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OVERNIGHT MAIL

JAN 07 1999

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U.S. DEPARTMENT OF ENERGY (DOE) TOPICAL REPORT ON DISPOSAL CRITICALITY ANALYSIS METHODOLOGY

Enclosed is DOE's *Disposal Criticality Analysis Methodology Topical Report (YMP/TR-004Q, Revision 0)* for review by the U.S. Nuclear Regulatory Commission (NRC). To facilitate your review, we are enclosing one copy of those references cited in the topical report that may not be readily available for your use. We have had many substantive interactions with your staff on our approach to disposal criticality analysis, and we look forward to the results of your acceptance and technical reviews of the topical report.

As we discussed with your staff in the most recent of these interactions (an Appendix 7 meeting on October 7, 1998), we are requesting NRC's review and comments on DOE's disposal criticality analysis methodology and the planned approach to validating the methodology. As you are aware, we will be requesting your review of the application of the methodology to specific waste forms and waste package designs at repository conditions when we have determined those specific conditions. We will continue to discuss these key areas with you and your staff to keep you informed as these issues are resolved.

Criticality analyses will use information on projected postclosure conditions when this information is available, based on design selection and design development sufficient to support detailed analyses of waste package and repository conditions for the chosen design. If our approach is acceptable, the license application and its supporting references would contain: 1) the demonstration that the methodology is valid for use under specific waste form, waste package, and repository conditions, and; 2) criticality analyses using the validated methodology.

The methodology presented in this topical report is risk-informed. It supports calculation of the probability and consequences of postclosure criticality, both of which will be inputs to the total system performance assessment that will support the license application. We believe the methodology presented in this topical report will support compliance with the risk-informed regulations currently under consideration by the NRC, as indicated in the draft 10 CFR Part 63. We agree with the NRC that risk-informed analysis is the best approach to providing reasonable assurance that the health and safety of the public will not be adversely affected by potential postclosure criticality.

In addition to this topical report, a submittal to the NRC on the subject of disposal criticality is planned. In September 1999, we plan to submit an addendum to this topical report that will describe the analysis methodology appropriate for naval spent fuel. The methodology described in this report, with minor exceptions, is planned for use for degraded naval fuel. However, a more deterministic methodology is

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proposed for intact naval fuel as a result of its unique design. This methodology would employ different codes, cross sections, and benchmarks to validate naval fuel calculational methods and results.

On a related subject, we discussed with your staff at the recent Appendix 7 meeting (referenced above) disposition of NRC's October 4, 1995 comments on the annotated outline for this topical report. As we noted in the meeting, the three-year interval between development of the annotated outline and completion of the topical report has resulted in a substantial maturation of our approach, as reflected in differences between the annotated outline and the structure of the final topical report. We believe we have addressed the staff's comments on the annotated outline in the final topical report, where appropriate. However, we look forward to your confirmation that your original comments on the annotated outline have been adequately resolved.

Again, we look forward to your review of the topical report, as well as to future interactions with your staff on the report and on the subject of postclosure criticality. If you have any questions, please call Paige R.Z. Russell at (702) 794-1315, or April V. Gil at (702) 794-5578.



Stephan Brocoum
Acting Assistant Manager, Office of
Licensing and Regulatory Compliance

OL&RC:AVG-0582

Enclosures:

- 1) Disposal Criticality Analysis Methodology
Topical Report
- 2) Reference Documents

cc w/encl 1:

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The following is a listing of the M&O generated documents that have been provided in the accompanying package. A total of 52 reference documents have been provided.

✓ Ever letter + Topical Report

1 Bruton, C.J. 1996. *Near-Field and Altered-Zone Environmental Report*, Volume II. Livermore, California: Lawrence Livermore National Laboratory. MOL.19970515.0072.

2 CRWMS M&O (Civilian Radioactive Waste Management System Management and Operating Contractors) 1996a. *Waste Package Development Technical Document*. BBA000000-01717-5705-00009 REV 01. Las Vegas, Nevada: Author. MOL.19961105.0228.

3 CRWMS M&O 1996b. *Total System Performance Assessment-1995: An Evaluation of Potential Yucca Mountain Repository*. B00000000-01717-2200-00136 REV 01. Las Vegas, Nevada.: Author. MOL.19960724.0188.

4 CRWMS M&O 1996c. *Probabilistic External Criticality Evaluation*. BB0000000-01717-2200-00037 REV 00. Las Vegas, Nevada: Author. MOL.19961029.0024

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6 CRWMS M&O 1997b. *Summary Report of SNF Isotopic Comparisons for the Disposal Criticality Analysis Methodology*. B00000000-01717-5705-00077 REV 00. Las Vegas, Nevada: Author. MOL.19971231.0277.

7 CRWMS M&O 1997c. *Third Waste Package Probabilistic Criticality Analysis, Methodology for Basket Degradation with Application to Commercial Spent Nuclear Fuel*. BBA000000-01717-0200-00049 REV 00. Las Vegas, Nevada: Author. MOL.19980116.0070.

8 CRWMS M&O 1997d. *Degraded Mode Criticality Analysis of Immobilized Plutonium Waste Forms in a Geologic Repository*. A00000000-01717-5705-00014 REV 01. Las Vegas, Nevada: Author. MOL.19980422.0911.

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12 CRWMS M&O 1997i. *Construction of Scenarios for Nuclear Criticality at the Potential Repository at Yucca Mountain, Nevada*. B00000000-01717-2200-00194 REV 00. Las Vegas, Nevada: Author. MOL.19980204.0281.

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14 CRWMS M&O 1998c. *Criticality Abstraction/Testing Workshop Results*. B00000000-01717-2200-00187 REV 00. Las Vegas, Nevada: Author. MOL. 19980528.0040.

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Box 2
15 CRWMS M&O 1998e. *Evaluation of Codisposal Viability for Aluminum-Chloride-Owned Spent Fuel: Phase II Degraded Codisposal Waste Package Internal Criticality*. BBA000000-01717-5705-00017 REV 01. Las Vegas, Nevada: Author. MOL.19980701.0782.

16 CRWMS M&O 1998f. *Principal Isotope Selection Report*. B00000000-01717-5705-00104 REV 00. Las Vegas, Nevada: Author. MOL.19980827.0187.

17 CRWMS M&O 1998j. *Canistered Spent Nuclear Fuel Disposal Container System Description Document. Criteria Basis Statement 1.2.1.5*. BBA000000-01717-1705-00001 REV 00. Las Vegas, Nevada: Author. MOL.19980819.0223 (vol. 1), MOL.19980819.0223 (vol. 2).

18 CRWMS M&O 1998k. *Summary Report of Commercial Reactor Critical Analyses Performed for Disposal Criticality Analysis Methodology*. B00000000-01717-5705-00075 REV 01. Las Vegas, Nevada: Author. MOL.19980825.0001.

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22 CRWMS M&O 1998o. *Software Routine Report for WAPDEG (Version 3.06)*. 30048-2999 Rev. 00. Las Vegas, Nevada: Author. MOL.19980609.0061.

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24 CRWMS M&O 1998q. *Geochemical and Physical Analysis of Degradation Modes of HEU in a Codisposal Waste Package with HLW Canisters*. BBA000000-01717-0200-00059 REV 01. Las Vegas, Nevada: Author. MOL.19980624.0325.

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27 DOE (U.S. Department of Energy) 1996. *Civilian Radioactive Waste Management System Management and Operating Contractor Requirements Document* DOE/RW-0406, Rev 04. A00000000-00811-1708-00003 REV 04. Washington, D.C.: U.S. Department of Energy. MOL.19980623.0946.

28 DOE 1998a. *Quality Assurance Requirements and Description*. DOE/RW-0333P, Rev 8. Washington, D.C.: U.S. Department of Energy. MOL.19980601.0022.

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- 34 CRWMS M&O 1996d. *Emplaced Waste Package Structural Capability Through Time Report.* BBAA000000-01717-5705-00001 REV 00. Las Vegas, Nevada: Author. MOL.19970401.0059.
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- 41 CRWMS M&O 1997h. *Criticality Consequence Analysis Involving Intact PWR SNF in a Degraded 21 PWR Assembly Waste Package.* BBA000000-01717-0200-00057 REV 00. Las Vegas, Nevada: Author. MOL.19980106.0331.
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- 50 CRWMS M&O 1998o. *Criticality Evaluation of Degraded Internal Configurations for a 44 BWR Waste Package.* BBA000000-01717-0210-00020 REV 00. Las Vegas, Nevada: Author. MOL.19980825.0207.
- 51 CRWMS M&O (Civilian Radioactive Waste Management System Management and Operating Contractor) 1998a. *Evaluation of Codisposal Viability for Aluminum-Clad DOE-Owned Spent Fuel: Phase II Degraded Codisposal Waste Package Internal Criticality.* BBA000000-01717-5705-00017 REV 01. Las Vegas, Nevada: Author. MOL.19980616.0098.
- 52 CRWMS M&O 1998b. *Disposal Criticality Analysis for Aluminum Based Fuel in a Codisposal Waste Package-ORR and MIT SNF.* BBA000000-01717-0200-00060 REV 00. Las Vegas, Nevada: Author. MOL.19980224.0670.

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