YUCCA
MOUNTAIN
PROJECT

Studies

Repository Cost Estimate
Viability Assessment - Volume 5

Presented to:
Nuclear Waste Technical Review Board

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

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Why a Repository Cost Estimate?

- **The 1997 Energy and Water Development Appropriation Act required an estimate of …**

  ..."the costs to construct and operate the repository in accordance with the design concept as part of the viability assessment of the Yucca Mountain site"

- **Need to update and improve on past repository estimates given latest reference design and operating scenarios**
- **Need to maintain a current baseline estimate for use in future project planning and decision making**

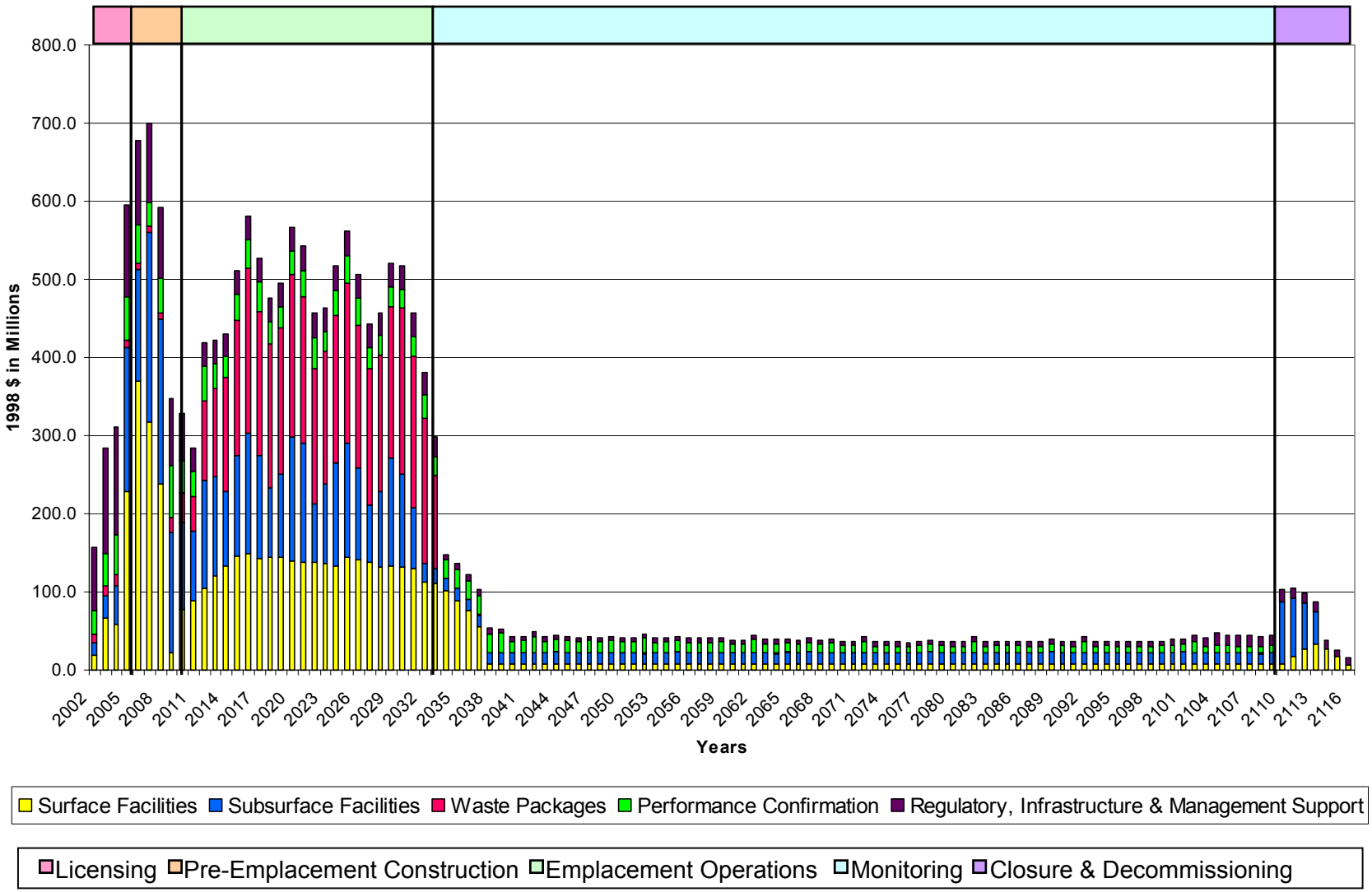
What Were the Results?

Project Phase	Subtotal	Surface Facilities	Subsurface Facilities	Waste Packages	Performance Confirmation	Regulatory, Infrastructure Management Support
Licensing	$ 753	$ 146	$ 92	$ 38	$ 124	$ 353
Pre-Emplacement Construction	$ 2,914	$ 1,180	$ 933	$ 52	$ 246	$ 503
Emplacement Operations	$ 11,166	$ 3,112	$ 2,603	$ 3,948	$ 750	$ 753
Monitoring Operations	$ 3,514	$ 862	$ 1,199	$ 20	$ 942	$ 490
Closure and Decommissioning	$ 370	$ 129	$ 176	$ -	$ -	$ 65
Grand Total	**$ 18,716**	**$ 5,429**	**$ 5,003**	**$ 4,059**	**$ 2,062**	**$ 2,165**

Note: Costs are rounded and in Millions, 1998 Dollars. These cost estimates reflect DOE's best estimates, given the scope of the work identified and planned schedule of required activities. Future budget requests for the program have yet to be established, and , in any event, will be determined through the annual executive and congressional budget process.

What Were the Results?

(Continued)



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What is Different from Earlier Estimates?

- **Technical Scope - improved level of details provided based on VA Reference Design**
- **Assumptions - more fully developed assumptions, and consistent across all VA products**
- **Data - greater body of knowledge with more fidelity and detail**
- **Schedules - activities scheduled by element at sub-account levels; extended retrieval period - 100 years**
- **Contracting - employed competitive and fixed price strategies**
- **Contingencies - applied appropriately across all elements based upon level of detail**

What Were Some of the Key Assumptions?

- The Repository designed at least 100 years from initial emplacement, allowing flexibility to future decision-makers
- Waste Sources
  - Commercial SNF - 63,000 MTHM
  - Defense High Level Waste - 4,667 MTHM
  - DOE SNF - 2,333 MTHM
- Cost impacts resulting from schedule delays or actions beyond project's control NOT included
- No interim storage considered
- Estimated costs in 1998 dollars

How was the Estimate Prepared?

- **Identified assumptions, scope of work, level of detail and necessary resources**
- **Prepared cost accounts and schedules by element and each of five project phases**
- **Determined appropriate estimating technique, analyzed project and industry data, built estimates and applied contingency**
- **Conducted internal checks and integration reviews to ensure scope and interface requirements, and prevent duplications or omissions**

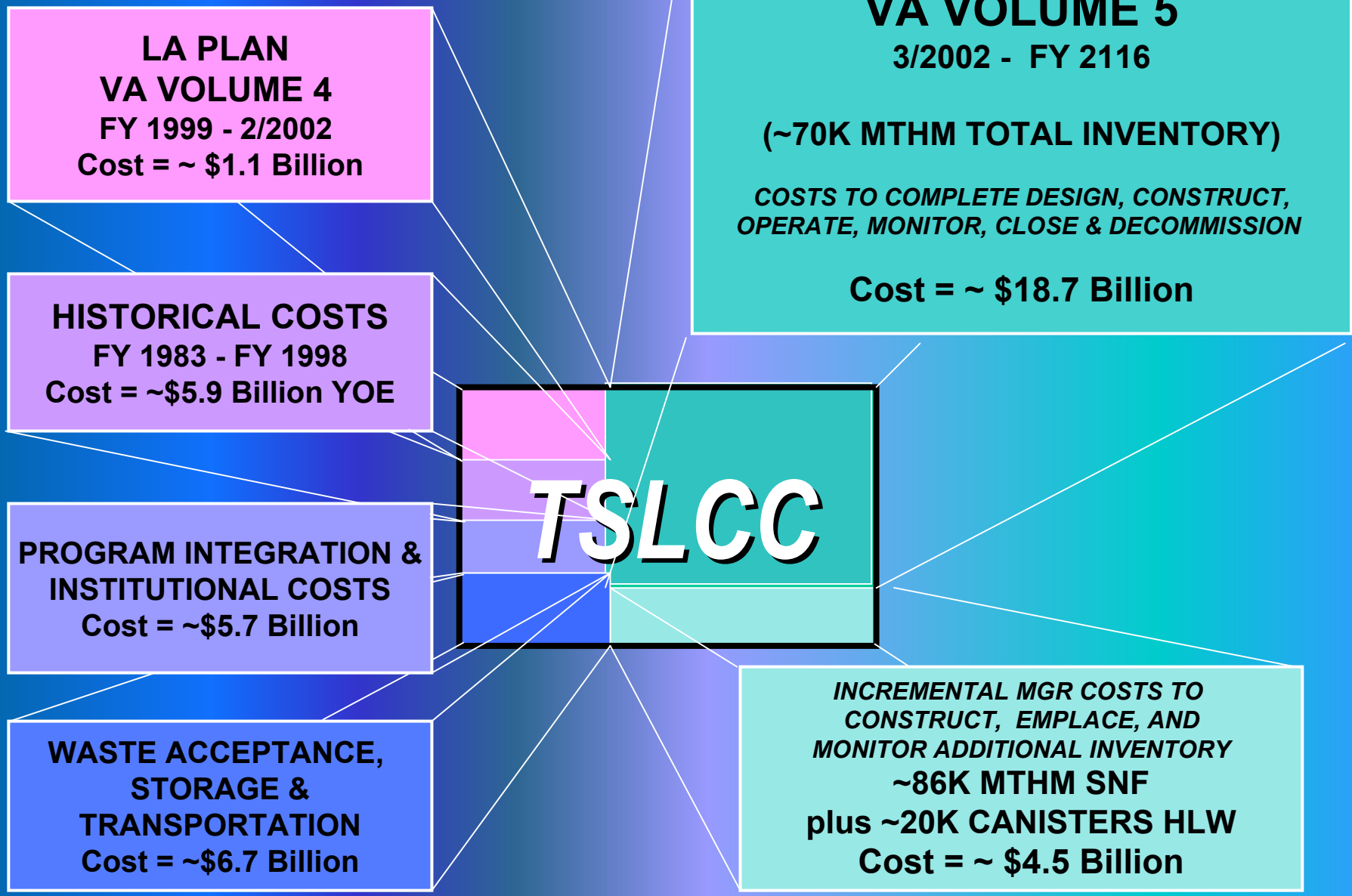
How Was the Estimate Prepared?

(Continued)

- **Supported third party independent reviews by DOE contractor, and made changes or corrective action as necessary**
- **Prepared estimate documentation and backup books for all cost elements**

How Do We Use Volume 5 Information?

- Provides a basis and input for planning future work activities
- Supports budget development and analysis
- Assists assessments of potential repository enhancements, alternatives and options
- Provides a decision tool for project and program management what-ifs
- Feeds “Total System Life Cycle Cost” and Fee Adequacy Analyses



NOTE: Cost figures are rounded

Summary

- **$18.7 billion estimate was developed consistent with the current VA design, DOE guidelines and industry practices**
- **Estimates reflect DOE's best projections, given scope of work identified and planned schedule of required activities**
- **Independent external reviews stated overall quality of the repository cost estimate to be well done -- Adding confidence to the project cost estimate**
- **The VA cost and schedule information will support future planning activities, budget development and assessments of potential repository enhancements, alternatives and options**

Backup

What Were the Estimated Results?

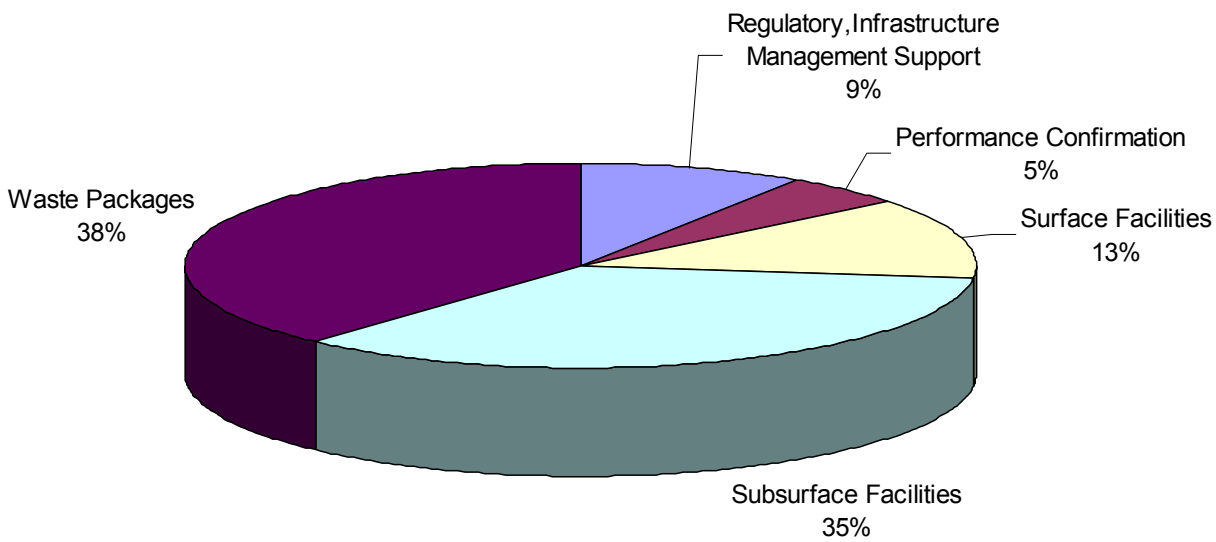
Phase	Phase Total	Surface Facilities		Subsurface Facilities		Waste Packages		Performance Confirmation		Regulatory, Infrastructure & Management Support	
		Capital	O&M	Capital	O&M	Capital	O&M	Capital	O&M	Capital	O&M
Licensing	752	132	13	92	0	38	0	106	17	353	0
Pre-Emplacement Construction	2,914	1,075	104	933	0	52	0	191	55	503	0
Emplacement Operations	11,166	0	3,112	2,350	252	3,948	0	183	568	36	717
Monitoring	3,514	0	862	130	1,068	0	20	55	886	6	484
Closure and Decommissioning	370	129	0	172	3	0	0	0	0	65	0
Grand Total	**18,716**	**1,337**	**4,092**	**3,678**	**1,324**	**4,038**	**20**	**536**	**1,525**	**963**	**1,201**

Summary of Repository Capital and Operations & Maintenance Costs by Major Element and Phase

What Were the Estimated Results?

(Continued)

MGR-VA Capital Costs By Elements



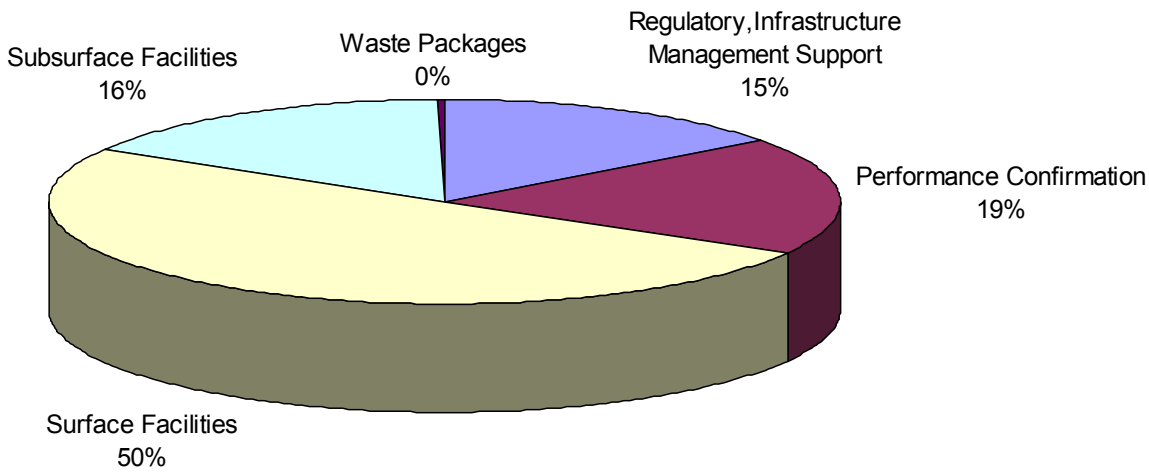
Total Capital Cost - As a Percentage of the Total

Regulatory,Infrastructure Management Support | Performance Confirmation | Surface Facilities | Subsurface Facilities | Waste Packages

What Were the Estimated Results?

(Continued)

MGR-VA O&M Costs By Elements



Total O&M Cost - As a Percentage of the Total

Regulatory, Infrastructure Management Support | Performance Confirmation | Surface Facilities | Subsurface Facilities | Waste Packages

What Were the Goals and Focus?

- Ensure repository schedule and cost estimates are consistent with VA design and other activities
- Stress importance on level of detail, reasonableness and quality of ALL estimates
- Emphasize estimating methods, processes and bases are complete and thorough
- Seek and ensure ”realism" in cost numbers, eliminate potential redundancies and unjustified expenditures
- Assure strong overall cost life cycle estimate and schedule for all repository cost elements and phases for decision analyses

What Time Phases Were Estimated?

- **Licensing - March 2002 to February 2005**
- **Pre-Emplacement Construction - March 2005 to February 2010**
- **Emplacement Operations - March 2010 to September 2033**
- **Monitoring - October 2033 to February 2110**
- **Closure & Decommissioning - March 2110 to September 2116**

What Elements Were Costed?

- **Surface Facilities - design, construction, operations, maintenance and decommissioning costs**
- **Subsurface Facility - design, construction, operations, maintenance and decommissioning costs**
- **Performance Confirmation - testing, facilities and evaluation and reporting costs**
- **Waste Package - design, testing, fabrication and emplacement costs**
- **Regulatory, Infrastructure and Management - licensing, regulatory, environmental, infrastructure, training, administrative and project management costs**

How Does Volume 5 Fit with TSLCC Costs?

- **Repository cost is NOT everything. It is, however, a significant portion of the Total System Life Cycle Costs (TSLCC)**
- **Costs NOT part of repository, Vol. 5, estimate**
  - **Historical (i.e., costs prior to 1998)**
  - **License Application Plan, VA Vol. 4 (i.e., costs 10/98 - 2/02)**
  - **Waste Acceptance, Storage and Transportation**
  - **Program Integration**
  - **Institutional**
- **Other costs, combined with repository estimate, support TSLCC and Fee Adequacy analyses**

How Robust is the VA Cost Estimate?

- **Team consisted of over 30 cost, planning and engineering professionals**
- **Most extensive cost estimate prepared to date resulting in higher confidence level**
- **Improved methods, processes, bases of estimates and traceability, as well as reasonableness and quality over previous project estimates**

How Robust is the VA Cost Estimate?

(Continued)

- **M&O and DOE review groups assessed repository activities and costs against current plans, baseline design & assumptions, and other VA volumes**
- **Extensive independent third party cost assessment performed by large architect-engineering firm found repository cost estimate to be of high quality and well done**