Integration of EM Activities at the INEL

June 6, 1995

National Waste Technical Review Board

LOCKHEED MARTIN
Lockheed Martin Idaho Technologies
What Was Accomplished

- Achieved an integrated solution for INEL EM activities
- Developed an analytical tool to evaluate alternatives
- Result – does more, life cycle costs less
Governing Criteria

• Address budget realities while meeting environmental regulations

• Achieve real, measurable results
  – Road ready waste, ready for disposal

• Integrate ES&H risk into the evaluation

• Address stakeholder concerns
  – Expeditious site cleanup
  – Move waste out of Idaho
EM Integration
Through Systems Engineering

Prior Approach

- Waste inventory → Technology selection → Facility selection → Disposal
- Waste inventory → Technology selection → Facility selection → Disposal
- Waste inventory → Technology selection → Facility selection → Disposal
- SNF inventory → Technology selection → Facility selection → Disposal

Integrated Solution

- Waste inventory → Multipurpose facility using common technologies → Disposal
- Waste inventory → Multipurpose facility using common technologies → Disposal
- Waste inventory → Multipurpose facility using common technologies → Disposal
- SNF inventory → Multipurpose facility using common technologies → Disposal

Systems Engineering
What Alternatives Did We Consider

• Baseline
  – Treatment plan elements provided as input for Baseline Environmental Management Report

• Full treatment
  – Maximizes volume reduction and stabilization
  – Minimizes characterization and repackaging

• Minimal treatment
  – Allows characterization/repackaging as an option to treatment

• Storage
  – Places waste in compliant storage, defers treatment and disposal until the future
The Alternatives and Crucial State Variables

“Bounding the Problem”

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>S₁</th>
<th>S₂</th>
<th>S₃</th>
<th>S₄</th>
<th>S₅</th>
<th>S₆</th>
<th>S₇</th>
<th>S₈</th>
<th>S₉</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1</td>
<td>5</td>
<td>9</td>
<td>13</td>
<td>17</td>
<td>21</td>
<td>25</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>Full treatment</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>14</td>
<td>18</td>
<td>22</td>
<td>26</td>
<td>30</td>
<td>34</td>
</tr>
<tr>
<td>Minimal treatment</td>
<td>3</td>
<td>7</td>
<td>11</td>
<td>15</td>
<td>19</td>
<td>23</td>
<td>27</td>
<td>31</td>
<td>35</td>
</tr>
<tr>
<td>Storage</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>28</td>
<td>32</td>
<td>36</td>
</tr>
</tbody>
</table>

**Crucial State Variables**
- WIPP availability
- No-migration determination (NMD)
- Yucca Mountain availability
- Acceptability of highly-enriched uranium (HEU) at Yucca Mountain

The Possible Combinations of State Variables Generate Nine Scenarios

Note 1.
The Full Treatment Alternative is insensitive to the no-migration determination. Therefore, case 2 and case 14 are equivalent.
INEL EM Integration Model

Input:
- Material quantity
- ES&H risk
- Cost

Output:
- Waste inventory
- ES&H risk
- Cost

User variables:
- Alternative
- Budget
- Schedule
- etc.

Model:
- Material types
- Quantity
- Storage or Process State
- Time

- Material types
- ES&H risk
- Storage or Process State
- Time

- Material types
- Cost
- Storage or Process State
- Time
Comparative Costs for Full Treatment and Other Alternatives (1995 constant $)
Present Value for Full Treatment and Other Alternatives

Note: Discounting based on OMB guidance circular # A-94
Reduction of Waste/Materials in Idaho
Full Treatment Alternative

Note: 104,000 cubic meters not removed from Idaho under Baseline
Risk Comparison by Alternative

Relative Risk for INEL SNF
Alternative Comparison

Relative Risk for INEL HLW
Alternative Comparison

Relative Risk for INEL Stored TRU
Alternative Comparison

LOCKHEED MARTIN
Lockheed Martin Idaho Technologies
Benefits of Full Treatment

Cost Control
• Eliminates funding peaks
• Saves $7 billion over 35 years compared to Baseline
• Achieves additional cost savings if regional or complex-wide waste streams are integrated

Measurable Results
• Makes major waste streams “road ready” for disposal
  – Satisfies WIPP operations window
  – Sends all SNF/HLW to Yucca by 2050
• Extends repository operating life through volume reduction
• Results in “best” waste form for storage if repositories are delayed; insensitive to WIPP no-migration determination

LOCKHEED MARTIN
Lockheed Martin Idaho Technologies

R95 0627
Benefits of Full Treatment (cont’d)

ES&H Risk Reduction
• Achieved by treatment
• Achieved by disposal to deep geologic repositories

Stakeholder Concerns
• Moves more waste out of Idaho
• Achieves measurable results