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

<table>
<thead>
<tr>
<th>Annual Dose Equivalent Limit, mrem/yr</th>
<th>Isotope</th>
<th>Limit</th>
<th>Potential Emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole body dose</td>
<td>Kr-85</td>
<td>50,000 Ci/Gwe-yr</td>
<td>300,000</td>
</tr>
<tr>
<td></td>
<td>I-129</td>
<td>5 milliCi/Gwe-yr</td>
<td>1,000</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Pu-239 and other alpha-emitting TRU</td>
<td>0.5 milliCi/Gwe-yr</td>
<td>&lt; 0.5 (met)</td>
</tr>
<tr>
<td>Any other organ</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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