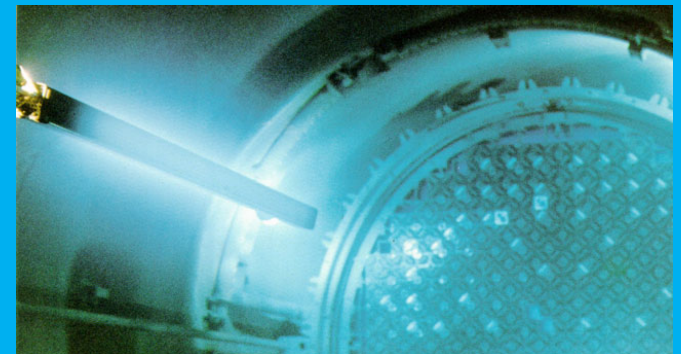




Reprocessing And Recycling: Regulatory And Licensing Framework Discussion

U.S. Nuclear Regulatory Commission
Reprocessing Workshop
September 7th and 8th, 2010
Rockville, MD



Reprocessing And Recycling

(context from NUREG-1909)

- **Reprocessing**
 - Also termed processing or separations
 - Dissolves SNF and separates SNF constituents
 - Recovers potentially useful constituents
 - Fuel materials (U, Pu for LWRs, and TRUs for advanced reactors)
 - Potential for others (e.g., Cs, Xe, Ru/Pt)
 - Removes and conditions wastes
 - Processes highly radioactive and self-heating materials
- **Recycling**
 - Converts recovered useful constituents into reusable items (e.g., MOX fuel assembly for LWRs) and avoid SNM accumulation and inventory
 - Potentially involves more separations and blending
 - Processes materials less radioactive and less self-heating
 - Usually represents last operations in a reprocessing facility

Atomic Energy Act (AEA), As Amended



- Defines production facility
- Reprocessing facilities meet the definition of a production facility
 - “... facility ... separation of isotopes of plutonium ...”
 - “... process irradiated materials containing special nuclear material ...” [e.g., plutonium, uranium-233, uranium enriched in U-233 or U-235]
- Identifies minimum requirements for reprocessing facilities, which are codified in 10 CFR 50 (e.g., 50.34, 50.36, Appendices A, F etc.)
- Nuclear power reactors are also regulated by Part 50
- Special Nuclear Material is regulated by Part 70

Main NRC Regulations For Reprocessing/Recycling – R&R (today)

Part 50

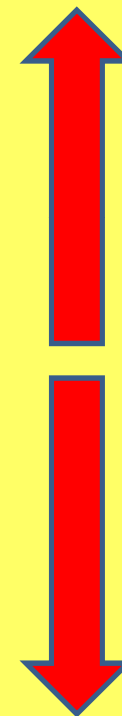
- Production facilities (this context): processing irradiated materials containing SNM
- Reprocessing facilities are production facilities
- Deterministic, DBAs, adjust via PRAs
- GDCs, tech specs, source term, QA, ALARA
- Focus has become LWRs
- **Current regulation for R&R**

Part 70

- SNM – Special Nuclear Material
- Process non-irradiated materials containing SNM
- Includes enrichment, fuel fab., and MOX facilities
- Risk informed via ISA
- Most licenses and applications involve LEU processing
 - One involves MOX
 - Two involve HEU

NRC's Focus Is Safety: Relative Hazards/Consequences

Material	Relative Inhalation Dose/mass
LEU, 5% U-235	1
U-235, 100%	5
MOX, 5% Pu-239, 95% U-238	19,000
MOX, 5% Puf, Weapons-grade Pu	25,000
Fission Products – Cs + Sr	41,000
SNF – Cs, Sr, U, TRUs	220,000
MOX, 5% Puf, Reactor Pu	230,000
MOX, 5% Puf, Reactor Pu, 0.25% Am	310,000



More Like Part 70

More Like Part 50

SNF, FPs based upon 60,000 MWD/MTIHM Burnup

One-Step Or Two-Step Licensing

- Part 50 is based upon two-step licensing
 - Construction Permit, followed by
 - Operating License
- Part 50/52 combination allows one-step licensing
 - Combined construction permit and operating license
 - Also includes ESP, design certification, ITAAC
- Part 70 allows one or two-step licensing; for two-step:
 - Construction Permit, followed by
 - Possession and Use license

Reprocessing And Recycling Technology



- Existing, overseas commercial scale technologies
 - Use aqueous dissolution followed by decontamination
 - Separates and decontaminates based upon partitioning between aqueous and immiscible solvent phases
 - Optimizations of the PUREX process
- Laboratory or pilot-scale processes
 - Several aqueous, some non-aqueous processes (e.g., pyrochemical, electrorefining)
- Potential domestic commercial reprocessing facilities might use additional modifications of PUREX or pyrochemical processes

Potential Points For Discussion

- Regulate more like a reactor (Part 50)
- Regulate more like a fuel cycle facility (Part 70)
- New or modify existing regulation
- One step or two step licensing, or option
- Should other licensing options be included, such as ESP, certification etc.?
- Level and type of design information, and detail in application(s) and technical parts of SARs
- Balance between regulations and guidance
- Inspections, ITAACs etc.
- Technology neutral, technology specific, or a blend