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STONE & WEBSTER

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

12 November 2001
DCS-NRC-000070

Subject: Docket Number 070-03098
Duke Cogema Stone & Webster
Mixed Oxide Fuel Fabrication Facility
Seismology and Geotechnical Engineering Technical Exchange
Action Items

In our 19-20 September 2001 Technical Exchange meeting on Seismology and Geotechnical Engineering in Aiken, SC, the NRC Staff requested clarification of several issues and copies of several reference documents to assist in their review of the CAR and the MFFF Site Geotechnical Report. The responses to these action items are shown in Enclosure A, and the requested references are also enclosed. This letter transmits one hard copy of each document, and four CDs containing electronic (PDF) copies of the documents. If you have any questions, please contact me at (704) 373-7820.

Sincerely,

Peter S. Hastings, P.E.
Licensing Manager

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Enclosure: (A) Action Item Followup

(B) References listed by citation in Enclosure A (one hard copy for Document Control/PDR; four CD copies for distribution):

Day 1

2a Amick and Talwani (1986)
2b Talwani and Sharma (1999)
3 Madabhushi and Talwani (1993)
6a Moos and Zoback (1992)
6b Moos and Zoback (1993)
7a Domoracki (1995)
7b Wyatt and Harris (2000)
8a Stieve, Coruh and Costain (1994)
8b Cumbest, Stephenson, Wyatt and Maryak (1998)
8c Cumbest, Wyatt, Stephenson and Maryak (2000)

Day 2

4 WSRC (1998) (K-ESR-F-0005)

xc (without Enclosure B):

David Alberstein, USDOE/HQ
Edward J. Brabazon, DCS
Joseph G. Giitter, USNRC/HQ
Robert H. Ihde, DCS
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PRA/EDMS: Corresp\Outgoing\NRC\Licensing\DCS-NRC-000070

Enclosure A

NRC Technical Exchange Seismology/Geotechnical Engineering (19-20 September 2001)

Action Item Followup

Day One

1. Provide dates of DNFSB meetings about SRS site-specific seismic hazards.

   DNFSB meetings concerning SRS site-specific seismic hazards have been conducted on the following dates:

   - 23 October1997
   - 14 April 1998
   - 05 May 1998
   - 25 August 1998
   - 17 May 1999
   - 18 May 1999
   - 19 October 1999

2. Characterize the number/magnitude of 1886 Charleston earthquake aftershocks, particularly for those at or above MMI VI.

   The following two enclosed documents present information characterizing the number and magnitudes of aftershocks of the 1886 Charleston Earthquake:

   a. Amick, D. and P. Talwani (1986). *Earthquake Recurrence Rates and Probability Estimates for the Occurrence of Significant Seismic Activity in the Charleston Area: The Next 100 Years*, Third U.S. National Conference on Earthquake Engineering, Vol 1, pp. 55-64.

   b. Talwani, P. and N. Sharma (1999). *Reevaluation of the Magnitudes of Three Destructive Aftershocks of the 1886 Charleston Earthquake*, Seismological Research Letters, Vol 70, No. 3, pp. 360-367.

3. Confirm that the Woodstock fault is right lateral. Confirm that the dip on the Ashley River fault is almost vertical.

Information contained in the following (enclosed) reference confirms these issues.

Madabhushi, S. and P. Talwani (1993). *Fault Plane Solutions and Relocations of Recent earthquakes in Middleton Place Summerville Seismic Zone Near Charleston, South Carolina*, Bulletin of the Seismological Society of America, Vol. 83, No. 5, pp. 1442-1466.

As detailed below see page 1465, Paragraph 2; Page 1443, Paragraph 3, Sentence 2 and Paragraph 2, pages 1464 - 1465; Page 1442, Abstract, Paragraph 3, respectively.

Confirm that the Woodstock Fault (WF) is right lateral:

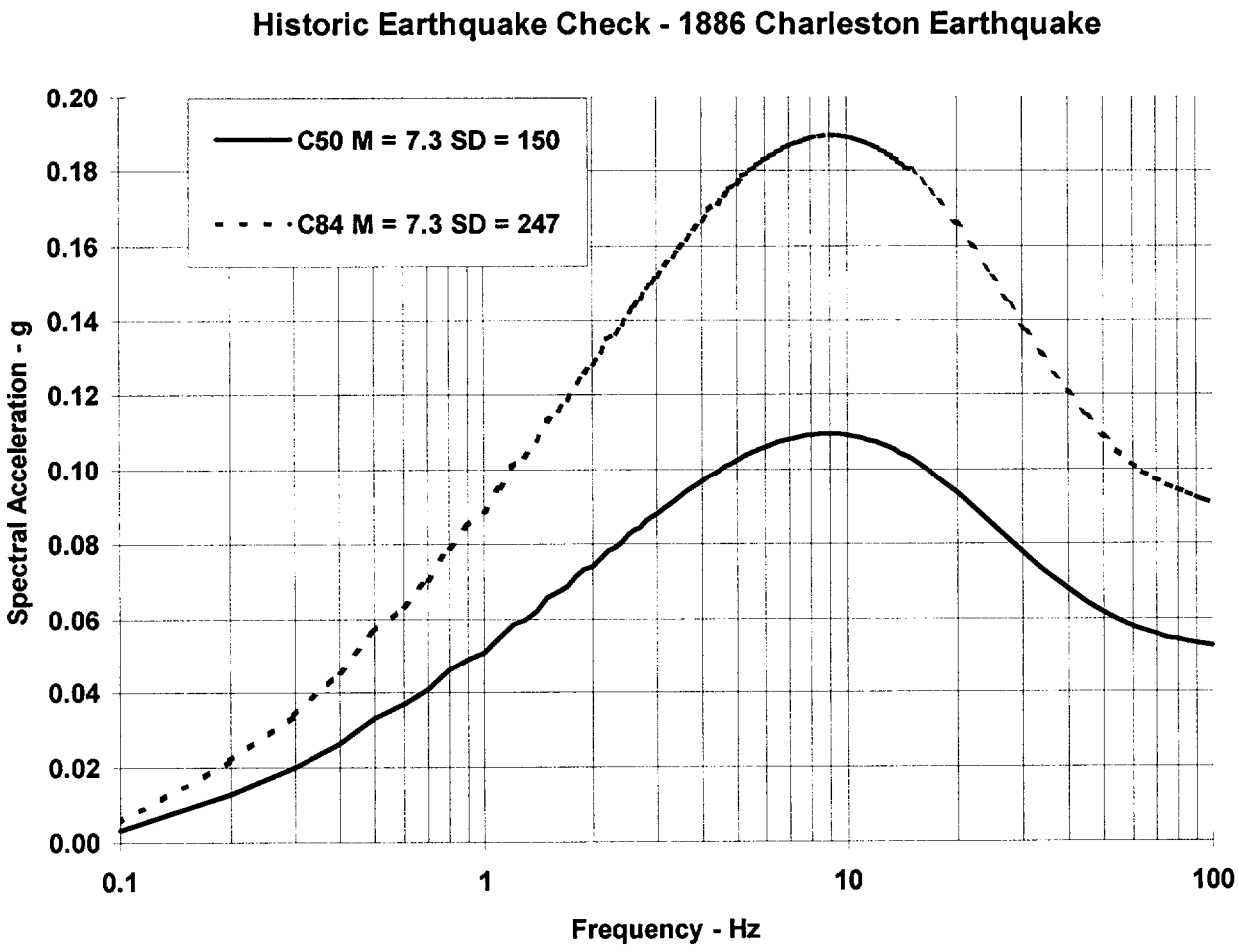
- Page 1465, Paragraph 2 states, "The second set consists of 11 events with vertical fault planes and the others dipping to the west were oriented NNE-SSW and N-S, respectively. Segregation of these events into two subsets revealed that the subset IIA, oriented NNE-SSW was associated with **right-lateral strike slip motion on near vertical fault** and subset IIB oriented N-S with oblique faulting with a strong thrust component on a plane dipping about 41° W. These styles of faulting are in general agreement with the anticipated sense of motion on these faults in response to the orientation of S_{Hmax}. **These two subsets were classified as belonging to WF zone.**"
- Page 1443, Paragraph 3, Sentence 2 states, "**Composite fault plane solutions (CFPS) of other events suggested that the WF was associated with right-lateral strike slip motion...**"

Confirm dip on Ashley River Fault (ARF) is almost vertical:

- Paragraph 2, pages 1464 - 1465, states, "For the first set, the strike and **dip** of the individual FPS varied between N70° W and N20° W and **40° and 70° SW**, respectively. These events were associated with various amounts of reverse faulting with variable amounts of strike-slip motion on fault planes striking NW and dipping to the SW. **The FPS suggests compatibility with the Ashley River fault zone.** The events were further divided into three subsets, according to their strike and dip. **The results of CFPS and cross sections suggest that the ARF zone is not a planar feature, but is composed of short segments with varying strikes and dips - all generally striking NW and dipping SW.**"
- Page 1442, Abstract, Paragraph 3 provides the dips of the Ashley River Fault zone segments as **40° to 70° SW.**

4. Provide Charleston earthquake deterministic check curve (with correct labeling).

The figure below, updated from that used in the 19-20 September technical exchange, presents the bedrock response spectra associated with the Charleston earthquake deterministic check.



5. Provide reference information regarding attenuation model/minutes of USGS St. Louis workshop; confirm that logic tree from San Francisco meeting minutes as input to new national maps is part of the St. Louis minutes.

   DCS has reviewed the material used in the subject USGS workshops. After further review, we believe that while this material was appropriate for workshop discussions of principles, it had not yet received appropriate checks and peer review to be used as a design input or reference for formal evaluation of the appropriateness of MFFF design criteria. On this basis, the reference material is not submitted.

6. Provide References 307 & 308 in WSRC-TR-2000-00454.

   The following documents are enclosed:

   a. Moos, D. and Zoback, M.D. (1992) *In Situ Stress Measurements in the NPR Hole, Savannah River Site, South Carolina: Final Report to Westinghouse Savannah River Co., Vol. 1, Results and Interpretations.* Subcontract AA00925P, Science Applications International Corporation, Augusta, GA.

   b. Moos, D. and Zoback, M.D. (1993) *Near Surface "Thin Skin" Reverse Faulting Stresses in the Southeastern United States.* International Journal of Rock Mechanics and Mining Sciences and Geomechanical Abstracts Vol. 30, No. 7, pp. 965-971.

7. Provide references for bedrock faulting.

   The following bedrock faulting references are enclosed:

   a. Domoracki, W.,1995, *A Geophysical Investigation of Geologic Structure and Regional Tectonic Setting at the Savannah River Site, South Carolina.* Ph.D. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

   b. Wyatt, D. E. and Harris, M. K., eds., 2000, *Carolina Geological Society Field Trip Guidebook*, WSRC-MS-2000-00606. (CGS field guide)

8. Provide fault/margin reports.

   The following faulting and margin references are enclosed:

   a. Stieve, A., C. Coruh and J. Costain, October 1994, *Confirmatory Drilling Project Final Report (U)* WSRC-RP-94-0136, Rev.0, Westinghouse Savannah River Company, Aiken, SC. (Pen Branch Fault Report)

b. Cumbest, R.J., D.E. Stephenson, D.E.Wyatt and M.Maryak,1998, *Basement Surface Faulting and Topography for Savannah River Site and Vicinity.* WSRC TR-98-00346, Rev.0, Westinghouse Savannah River Company, Aiken, SC. (Other Faults Report)

c. Cumbest, R. J., D. E Wyatt, D. E. Stephenson and M. Maryak, 2000, *Comparison of Cenozoic Faulting at the Savannah River Site to Fault Characteristics of the Atlantic Coast Fault Province: Implications for Fault Capability,* WSRC-TR-2000-00310, Rev.0. (Atlantic Margin Report)

9. Provide a copy of WSRC-TR-2000-00454.

This report has been cleared for public release. It was previously submitted to NRC as a part of a response to an informal request for CAR reference material (refer to letter dated 22 October 2001, Hastings to Document Control Desk, *Requested References*, DCS-NRC-000065).

Day Two

1. Can DCS provide additional information regarding the correlation of consolidation test results (which is not discussed directly in DCS' Geotechnical Report)?

2. Can DCS provide safety factor contours from soft zone modeling (FLAC)?

3. Can DCS provide additional information on how did they calculated cyclic stress ratios with uncertainties?

1, 2, and 3: This detailed analytical information is contained in analyses referenced in the Site Geotechnical Report. If NRC Staff still have questions on these issues after reviewing that report, DCS suggests an onsite review of the supporting analyses and discussions with the cognizant DCS staff.

4. Provide WSRC report concerning correlation of CPT to SPT.

The following report is enclosed:

Use of the Cone Penetration Test for Geotechnical Investigations at the Savannah River Site, (K-ESR-F-0005), WSRC, May 1998.

5. Coordinate future DCS-NRC meeting on SSI

DCS will arrange a technical exchange meeting to present the conduct of Soil-Structure Interaction analyses.