SUBJECT: OVERVIEW OF THE REVISED YUCCA MOUNTAIN PROJECT

PRESENTER: STEPHAN J. BROCOUM

PRESENTER'S TITLE AND ORGANIZATION: ASSISTANT MANAGER FOR SUITABILITY AND LICENSING YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE LAS VEGAS, NEVADA

TELEPHONE NUMBER: (702) 295-9611

AUSTIN, TEXAS
APRIL 30 - MAY 1, 1996
Topics to be Discussed

• Background leading to Revised Program Plan
• Rationale for Revised Program Plan
• Integrated planning process
• Project Integrated Safety Assessment
• Summary of Program element focus and changes
Background

- The SCP philosophy was to plan a comprehensive program to account for:
  - Uncertainties in site features and processes
  - The absence of a robust Total System Performance Assessment (TSPA)

- The Project revised this approach in the 1994 Program Plan recognizing:
  - Enhanced understanding of site processes and features and refined TSPAs
  - Limited resources
The Program Plan of 1994 reflected
- Emphasis on data synthesis and documentation to better focus data collection
- Enhanced integration through consolidation of the Labs and other technical contractors
- Milestones to demonstrate clear and measurable progress in site suitability and licensing
Rationale for Revising the 1994 Program Plan

- Programmatic needs and Congressional actions required the Yucca Mountain Project to be refocused
  - Technical rational
    » Existing data and data syntheses allow for a reduction in the overall scope
    » Better understanding exists for what information is necessary to meet Project objectives
  - Regulatory initiatives
    » Need to update regulatory framework to reflect current understanding and Congressional intent
  - Project efficiencies
    » Need to achieve greater efficiencies, a near-term viability assessment, and License Application
Technical Rationale

• Investigations and synthesis of technical data have led to a better understanding of site conditions and processes
  - No major unexpected conditions have been encountered since site characterization began in 1986
  - Tunneling and testing are confirming EA/SCP hypotheses on site conditions

• The Waste Isolation Strategy aids in focusing the testing program on most critical testing to demonstrate pre- and postclosure safety of repository
  - Builds on 15 years of data collection
  - Supported in realistically conservative performance assessments
Technical Rationale 

(Continued)

• Significant progress over the past 18 months
  - Performance assessments demonstrated an increased confidence that Yucca Mountain would contain and isolate radioactive waste under a reasonable EPA standard
    » Disruptive tectonic events are unlikely to adversely impact performance
    » An improved site and engineering database provides more realistic bounding conditions
  - Site hydrologic models indicate groundwater flux is limited at the repository horizon and that infiltration may be diverted laterally away from the repository horizon and vertically along fracture zones
  - Underground observations have increased our confidence in constructability and existing geologic characteristics
EA/SCP Cross Section of Yucca Mountain (1984)

WEST

QAL ALLUVIUM
TCw TIVA CANYON WELDED UNIT
PTn PAINTBRUSH NONWELDED UNIT
TSw TOPOPAH SPRING WELDED UNIT
CHn CALICO HILLS NONWELDED UNIT
CFu CRATER FLATS (Undifferentiated) UNIT

EAST

LIQUID-WATER FLOW
WATER-VAPOR FLOW
NORMAL FAULT
WATER TABLE
POSSIBLE PERCHED-WATER ZONE
SATURATED ZONE
UNIT UNCERTAIN
CONCEPTUAL MOISTURE FLOW SYSTEM

TCw  Tiva Canyon Welded Unit
PTn  Paintbrush Nonwelded Unit
TSw  Topopah Spring Welded Unit
CHn  Calico Hills Nonwelded Unit
CFu  Crater Flats (Undifferentiated) Unit

Liquid Water Flow
Water-Vapor Flow
Normal Fault
Water Table

WEST  EAST

RUNOFF  EVAPOTRANSPIRATION

Discontinuous Perched Water

Saturated Rock

Upper Repository Block
Lower Block

WEST  EAST
Regulatory Initiatives

• The regulatory framework needs to be updated to ensure a clear focus on health and safety aspects at Yucca Mountain
Regulatory Initiatives

(Continued)

• In response, DOE has taken the following actions:
  – Recommendations to the EPA on a revised standard
    » Clearly define policy and technical considerations
    » Provide appropriate degrees of conservatism to protect public health and safety
  – Plan to propose changes to 10CFR960 that focus on system performance
  – Planning to discuss with the NRC
    » Possible changes to 10CFR60
    » Process of regulatory reviews
DOE Recommendations to EPA

- DOE recommends a site-specific standard
  - Time frame for compliance
    » 10,000 years
  - Exposure Limit
    » Risk limit based on $10^{-4}$ to $10^{-5}$ fatal cancers per year
    » Dose limit on the order of 100 mrem/year
  - Define reference biosphere
    » Critical population based on current characteristics
Potential 10CFR960 Revisions

- Streamline compliance process to focus on aspects most important to protect health and safety at Yucca Mountain
- Focus on system performance guideline approach
  - Postclosure systems guideline
  - Preclosure radiological safety
Suggestions for NRC on 10CFR60

• DOE is considering making suggestions for modifications to 10CFR60
  – Focus on total system performance

• DOE philosophy for interactions with NRC
  – Focus on issues significant to performance
  – Request timely feedback on regulatory sufficiency
  – Viability Assessment is not a licensing document
  – Ensure actions planned are sufficient for developing a docketable License Application
Project Management Efficiency

• As part of the effort to streamline project management, a revised planning process was initiated that focuses on enhanced integration

• This revised planning process is iterative and interactive between DOE and its contractors and among all technical disciplines
  – Provides detailed guidance from DOE to its contractors
  – Ensures proactive DOE management involvement
  – Ensures that all upper-level activities and milestones are logically tied and the lower-level activities can be directly related to the upper-level milestones
YMSCO Integrated Planning Process

- DOE steering committee provides planning guidance and Program Summary Schedule
- M&O provides detailed annual and long-range planning that is resource-loaded for review and acceptance by DOE
- DOE/PMO support team provides support to Steering Committee and guidance to M&O Planning Integration Team
Revised Program Plan

• The Revised Program Plan
  – Identifies the Project Integrated Safety Assessment (PISA) document that integrates technical elements of the program and minimizes redundancy
  – Focuses testing on the elements of the Waste Isolation Strategy and key public health and safety issues
  – Reflects a streamlined design process
  – Reflects an interactive performance assessment
  – Emphasizes technical data management and data integration
## Summary Schedule

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Licensing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Viability Assessment</td>
<td>960</td>
<td>960 Compliance Report</td>
<td>Recommend Site</td>
<td>Prepare Site Recommendation</td>
<td>Prepare License Application</td>
<td>License Application</td>
</tr>
<tr>
<td></td>
<td>Prepare PISA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PISA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TSPA-VA</td>
<td>Performance Assessment</td>
<td>Sensitivity Analyses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACD</td>
<td>Phase I Design</td>
<td></td>
<td>Phase II Design</td>
<td>LA Designs</td>
<td>Phase III Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VA Designs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site Data &amp; Models</td>
<td></td>
<td>Data Synthesis and Confirmatory Testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Scientific Programs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ESF Excavation</td>
<td></td>
<td>E-W Drift (?)</td>
<td>ESF Thermal Testing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ESF</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prepare Draft EIS</td>
<td></td>
<td>DEIS</td>
<td>FEIS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEPA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Approach to Integrating Technical Information, Analyses and Conclusions

- Project Integrated Safety Assessment is a single document that integrates and coordinates the elements of the technical program

- Focuses on technical data management and information systems

- Uses Performance Assessment as a tool for integration
Project Integrated Safety Assessment

- Consistent with the elements of the Waste Isolation Strategy and incorporates TSPA
- Generally follows format of a Safety Analysis Report
- Produced by the technical organizations and coordinated by the regulatory organization
- Common data sets for VA, NEPA, SR, LA
- Minimizes excessive review cycles, inconsistencies, and redundancies
- Integrates major critical activities into a single document
- Establishes basis for 10CFR960 compliance document and License Application
- Serves as the basis for proceeding toward site recommendation and a License Application
## Development of the PISA

<table>
<thead>
<tr>
<th>PROJECT ELEMENT</th>
<th>PISA CHAPTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4. Repository Design</td>
</tr>
<tr>
<td></td>
<td>5. Waste Package Design</td>
</tr>
<tr>
<td></td>
<td>6. Engineered Barrier Design</td>
</tr>
<tr>
<td></td>
<td>9. Radioactive Waste Management</td>
</tr>
<tr>
<td></td>
<td>11. Conduct of Operations</td>
</tr>
<tr>
<td>Performance Assessment</td>
<td>7. Performance of the Repository Through Permanent Closure</td>
</tr>
<tr>
<td></td>
<td>8. Performance of the Repository After Permanent Closure</td>
</tr>
<tr>
<td></td>
<td>12. Accident Analyses</td>
</tr>
<tr>
<td>Core Science</td>
<td>2. Site Characteristics</td>
</tr>
<tr>
<td>Environment, Safety and Health</td>
<td>10. Radiation Protection</td>
</tr>
</tbody>
</table>
Technical Data Management

- In response to the shift toward data synthesis and documentation, the emphasis on data integration, and the use of a common database (PISA), greater focus is placed on data management

  - Availability of latest data sets and synthesis for use in
    » model development
    » performance assessment
    » design

  - Data integration and proper use
    » data sets are tagged to track their use

  - More readily available use of referenced material
Licensing Support System

• 10 CFR Part 2, Subpart J, requires a computer-based information management system

• NRC, DOE, and Affected Units of Government are working together to clearly define system expectations

• DOE records systems have been modified to assure that records can be easily converted to Licensing Support System format requirements
Integration Through Performance Assessment

|--------------|------|------|------|------|------|------|------|

- Data Collection & Synthesis
- Confirmatory Testing
- Performance Confirmation

- Process Model Development
- Process Model Confirmation

- Abstract Models: VA
- Abstract Models: LA

- Performance Assessment
- Sensitivity Analyses

- TSPA VA

- Phase I Design
- Phase II Design
- Phase III Design

- ACD
- VA Designs
- LA Designs

- Construction Designs

License Application
Performance Assessment

• A Total System Performance Assessment will be completed in support of the 1998 viability assessment. Subsequent TSPA iterations or detailed sensitivity analyses will be conducted for the License Application
  – A phased review process with four major activities is being developed:
    – TSPA Orientation
    – Abstract PA Model Review
    – Process Model Review
    – TSPA-1998 Review
Summary of Revised Program

- Scientific Programs strategy, focus and schedule are based on addressing priority data needs, information requirements, and key interface issues for:
  - Site characterization activities
  - Moving to performance confirmation in 1998
- Design effort completed in three phases through LA and into construction
  - Greater focus on interface inputs and recognition of user needs
  - Minimizing number of discrete design reports
- Restart the EIS process in 1997 that will
  - Utilize a common data set from Site Characterization and design
  - Support PISA and TSPA