

Working Group Technical Basis Outline

- I. Introduction (Ordaz/Jackson)
- II. Spent Fuel Pool (SFP) Accident Scenarios (SPSB)
 - A. Identification of initiating events that could lead to spent fuel uncover (Including qualitative screening of events that are not risk significant)
 - 1. Internal events (e.g., LOSP, loss of UHS, loss of CCW/SW, loss of coolant flow, fire, etc.)
 - 2. External events (e.g., seismic, tornado/high winds, aircraft impact)
 - 3. Errors of commission (e.g., heavy load drop, maintenance errors leading to draining of pool, etc.)
 - B. Identification of available systems for the mitigation of the initiating event (plant configuration, system alignment, backup systems available, etc.)
 - C. Identification of potential operator recovery actions (availability of alarms, instrumentation, procedures, staffing, etc.)
 - D. Formulation of accident sequences
 - 1. Success criteria (timing, system flow rates, etc.)
 - 2. Accident sequence progression using event trees
 - 3. System modeling and recovery actions using fault trees
 - E. Description of the initiating events under Section II.A. (Jackson)
- III. Quantification of Accident Frequency
 - A. Estimate frequency of initiating events that could lead to spent fuel uncover (For each event identified, but not qualitatively screen out it item II.A.)
 - 1. Existing data (e.g., for LOSP) (SPSB)
 - 2. Literature search (e.g., site specific hazard curves, load drops, aircraft impact, tornados) (SPSB)
 - 3. Seismic hazard curves for Susquehanna & Pilgrim in III.A.2. (Bagchi)
 - 4. Fault tree analysis for loss of support system initiating events (SPSB)
 - 5. HRA for errors of commission (Throm)
 - B. Estimate equipment failure probability for active and passive components/systems. Estimate availability of backup systems. (SPSB)
 - 1. Information from plant walkdowns
 - 2. AEOD data
 - 3. Information from literature search
 - C. Perform a human reliability analysis to estimate error probabilities for recovery actions. (SPSB)
 - D. Quantify fault trees and event trees using best estimate data. Discuss quantification uncertainty in a qualitative sense. (SPSB)
- IV. Consequences of SFP accident scenarios
 - ✓ A. Inventory discussion on reduction of consequences over time (Jackson)
 - ✓ B. Evaluation of release fraction due to a zircaloy fire. (Schaperow)
 - ✓ C. Evaluation of inventories of each radionuclide. (Schaperow)
 - ✓ D. Dose assessments for time-dependent offsite consequences for a zircaloy fire [based on Millstone 1, and a fire that covers 3 cores of spent fuel]. (Schaperow)

1. 30 days with offsite EP and without offsite EP
 2. 90 days with offsite EP and without offsite EP
 3. One year with offsite EP and without offsite EP
- E. Identification of consequences (e.g., early fatalities, cancer fatalities, total population dose) (Schaperow)
- F. Consequences of other SFP accident scenarios (e.g., loss of cooling) (Jackson)
- G. Evaluation of existing accident dose assessments to determine if they represent current operating and storage practices and if they are applicable to decommissioned plants. (O'Brien)
- V. Overall Risk of SFP accidents at Decommissioned Plants (SPSB)
- A. Risk at 30 days with offsite EP and without offsite EP
 - B. Risk at 90 days with offsite EP and without offsite EP
 - C. Risk at one year with offsite EP and without offsite EP
- VI. Spent Fuel Pool Heatup Analysis Following Loss of Water
- A. Evaluation of the phenomena of a zircaloy fire (Connell/Eaton)
 1. Literature search
 - a. NRC documentation on zirc fires
 - b. UM library for zirc & similar metal fire data
 - c. NIST FIREDOC database for zirc & similar metal fire data
 - d. Contact DOE for data & experience w/fuel cladding fires
 - e. Contact foreign entities for experience/research w/zirc fires
 2. Evaluation of whether to model the zircaloy fire (e.g., fire/yr) (Connell)
 - B. Fuel Failure Criteria (Staudenmeier)
 1. Evaluation of 565 degrees C as an appropriate acceptance criterion for analysis and/or,
 2. Recommendation on an appropriate temperature
 - C. Evaluation of existing spent fuel heat up analyses (Jackson/Staudenmeier)
 1. Evaluation of GSI-82, SHARP Code, and NUREG-6451
 2. Determine if they represent current operating and storage practices, and if they are applicable to decommissioned plants
 - D. Heatup Calculation Uncertainties and Sensitivities (Staudenmeier)
 1. Evaluation of existing computer codes (e.g., SHARP, etc.)
 2. Determine if they could be used to analyze the heat up of the SFP
 - E. Critical Decay Times for Reaching a Zirc Fire (Staudenmeier/Boyd)
 1. Perform a 2 year/4 year decay time simulation of a generic BWR using the Fluent Code
 2. Evaluation of the generic decay times associated with SFP configurations
 - F. Evaluation of potential fire protection mitigating controls (e.g., high expansion foam, unattended nozzle, etc.) (Connell/Eaton)
- VII. Structural integrity of the SFP structure (Bagchi)
- A. Current NRC studies
 - B. Hazards to consider (e.g., seismic, heavy load drops, tornado missiles, safeguards)
 - C. Risk Ranking of hazards
 - D. Structure failure modes
 - E. Deterministic considerations
 - F. Risk-Informed Performance Goal

- VIII. Potential for criticality (Kopp)
 - A. Evaluation of the potential for criticality from accidents
 - B. Evaluation of the potential for criticality from personnel actions in response to an accident
 - C. Evaluation of the worst case criticality scenario (i.e., no boron)
 - D. Evaluation of potential for criticality at older plants
- IX. Effects of other Programs
 - A. Maintenance Rule (Ford)
 - 1. Identification of maintenance rule concepts at decommissioned plants
 - 2. Identification of potential systems, equipment, functions at decommissioned plants (Obtain info. from Kelly's site visits)
 - 3. Evaluation of what maintenance rule means to decommissioned plant oversight.
 - B. Quality Assurance (QA) Programs (Heck)
 - 1. Identification of QA concepts at decommissioned plants
 - 2. Identification of potential QA programs at decommissioned plants
 - 3. Evaluation of how QA applies to decommissioned plant oversight.
- X. Comparison of design considerations for Wet-Basin ISFSIs (Jackson)
 - A. Defense-in-depth
 - B. Minimum decay time
 - C. Design events
 - D. Controls
- XI. Technical basis for reviewing SFP accidents for exemption requests that can be applied to emergency preparedness, safeguards, and insurance indemnity at decommissioned plants. (ALL)
 - A. Identify risk-informed criteria
 - B. Recommend any administrative or other controls (i.e., enhanced Tss for level, temperature, etc.), if necessary
- XII. Follow up research or other technical support which need to be performed to address any large uncertainties in the available information. (ALL)
 - A. NRC work (NRR, NMSS, RES or contractors, such as INEL, PNNL, etc.)
 - B. External to the NRC (i.e., NEI, Owner's Groups, etc.)