

- I. Introduction - Risk and Safety Level at decommissioned plants
 - A. During operation, SFP accident risk not greater than risk from reactor
 - a. During shutdown, SFP accident risk no longer bounded by reactor risk
 - B. After shutdown, decreasing risk over time
 - C. Current level of protection for operation
 - D. Probability of several accidents not changed
 - E. Credit for detection, mitigation, and/or prevention features /compensatory measures

- II. Decrease in Risk when permanently shutdown
 - A. Decreasing decay power
 - 1. Increasing time to boil
 - a. Generally takes 10 days for full core offload
 - b. From 10 to 60 days; decrease in decay power by factor of 2 for last core
 - c. From 10 days to 17 months; decrease in decay power by factor of 10 for last core
 - 2. When air-cooled, increasing time to heat up to oxidation temperature
 - B. Short-lived radioisotopes decayed significantly
 - 1. Decrease in early fatalities/high consequences if offsite release
 - a. I-131
 - C. Possible increase in controls (PDTS) for spent fuel pool parameters

- III. Increase in Risk when permanently shutdown
 - A. Decreased number of plant personnel
 - B. Decreased need to maintain quality of SFP environment
 - 1. RCS quality no longer a concern
 - C. Increase in daughter products in first year
 - a. Sr-90; Cs-137; Pu
 - D. Possible decrease in assurance for electrical power
 - 1. possibly no diesels
 - E. Possible siphon from temporary equipment in pool
 - 1. Blg Rock Point

- IV. Risks that remain the same when permanently shutdown as operation
 - A. Occurrence of natural events (e.g., seismic)
 - 1. Mean of E-6/RY (NUREG/CR-4982)
 - 2. Range 2.6E-4 to 1.6E-10 (PWR) and 6.5E-5 to 4E-11 (BWR)
 - B. Systems designed to prevent drainage by siphon

- V. Comparison to Other Types of Facilities
 - A. GE Morris
 - B. Wet-Basin ISFSI

B/97

VI. Detection, Mitigation, and Prevention Features

- A. SFP level indication
 - 1. During and in preparation of fuel movement (STS)
 - 2. During periods of no fuel movement (suggested PDTs)
- B. SFP temperature limit
- C. SFP cooling and cleaning system
- D. Power sources
- E. SFP coolant chemistry (suggested PDTs program)
- F. Radiation monitors
- G. SFP makeup source
- H. SFP liner leak detection
- I. Cold weather programs
- J. Fire Protection System

VII. Radiation Protection (EP rule only)

- A. Radioisotope inventory over time
 - 1. Significant decrease in short-lived, high-consequence isotopes (e.g., I-131)
 - 2. What are the isotopes of concern for dose?
 - a. Show decay rate/time for important isotopes
 - (1) I-131 - half life:

VIII. Allowance for ad hoc/ regular community EP actions (EP rule only)

- A. 10 hours to the start of a release is adequate time to credit ad hoc off-site actions

IX. Types of accidents for SFPs

- A. Extended loss of SFP cooling
- B. Rapid reduction in SFP level (e.g., siphon) w/ loss of SFP cooling
- C. Structural failure due to external phenomena (e.g., seismic)
- D. Cask or heavy load handling
- E. Spent fuel handling accident
- F. Loss of offsite power
- G. Fuel failure
- H. Criticality

X. Extended Loss of SFP cooling

- A. Probability of accident
 - 1. Maintenance on system changed (Maint. Rule)?
 - 2. Possibly new TSs
 - 3. Possibly no backup/on-site power
 - 4. Maintenance of makeup sources (?)
- B. Detection / Prevention / Mitigation Features
 - 1. Temperature indication
 - 2. Makeup sources
 - 3. Level detection
 - 4. Radiation monitors
 - 5. On-site power
- C. Consequences of accident (reduces with time)
 - 1. System not required as much since less decay heat
 - 2. If lost, time to boil increases as decay heat decreases
 - 3. Boil-off rate decreased so rate of makeup required is reduced

- XI. Rapid reduction in SFP level (e.g., siphon) w/ loss of SFP cooling
 - A. Probability of accident
 - 1. Design of piping into pool has not changed
 - 2. Temporary equipment may increase probability (Big Rock Pt)
 - 3. Same as extended loss of SFP cooling accident
 - B. Detection / Prevention / Mitigation Features
 - C. Consequences of accident (reduces with time)
 - 1. Same as extended loss of SFP cooling accident
 - 2. Occurs in less time than loss of cooling alone
 - 3. Same as extended loss of SFP cooling accident

- XII. Cask drop
 - A. Probability of accident
 - 1. Significant uncertainty if damage will occur
 - 2. Maintenance of makeup sources (?)
 - 3. Possibly reduced since less/no movement until final pool offload to ISFSI or offsite
 - B. Detection / Prevention / Mitigation Features
 - 1. Makeup sources
 - 2. Level detection
 - 3. Radiation monitors
 - C. Consequences of accident
 - 1. No change from operation on draindown time
 - 2. Reduced consequences due to reduced decay power

- XIII. SFP structural failure due to SEVERE ACCIDENT - external phenomena (e.g., seismic)
 - A. Severe Accident
 - 1. Use Best Estimate / Realistic Assumptions
 - B. Probability of accident (same)
 - 1. No change in initiating event from operation
 - 2. Maintenance of radiation monitors
 - 3. Failure of structure generically dominates risk
 - a. $2.6E-4$ to $1.6E-10$ PWR and $6.5E-5$ to $4E-11$ BWR (NUREG/CR-4982 (BNL))
 - b. may not be dominate for each site
 - 4. SFPs generically can withstand larger than SSE
 - a. 4 - 19 times stronger than design SSE (source?)
 - C. Detection / Prevention / Mitigation Features
 - 1. Radiation monitors
 - 2. Level indicator
 - D. Progression of Accident
 - 1. What does a Zirc fire look like?
 - a. Exothermic reaction
 - b. Low /no smoke
 - 2. How much of the pool is involved in the Accident?
 - E. Consequences of accident (reduces with time)
 - 1. Reduced decay heat to cause a Zircaloy fire over time (2-4 years)

XIV. Changes in Configuration Considerations

- A. Double layer of SFAs
- B. Ability of accept another plants fuel for storage to fill pool
- C. Storage of SFAs vs. Fuel Consolidation

XV. Maintenance Rule and QA

- A. SFP cooling and cleaning system and instrumentation
- B. Pool makeup system
- C. Cask handling equipment
- D. HVAC
- E. SF handling equipment
- F. Radiation monitors
- G. Electrical power - instrumentation, alarms, pumps, radiation monitoring, lighting, communications

XVI. Site -Specific options for demonstrating no spent fuel hazard for reduced offsite EP

- A. Site hazard assessment
 - 1. If seismic is dominate failure mode, then seismic margins assessment
- B. Spent fuel heatup analysis

XVII. Technical Conclusions and Guidance for Interim Reviews

- A. Decay power?
- B. Change in radioisotope inventory?
- C. Required compensatory measures for early identification/ mitigative actions/defense in depth
 - 1. Level?
 - 2. Temperature?
 - 3. Radiation monitors?
 - 4. HVAC?

XVIII. Identification of Additional Information Needed