UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 12, 1999

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

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

SUBJECT: SPENT FUEL POOL RISK ASSESSMENT

As part of its generic study of spent fuel pool accidents, undertaken to develop generic, risk-informed regulatory requirements for plants that are being decommissioned, the Office of Nuclear Reactor Regulation (NRR) had requested the Office of Nuclear Regulatory Research (RES) to perform an evaluation of the offsite radiological consequences of a severe spent fuel pool accident. Accordingly, RES completed an in-house analysis of offsite radiological consequences, which included sensitivity and uncertainty analysis to assess the effect of critical parameters and assumptions. On May 25, 1999, RES forwarded to NRR a summary of the evaluation. A primary objective of the evaluation was to assess the effect of extended storage in a spent fuel pool, and the resulting radioactive decay, on offsite consequences. The evaluation showed about a factor-of-two reduction in prompt fatalities if the accident occurs after 1 year instead of after 30 days. The evaluation also showed that beginning evacuation three hours before the release begins reduces prompt fatalities by more than an order of magnitude.

The purpose of this letter is to forward to you a report containing the detailed technical basis of the offsite consequence evaluation. This report documents the offsite consequence calculations we performed using the MACCS code (MELCOR Accident Consequence Code System) and includes the input files used. In addition, this report documents follow-up calculations, performed since our earlier letter, to evaluate the importance of cesium to better understand why the consequence reduction from a year of decay was not greater. These follow-up calculations showed that cesium with its long half-life (30 years) is responsible for limiting the consequence reduction. For the population within 100 miles of the site, 97 percent of the societal dose was from cesium.

Through our evaluation of the effects of radioactive decay and evacuation start time on offsite consequences, we have been able to eliminate unnecessary conservatism in the consequence assessment. However, there may be unnecessary conservatism remaining which is relevant to a risk assessment of these accidents. For example, while we consider this current dose assessment complete, further assessment of accident progression could lead to lower estimates of cesium releases. (All analyses to date assumed complete release of the cesium inventory.) In addition, the decay power in the final core offload into the spent fuel pool decreases by a factor

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of three between 30 days and 1 year after final shutdown (hence the lower offsite consequences). For non-seismic events, a lower decay power provides additional time to take action to maintain cooling or to reinstate cooling in time to prevent significant fuel heat up. Memoranda from NRR (G. Holahan) to RES (T. King and J. Craig) of August 3, 1999, and August 18, 1999, requested RES perform an independent review of the NRR assessment of the frequency of a severe spent fuel pool accident. As a result of our independent review we intend to provide additional recommendations for the frequency assessment and seismic evaluation by late November. Further recommendations for the thermal hydraulic and consequence analysis will be provided by January 2000. It is our expectation that the reviews will reveal further opportunities for developing a more realistic evaluation.

Attachment: As stated

cc: G. Holahan
J. Hannon
R. Barrett
C. Paperiello

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