March 22, 1999
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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; decease 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. Big 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

3/97

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