U.S. DEPARTMENT OF ENERGY | Nuclear Energy

Advanced Nuclear Fuel Cycle Isotope Needs

Workshop on Isotope Federal Supply and Demand

James C. Bresee, ScD, JD

January 11-12, 2012

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Scale of Fuel Cycle Research and Development Reduces Isotope Requirements

- During the past several years, the focus of fuel cycle R&D programs has changed from near-term to longer term
- The expected date for commercial-scale implementation has changed from the 2020s to mid-century
- Pilot plant-scale testing has also been substantially delayed
- The current focus is on laboratory-scale experimentation, seeking to understand the underlying scientific principles for the observed properties of various parts of the fuel cycle
- Such fundamental studies generally require relatively small quantities of specific isotopes, often at the micro-curie level and usually less than a gram

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Scale of Fuel Cycle Research and Development Reduces Isotope Requirements

- Similar science-based studies have been conducted by the university research community and in industrial laboratories, resulting in the establishment of a commercial market for small quantities of isotopes
- The following table provides examples of quantities of currently specific isotopes used in fuel cycle research studies

U.S. DEPARTMENT OF ENERGY
Nuclear Energy

Advanced Fuel Cycle R&D Typical Isotope Requirements

Isotope	Research or Applied	User (DOE, Agency, Nat'l Lab, Univ., others)	Intended Use	Purity and/or Specifications (Purity)	Physical Form	Qty. FY 12	Qty. FY 13	Qty. FY 14	Qty. FY 15	Qty. FY 16
Pm-147	Research	Nat'l Lab	Aqueous Separation Research	>99%	Liquid	100 µCi	100 µCi	100 µCi	100 µCi	100 µCi
U-233	Research	Nat'l Lab	Aqueous Separation Research	>99%	Liquid	1 µCi	1 µCi	1 µCi	1 µCi	1 µCi
Eu-151	Research	Nat'l Lab	Target for Eu-152 Preparation	>95%	Solid Oxide	1 g	1 g	1 g	1 g	1 g
Cm-244	Research	Nat'l Lab	Alpha Radiolysis	99+%	Solid Nitrate		0.1 mg		0.1 mg	
Pu-242	Research	Nat'l Lab	Aqueous Separation Research	95+%	Solid Nitrate	25 mg	25 mg	25 mg	25 mg	25 mg
Am-243	Research	Nat'l Lab	Aqueous Separation Research	95+%	Solid Nitrate	10 mg	10 mg	10 mg	10 mg	10 mg