Reprocessing And Recycling: Safeguards and Security

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

- 10 CFR 73 – Physical Protection Of Plants And Materials
- 10 CFR 74 – Material Control And Accounting [MC&A] Of Special Nuclear Material
SNM
Special Nuclear Material

• SNM comprises:
  – Plutonium
  – Uranium-235
  – Uranium-233

• NRC divides SNM into three categories, for security and MC&A, based upon potential for:
  – Direct use for nuclear fissile explosive
  – Indirect use – for the production of materials to be used for a nuclear fissile explosive

• Categories based upon:
  – Mass quantities
  – Enrichment levels (for U-235)
# Three SNM Categories (defined in 73.2)

<table>
<thead>
<tr>
<th>Nuclide and % Enrichment Level</th>
<th>Category I</th>
<th>Category II</th>
<th>Category III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plutonium</td>
<td>≥ 2 kgs</td>
<td>&lt; 2 kgs and &gt; 500 g</td>
<td>≤ 500 g and &gt; 15g</td>
</tr>
<tr>
<td>Uranium 235 ≥ 20%</td>
<td>≥ 5 kgs</td>
<td>&lt; 5 kgs and &gt; 1 kg</td>
<td>≤ 1 kg and &gt; 15g</td>
</tr>
<tr>
<td>Uranium 235 &lt; 20% &amp; ≥ 10%</td>
<td></td>
<td>≥ 10 kg</td>
<td>&lt; 10 kg and &gt; 1 kg</td>
</tr>
<tr>
<td>Uranium 235 &lt; 10% &amp; &gt;Natural</td>
<td></td>
<td></td>
<td>≥ 10 kg</td>
</tr>
<tr>
<td>Uranium 233</td>
<td>≥ 2 kgs</td>
<td>&lt; 2 kgs and &gt; 500 g</td>
<td>≤ 500 g and &gt; 15g</td>
</tr>
</tbody>
</table>
Current Material Categorization for Materials Involved in Reprocessing and Recycling

- All current U.S. nuclear power reactor fuels are Category III materials
- Reprocessing and recycling would introduce plutonium and other TRUs
  - Fuels containing >2 kg Pu would be Category I regardless of isotopes, form, or the presence of other materials (i.e., different “attractiveness”)
  - Other TRUs (e.g., Np, Am) have SNM-like characteristics
- Current regulations do not consider the other TRUs
- Pu is categorized without consideration of form or isotopic composition
Reprocessing Exclusion

• 10 CFR Part 74.51 currently excludes reprocessing facilities from Category I MC&A requirements
  – Thus, Category I reprocessing facilities would not have the same MC&A requirements as other Category I materials

• Appropriate and predictable requirements are needed
Potential Points For Discussion

• Risk informing Parts 73 and 74
• Include a gradient or attractiveness levels
• Alternate diversion path analyses
## Key Security Requirements - FCFs

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>DBT/ FoF</th>
<th>Fixed Site Rule</th>
<th>Trans. Rule</th>
<th>Post 9-11 Orders</th>
<th>Key 10 CFR Requirements for Fixed Sites</th>
</tr>
</thead>
</table>
| Category I    | Yes     | 10 CFR 73.45, 73.46 | 10 CFR 73.25, 73.26 | Yes | Broad performance requirement (73.45)  
Armed security organization w/Appendix B training  
Physical fitness standards  
Tactical Response Team (TRT)  
Physical barrier systems for PA, MAAs, vaults  
Isolation zones for PA, with illumination  
Vaults for material storage  
Tamper indicating containers  
Access controls, access authorization to PA, MAA; 2-person rule in MAAs  
Badging system  
Vehicle access control, entry / exit search  
Enter/exit search of personnel and packages  
Drum scanning of waste  
Separate shipping, waste packaging areas  
Escorts for visitors, visitor log  
Key, lock and combination control  
Alarmed MAA and vault when unoccupied  
CCTV on vaults, elsewhere  
CAS/ SAS  
Back-up power  
Dual communications capability  
Contingency plan per Appendix C  
Deadly force policy |
| Category II   | No      | 10 CFR 73.67 (d) | 10 CFR 73.67 (e) | No | Use and store material in CAA  
Monitor CAA with intrusion alarm  
Conduct screening prior to access  
Badging / lock system  
Access control to CAA  
Escort visitors  
On-site watchperson(s) with at least one responder  
Communications to responders  
Written response procedures |
| Category III  | No      | 10 CFR 73.67 (f) | 10 CFR 73.67 (g) | Yes | Store material in CAA  
Monitor CAA with intrusion alarm  
Watchperson or offsite response force  
Written response procedures |
Part 50:
Previously Proposed Appendix Q

- Proposed GDC for physical protection and MC&A of reprocessing facilities
- 50.34(a)(3) (i) footnote: “GDC for chemical processing facilities are being developed”
- “Design Criteria for Protection of Fuel Reprocessing Plants and Licensed Material Therein”
  - 39 Federal Register 26296, July 18th, 1974
  - Indefinitely deferred on April 19th, 1984 until needed for NRC’s regulation of a reprocessing facility (49 Federal Register 16699, April 19th, 1984).
- 19 GDC in 3 categories