U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Reprocessing And Recycling: Environmental Protection

U.S. Nuclear Regulatory Commission
Reprocessing Workshop
September 7th and 8th
Rockville, MD

Several Aspects To Environmental Protection

- NEPA Requirements
  - EIS required for rulemaking
  - May generate a topical report or BTP as a precursor
- Effluents/Emissions (current focus)
- Other aspects
  - For example, confinement/containment, filters/types

Effluents And Emissions

- Limits established by the EPA in 40 CFR 190
  - NRC regulates to the EPA limit via Part 20
- Dose Limits relatively low
  - Based upon individual health impact
  - 25/75/25 mrem/yr whole body/thyroid/other organs
    - 1 chest x-ray is about 10 mrem
    - moving to Denver from Washington DC is about 200 mrem/yr
  - Easily met by modern, commercial reprocessing facilities
- Quantity (radioactive – curie) limits more difficult to ascertain and meet
  - Based upon collective exposure of populations
  - Very small doses to very large populations
  - This “microdoses to megapopulations” may overstate the impacts

EPA 40 CFR 190 Limits Apply To Entire Fuel Cycle And Power Reactors

Essentially all of the releases would come from reprocessing operations

Annual Dose Equivalent Limit, mrem/yr	
Whole body dose	25
Thyroid	75
Any other organ	25

Isotope	Limit	Potential Emission
Kr-85	50,000 Ci/Gwe-yr	300,000
I-129	5 milliCi/ Gwe-yr	1,000
Pu-239 and other alpha-emitting TRU	0.5 milliCi/Gwe-yr	< 0.5 (met)

Basis For EPA Quantity (curie) Limits

- Population (Collective) dose
- 1,000 GWe nuclear power (10 times actual value)
- 25 1,500 MTIHM/yr reprocessing plants (actual value is zero)
- Relatively short cooling times before reprocessing (1-5 years; current practice is 4-5 years)
- Land-locked site (current practice is coast-based)

Analysis

- Some emission control technologies add potential hazards (e.g., voloxidation, krypton and tritium capture)
  - Do benefits outweigh the risks?
- Use of old SNF reduces Kr and T significantly
  - Significant quantity of SNF > 30 years after discharge
  - Reduces Kr and T by circa 90%
  - Loses fuel value of Pu-241 and increases Am-241 (recycle/disposal)
- Iodine limit based upon many assumptions, some of which may not be valid today

Any Specific Requirements For Environmental Protection?

- Technologies
  - Confinement/containment
  - Filtration
- Performance-based
  - Minimum decontamination factors
- ALARA

Potential Points For Discussion

- Specific environmental topics or topical reports
- Potential sources of data and analyses
- Approaches, assessments, or methodologies to use
- Siting attributes (e.g., coast vs desert, humid vs arid)
- SNF time, aging, or other requirements
- Technology or performance requirements