

# **Safety and Licensing Consideration (Gaps 5, 7, 9, 10, and 11)**

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**Reprocessing Public Meeting  
June 21, 2011**

# Gap 5: Safety and Risk Assessment Methodology

- NRC's regulations require licensed facilities to demonstrate adequate assurances of safety, limiting risk to acceptable levels
- Existing regulations in 10 CFR Parts 50 and 70 do not adequately address the potential hazards, consequences, and risks of reprocessing facilities
  - Potential source terms (e.g., fission products and actinides), number of scenarios, and sequence consequences are greater than existing fuel cycle facilities
  - Given these potential risks, the existing requirements solely based on the integrated safety analysis (ISA) approach of 10 CFR Part 70 may not be adequate



## Gap 5: NRC Staff Position

- Incorporate quantitative risk assessment in safety evaluations, through hybrid approach that includes ISA and probabilistic risk assessment methodologies
  - Use ISA to identify and categorize accident sequences
  - Use probabilistic risk assessment methodologies (to the extent practicable) to evaluate high consequence and very high consequence events
  - Apply safety controls (items relied on for safety) to reduce total risk
  - Reduce risks as needed to meet the appropriate NRC risk limits/criteria
  - Minimize total risks to receptors by applying As Low As Reasonably Achievable (ALARA)/As Low As Reasonably Practicable (ALARP)
  - Identify general design criteria/controls to meet ALARA/ALARP

## Gap 5: NRC Staff Position (cont'd.)



- The staff also anticipates
  - Recommending requirements analogous to 10 CFR 70.23(a)(3) and (a)(4) for high consequence and very high consequence events
  - Developing guidance to support application quantitative risk assessment methodologies



# Gap 5: NRC Staff Position (cont'd.)



|             |                     | Likelihoods ( /yr)            |                          |   |                       |
|-------------|---------------------|-------------------------------|--------------------------|---|-----------------------|
|             |                     | Very Highly Unlikely<br><1e-6 | Highly Unlikely<br><1e-5 | Unlikely<br><1e-4                           | Not Unlikely<br>>1e-4 |
| Consequence | VHCE<br>(Very High) | Acceptable                    | Not Acceptable           | Not Acceptable                              | Not Acceptable        |
|             | HCE<br>(High)       | Acceptable                    | Acceptable               | Not Acceptable                              | Not Acceptable        |
|             | ICE<br>(Inter.)     | Acceptable                    | Acceptable               | Acceptable<br>(requires more documentation) | Not Acceptable        |
|             | LCE<br>(Low)        | Acceptable                    | Acceptable               | Acceptable                                  | Acceptable            |

# Gap 5: Previous Stakeholder Input

- The Advisory Committee on Reactor Safeguards (ACRS) White Paper (NUREG-1909)
  - In favor of using probabilistic risk assessment over ISA
  - Recommends formulating ALARA requirements that establish design objectives
  
- NEI Paper, “Integrated Safety Analysis: Why It Is Appropriate For Fuel Recycling Facilities,” September 2010
  - In favor of using ISA with a quantitative assessment of fission product releases to members of the public for high consequence events, based on availability of data
  
- General Electric-Hitachi Industry Paper, “Applying Nuclear PRA to a Nuclear Fuel Facility Integrated Safety Analysis”
  - Discusses use of probabilistic risk assessment methodologies based on related nuclear industry data

# Gap 7: Licensed Operators and Criteria for Testing and Licensing Operators

- The Atomic Energy Act of 1954, as amended, requires production facilities to have licensed operators (42 USC 2137)
- The current NRC regulations in 10 CFR Part 55—Operator’s Licenses are not applicable, in whole, to operators of reprocessing facilities
- The NRC staff is developing a regulatory framework to establish regulations for licensed operators and criteria for testing and licensing operators



# Gap 7: NRC Staff Position

- Apply a risk-informed and performance-based approach to determine which personnel (including senior operators) need to be licensed and the requirements for their licensure
- Personnel whose actions are clearly related to safety, such as preventing or mitigating very high consequence events, will be licensed by NRC
- Include requirements similar to 10 CFR Part 55 approach for a systems approach to training, tests, simulation facilities, requalification, and roles and responsibilities





# Gap 7: Previous Stakeholder Input



- NEI White Paper, “Regulatory Framework for Recycling Nuclear Fuel,” addresses operator licensing
  - Recommends operators be certified by the facility licensee according to an NRC-approved program
  - Defines certified operators for possible fission product releases to members of the public for high consequence events
  - No senior operators

# Gap 9: General Design Criteria

- NRC establishes minimum requirements for proposed facilities or applications of licensed radioactive materials provide assurance that
  - Important to safety structures, systems, and components will have the ability and reliability to perform their intended safety functions
  - Uncertainties and errors, from design and analysis and from unknowns, are adequately addressed
  - There is adequate defense in depth, redundancy, and diversity
  - Balance of plant and unanalyzed situations do not negatively impact safety
  
- General design criteria currently do not exist for reprocessing facilities

# Gap 9: NRC Staff Position

- NRC staff proposes 10 categories for general design criteria:

Overall  
Confinement and Containment  
Process Safety  
Criticality Safety  
Siting

Radiological Protection  
Physical Security  
Material Control & Accounting  
Fuel and Radioactive Waste,  
Decommissioning

- The NRC staff identified 78 potential general design criteria within these ten categories



# Gap 9: Previous Stakeholder Input

- NEI proposed 28 General Design Criteria (2008 White Paper)
  - Largely from 10 CFR Part 50 for nuclear power plants
  - Some additions from 10 CFR Parts 70 and 72
  - Proposed thresholds for applicability of some general design criteria
  - Applicant to explain how general design criteria are addressed to achieve performance requirements
  - Some general design criteria may not be necessary based on ISA results
  
- Other stakeholders input includes
  - Need to minimize regulatory uncertainty on general design criteria
  - Establish general design criteria by regulation, not guidance

# Gap 10: One-Step Licensing and Inspection Testing and Acceptance Criteria (ITAAC)

- Currently, there are no regulations for one-step licensing, combine license (COL) of a reprocessing facility
  - 10 CFR Part 52 does not apply to spent nuclear fuel reprocessing facilities
  - Requirements for approval of applications for domestic licensing of special nuclear material in 10 CFR 70.23 do not address reprocessing facilities



# Gap 10: NRC Staff Position

- General license authority similar to nuclear power plant requirements of 10 CFR Part 52
- One-step licensing process for reprocessing facilities will include inspection process (ITAAC or ITAAC-like) to confirm the facility meets the design, construction, and licensing requirements
- The proposed regulation will provide requirements and procedures for NRC to issue an early site permit that could be referenced in COL
- Reserve areas in the regulation for technology-specific requirements for particular technologies, such as aqueous and electro-chemical processes

# Gap 10: Previous Stakeholder Input



- NEI White Paper, “Regulatory Framework for Recycling Nuclear Fuel,” includes a framework that could allow an applicant the flexibility for either a two- or one-step licensing process
- Industry has expressed interest in a one-step approach with the flexibility for a two-step licensing process

# Gap 11: Technical Specifications

- The Atomic Energy Act of 1954, as amended, requires technical specifications for production facilities (42 USC 2137)
- 10 CFR Part 70 does not require technical specifications
- The IROFS to be addressed by technical specifications need to be established for new 10 CFR Part 7X regulation





# Gap 11: NRC Staff Position

- Define safety limits and limiting control settings, limiting conditions of operation, surveillance requirements, and design requirements for IROFS that address very high consequence accident sequences
- Additional technical specifications may be needed to ensure safe operation within the bounds of the safety analysis (e.g., spent fuel burn-up limits and effluents), as well as administrative/programmatic technical specifications



# Gap 11: Previous Stakeholder Input



- NEI White Paper, “Regulatory Framework for Recycling Nuclear Fuel,” recommended technical specifications of items relied on for safety for high consequence events involving fission product releases to an individual located outside the controlled area

# Conclusion

- Gap questions provided in handout material

