

6/4/99
EDO briefing 25/7

Rich's Overview

- ◆ **At the 3/17/99 Commission brief, the staff proposed stepping back and taking an integrated, risk-informed approach at the decommissioning arena. We agreed to provide our interim technical results by 6/18/99.**
- ◆ **A Technical Working Group (TWG) of 16 technical experts in the relevant review areas have been working (overtime) to meet that deadline. We have met 3 times with public stakeholders and have another meeting scheduled on Monday (6/7/99).**
- ◆ **We are providing this briefing today because the results that we plan to present Monday differ from those put forward earlier by the industry.**
- ◆ **Our preliminary results are based on site visits and current information on SFP configuration.**

- ◆ **There is general agreement that the zirconium (zircaloy) fire is the limiting accident for decommissioned plants. The TWG has quantified the consequences in terms of offsite doses, and, not surprisingly, they are substantial.**

- ◆ **Industry representatives have concluded based on NRC-sponsored reports (GSI-82) that a zircaloy fire results primarily from a seismic initiator, and the annual frequency is sufficiently low to dismiss it from consideration. Our preliminary analysis indicates that there are other credible scenarios that can initiate this event, and the probabilities are not sufficiently small to dismiss it.**

- ◆ **The period of vulnerability to a zircaloy fire is longer than previously estimated.**

- ◆ **These results do not raise any immediate regulatory or safety issues for current decommissioned plants. Furthermore, although this is a credible technical product, it is preliminary and will be subjected to an independent, technical, quality review.**

EDO and DEDO Briefing

Preliminary Technical Assessment Results of Spent Fuel Pool Accidents for Decommissioned Plants



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Introduction

*Build in risk's
Exposure
Bridging*

- ◆ Licensees are requesting exemptions from emergency preparedness (EP) and other regulations to reduce unnecessary costs at decommissioned plants.
- ◆ 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.
- ◆ Technical Working Group (TWG) was formed to establish a predictable, risk-informed approach for addressing spent fuel pool (SFP) accidents at these plants.
- ◆ The staff considers that such an approach would contribute to safety and reduce unnecessary regulatory burden.
- ◆ The staff is sensitive to the need to improve efficiency and effectiveness and increase public confidence.

Overview

- ◆ The TWG performed preliminary deterministic evaluations and probabilistic assessments.
- ◆ The assessment is not complete. However, the preliminary results discussed today are intended to provide a basis for further stakeholder interaction.
- ◆ The TWG is seeking review and input of preliminary results from technical experts and stakeholders prior to finalizing the assessment.
- ◆ The preliminary results may change based on the review feedback.
- ◆ No immediate regulatory or safety issues have been identified for current decommissioned plants. (⊕ operating plants)

Overview (cont.)

- ◆ **Some preliminary results provided a different perspective than expected:**
- ◆ **There is limited SFP cooling and support at decommissioned plants versus operating plants.**
- ◆ **Several important scenarios were identified as credible contributors for SFP accidents.**
- ◆ **Initiating event frequencies for fuel uncovering are higher than expected.**
- ◆ **Time period in which a plant is vulnerable to a zircaloy fire is longer than previously estimated.**

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 have effected both parameters ~~non-conservatively~~.
a
- ◆ Increase in fuel burnup (higher decay power)
- ◆ Denser fuel storage racking (reduced heat removal)
- ◆ The TWG preliminary results indicate that previous studies underestimate the decay time required to preclude zircaloy oxidation.
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Deterministic Assessment Results (cont.) Analyses for Preclusion of Zircaloy Fire

Preclude Zircaloy Fire

- ◆ Using generic, near-bounding thermal hydraulic spent fuel heatup assumptions, the TWG estimated that 3 to 5 years of decay time* would be needed to preclude a zircaloy fire.
 - ◆ A more realistic, plant-specific analyses could yield shorter time estimates.
 - ◆ For a plant-specific analysis, preliminary results indicate that a maximum allowable temperature of 800 °C is acceptable, if certain conditions are met.
- * Decay time: length of time elapsed since reactor shutdown for the most recently discharged fuel

Deterministic Assessment Results (cont.) Estimated Heatup Time Prior to Zircaloy Fire

One potential exemption
criteria is

◆ Two previous EP exemptions were granted based on the finding that 10 hours was sufficient time to take ad hoc protective measures.

We did 10 hour period

- ◆ The TWG performed generic, bounding calculations to correlate decay time to heatup time (time available for ad hoc actions). The calculations were conservatively based on adiabatic conditions (no heat loss) using one fuel rod heating up from 30 to 900 °C.
- ◆ TWG preliminary results indicate that 2 years of decay time for a BWR and 2.5 years for a PWR are needed to ensure at least 10 hours are available for ad hoc protective measures.

◆ *More realistic calc could lead to earlier time to 10 hours.*

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.
- ◆ ~~Contrary to previous analyses, preliminary results indicate that a seismic event is not the most important contributor;~~ there are several credible initiators. *Seismic may not be the most important largest contributor.*
- ◆ 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.**

◆ actual vs ^{A:} No plant fits these parameters
Assumption Not 1 of your fire.

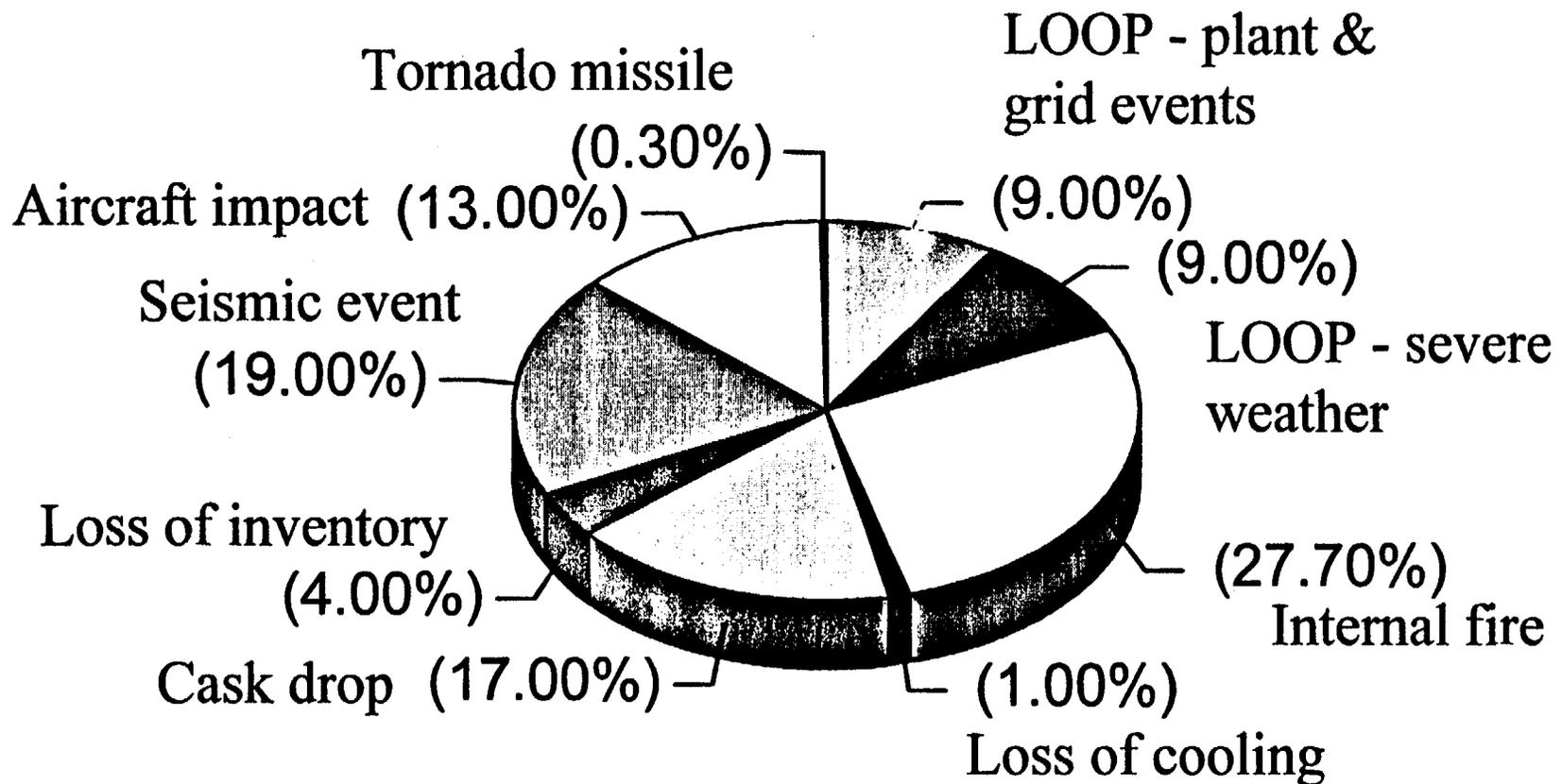
Contribution of Initiating Events to the Frequency of Fuel Uncovery

More assumptions

Scenario: The SFP and its cooling system are configured and operated in a manner similar to that found by the TWG in its site visits. Last fuel transferred one year previously.

Initiating Event	% of FFU from Initiating Event
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



Frequency of Fuel Uncovery at Decommissioned Plants (cont.)

- ◆ ~~These~~ ^{assumptions} **Two important factors in arriving at these results were:** ^{is}
- ◆ ^{an} ~~the~~ ^{amount of} **as-found equipment removal/abandonment** ^{assumptions} performed under the 50.59 process
- ◆ ^{amount} **the lack of redundancy and diversity of SFP heat removal systems, SFP makeup systems, and their support systems** ^{as the result of equipment removal/abandonment}
- ◆ **As previously estimated, TWG preliminary calculations of SFP zircaloy fire consequences confirmed that the offsite doses would be significant.** ^{indicate}

TWG's Current Plan

looking at preliminary assessment to see if ok.

Developing interim criteria and recommendations based on the preliminary results to have a more uniform exemption process for decommissioned SFP requirements.

- ◆ **Requesting independent, technical, quality reviews on the interim assessment from:**
 - ◆ **National laboratories and technical organizations**
 - ◆ **Nuclear Energy Institute (NEI)**
 - ◆ **Stakeholders (public, licensees, etc.)**
 - ◆ **Advisory Committee on Reactor Safeguards (ACRS)**
 - ◆ **Committee to Review Generic Requirements (CRGR)**

Current Schedule

- ◆ **Staff's interim response to the SRM with plans and schedules to the Commission - 6/18/99**
- ◆ **TWG's interim technical assessment paper issued - 7/30/99**
- ◆ **Solicitation of comments and independent review to the groups or organizations listed above - 8/6/99**
- ◆ **Independent, technical, quality reviews to be completed - 12/31/99**
- ◆ **TWG to complete final technical assessment - 3/31/00**

Technical Working Group Summary

- ◆ **Results to date indicate that frequency of fuel uncover associated with SFP accidents cannot be generically dismissed.**
- ◆ **No one initiating event dominates for SFP accidents.**
- ◆ **If a zircaloy fire occurs, the consequences can 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 is sought to possibly refine data and assumptions.**