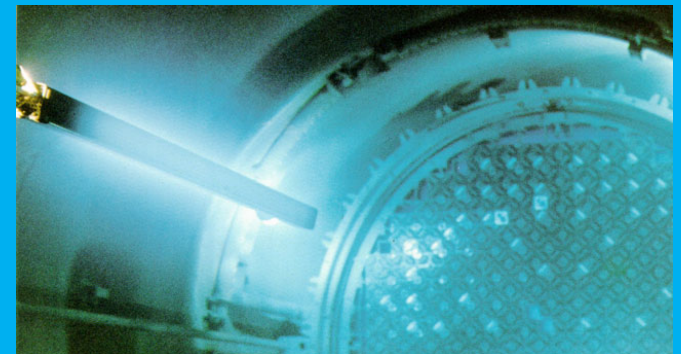




# Reprocessing And Recycling: Regulatory And Licensing Framework Discussion

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



# Reprocessing And Recycling

(context from NUREG-1909)

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- 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

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- 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)

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## Part 50

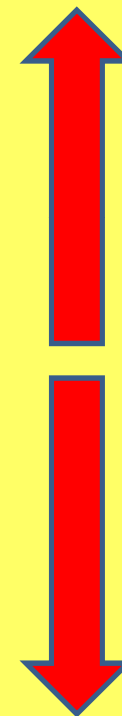
- Production facilities (this context): processing irradiated materials containing SNM
- Reprocessing facilities are production facilities
- Deterministic, DBAs, adjust via PRAs
- GDCs, tech specs, source term, QA, ALARA
- Focus has become LWRs
- **Current regulation for R&R**

## 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

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- 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

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- 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