Sandia National Laboratories
Albuquerque, New Mexico 87185

January 24, 1983

50-537

Dr. T. J. Walker
U. S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
7915 Eastern Avenue
Silver Spring, MD 20912

Dear Tom,

Reviews are enclosed of the following documents submitted to NRC by CRBRPO:

(1) TMBDB Melting Scenario

(2) L. D. Muhlestein and R. P. Colburn, Aerosol Release from Sodium-Concrete Reactions

These reviews were prepared at your request by personnel involved in the Sodium Containment Structural Integrity program sponsored at Sandia by NRC-RES. The reviews were prepared to assist NRR in developing an SER for the CRBR.

The analyses done by CRBRPO of combined sodium/core debris/concrete interactions is largely endorsed by the enclosed review of Bradley and Randich. The analysis was done assuming no synergism between sodium attack on concrete and core debris attack on concrete. Comparison of the CRBRPO analysis to that done in the review using data and models developed in the research efforts sponsored at Sandia by NRC-RES shows the CRBRPO analysis to be conservative if the assumption of no synergism is accepted. There appears to be no unequivocal basis for evaluating synergistic processes when both core debris and sodium attack concrete.

The reviews also endorse the conclusion by Muhlstein and Colburn that aerosols produced when sodium interacts with concrete are largely sodium and perhaps sodium hydride if these aerosols do not encounter water or air. The review goes on to point out that there are several aspects of aerosol and fission product behavior during accidents beyond design basis at CRBR that remain not well known. The major points in the review are:

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(1) Characteristics of the aerosol source term are important input to analyses of aerosol behavior in containment, predictions of suspended aerosol mass and aerosol particle size.

(2) The efficiency with which filters trap aerosol particles depends critically on particle size. Sectional codes that do not restrict the particle size distribution to be log-normal are best suited for estimating particle size. Accurate prediction of particle size may be most important for analyzing filters that protect in-containment sensors.

(3) Timing of fission product release may be most important in assessing accident consequences and risk. Release of volatile fission products in the CRBRPO analysis of thermal margins (TMBDB) may not be conservative.

(4) Treatment of refractory fission release (TMBDB) ignores important mechanisms of release. These mechanisms can lead to enhanced release of Pu, Eu, Sr, and Ru.

(5) The ability of aerosols to plug flow pathways cannot be predicted with empirical correlations based on data taken for situations well-displaced from those that arise in an accident.

We hope these reviews will assist you in responding to J. Long's (NRR) requests in the two topical areas. A second copy of each review is enclosed for J. Long.

Sincerely yours,

Dana A. Powers, by
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