Meeting with Public Stakeholders on the Preliminary Technical Results of Spent Fuel Pool Accidents for Decommissioned Plants

June 7, 1999

Stuart Richards, DLPM
Richard Barrett, DSSA
Vonna Ordaz, DSSA/SPLB
Diane Jackson, DSSA/SPLB
Glenn Kelly, DSSA/SPSB

Introduction

- During the Commission briefing on 3/17/99, the staff proposed to step back and take an integrated, risk-informed approach to decommissioning rulemaking.

- Licensees are requesting exemptions from emergency preparedness (EP) and other regulations to reduce unnecessary costs at decommissioned plants.

- To increase the efficiency and effectiveness of decommissioning regulations, the staff has been engaged in rulemaking activities that would reduce the need to process exemption requests.

Introduction (cont.)

- The staff considers that such an approach would contribute to safety and reduce unnecessary regulatory burden. The staff is sensitive to the need to increase public confidence.

- Technical Working Group (TWG) was formed to evaluate SFP accidents at decommissioned plants.

- A status report of the technical work group progress together with plans and schedules for completion of the risk assessment will be provided to the Commission in a SECY paper on 6/18/99.

Introduction (cont.)

- Long-term staff goal is to establish a predictable, risk-informed approach for addressing spent fuel pool (SFP) accidents at these plants.

- Purpose of the briefing is to inform the public stakeholders of our preliminary results and our plans for their further involvement.

Schedule

- Staff plans to provide the stakeholders and outside technical organizations with the completed preliminary assessment for comment and an independent, technical, quality review by 8/99.

- Staff plans to have the independent, technical, quality reviews completed by 12/99.

- Staff plans to complete the final technical assessment by 3/00.

- Eventually, this will be applied in our regulatory process.

Overview

- To date, the staff has reviewed the licensee's EP requests on a case-by-case basis using criteria that a zircaloy fire will not occur or sufficient time is available to take ad hoc protective measures.

- The TWG has performed preliminary deterministic and probabilistic assessments. The preliminary results are based on site visits and current information on SFP configuration.

- Preliminary results are provided for information and discussion purposes and cannot be applied to the regulatory process at this time.

Deterministic Assessment Results

- Existing generic studies identified that the initiation of a zircaloy fire was highly dependent on decay power and fuel storage configuration.

- Changes in operating practices may affect spent fuel heatup analysis results.
  - ◇ Increase in fuel burnup (higher decay power)
  - ◇ Denser fuel storage racking (reduced heat removal)

- TWG preliminary results indicate that on a generic basis the decay time required to preclude a zircaloy fire may be longer than the generic studies performed for operating reactors. Previous plant-specific analyses are unaffected.

Deterministic Assessment Results (cont.)

Analyses for Preclusion of Zircaloy Fire

- One potential criterion for reviewing exemptions is the determination that a zircaloy fire cannot occur.

- TWG preliminary estimates using generic, near-bounding thermal hydraulic spent fuel heatup assumptions, indicate that 3 to 5 years of decay time* may be needed to preclude a zircaloy fire.

- A more realistic, plant-specific analysis could yield shorter time estimates.

* Decay time: length of time elapsed since reactor shutdown for the most recently discharged fuel

Deterministic Assessment Results (cont.)

Analyses for Preclusion of Zircaloy Fire

- The generic estimate uses some conservative assumptions, such as a full SFP. A plant-specific analysis could yield shorter time estimates due to the that pool's fuel configuration and the decay heat level of the actual fuel.

- For a plant-specific analysis, preliminary results indicate that a maximum allowable temperature of 800 °C may be acceptable, if certain analysis conditions are met.

Deterministic Assessment Results (cont.)

Estimated Heatup Time Prior to Zircaloy Fire

- Another potential criterion for reviewing exemptions is the determination that sufficient time is available to take ad hoc protective measures after the fuel is uncovered.
- TWG generic, bounding calculations correlated decay time to heatup time (time available for ad hoc actions). The calculations were conservatively based on adiabatic (no heat loss) conditions using one fuel rod heating up from 30 to 900 °C.
- TWG preliminary, generic results indicate that, at 2 years of decay time for a BWR and 2.5 years for a PWR, 10 hours may be available for ad hoc protective measures.
- More realistic, plant-specific calculations could yield shorter decay time estimates.

Frequency of Fuel Uncovery (FFU) at Decommissioned Plants

- The TWG performed a preliminary analysis of the initiating events that could lead to fuel uncovery. The analysis considered a wide range of initiating events.
- An important assumption in arriving at these preliminary results is the amount of redundancy and diversity of SFP heat removal systems, SFP makeup systems, and their support systems.
- The conditions assumed in the TWG analysis do not apply to operating plants.

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The configuration analyzed contained a significant reduction in the redundancy + diversity of

Frequency of Fuel Uncovery (FFU) at Decommissioned Plants (cont.)

- The frequency of fuel uncovery is not equivalent to the frequence of zircaloy fires in SFPs at decommissioned plants.

- TWG preliminary results indicate that a seismic event may not be the largest contributor; there are several credible initiators for decommissioned plants.

Frequency of Fuel Uncovery (FFU) at Decommissioned Plants (cont.)

- Based on site visits, current plant configurations, and probabilistic analyses, the TWG made preliminary estimates that the frequency of fuel uncovery is about 1E-5 per year for the scenario described on the next slide.

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- No decommissioned plant today matches the conditions assumed in the risk assessment.

- TWG preliminary calculations of SFP zircaloy fire consequences indicate that the offsite doses may be significant.

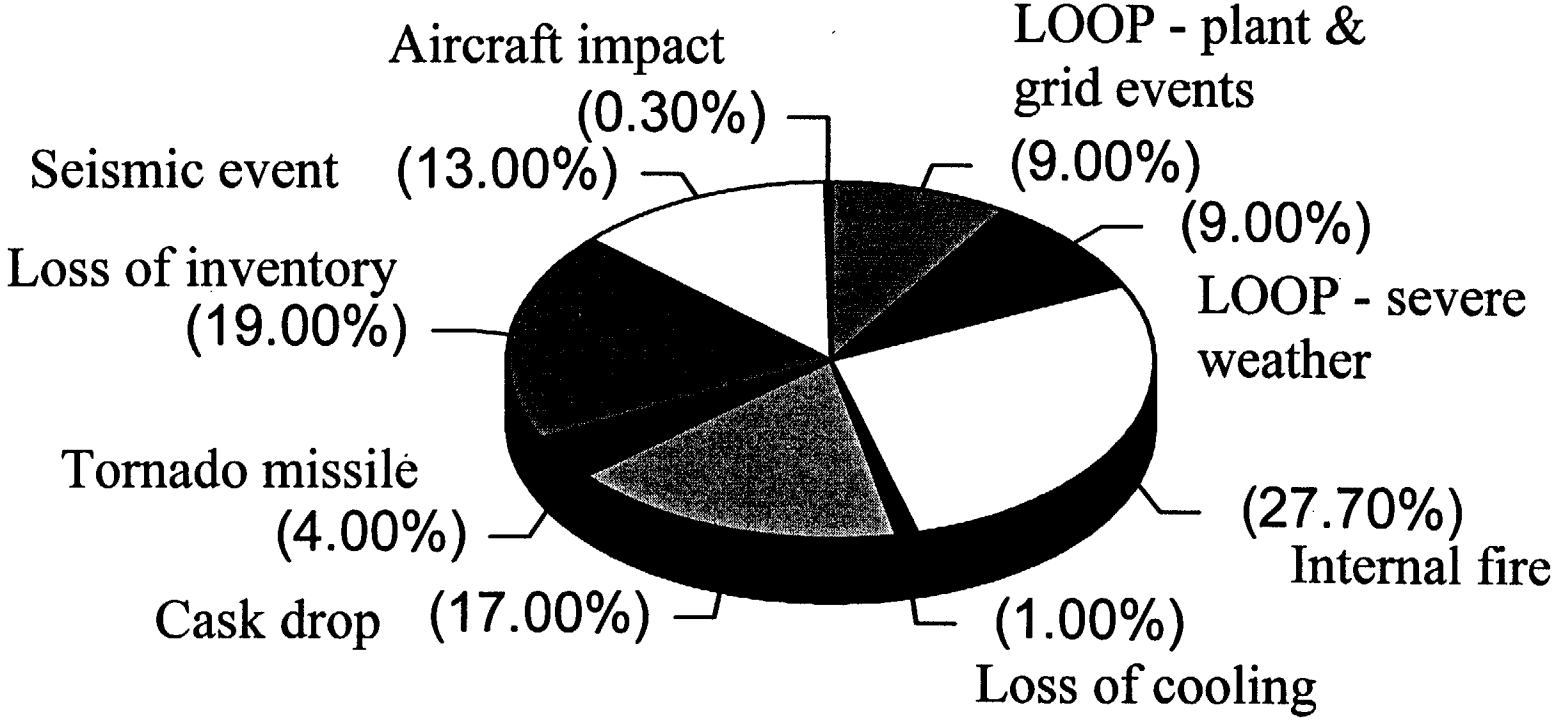
major assumptions that lead to the decommissioning plants not being like operating Rx.

Contribution of Initiating Events to the Frequency of Fuel Uncovery

Scenario: The SFP and support systems are configured and operated in a manner similar to that found by the TWG in its site visits (plants > 2 years since shutdown with equipment such as skid-mounted SFP cooling). The last fuel is assumed to have one year of decay time.

Initiating Event	Initiating Event FFU%
Internal Fire	28
Loss of Coolant Inventory	19
Cask Drop	17
Seismic Event	13
Loss of Offsite Power - Events initiated by severe weather	9
Loss of Offsite Power - Plant centered and grid related events	9
Tornado Missile	4
Loss of Pool Cooling	1
Aircraft Impact	0.3

Initiating Event Frequencies for Fuel Uncovery



Technical Working Group Summary

- **Preliminary results indicate:**
  - ◊ **that the frequency of fuel uncovery associated with SFP accidents cannot be generically dismissed.** at decommissioned plants
  - ◊ **that no single initiating event dominates for SFP accidents.**
  - ◊ **if a zircaloy fire occurs, the consequences could be significant.**

- **The results are driven by the assumptions made. Some of the assumptions are conservative.**

- **Results presented today are preliminary and may change. Stakeholder interaction and independent review may refine data and assumptions.**

Conclusions

- The spent fuel pool risk assessment is planned to be completed by 03/31/00.
- Rulemakings impacted by the spent fuel pool accidents (emergency planning, safeguards, and insurance) cannot be pursued until the assessment is complete.
- It is estimated that rulemaking will probably take an additional two years to finalize after the spent fuel pool assessment is complete.
- The staff will continue to process exemption requests in these areas on a plant-specific, case-by-case basis.