Meeting Minutes Summary
U.S. NUCLEAR REGULATORY COMMISSION/
U.S. DEPARTMENT OF ENERGY
QUARTERLY TECHNICAL MEETING
License Application Design Update
June 22, 1999

See Attachments 1, 2, and 3 for the list of attendees, agenda and presentation materials, respectively. Highlights of the discussion are listed below.

Engineering Design Program

◆ Of the five Enhanced Design Alternatives (EDA) considered, EDA II is recommended for repository design by the Yucca Mountain Management and Operating (M&O) contractor. The decision to recommend EDA II was supported with dose curves, design elements and associated design values.

◆ The design for EDA II is flexible enough to accommodate changes in thermal loading.

◆ Titanium (Ti) has been identified as a candidate material for the drip shield due to high corrosion resistance and its difference from the waste package material (Alloy 22). The material was chosen to avoid common mode failure. The available data from other industries on Ti will be supplemented by additional testing at Lawrence Livermore National Laboratory (LLNL).

◆ A U.S. Department of Energy (DOE) decision to proceed with the recommended or other repository design option is expected by summer 1999 pending completion of review of the five design options by DOE.

◆ Even though a preferred design approach will be pursued, further changes to the design will continue as design of a facility is an iterative process.

◆ Since design is still in the conceptual phase, additional design work is required.

◆ Work continues on testing backfill material. The recommendation on a basic design approach for backfill will be based on general information available at the time, but a combination of tests and analyses will continue after the decision has been made to refine the backfill process.

◆ Discussion on retrievability centered on implementation of the U.S. Nuclear Regulatory Commission's (NRC) proposed rule 10CFR63, as well as the License Application (LA) approach

◆ For the purpose of design basis event analysis and the integrated Safety Analysis, the preclosure period is taken to be 100 years, however subsurface design for ground control is planned for a possible extension of preclosure, which could result in a preclosure period as long as 300 years. Retrieval could occur anytime between the start of emplacement to 300 years after emplacement. Retrieval would occur prior to backfill and emplacement of the drip shields, but would not occur until NRC had approved the plan.

◆ No performance testing will occur for off-normal conditions.

◆ Various aspects of maintenance of ground support will be considered due to the extension of the monitoring period since it would impact the operation of the facility.

◆ Drift remediation may be necessary at the end of the monitoring period to ensure placement of drip shields and backfill. Waste packages will be moved to interim drifts to allow drift remediation. Additional analyses are required on long-term performance of waste packages due to the packages being moved during remediation.

◆ Drift Stability Panel and Repository Consulting Board had differing opinions on ground support of the repository. The views of the two expert bodies will be considered during subsurface design in conjunction with the performance assessment. A determination of the impact is expected by the end of the year.

◆ Thermal impacts were considered in the panel's report on ground support. However the thermal effects considered were limited due to availability of finite information regarding the types of thermal effects that will be experienced in the drifts. Thermal effects are being examined using numerical modeling and results from the Drift Scale Test. Data on parameters such as deformation modulus, available from the Drift Scale Test, are undergoing further evaluation.

◆ The information on the three Quality Levels' (1, 2, and 3) criteria along with the essential elements of the Graded Quality Assurance (QA) Program with examples were presented. The NRC staff provided comments on the methodology for documenting graded QA controls and the lack of detail in procedures controlling the quality level categorization process. Since there was insufficient time to explain the process, a follow-up meeting will be necessary to provide more details on the graded QA approach. An Appendix 7 meeting will be scheduled in October or November of 1999 to address the comments stated in the meeting.

Yucca Mountain Work Planning

◆ The Fiscal Year 2000 Planning for the Multi-Year Plan specified the established priorities, and showed the historical perspective (since 1997) of how appropriations have not met planned budget needs and the integrated process for product development and the revised work breakdown structure.

◆ The fiscal year 2000 planning (covering fiscal years 00-02) identified activities to achieve the site recommendation milestone and then to be able to submit the license application.

◆ The management reserve is a finite amount of funds set aside in the budget to complete tasks that were unforeseen during the budgeting process. The expenditure of these funds is authorized typically by senior management and use of those funds do not affect the planned science work. This explanation was provided in response to a question by the State of Nevada.

◆ During the presentation, the NRC (Rockville, MD and the Onsite Representative) requested a set of the Product Guidance Documents. The State of Nevada and the NRC Onsite Representative requested copies of CR 99-008 [Revise the Project Baseline to Add and Delete Work Scope, Budget, and Milestones for Process Models and Data Qualification (PMDQ) and Enhanced Design Alternative II (EDA II)]

◆. The Process Model Reports (PMR) Schedule included the PMR scope, a graphical presentation of the PMR linkage to major programmatic SR and LA milestones, and a schedule.

NRC Re-Organization/Responsibilities

◆ Recent organizational changes in the NRC's Division of Waste Management were presented through a recent organizational chart.

Closing Remarks

◆ No closing comments were presented.

M. Comar

Manny Comar, Project Manager
U.S. Nuclear Regulatory Commission

Timothy C. Gunter

Timothy C. Gunter
U.S. Department of Energy
Yucca Mountain Site Characterization Office

NRC/DOE QUARTERLY TECHNICAL MEETING
Videoconference Las Vegas, NV; Rockville, MD; San Antonio, TX
June 22, 1999
1:00PM - 4:00PM EDT

Name	Organization	Telephone Number
Jerry Self	M&O Licensing	702-295-5335
Tim Gunter	DOE/YMSCO	702-724-1343
Rick Nolting	M&O/ Repository Design	702-295-7591
Homi Minwalla	M&O	702-[illegible]4995
Krishna R. Iyengar	M&O/R&L	702-295-6620
Dan Kane	DOE	702-794-5511
Dave Haught	DOE	702-794-5474
Jim Linhart	NSNFP-LV	702-295-0366
E von Tiesenhousen	Clark County	702-455-5184
Steve Dana	QATSG/OQA	702-295-2749
Susan Zimmerman	State of Nevada	775-687-3744
Bill Belke	NRC	702-794-5047
Chad Glenn	NRC	702-794-5046
Jane Summerson	DOE	702-794-1493
Bernard Verna	DOE	702-794-1374
Charlotte Zaccone	MTS/S&W	702-794-5580
Bob Gamble	MTS/BAH	702-794-1440
Dan McKenzie III	M&O/RSSD	702-295-4393
Bob Bradbury	MTS	702-794-5424
Gary Sequeira	MTS	702-794-1413
Ram B. Murthy	DOE-RW-3	702-794-5549
April Gil	DOE/YMP/OLRC	702-794-5528

Steve Hanauer	DOE	202-586-3547
Sandra Wastler	NRC	301-415-6724
Gene Roseboom	USGS (Retired)	301-530-1059
Mysore Natraja	NRC	301-415-6695
Banad Jagannath	NRC	301-415-6653
Dave Dancer	NRC	301-415-6618
Kien Chang	NRC	301-415-6612
Charles Greene	NRC	301-415-6177
Bret Leslie	NRC	301-415-6652
Alvin Henry	NRC	301-415-5114
Tae M Ahn	NRC	301-415-5812
Ray Wallace	USGS/HQ	202-586-1244
Andy Campbell	ACNW	301-415-6897
Manny Comar	NRC	301-415-6074
Wesley C. Patrick	CNWRA	210-522-5158
Simon Hsiung	CNWRA	210-522-5209
Doug Gute	CNWRA	210-522-2307
Asad Chowdhery	CNWRA	210-522-5151
Bruce Mabrito	CNWRA	210-522-5149
Tom Trbovich	SWRI-QA	210-522-3145
English Pearcy	CNWRA	210-522-5540

AGENDA

DOE/NRC QUARTERLY TECHNICAL MEETING
(Video Conference)
Las Vegas, NV; Rockville, MD; San Antonio, TX
June 8, 1999
1:00 P.M. to 4:15 P.M. (EDT)

1:00 EDT	**Opening Remarks**	DOE, NRC, AUG
1:15 EDT	**Engineering Design Program** LA Design Selection Update Retrievability-Compliance with Performance Objectives Pre-Closure Period & Design Impact QA Classification Methodology - Examples	DOE
2:30 EDT	**Break**	
2:45 EDT	**Yucca Mountain Work Planning** FY99 Baseline 2000 Planning Effort	DOE
3:45 EDT	**NRC Re-Organization/Responsibilities**	NRC
4:00 EDT	**Closing Remarks**	DOE, NRC, AUG
4:15 EDT	**Adjourn**	

Enclosure 2

YUCCA
MOUNTAIN
PROJECT

License Application Design Selection Update

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Richard Snell
CRWMS/M&O

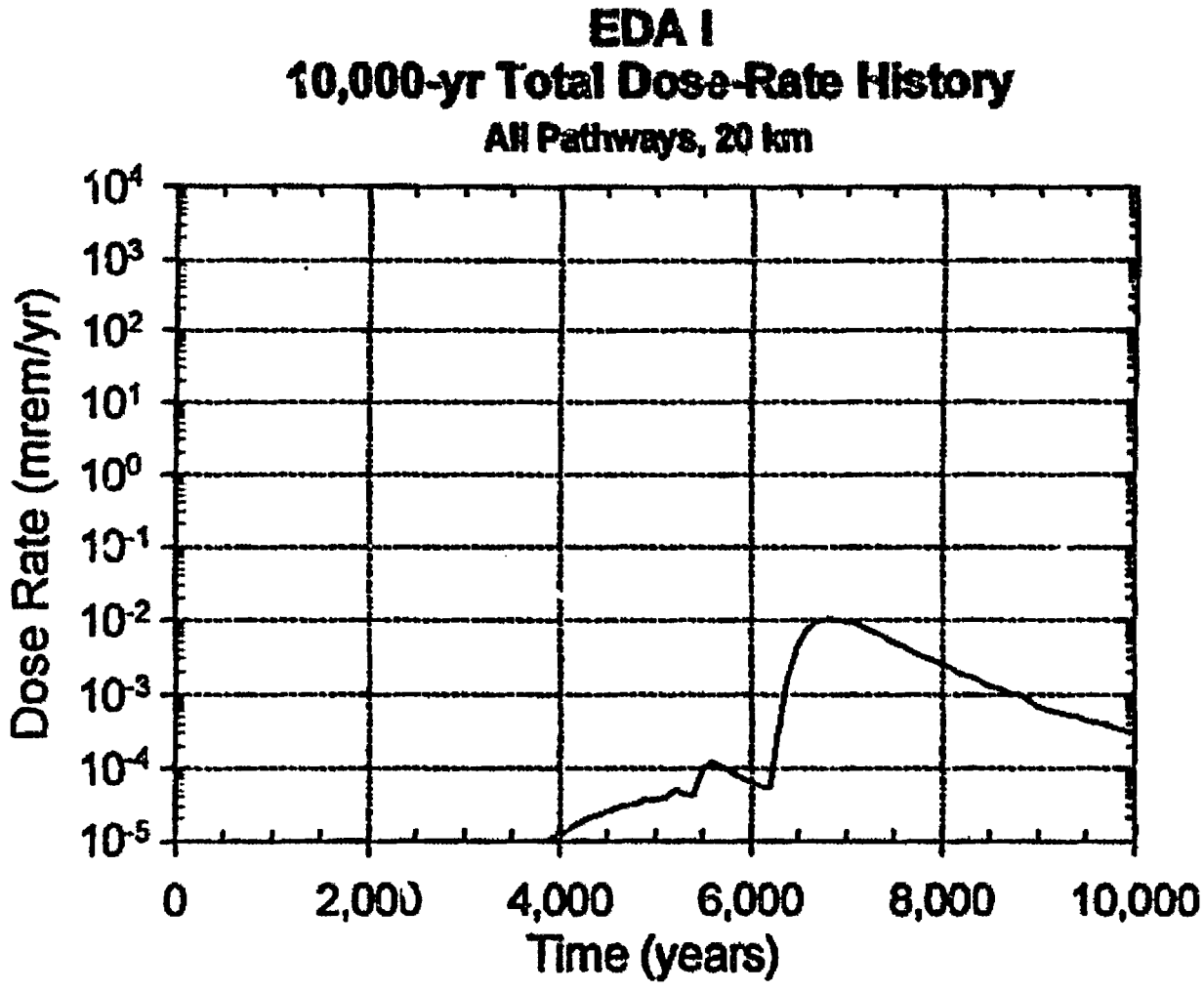
June 22, 1999

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

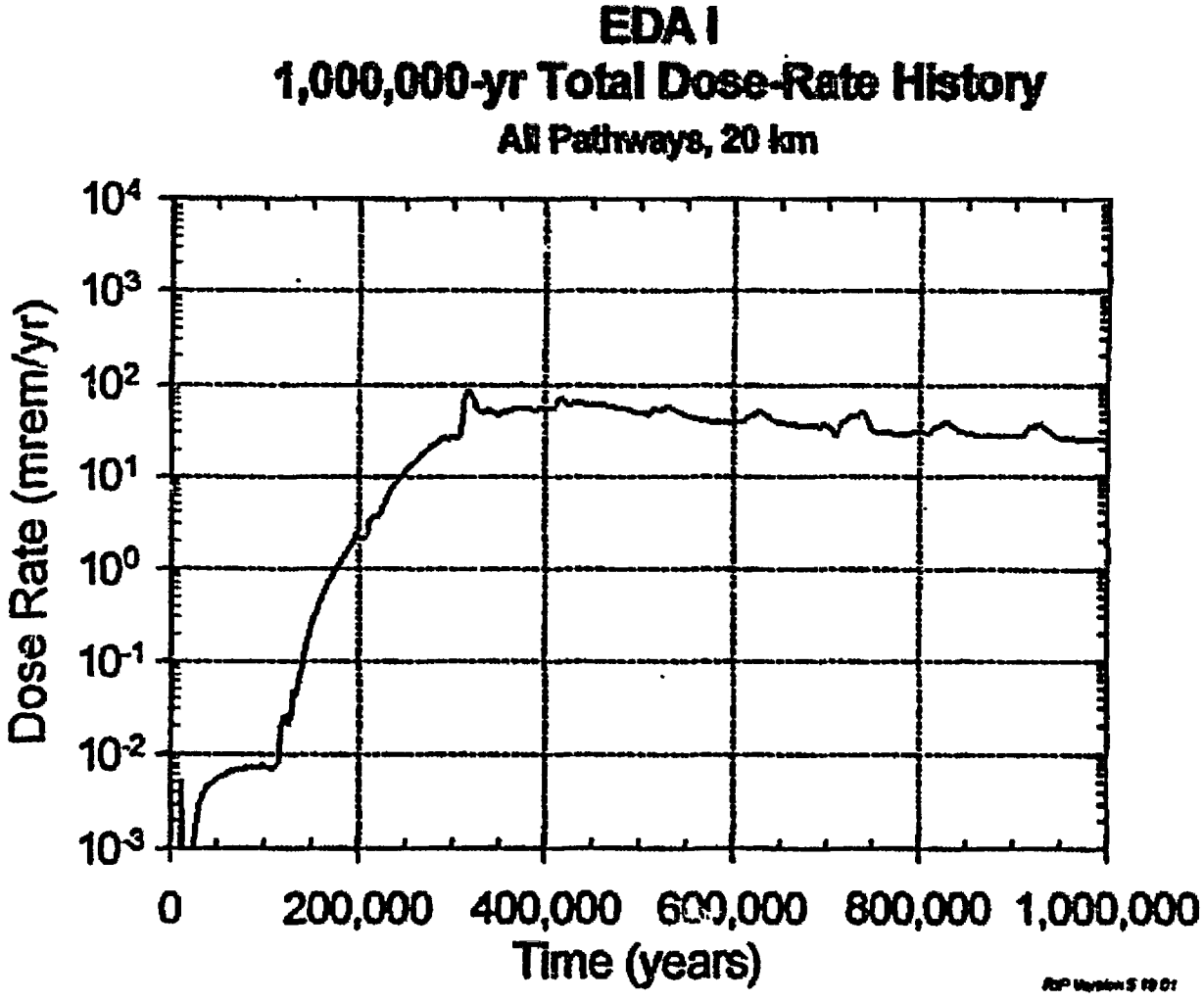
LA Design Selection Update

- Dose Curves for EDA I through EDA V
  - 10,000 years
  - 1,000,000 years

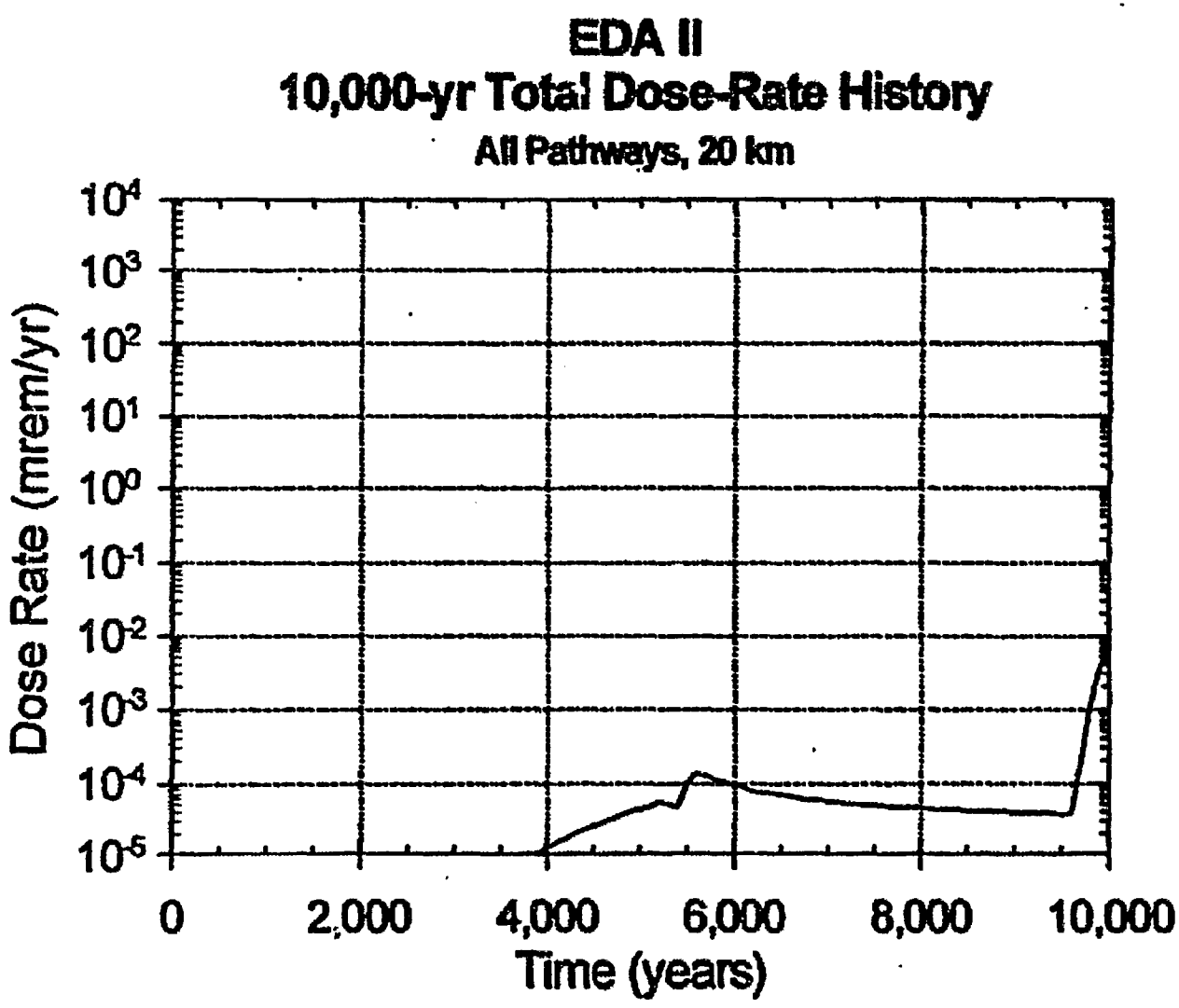
EDA I


EDA I
10,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
2,000
4,000
6,000
8,000
10,000
Time (years)

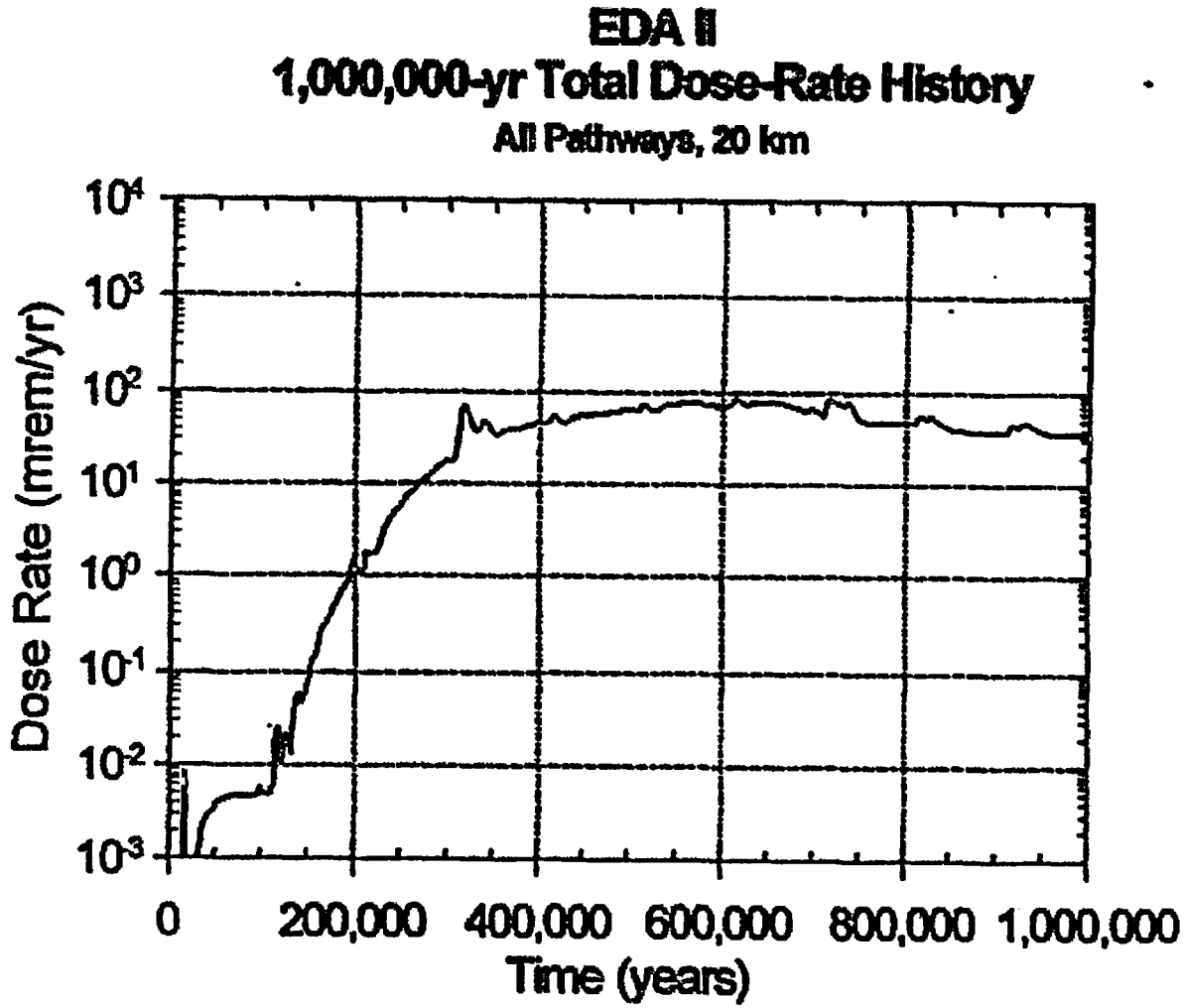
EDA I


EDA I
1,000,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
0
200,000
400,000
600,000
800,000
1,000,000
Time (years)

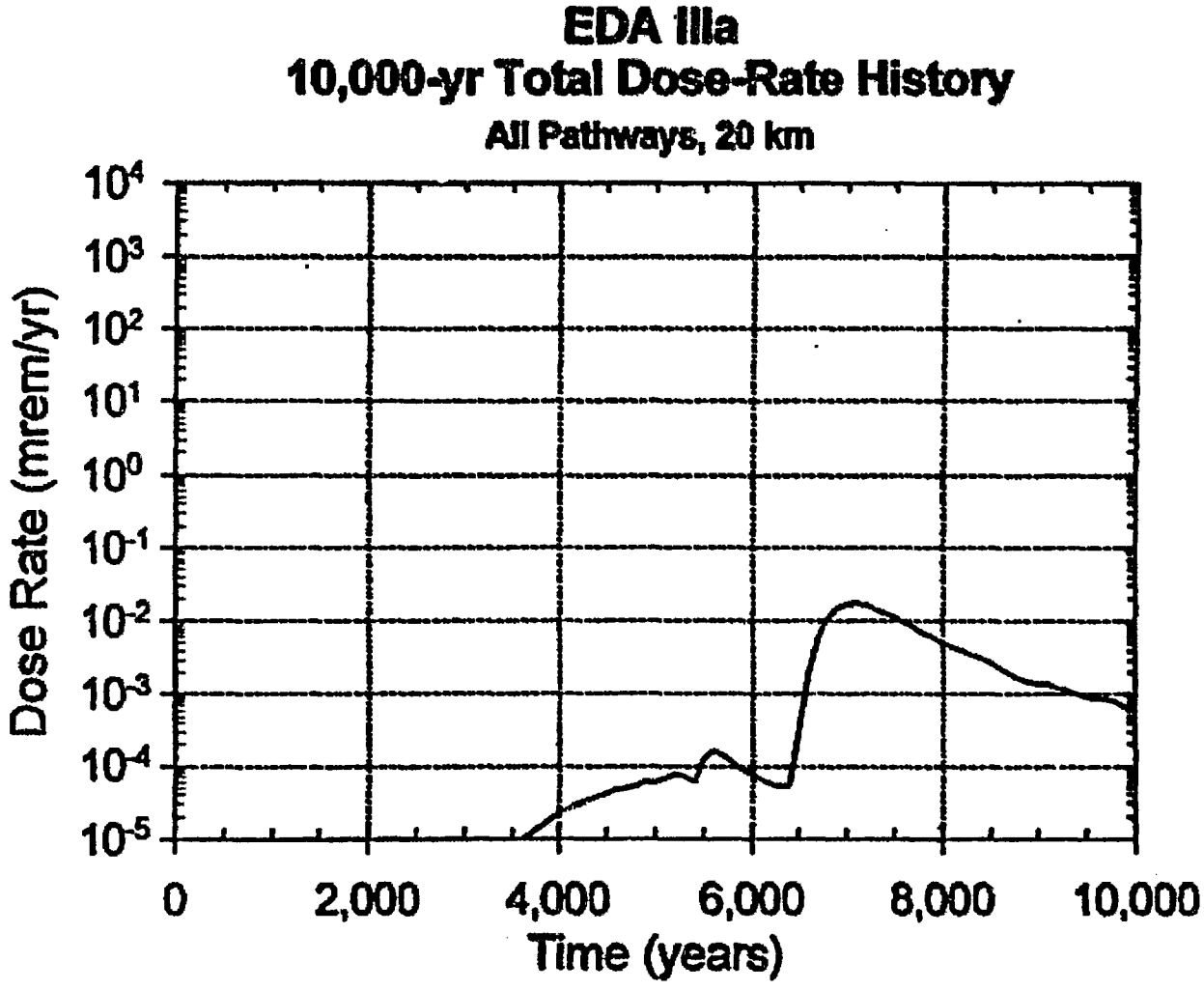
EDA II


EDA II
10,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
2,000
4,000
6,000
8,000
10,000
Time (years)

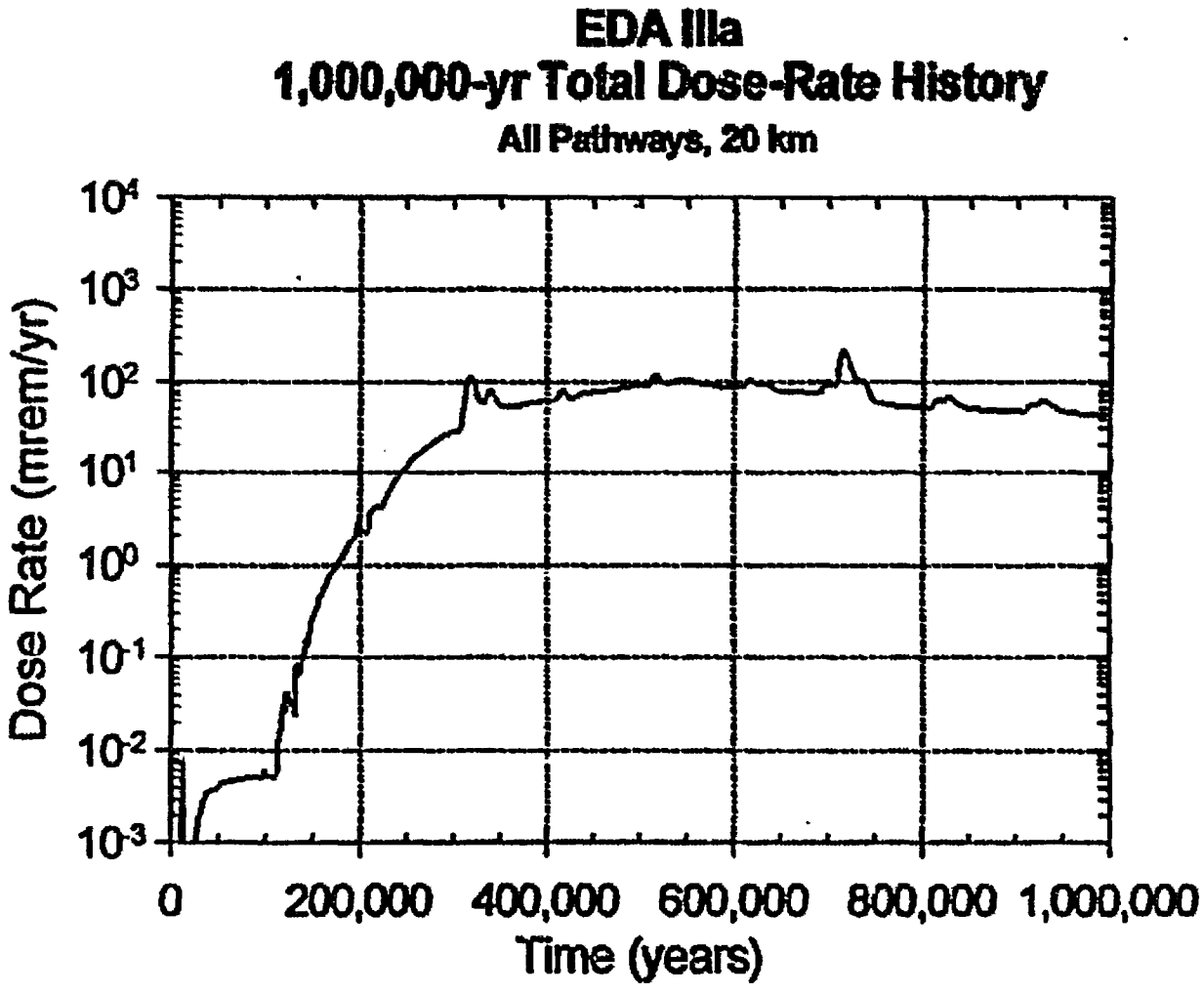
EDA II


EDA II
1,000,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
0
200,000
400,000
600,000
800,000
1,000,000
Time (years)

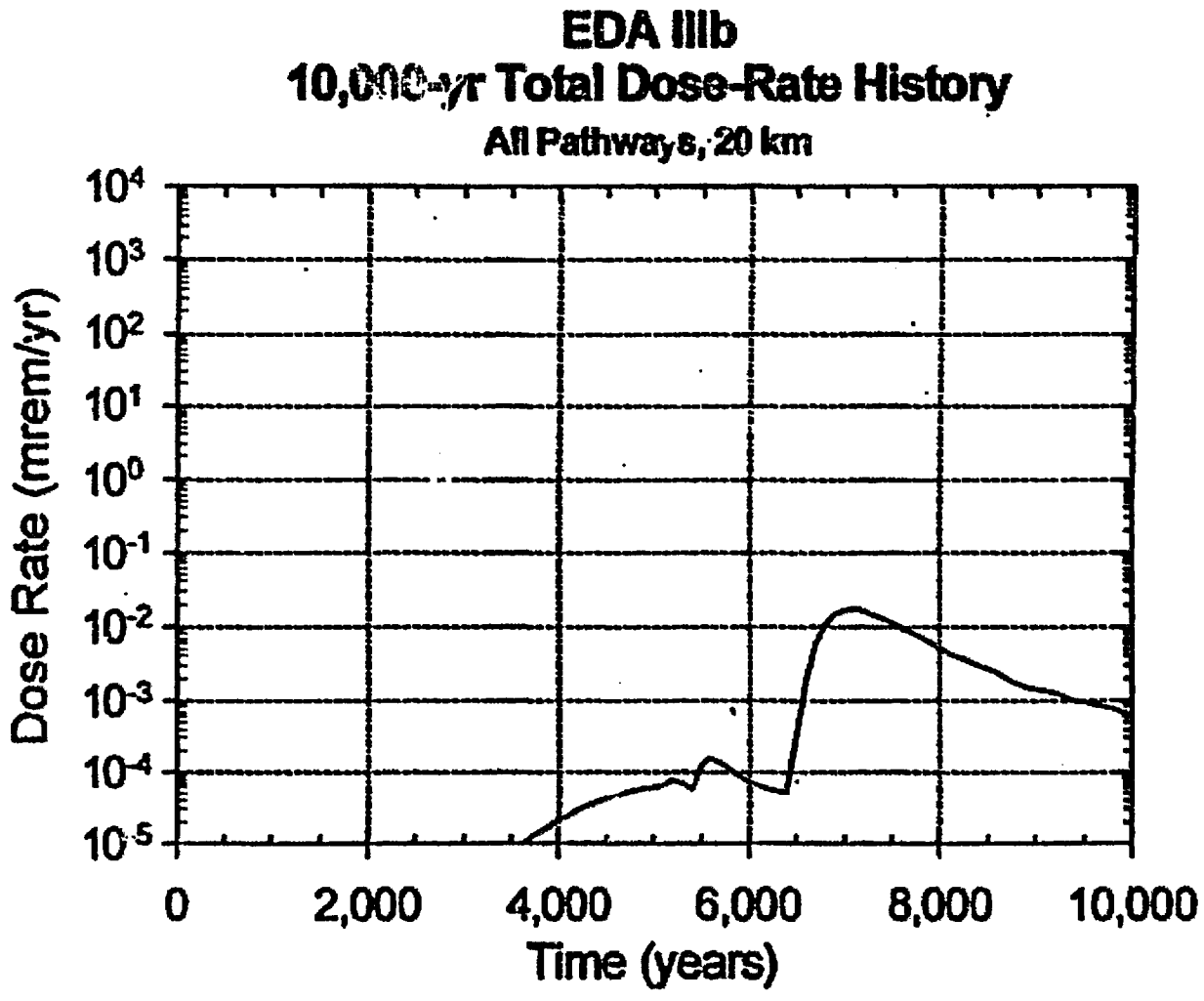
EDA IIIa


EDA IIIa
10,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
2,000
4,000
6,000
8,000
10,000
Time (years)

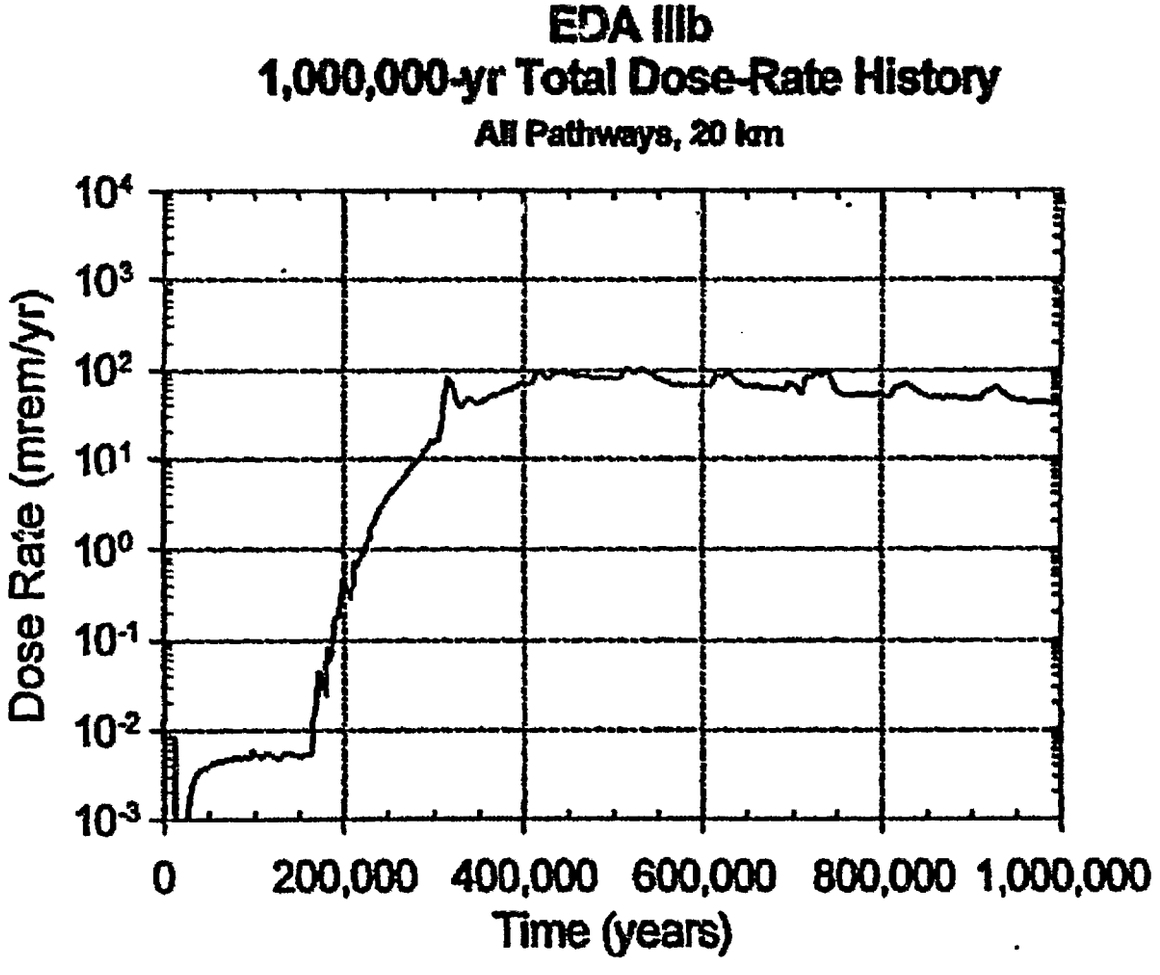
EDA IIIa


EDA IIIa
1,000,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
0
200,000
400,000
600,000
800,000
1,000,000
Time (years)

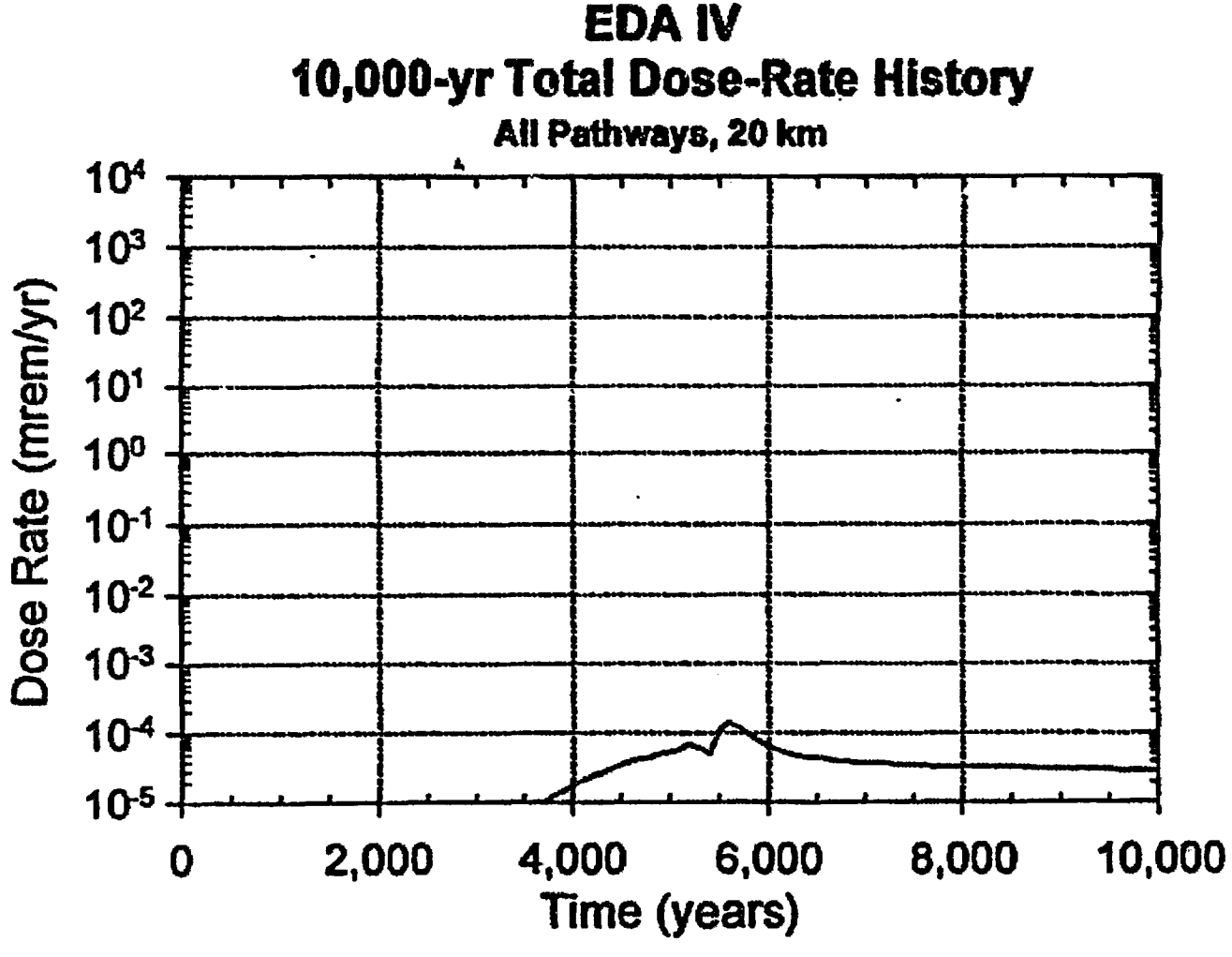
EDA IIIb


EDA IIIb
10,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
2,000
4,000
6,000
8,000
10,000
Time (years)

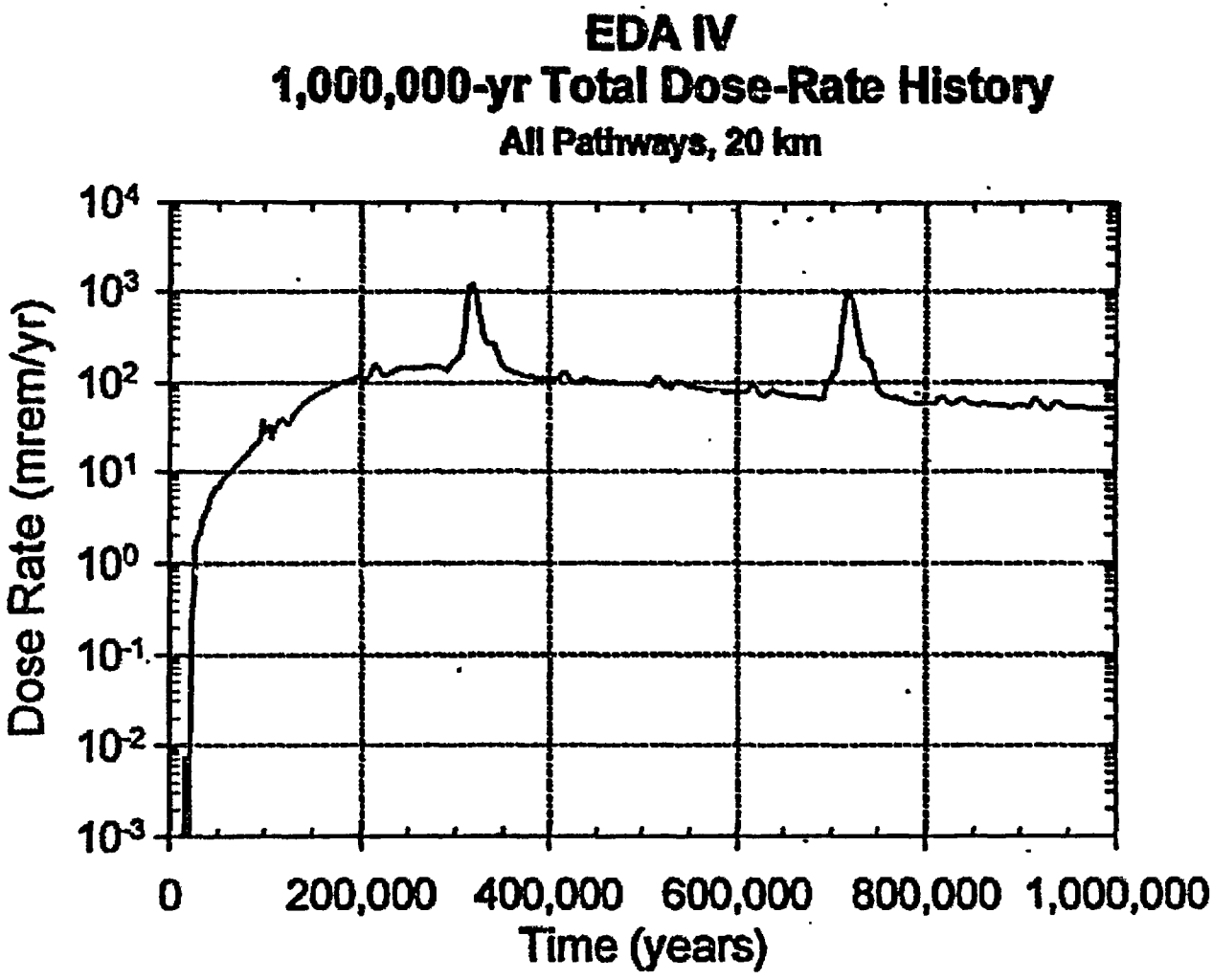
EDA IIIb


EDA IIIb
1,000,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10⁴
10³
10²
10¹
10⁰
10⁻¹
10⁻²
10⁻³
0
200,000
400,000
600,000
800,000
1,000,000
Time (years)

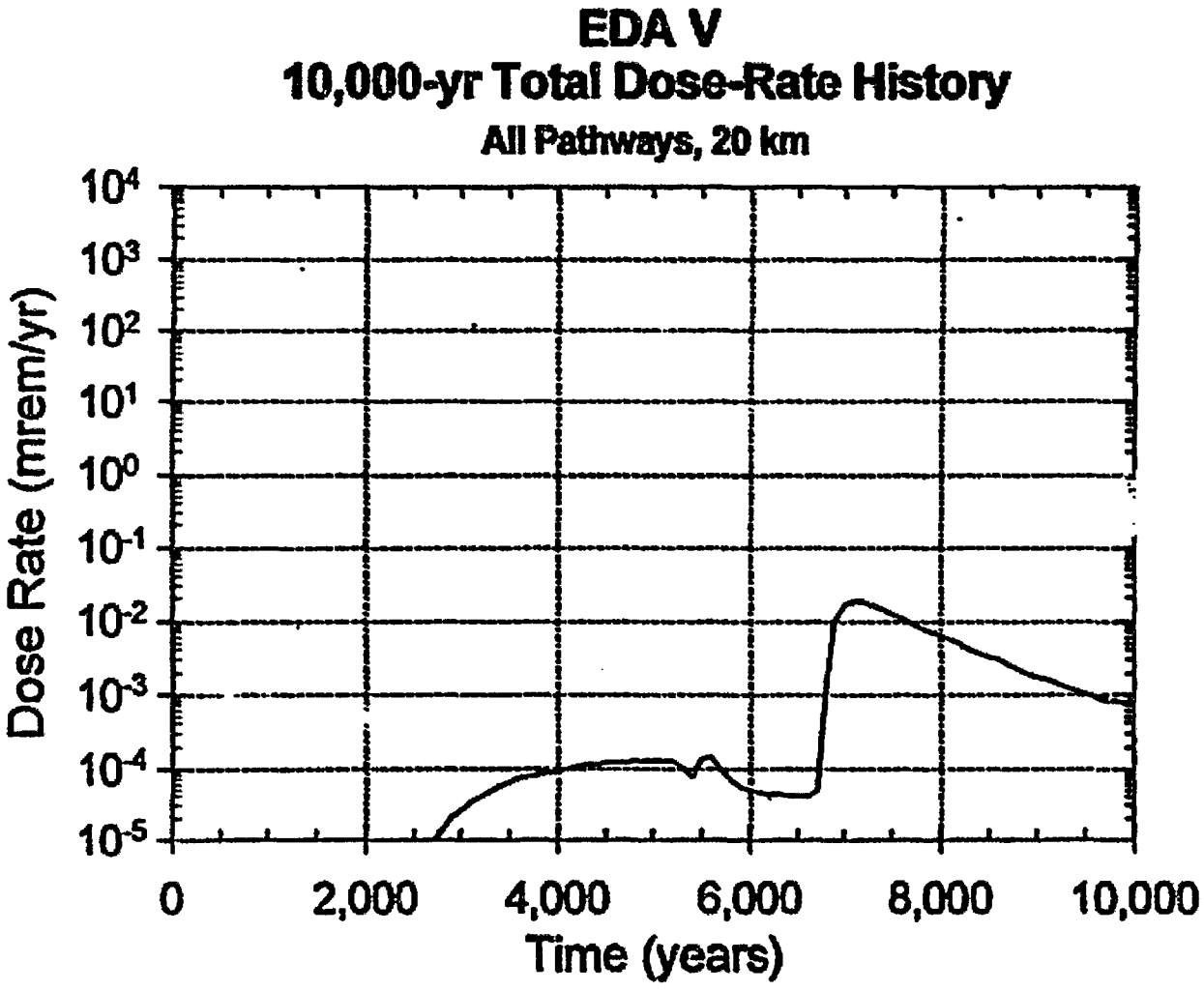
EDA IV


EDA IV
10,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
2,000
4,000
6,000
8,000
10,000
Time (years)

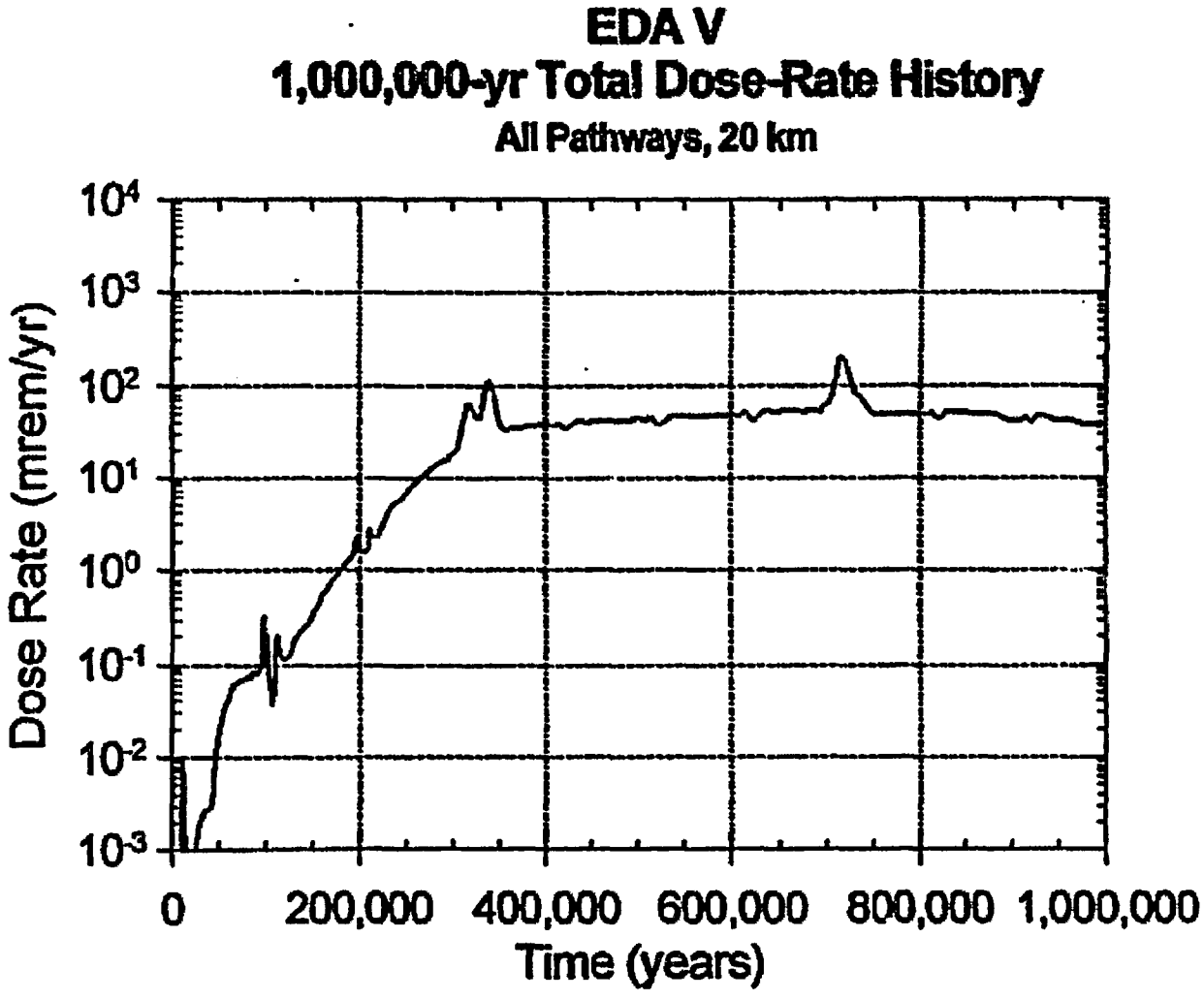
EDA IV


EDA IV
1,000,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
0
200,000
400,000
600,000
800,000
1,000,000
Time (years)

EDA V


EDA V
10,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
10^-5
0
2,000
4,000
6,000
8,000
10,000
Time (years)

EDA V


EDA V
1,000,000-yr Total Dose-Rate History
All Pathways, 20 km
Dose Rate (mrem/yr)
10^4
10^3
10^2
10^1
10^0
10^-1
10^-2
10^-3
0
200,000
400,000
600,000
800,000
1,000,000
Time (years)

LA Design Selection Update

(Continued)

- **Options Considered and Criteria Used to Arrive at a Recommendation**
  - **10,000 year dose not a discriminator (all 5 EDAs meet expected requirement)**
  - **other criteria considered**

Table 5-4. License Application Design Selection EDA Design Values

License Application Design Selection Enhanced Design Alternatives—Design Values

Design Element	EDA I	EDA II	EDA III	EDA IV	EDA V
Thermal Goals					
• Cladding	350°C	350°C	350°C	350°C	350°C
Waste package surface			Cools to 80°C before relative humidity reaches 90%		
Drift wall	96°C	200°C	200°C	200°C	225°C
Drift environment				Keep drifts dry for thousands of years	Keep drifts dry for several thousand years
Pillar temperatures		Keep centers of pillars below boiling (96°C)			
Other goals				Limit gamma dose at waste package surface to 200 mrem/hr	
Areal Mass Loading (MTHM/acre)	45	60	85	85	150
Area (acres) for 70,000 MTHM[1]	1,400	1,050	740	740	420
Line/Point Load	Point	Line	Line	Line	Line
Waste Package Size (PWR)	12	21	21	21	21
Drift Diameter (m)	5.5	5.5	5.5	5.5	5.5
Drift Spacing (m)	43	81	56	56	32
Preclosure Ventilation	50 years @ 2 to 10 m^3/s	50 years @ 2 to 10 m^3/s	50 years @ 2 to 10 m^3/s	50 years @ 2 to 10 m^3/s	50 years @ 2 to 10 m^3/s
Waste package heat output at emplacement Maximum Average (PWR waste package) (CRWMS M&O 1999hh)	20% blending used to reduce maximum 6.7 kW 5.6 kW	20% blending used to reduce maximum 11.8 kW 9.8 kW	Limited blending 18.0 kW 9.5 kW	Limited blending 18.0 kW 9.5 kW	20% blending used to reduce maximum 11.8 kW 9.8 kW
Waste Package Material	2-cm Alloy-22 over 5-cm stainless steel	2-cm Alloy-22 over 5-cm stainless steel	a) 2-cm Alloy-22 over 5-cm stainless steel b) 2-cm Alloy-22 over 15-cm Ti-7 over 4-cm stainless steel	30-cm carbon steel	2-cm Alloy-22 over 5-cm stainless steel
Fillers	No	No	No	Inert gas	No
Backfill	No	Yes	No	Yes	No
Drip Shield	Yes	Yes	Yes	Yes	Yes
Total Waste Packages	15,903	10,039	10,213	10,213	10,039

[1] Areas are calculated by dividing the commercial inventory (63,000 MTHM) by the areal mass loading and rounding to the nearest 10 acres; additional area would be required for perimeter drifts, maintenance drifts, and contingency areas.

Evaluation Criteria Summary

- Criteria Considered
- Licensing Probability/Safety
- Construction, Operations, and Maintenance
- Flexibility
- Cost/Schedule

Evaluation Criteria Summary

(Continued)

Licensing Probability/Safety

- Design function could be clearly communicated
- Engineering analysis followed accepted methods
- Postclosure functions could be demonstrated
- Precedents for design and construction involved regulatory as well as engineering issues
- Availability of qualified data was likely in possible License Application time frame

Evaluation Criteria Summary

(Continued)

Licensing Probability/Safety (Continued)

- No high-level design goals for MGR and assumptions document violated
- Measures: performance margin, defense in depth, constructed scales expressing uncertainties in postclosure performance, engineering acceptance, and advantages and disadvantages

Evaluation Criteria Summary

(Continued)

Construction, Operations, and Maintenance

- **Worker safety**
- **Constructability**
- **Operations**
- **Maintainability**
- **Handling logistics**
- **Performance confirmation activities**
- **Off-normal event recovery**
- **Measures: constructed scales expressing overall degree of advantage or disadvantage, taking into account the degree of simplicity or complexity in addressing COM issues**

Evaluation Criteria Summary

(Continued)

Flexibility

- Increased capacity (if authorized)
- Longer preclosure period
- Shorter preclosure period
- Receipt of 5-year-old spent fuel
- Late design changes (prior to construction)
- Unanticipated natural features
- Measures: constructed scale expressing flexibility to accommodate these contingencies

Evaluation Criteria Summary

(Continued)

Cost/Schedule

- Total repository life cycle costs (-25% to +50% contingency) associated with the phases of site characterization and licensing, construction, operations, monitoring, and closure
- Net present value costs for each phase (in 1998 dollars with 2.3 percent real annual interest rate)
- Number of years associated with each phase (assumed 50-year period from start of emplacement to closure)
- Measures are the three above items

EDA-II Recommendation Basis

- EDAs were ranked within each criteria category
- Non-numerical (e.g. paired-comparison) methods were used to arrive at a recommendation
- Provides good balance between postclosure advantages of lower temperature (reduce uncertainties) and preclosure advantages of higher temperature (COM, flexibility, and cost)
- Provides good flexibility with respect to optimization including sufficient margin with respect to its cladding and drift wall temperature goals

EDA-II Recommendation Basis

(Continued)

- Also flexible with respect to possible modifications toward either higher or lower temperature design goals
- No further technology development or site characterization needed to transition to cooler temperature goals by extending preclosure ventilation
- Performance assessment models required, if lower temperature design selected, should be simplifications of those required for this EDA

YUCCA
MOUNTAIN
PROJECT

License Application Design Selection Update

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Tim Gunter
U.S. Department of Energy

June 22, 1999

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

LA Design Selection Update

- The M&O recommendation was submitted April 15, 1999
- Design Alternatives underwent an RW project review (which included EM and NR)
- Rev. 01 of the License Application Design Selection report is undergoing an RW program review

LA Design Selection Update

(Continued)

- That review is expected to take at least a month, with comments being returned to the project in early July 1999
- Upon resolution of those comments, the program will provide direction to the project for preparation of a change request

YUCCA
MOUNTAIN
PROJECT

Preclosure Duration

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Dan Kane
U.S. Department of Energy

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

June 22, 1999

Preclosure Period Duration

- Design basis preclosure period is 100 years from start of emplacement - documented in CRWMS Requirements Document
- Preclosure Design Basis Event analyses and rest of Integrated Safety Analysis based on 100 years

Preclosure Period Duration

(Continued)

- The capability to extend the preclosure period will be provided
  - Only those features necessary to support the subsurface facility are needed after emplacement is complete
  - Repair, replacement, maintenance
- Extension of preclosure period would require license amendment request and NRC approval

YUCCA MOUNTAIN PROJECT

Retrievability

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Dan Kane
U.S. Department of Energy

U.S. Department of Energy
Office of Civilian Radioactive

June 22. 1999

NRC Requirements

- 10 CFR 63.21(c)(19) – "A description of plans for retrieval and alternate storage of the radioactive wastes, should retrieval be necessary."
- 10 CFR 63.111(e)(1) – "The geologic repository operations area shall be designed to preserve the option of waste retrieval throughout the period during which wastes are being emplaced and thereafter,.... To satisfy this objective, the geologic repository operations area shall be designed so that any or all of the emplaced waste could be retrieved on a reasonable schedule starting at any time up to 50 years after waste emplacement operations are initiated,..."

NRC Requirements

(Continued)

- 10 CFR 63.111(e)(3) "....a reasonable schedule for retrieval is one that would permit retrieval in about the same time as that required to construct the geologic repository operations area and emplace waste."

LA Approach

- Physical aspects of retrieval addressed in VA for normal and off-normal scenarios
- The design and concept of operations will preserve the ability to retrieve waste during the preclosure period
- Retrieval under normal conditions will use the same equipment as used for emplacement. Design criteria for this equipment will include retrieval and will be described in the LA
- Concept of operations for retrieval to be described in the LA

LA Approach
(Continued)

The facility design will allow for periodic access to emplacement drifts for repair and refurbishment

Startup testing will verify that equipment operates as designed and installed

- Any problems resolved before any waste is emplaced

NRC monitoring of startup testing will form part of the basis for granting a license to receive and possess waste

Retrieval could be at any time before placement of backfill and drip shields

Regulatory Aspects of Retrieval

- Inform NRC of intent to and reason for retrieval
- Submit application for amendment to license to receive and possess
  - Scope based on Regulatory Guide 3.48 and NUREG 1567 (format and content and review plan for ISFSI)
    - » Principal Design Criteria
    - » Operating Procedures
    - » Thermal Evaluation
    - » Criticality Evaluation
    - » Accident Analysis
    - » Technical Specifications
    - » Installation Design and Structural Evaluation
    - » Operating Systems
    - » Waste Confinement and Management
    - » Radiation Protection Evaluation
    - » Confinement Evaluation
    - » Conduct of Operations

Regulatory Aspects of Retrieval
(Continued)

- **Incorporate in application for amendment relevant information from**
  - **Dry Transfer System Topical Safety Analysis Report**
  - **Centralized Interim Storage Facility Topical Safety Analysis Report**

YUCCA MOUNTAIN PROJECT

Repository Schedule/Impact of Extended Life on the Retrieval Option

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Daniel McKenzie
CRWMS/M&O

June 22, 1999

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

Repository Sequence

- **Construction: 2005 - 2010**
  - **The period of initial construction following receipt of Construction Authorization and prior to the start of emplacement**
- **Emplacement / Development: 2010 - 2031**
  - **A period of simultaneous waste emplacement and ongoing construction, following receipt of an amendment to receive and possess waste**

Repository Sequence
(Continued)

- **Emplacement: 2032-2033**
  - **Completion of emplacement following the end of subsurface development**
- **Monitoring: 2034 - (Closure)**
  - **A period during which no construction or emplacement occurs, but during which the repository is maintained and the Performance Confirmation program is ongoing**

Repository Sequence
(Continued)

- **Decommissioning / Closure**
  - **An approximate 7 year period commencing with the receipt of a license amendment to close the repository during which any EBS closure features (drip shield, backfill) are placed, non-permanent subsurface materials are removed, and the facility is closed and sealed**

Extended Monitoring Period

- Extension of the Monitoring period would allow acquisition of additional data to better support an eventual decision to close the repository
- It should enhance confidence because the decision to close is based on a more comprehensive base of information

Impacts of Extended Monitoring Period

- Extending the life of the subsurface facility will entail long-term observation and maintenance of subsurface and site infrastructure
- Total System Life Cycle Cost is increased
- Infrastructure must be designed to be maintainable for the extended period

Impact of Longer Monitoring Period on Operability

- The repository design and operations concept is based on robustness and "maintainability"
- It is not reasonable to expect a facility to operate without maintenance for 300 years
- The facility design will allow for periodic access to emplacement drifts for repair and refurbishment
- This is accounted for by the presence of standby emplacement drifts, prepared and ready for emplacement

Impact of Longer Monitoring Period on Operability

(Continued)

- These drifts would be available to accept waste packages relocated from a drift in need of repair
- For long monitoring periods, a regular cycle could be established in which drifts would be cooled, waste packages moved to an empty drift, and the drift re-worked as needed
- Packages from the next drift scheduled for repair would be placed in the newly remediated drift

Impact of Longer Monitoring Period on Operability

(Continued)

- Just as the in-drift conditions must be monitored and maintainable, the rest of the subsurface, and subsurface-related surface facilities, must also be maintained and replaced, as appropriate, at regular intervals
- Performance Confirmation instrumentation and data acquisition equipment, whether fixed in-place or on mobile equipment, must be designed for maintenance and/or replacement

Impact on Retrievability

- The retrieval option will be maintained throughout the period from the start of emplacement until a license amendment to close the facility is received
- Because there is ongoing inspection and maintenance of the emplacement drifts, retrieval should be possible at any time prior to the start of decommissioning

YUCCA
MOUNTAIN
PROJECT

The Drift Stability Panel and the Repository Consulting Board on Ground Support

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Richard Nolting
CRWMS/M&O

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

June 22, 1999

Ground Support
Differing Views of Panel and Board

- The Drift Stability Panel was convened to provide input on the ground control design efforts of the Repository Sub-surface Design team
- The Panel's recommendation for ground control differs somewhat from that of the Repository Design Consulting Board

The Drift Stability Panel's View

- The Panel prefers "rock reinforcement" in the form of grouted rock bolts with heavy wire mesh and channel
- The Panel also suggests a multiple support system of rock bolts and steel sets
- The Panel's period of reference was 100 years rather than the 150- to 300-year period the Board used

The Repository Consulting Board's View

- The Board favors "support" in the form of a robust lining concept and their first choice remains a pre-cast concrete segmental lining
- The Board's second option is an internal support system of steel ribs with steel channel lagging, which they said would be more robust and require less maintenance than a rock dowel/wire mesh system

The Repository Consulting Board's View
(Continued)

- The Board said a dowel/mesh support would be satisfactory for 50 years, if provision is made for maintenance which would require temporary removal of waste from the affected drift

Function of the Two Ground Support Systems

Failure mechanism:

- **Both the Board and the Panel agree that either bolts/mesh or steel sets/lagging will be able to control the expected mechanism of rock deterioration, which is loosening, raveling, and falls of rock in a shallow zone surrounding the drift**

The Issue of Cementitious Material

- An outstanding issue is the post-closure acceptability of cementitious grout used with rock bolts and the effect of grout-filled bolt holes
- This issue is being addressed by Subsurface Design in conjunction with PA. A determination of the impact is expected by the end of the calendar year

Longevity Issues

- The principal issues regarding the longevity of a permanent ground support system are:
- Longevity of materials, i.e., metallic and cementitious components and any reactions between components, including waste packages
- Longevity of the installed systems, i.e., performance in response to initial and long-term loadings

Resolution of Issues

Current and planned analyses that will provide a basis for resolving the longevity issues include further examination of :

- Drift stability
- Materials longevity and interactions
- Steel set design and performance
- Rock bolt design and performance

Resolution of Issues

(Continued)

- Both steel sets and rock bolts have unique advantages, and based on current knowledge, a permanent support system could include both
- But whatever the type and proportion of components, a goal is to develop a system that minimizes uncertainties regarding longevity
- It is the intent of the Sub-surface Design team to develop an approach to emplacement drift ground support by the end of this calendar year

YUCCA
MOUNTAIN
PROJECT

Quality Assurance Classification and Grading

Presented to:
DOE/NRC Quarterly Tcchnical Meeting
Las Vegas, Nevada

Presented by:
David Haught
U.S. Department of Energy

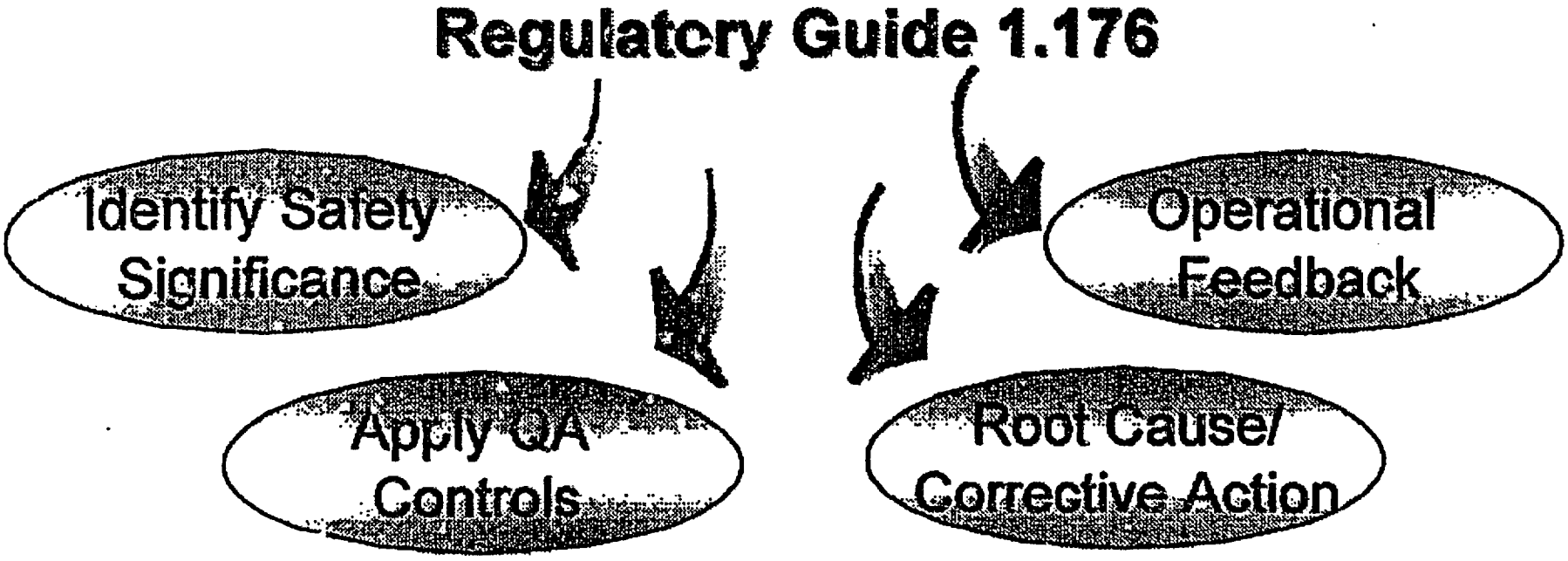
June 22. 1999

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

Agenda

- Purpose
  - Describe the essential elements of the graded Quality Assurance process
- Classification/Graded Quality Assurance
- Examples
- Conclusion

Essential Elements of Graded Quality Assurance Program



Identify Safety Significance

- QAP-2-3 Revision 10
  - Three quality levels based on safety significance
  - Preclosure and postclosure
  - Risk
    - » Consequences of failure
    - » Probability of failure

Apply Quality Assurance Controls Based on Safety Significance

Factors to Consider

- Function
- Consequence of failure
- Importance
- Complexity
- Reliability
- Reproducibility
- Uniqueness
- History
- Special controls or processes
- Inspection or test
- Precedence

Quality Level 1

Criteria

- Failure could directly result in a condition adverse to public safety
- Failure could directly result in offsite dose in excess of 100 mrem for Category 1 DBEs or 5 rem for Category 2 DBEs
- Required for containment and criticality control of high level waste and SNF
- Directly required to meet postclosure performance objectives

Examples

- Waste handling building structure
- Assembly racks
- Waste package

Quality Assurance Controls

- QARD

Quality Level 2

Criteria

- Failure could indirectly result in a condition adverse to public safety (i.e., defense in depth)
- Failure could directly result in an offsite dose in excess of 25 mrem for Category 1 DBEs
- Required for radioactive waste treatment; fire protection systems for QL 1 SSC
- Failure could indirectly result in a condition adverse to waste isolation (i.e., defense in depth)

Examples

- WHB ventilation
- Cranes

Quality Assurance Controls

- QL-2 vendor list
  - ASME N509
  - ASME NOG-1
- Receipt inspection
- Periodic maintenance/testing
  - Preoperational
  - Periodic (load)
  - Trending

Quality Level 3

Criteria

- SSCs required to meet occupational exposure requirements
- ALARA design features
- Radiological, technical specification compliance, and emergency response monitoring functions

Examples

- Shield walls
- Robotics
- Monitors (tech spec, emergency, radiation)

Quality Assurance Controls

- QL-3 vendors list
  - off the shelf
- Receipt inspection
- Periodic maintenance/testing
  - Installation
  - Calibration

Example - Identifying Safety Significance

- **Fuel Assembly Drop in Waste Handling Building**
  - Category 1 DBE
  - Event dose with HEPA = 0.02 mrem
  - Event dose without HEPA = 30 mrem
  - HEPA classified as QL-2 based on safety significance

Example - Identifying Controls

- QL-2 HEPA
  - Procured from ASME N509 certified vendor
  - Preoperation acceptance test, filter removal efficiency $\geq$ 99.9%
  - Annual test, filter removal efficiency $\geq$ 99.9%
  - Daily monitoring of filter ΔP
  - Quarterly calibration of ΔP instrument
  - Performance evaluation with 25% increase in filter ΔP

Example - Identifying Controls

- QL-3 Technical Specification Instrument
  - Procured from QL-3 vendor
  - Receipt inspection
  - Calibrated to standard traceable to NIST
  - Quarterly calibration
  - Out of calibration program
  - Annual maintenance

Uses of Graded Quality Assurance

- Factor for Selection of:
  - Codes and standards
  - Requirements
  - Design
- QA controls selected commensurate with safety significance

Conclusions

- Graded quality assurance
  - Essential elements
  - QAP-2-3 classifications based on safety significance
  - Establish QA controls commensurate with SSC safety significance
- Follow-up meeting recommended (to discuss details)

YUCCA
MOUNTAIN
PROJECT

Fiscal Year 2000 Planning for Multi-Year Plan

Presented to:
DOE/NRC Quarterly Technical Meeting
Las Vegas, Nevada

Presented by:
Jane Summerson
U.S. Department of Energy

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

June 22, 1999

Outline

- Planning Priorities
- Viability Assessment Volume 4
- Impacts to Planned Work in the Viability Assessment Volume 4
- Revised Work Breakdown Structure
- Fiscal Year 2000 Planning
- Resource Documentation
- Closing Statement

Planning Priorities

- Develop and implement Integrated Safety Management
- Ensure defensibility of radioactive waste products by developing and maintaining the validity, traceability, reproducibility, and retrievability of data, information, and products

Planning Priorities

(Continued)

- Meet planned Site Recommendation schedule (Site Recommendation Consideration Report - 11/00 and Site Recommendation Report - 7/01) by defining and implementing the necessary and sufficient work to achieve those milestones
- Define and implement work necessary for pre-closure design activities
- Complete required technical work and design necessary to support the License Application schedule

Viability Assessment Volume 4

- Viability Assessment Volume 4 was developed based on DOE's understanding of project needs in 1998
  - Defines DOE's proposed workscope to meet programmatic goals of Site Recommendation and License Application
  - Contains budget, and schedule to support workscope
- Any changes to the Viability Assessment proposed work-scope will be fully justified