YUCCA MOUNTAIN PROJECT

Studies

Overview of Design Selection Process

Presented to:
Nuclear Waste Technical Review Board
Panel For the Repository

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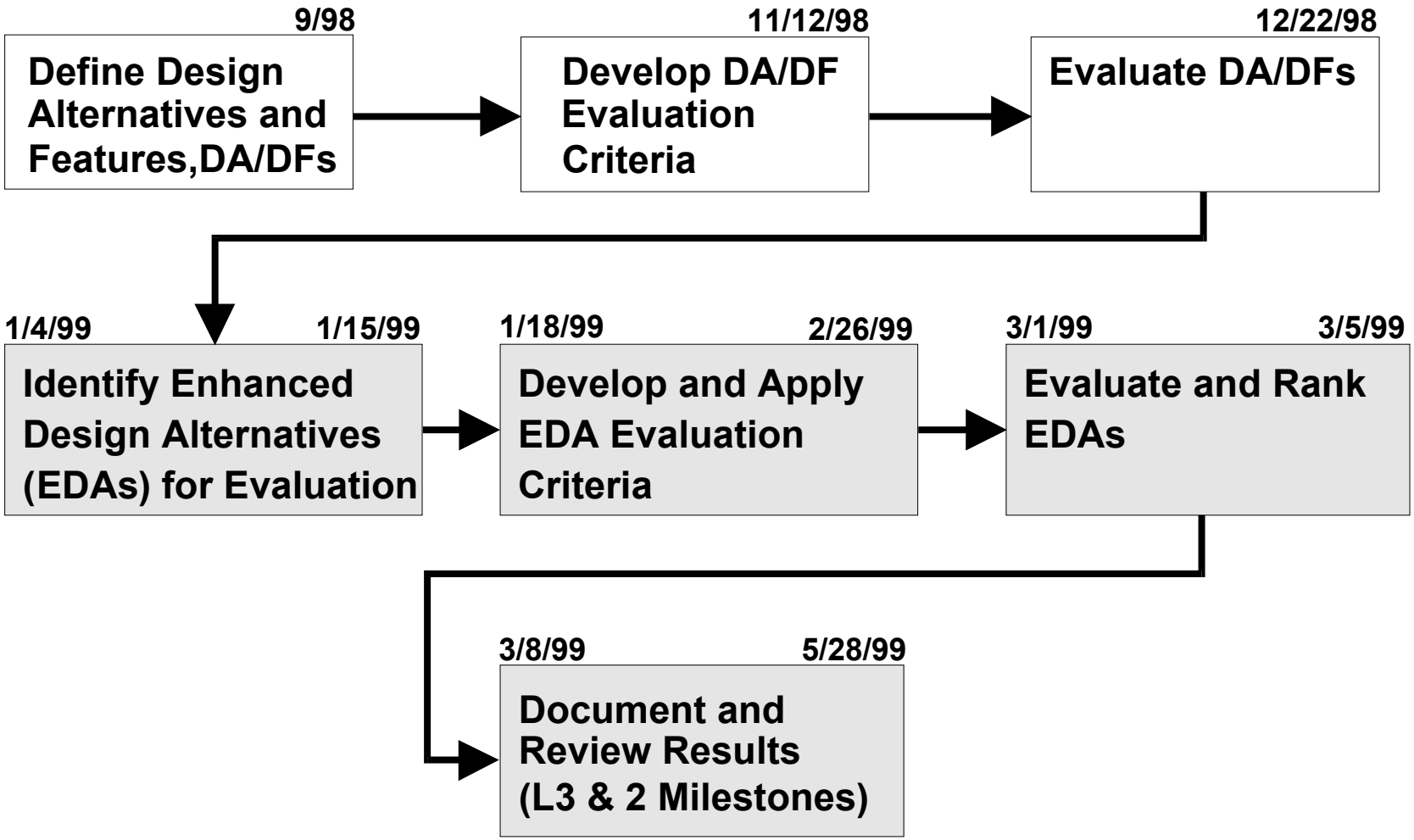
LADS Two Phase Process



Design Alternatives (DA)

- DA1: Tailored WP Spatial Distribution
- DA2: Low Thermal Load
- DA3: Continuous Post-closure Ventilation
- DA4: Enhanced Access
- DA5: Modified Waste Emplacement Mode
- DA6: VA Reference Design
- DA8: Modular Design

Design Features (DF)

- DF1: Ceramic coatings
- DF2: Drip shields
- DF3: Backfill
- DF4: Aging and blending
- DF7: Pre-closure ventilation
- DF8: Rod consolidation
- DF9: Timing of repository closure
- DF10: Maintenance of underground features and ground support
- DF11: Drift diameter

Design Features (DF)

(Continued)

- **DF12: Drift spacing/waste package spacing**
- **DF14: Waste package corrosion-resistant materials**
- **DF15: Richards barrier**
- **DF16: Diffusive barrier under waste package**
- **DF17: Getter under waste package**
- **DF18: Canister assemblies**
- **DF19: Additives and fillers**
- **DF20: Ground support options**
- **DF22: Near-field rock treatment**

Design Features (DF)

(Continued)

- **DF 23: Surface modifications**
- **DF25: Repository horizon elevation**
- **DF26: Higher thermal loading**

Phase 1 Evaluation Criteria for Design Alternatives and Design Features

1. Post-Closure Performance
2. Pre-closure Performance
   - Ability to limit exposure to public in case of Design Basis Events
3. Assurance of Safety
   - Support for attributes of Repository Safety Strategy
   - Significance of the uncertainty in post-closure performance and ability to reduce uncertainties by the time of LA, construction, and closure

Phase 1 Evaluation Criteria for Design Alternatives and Design Features

(Continued)

4. Engineering Acceptance

- Communication of element functions
- Engineering analysis follows accepted methods
- Demonstrable post-closure function
- Regulatory and/or engineering precedence
- Availability of qualified data in the LA time-frame
- Constructability with proven methods
- Consistency with high level design goals for the MGR (e.g, the CRD or CDA)

Phase 1 Evaluation Criteria for Design Alternatives and Design Features

(Continued)

5. Construction, Operations, and Maintenance
   - Worker radiation safety and/or industrial safety
   - Reliability, availability, maintainability, and inspectability
   - Throughput capacity
   - Ability to perform performance confirmation activities

Phase 1 Evaluation Criteria for Design Alternatives and Design Features

(Continued)

6. Schedule
   - Time for site characterization, design, licensing, and construction
7. Cost
   - Total system life cycle cost
8. Environmental Considerations
   - Evaluation relative to the NEPA process for environmental protection

Confidence in Assessments of Evaluation Criteria

- Confidence in each DA and DF assessment
- "Scales" (1 to 5) relative to supportability, defensibility, and uncertainties
- Elicited from the lead design engineers; these are engineering judgments based on available data and information
- Provides information on uncertainties in engineering and natural systems

EDA Development Methodology

- Enhanced Design Alternatives (EDAs) are design concepts that have been “enhanced” with various design features
- Build-up of EDAs with high probability of success, rather than screening/eliminating to arrive at “best” option
- Sought 5-10 EDAs for Phase 2 evaluation
- Diverse set representing a range of design types
- Take advantage of evaluations of DA and DFs, plus engineering judgment; PA, defense-in-depth, and cost evaluations as well
- No handbook methodology for creative design--no “algorithm” that will produce a “right” answer

Make-Up and Focus of Teams

- Three teams focused on one of the following:
  - Low Temperature Designs
  - Enhanced Access Designs
  - High Temperature Designs
- Representatives from the larger LADS team (both sides of the organization chart)
- DA and DF leads served as resources to all of the teams

General Schedule of EDA Workshop Activities

1/4	Monday	Presentation of DF evaluations (general session)
1/5	Tuesday	Presentation of DF/DA evaluations (general session)
1/6	Wednesday	Presentation of DF/DA evaluations; DID assessment for VA, guidance to teams (general session)
1/7	Thursday	First pass by teams (team sessions)
1/8	Friday	Review first pass evaluations (general session)
1/11	Monday	Second pass by teams (team sessions) review second pass (general session)
1/12	Tuesday	PA/DID/Cost evaluations based on second pass (team sessions)
1/13	Wednesday	Team caucus (team sessions)
1/14	Thursday	Review evaluations and all assessments (general session)
1/15	Friday	Select EDAs (general session)

Summary of Candidate EDAs

- **Presentation by EDA leads**
  - **Low Temperature Designs**
  - **High Temperature Designs**
  - **Enhanced Access Designs**
- **Description of design concepts**
- **Focus on features "integral" to design**
- **Identify features that can be applied to other designs as well (for DID, performance enhancement, etc.)**
- **Identify features not selected to support design concept**