



U.S. Department of Energy
Office of Civilian Radioactive Waste
Management

DOE Views on Staged Repository Development

Presented to:
Nuclear Waste Technical Review Board

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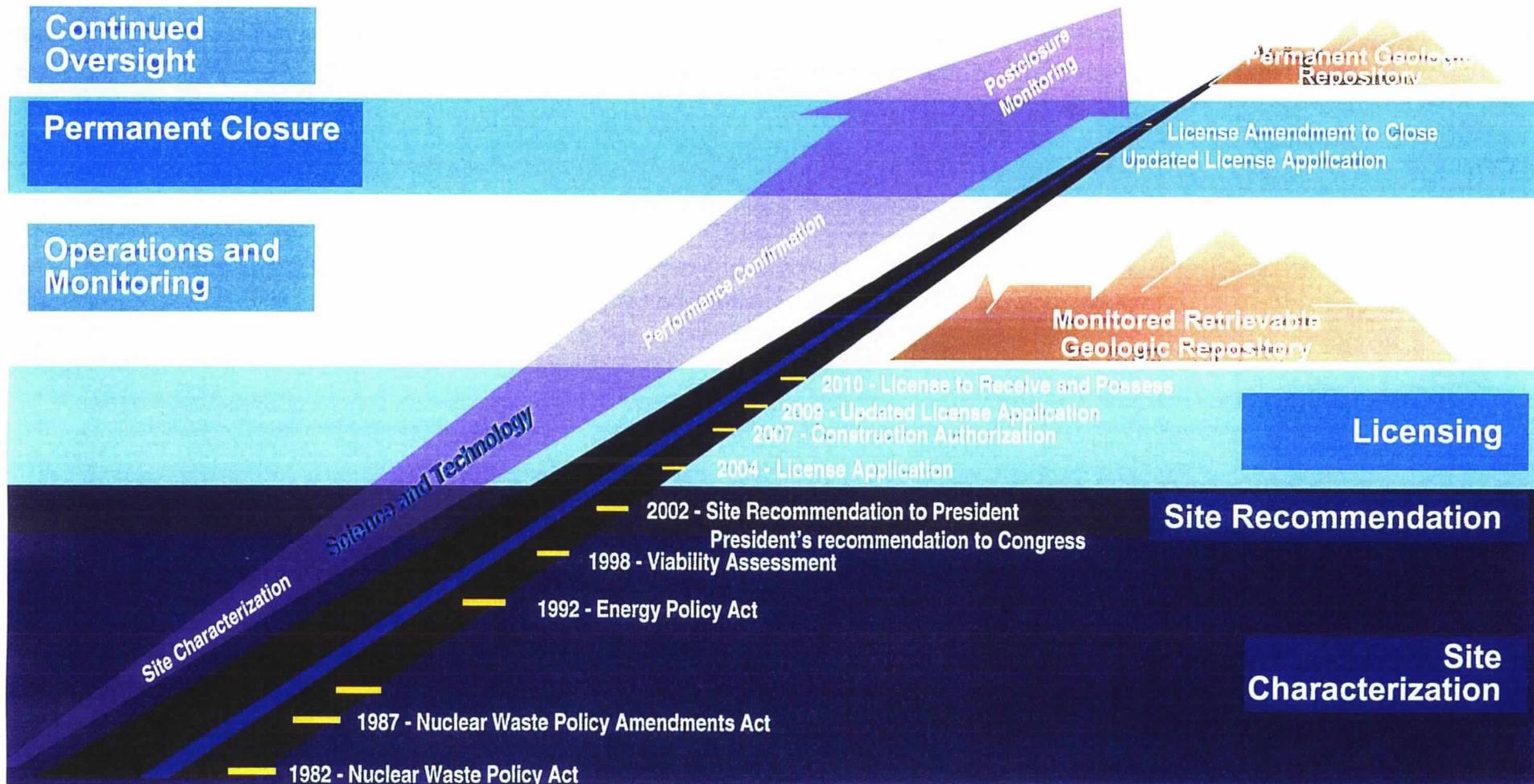
Consultations With National Research Council

- DOE supported a National Research Council-sponsored workshop on geologic disposal in 1999
- Report (June 2001) from workshop recommended national programs proceed in a stepwise manner
- DOE requested advice from Council on design and operational strategies for repository staging
- Interim report released in March deals generically with “adaptive staging” concept
- Final report with conclusions for Yucca Mountain expected by end of the year
- DOE looks forward to the final report and its conclusions and recommendations

Objectives

- **Discuss our thoughts about modular repository construction approaches and relation to staging**
- **Describe the staging that is already embodied in the repository development process under**
 - Federal law
 - NRC regulations
 - DOE requirements

Major Steps in U.S. Approach



Nuclear Waste Policy Act Process Steps

In return for the payment of fees, the Secretary will dispose of high-level radioactive waste and spent nuclear fuel

If, after conducting hearings and characterization activities, the Secretary decides to recommend the site, the Secretary must notify the Governor and Legislature of the State of Nevada

The Secretary must wait at least 30 days before submitting recommendation to the President

If the President considers the site qualified for application for construction authorization, he submits his recommendation to Congress

The Governor or Legislature of Nevada may submit a notice of disapproval to Congress, not later than 60 days after the President recommends the site

The site is disapproved unless Congress passes a joint resolution of siting approval during the first 90 calendar days of continuous session following the notice of disapproval

If the Governor or Legislature does not submit a notice of disapproval, or if Congress overrides the disapproval, the President's recommendation automatically takes effect and the Secretary submits an application for construction authorization

NWPA Sets Federal Obligations

Secretary Recommends Site

President Recommends Site

Nevada Disapproves Site

Congress Overrides Disapproval

Secretary Submits License Application

NRC Approves Construction

NRC Approves Emplacement

Congress Must Provide New Direction

No
Secretary terminates work, reclaims site, and reports to Congress within six months on recommendations for further action, including need for new legislative authority

No

No

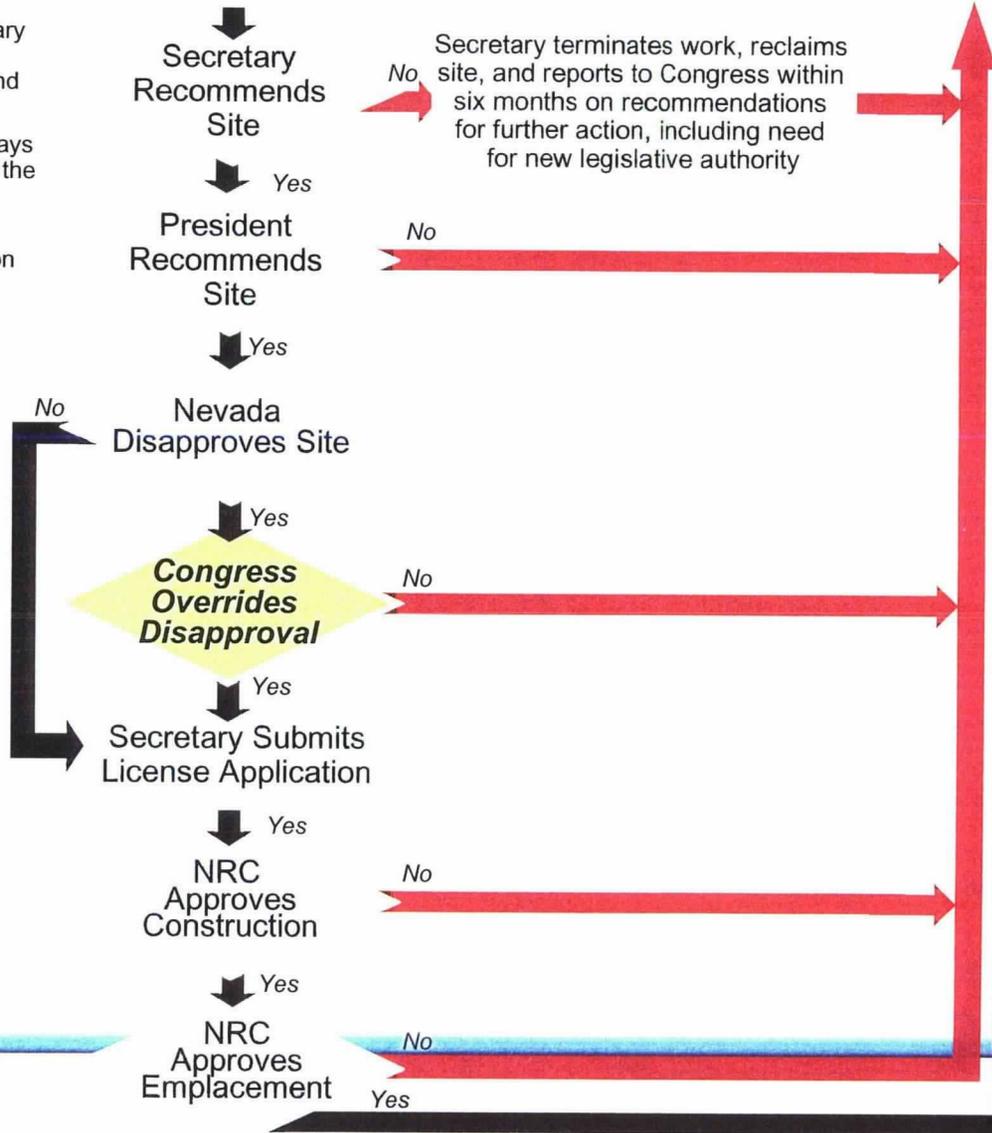
No

No

Yes

Closure and Site Monitoring

Operations and Monitoring

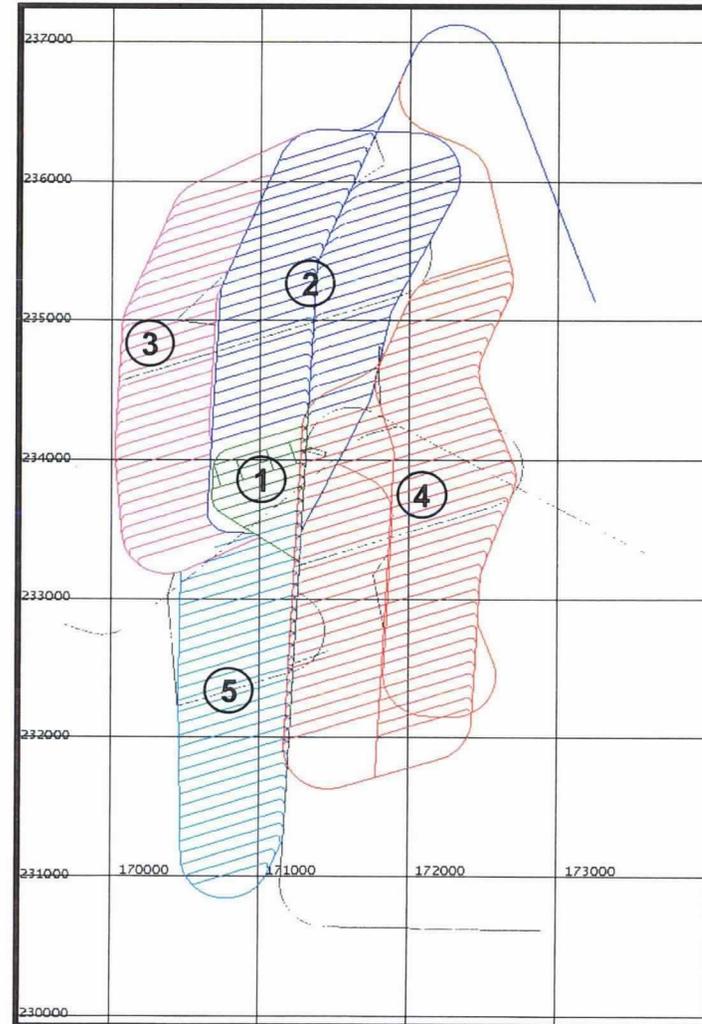


Repository Construction Concepts

- **We are conducting studies to evaluate approaches to constructing the repository in a modular fashion**
 - Enhance capabilities to begin waste receipt and emplacement in 2010 under a range of funding profiles
 - Improve cost, schedule, constructability, operability, and/or performance
 - Enhance the opportunity for staged development to implement lessons learned through modular construction of the surface and subsurface facilities
 - Enhance flexibility to adapt to changing information and circumstances
- **DOE studies so far have focused on assessing construction approaches that facilitate staging, not on evaluating staging options**

Possible Modular Subsurface Approach

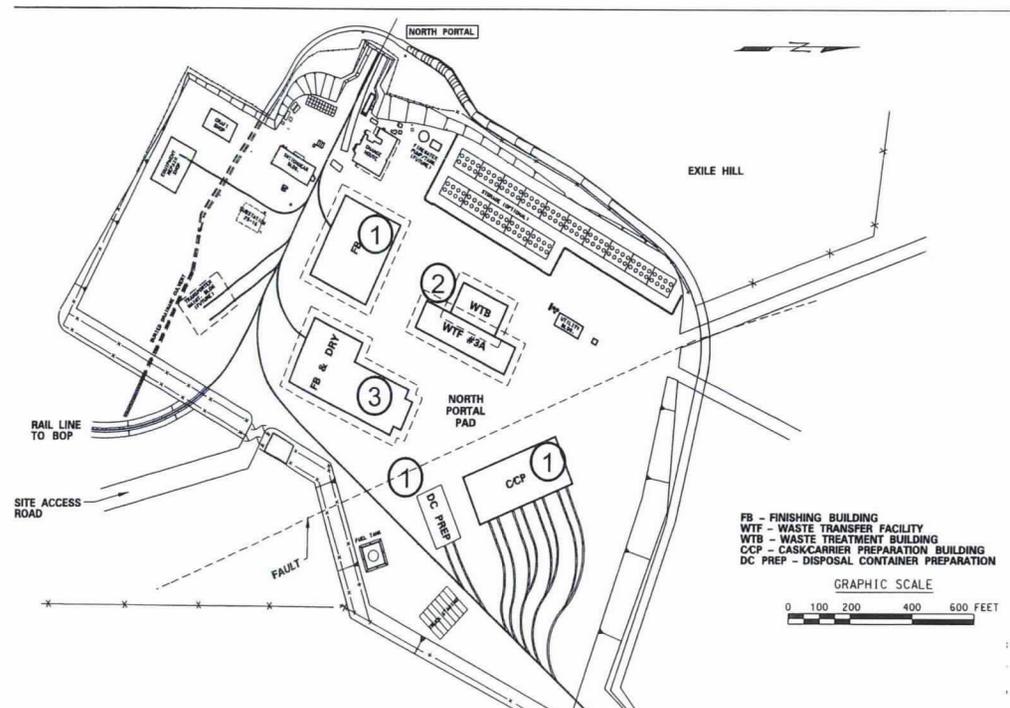
- Located within the primary and lower blocks shown in the FEIS
- Modular panel layout
 - 5 panels developed independently and in sequence
- Utilizes ESF for construction of small initial emplacement
Panel by 2010
- Substantially shortened construction schedule to first emplacement



Possible Modular Surface Facilities Approach

■ 3 Phase Construction

- **Phase ①** : half-capacity finishing building with waste receipt & dry transfer capability (~500-1,000 MT/yr), + cask/carrier prep building + disposal container prep building:
 - ◆ Substantially shortened construction schedule to first operation
 - ◆ Can process wastes for emplacement or storage
- **Phase ②** : Wet storage and off-normal handling + waste treatment facility:
- **Phase ③** : half-capacity finishing building plus dry waste transfer line (~2,000-3,000 MT/yr):



National Research Council's "Adaptive Staging" Concept

- **HLW repository development is divided into stages separated by explicit decision points**
 - provides the opportunity to evaluate obtained results and to decide whether and how to proceed to the next stage;
 - ◆ Reversibility is an option at each stage
 - allows for program improvement in safety, costs, schedule, etc.
- **Objective: increase repository safety, reduce uncertainties through systematic incremental learning**
- **The safety case is at the heart of adaptive staging**
 - evaluated and updated at each decision point
 - drives identification and choice of options

10 CFR 63 Appears Compatible With Staged Development

- **DOE can seek license to receive and possess when facilities needed for initial emplacement are complete**
 - DOE already plans to begin operation after only a portion of the underground facilities have been constructed, and to emplace waste simultaneously with further construction
 - Studies of construction approaches are examining ways to reduce underground construction needed for initial operation
 - Modular construction of surface facilities is under investigation

- **NRC can add, and DOE can commit to, conditions and specifications to the license to require additional checkpoints**

Reversibility

- **“Adaptive staging” keeps reversibility as an option at each stage**
- **10 CFR Part 63 requires retrievability up to 50 years after start of emplacement**
 - License application must include plans for storage of retrieved material up to full amount that has been emplaced
- **NWPA requires retrievability for spent fuel for a period specified by DOE, subject to NRC approval**
- **DOE’s requirements document states that the monitored geologic repository design shall allow the repository to remain open for up to 300 years**
 - Yucca Mountain subsurface conditions facilitate extended retrievability period

Treatment Of Modular Construction In a License Application

- **License application for modular construction would likely**
 - describe the entire system as it would be with all modules constructed
 - present the safety analysis for the full inventory allowed by regulations
 - describe the planned sequence for constructing modules and loading repository
 - seek permission to proceed with the described sequence
- **This is staged construction of a licensed full-scale repository, rather than a “staged” licensing process**
- **This approach does not involve deferring major issues until later decision points**

Stages In The DOE Decision Process

- **A “modular” design and construction approach would involve phased decision-making in DOE**
 - construction of each module would require Departmental review and approval
- **OMB and Congress must approve funding for constructing new facilities up front**
 - Opportunity to reverse previous program decisions and directions
- **Congress reviews program annually through budget process**
- **Decision-makers will consider results of repository operation, performance confirmation, stakeholder inputs in deciding whether to approve next stage**

Time to Review New Information is Inherent In Repository Construction

- **Underground drift construction schedule provides time to review results of new construction before loading new areas**
- **Construction of each underground panel would provide an initial “learning” stage as the main perimeter drift is constructed, before construction of emplacement drifts begins**
- **Construction of each emplacement drift provides additional information before emplacement begins**
- **DOE will evaluate the new information to determine whether any changes to plans are warranted**

Concluding Thoughts About “Adaptive Staging”

- **Current regulatory and DOE decision processes are compatible with staged development and already allow for many of the features identified by the National Research Council as part of “adaptive staging.”**
 - **DOE repository development process, whether modular or not, is a staged approach**
 - **We look forward to more discussion of the specific application of adaptive staging principles to a Yucca Mountain repository in the National Research Council’s final report**
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