From: Jason Schaperow RES
To: John Flack, Steven Arndt
Date: Tue, Sep 26, 2000 4:16 PM
Subject: September 11, 2000, User Need Letter on SFP Accidents

I have put together a draft response to the September 11, 2000, User Need Letter from NRR on spent fuel pool accidents. (The response is due to the RES director by Thursday, September 28.) I have attached my draft response for your review and comment.

In accordance with Farouk's request, my draft response lists all of previous work that RES has done for NRR on spent fuel pool accidents over the last year and a half. I will need some help from DET in listing all of the work they did for NRR. Also, I believe that Jack Rosenthal's branch may have done some work for NRR in the area of HRA. When you give me the go ahead, I will give my draft response to DET, DRAA, and Jack Rosenthal.

CC: Charles Tinkler

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Draft of September 26, 2000 (4:06PM)

MEMORANDUM TO: Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

FROM: Ashok C. Thadani, Director
Office of Nuclear Regulatory Research

SUBJECT: REPLY TO USER NEED REQUEST FOR TECHNICAL STUDY OF SPENT FUEL POOL ACCIDENT RISK AT DECOMMISSIONING PLANTS

The purpose of this memorandum is to reply to NRR's user need request of September 11, 2000, for technical study of spent fuel pool accident risk at decommissioning plants (Reference 1).

As part of its effort to develop generic, risk-informed requirements for decommissioning, NRR is performing a generic technical study to provide insight into the risk associated with spent fuel pool accidents at decommissioning plants. This study includes an assessment of the frequency and consequences of beyond-design-basis spent fuel pool accidents. In performing this study, NRR has requested RES assistance in several areas including seismic events, thermal hydraulics and accident progression, and offsite radiological consequences.

With regard to seismic events, NRR has requested analyses of the frequency of seismic events and the effect on the structural integrity of the spent fuel pool (Reference 4). RES has performed the requested analyses (Reference 5).

With regard to thermal hydraulics and accident progression, NRR has requested analyses of the thermal hydraulic response for accidents involving an instantaneous, complete drain-down of the spent fuel pool as a result of a seismic event (Reference 7). RES has performed the requested analyses (References 8 and 9). The objective of these analyses was to estimate the critical decay time using an integral three-dimensional computational fluid dynamics model of the spent fuel pool and spent fuel pool building. Critical decay time refers to the time required to ensure that natural circulation air flows will keep the fuel temperatures below a specified value after a complete loss of pool coolant to prevent significant offsite releases. NRR also has requested (Reference 10) a reexamination of the temperature criteria used in conjunction with the thermal hydraulic analysis to assess (a) the decay time needed to provide sufficient time to carry out an ad hoc evacuation prior to significant fission product release and (b) the critical decay time. We expect to provide the results of this reexamination by _____.

With regard to consequences, NRR has requested a quantification of the offsite radiological consequences of spent fuel pool accidents occurring up to one year after final reactor shutdown and analyses of related issues (References 11 and 12). RES has performed the requested evaluations (References 13 through 18). These evaluations included consideration of the reduction in consequences associated with reduced fission product inventory resulting from radioactive decay from 30 days to one year and the additional time available for evacuation associated with spent fuel pool accidents. The focus of these evaluations was for accidents

occurring at one year after final shutdown. Recently, NRR requested additional consequence calculations using fission product inventories at 30 and 90 days and one, two, five, and ten years after final shutdown to provide additional insight into the effect of reductions in inventory available for release (Reference 19). We expect to provide the results of these additional consequence calculations by _____.

In addition to the NRR requests for specific RES evaluations of seismic, thermal hydraulics, and radiological consequence issues, NRR requested, in August 1999, RES perform an overall review of a draft version of the technical study (References 20 and 21). RES performed the requested review (Reference 22 and 23).

The most recent NRR user need letter (Reference 1) requests additional RES effort in the seismic analysis. Specifically, this letter requests an evaluation of the conservatism and uncertainty in the treatment of seismic issues. It also requests an assessment of the most likely spent fuel pool failure modes and locations and the expected level of offsite collateral damage. RES has performed the requested seismic analyses (References 24 and 25). Reference 1 also requests that RES review and provide comments on the final report on the technical study of spent fuel pool accident risk at decommissioning risk. In addition, it requests that RES provide technical support for ACRS meetings and other public meetings on an as-needed basis. RES agrees to provide this technical support. However, RES is becoming increasingly concerned with the overall direction of the technical study. The technical study contains separate evaluations of accident frequency, thermal hydraulic response, accident progression, and offsite radiological consequences using a number of bounding assumptions. It is beginning to appear that these separate evaluations will be insufficient to support development of risk-informed regulatory requirements for decommissioning. A plan for integral analysis of spent fuel pool accidents using more realistic assumptions is needed. We recommend a meeting to discuss our concerns.

References: 1. User Need Request for Technical Study of Spent Fuel Pool Accident Request at Decommissioning Plants, memorandum from S. Collins to A. Thadani, September 11, 2000

Seismic

2.
3.

Thermal Hydraulics and Accident Progression

7. Technical Support for Spent Fuel Pool Heatup Analysis, memorandum from G. Holahan to T. King, April 16, 1999
8. Completion of 3D CFD Analysis for Spent Fuel Pool and Containment, memorandum from F. Eltawila to J. Wermiel, February 4, 2000
9. Final Report: Predictions of Spent Fuel Heatup after a Complete Loss of Spent Fuel Pool Coolant, memorandum form F. Eltawila to G. Holahan, June 29, 2000
10.

Consequences

11. Technical Support for Spent Fuel Pool Zirconium Fire Consequence Analysis, memorandum from G. Holahan to T. King, March 26, 1999
12. Support for Spent Fuel Pool Accident Risk Assessment for Decommisioning Plants, memorandum from J. Hannon to F. Eltawila, December 3, 1999
13. Technical Support for Spent Fuel Pool Zirconium Fire Consequence Analysis, memorandum from C. Rossi to G. Holahan, May 25, 1999
14. Spent Fuel Pool Risk Assessment, memorandum from A. Thadani to S. Collins, November 12, 1999
15. Opportunities to Reduce Uncertainty in consequence Assessment for Spent Fuel Pool Accidents, memorandum from F. Eltawila to J. Hannon, December 10, 1999
16. Issues Related to Spent Fuel Pool Accident Analysis, memorandum from F. Eltawila to J. Hannon, January 19, 2000
17. Effect of Fission Product Inventory and Air Ingression on Spent Fuel Pool Accident Consequences, memorandum from F. Eltawila to J. Hannon and R. Barrett, March 29, 2000
18. Risk-Informed Requirements for Decommissioning, memorandum from F. Eltawila to G. Holahan, August 25, 2000
19. Consequence Calculations for Decommissioning Probabilistic Risk Assessment, memorandum from R. Barrett to J. Flack, August 25, 2000

RES Review

20. Request of Review of Draft Technical Study of Spent Fuel Pool Accidents for Decommissioning Plants, memorandum from G. Holahan to T. King, August 3, 1999
21. Memorandum from G. Holahan to J. Craig, August 18, 1999
22. Review of Draft Technical Study of Spent Fuel Pool Accidents for Decommissioning Plants, memorandum from J. Craig to G. Holahan, November 19, 1999
23. Review of Draft Technical Study of Spent Fuel Pool Accidents for Decommissioning Plants, memorandum from T. King to G. Holahan, November 23, 1999

Seismic

24.
25.