Purpose

• To fulfill the Nuclear Materials Committee Work Plan topic

• Address a request from the Nuclear Materials Committee / CAB
Risk Analysis

• Documented Safety Analysis (DSA)
  – Facility Hazard Categorization
  – Hazard Analysis
    • Scenario development / event progression
    • Material–at-risk / source term analysis
    • Prevention features
    • Frequency binning
    • Mitigation features
    • Consequence analysis
  – Identification of controls to prevent occurrences and mitigate consequences
  – Defines risk and ensures within established evaluation guidelines
Potential Initiating Events

- Fire
- Explosion
- Loss of Containment / Confinement
- Direct Radiation Exposure
- Nuclear Criticality
- External Events
- Natural Phenomena (e.g., seismic, tornado, wind)
Accident Prevention - Examples

• Engineered Controls
  – Building structure
  – Storage rack and fuel bundle designs
  – Cask design
  – Fuel & cask handling equipment

• Administrative Controls
  – Combustible / flammable / explosive control programs
  – Hoisting & rigging program
  – Highly structured procedures
  – Personnel training & qualification
Consequence Mitigation - Examples

• **Engineered Controls**
  – Area radiation monitoring system
  – Basin water level
  – Shielding
  – Fire water supply

• **Administrative Controls**
  – Fuel receipt & shipping program
  – Emergency response
  – Fire department and manual fire fighting
  – Procedures & training
Results of Postulated Accident Scenarios – L Area

<table>
<thead>
<tr>
<th>Accident</th>
<th>Offsite Dose (mrem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire on -40’ Level</td>
<td>6.5</td>
</tr>
<tr>
<td>Bounding Facility Fire</td>
<td>22.5</td>
</tr>
<tr>
<td>Fire-Induced Criticality</td>
<td>41</td>
</tr>
<tr>
<td>Process-Induced Criticality in Disassembly Area</td>
<td>8.3</td>
</tr>
<tr>
<td>Wildland or Post-Seismic Initiated Fire</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Contributors to postulated fire-induced criticality accident (mrem):
- Bounding disassembly area fire 31
  - Dry fuel storage
  - Deionizers and filters
  - Radioactive waste
- No contribution from underwater fuel
- Evaporated basin water 1.6
- Criticality 8.3
  41
Mitigated Offsite Consequence (mrem)

Comparison of Nuclear Material Disposition Facilities to DOE Guides

- DSA Evaluation Guideline: 25,000
- New Design Evaluation Guideline: 5,000
- L Area: 41
- K Area: 28
- H Canyon: 360
- HB Line: 1,790

Note: Natural background, USA = 310 mrem/year
Risk from Spent Nuclear Fuel & Plutonium Storage

- None of the analyzed accident scenarios result in damage to or release of radioactive material from the entire inventory of stored nuclear material, thus
- Results of consequence analyses are not affected by the total inventory of stored nuclear material
- Offsite consequences for bounding accidents are categorized as “negligible” (SCD-11) and are unaffected by quantity of stored nuclear material
Nuclear Materials Management