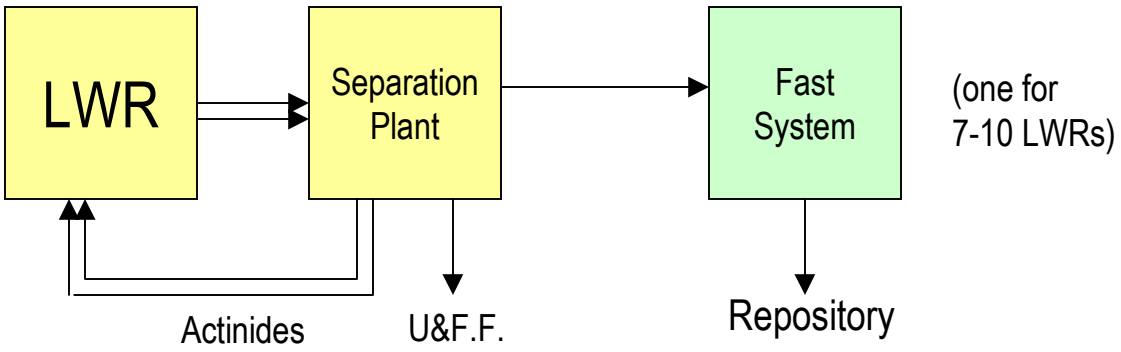
  Economics not yet known. French estimate is a few per cent to 15%.

Old Choice Tree (10-2001)



System Choices Have Been Made

- The leading option is a multiple recycle in LWR



- Questions:
  - Do minor actinides stay with Pu all the time?
  - Does Pu and minor actinides have to be treated separately in the final stage?
  - How is Generation-IV integrated?

- Note on international collaboration: DOE and labs estimate avoided costs as $100 million up to now.
- Note on education: About 100 students are or have been involved in Phase-I.

Phase II

- Not yet in a position to estimate life cycle costs as requested by Congress.
- A rough estimate to deployment:
  - $4 billion for fast reactor back end.
  - $7 billion for accelerator driven back end.
- Need a second phase focused on fuels, separation and systems studies: five to six years; $500 million.
- Issues:
  - Reprocessing system “leakage” to waste stream?
  - Fuels: Metallic, oxide, nitride?
  - Pu and minor actinides together or separate?
- If successful, set the stage for Phase III.

Phase III

- This is where the big money is: $4 to $7 billion.

- Needed: a scalable demonstration
  - Processing
  - Separation efficiency
  - Fuel fabrication
  - Proof of operability
- Fifteen years:
  - Perhaps less for a fast reactor
  - Perhaps more for an ADS.

- Broad international interest exists: France, Japan, Korea, Russia.

A Final Note

- It is time for DOE, the Administration, and Congress to decide if the potential benefits are worth the risk of Stage II -- $500 million.

- The program needs some stability in funding if it is to be pursued in a coherent fashion.