ACRS CONCLUSIONS AND RECOMMENDATIONS

3. "PRAs should be as realistic as possible."

The staff agrees with the ACRS. The staff's preliminary risk assessment was intended to identify potential areas of concern that then would be discussed among the stakeholders. As better information became available about the actual operation of spent fuel pools at decommissioning plants and as the industry made commitments on how spent fuel pool operations would be operated in the future for decommissioning plants, the staff has been able to refine its estimates to be more realistic, including human error probabilities.

5. "...we recommend that the acceptable frequency for this end point [uncovery to the top of the fuel] be the same as that for large, early release frequency in Regulatory Guide 1.174, which is a surrogate for the prompt fatality Safety Goal."

We recognize the ACRS' motivation and technical argument that acknowledges the low probability of recovery once spent fuel is uncovered. The staff sees the wisdom and the downside in using fuel uncovery as a surrogate for the prompt fatality Safety Goal for decommissioning plants. The staff believes it is important not to create situations that discourage industry initiatives that could prevent or mitigate anticipated events associated with spent fuel pools at decommissioning plants. It was a prudent strategy for the NRC to use uncovery to the top of the fuel as a surrogate during the preliminary risk assessment, which highlighted areas for further NRC and industry consideration. However, for rulemaking the staff believes that a more realistic criterion should be used, and credit should be given for innovative preventive and mitigative strategies such as remote spent fuel pool injection capability. In addition, the staff has not yet fully determined whether the differences in consequences between a Large Early Release (LERF) and the consequences of a zirconium fire in a spent fuel pool are or are not significant. A risk-informed assessment of a zirconium fire requires realistic assessment of offsite consequences. The staff is actively pursuing options for criteria to be used as a guideline for evaluating risk at decommissioning plants.

X. "We believe that the spent fuel fire issue would be a good candidate for testing the development of a rationalist regulatory approach..."

In its paper on the role of defense in depth in risk-informed regulation, the ACRS proposed a rationalist model that asserts that defense in depth is the aggregate of provisions made to compensate for uncertainty and incompleteness in our knowledge of accident initiation and progression. The structuralist model (the NRC's traditional model) of defense in depth asserts that defense in depth is embodied in the structure of the regulations and in the design of the facilities built to comply with those regulations. What distinguishes the rationalist model from the structural model is the degree to which it depends on establishing quantitative acceptance criteria, and then carrying formal analyses, including analysis of uncertainties, as far as the analytical methodology permits.

The staff believes that there may be circumstances where a rationalist model for defense in depth is warranted. For the issue of decommissioning risk, the staff has sought to

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develop numerical criteria that are similar to the criteria in Regulatory Guide 1.174 to help define when the safety concern is low enough that additional resources need not be expended. The staff has refined its numerical methods and analyses used to estimate the risk from decommissioning spent fuel fires in order to improve the realism of the estimates. However, assuming that such a criterion was acceptable to the Commission for decommissioning plants, it would appear that the certainty of the bottom-line numbers calculated would be of premier importance. In the case of spent fuel pool fires at decommissioning plants, the uncertainty of the dominant contributors (seismic and heavy load drop) is higher than most dominant contributors at operating plants. The potential seismic vulnerabilities at most decommissioning sites east of the Rocky Mountains begin to appear at return periods on the order of 10^{-5} per year or lower (i.e., at three or more times the ground motion of the safe shutdown earthquake that is the design bases of the plant.) The hazard curves are very flat in this region, and a small change in return period can cause the estimated peak ground acceleration to change dramatically. For heavy loads there is insufficient data to properly characterize the potential distribution of the chance of dropping a heavy load. While the number of actual failures is reasonably known, the number of lifts associated with the failures is not nor are the consequences of a drop easily determined. In addition, it is difficult to model and quantify heavy load drops that occur off the prescribed pathway.

There is no effective defense in depth for seismic events or heavy load drops at decommissioning plants. Unlike operating reactors and their in-vessel cores, the decommissioning plants have no reactor coolant system around the cores and there is no containment building around the entire spent fuel pool area. There is no effective method of mitigating the consequences of a very large seismic event at a decommissioning plant site during the window of vulnerability when a zirconium fire can occur if the spent fuel pool is drained. Similarly with the exception of crash pads, there is no effective way to mitigate the drop of a very heavy load (in or near the spent fuel pool) if it occurs during the window of vulnerability. The staff recognizes these possibilities and seeks to gather assurance that there are no vulnerabilities to seismic events or heavy load drops at decommissioning sites.