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



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# Introduction

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Stu Richards:

- ◆ **Licenseses 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.**

*Streamline decommissioning.*

## Introduction (cont.)

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

*• Safe + efficient.*

## Introduction (cont.)

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- ◆ **A Technical Working Group (TWG) was formed to evaluate spent fuel pool (SFP) accidents at decommissioned plants.**
- ◆ **A status report of the TWG 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.**
- ◆ **Staff recognizes that the results are preliminary, and are not ready to be applied in the regulatory process.**

*• My group looks at rules.*

*• Other group (G. H. H. H.) looks primarily at risk. Provides technical basis.*

## **Introduction (cont.)**

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- ◆ **Long-term staff goal is to establish a predictable, risk-informed approach for addressing SFP accidents at decommissioned plants.**
- ◆ **Purpose of the briefing is to inform the stakeholders of our preliminary results and our plans for their further involvement.**

## **Schedule**

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- ◆ **Provide the stakeholders and outside technical organizations with the completed preliminary assessment report for an independent, technical, quality review and stakeholder comment by 8/99.**
- ◆ **Complete the independent, technical, quality reviews by 12/99.**
- ◆ **Complete the final technical assessment by 3/00.**

# Overview

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- ◆ **To date, the staff has reviewed the licensee's EP exemption requests on a case-by-case basis.**
- ◆ **The TWG has performed preliminary deterministic and probabilistic assessments.**
- ◆ **Preliminary results are provided for information and discussion purposes and cannot be applied to the regulatory process at this time.**

## **Deterministic Assessment Results**

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- ◆ **Existing generic studies identified that the initiation of a zirconium fire was highly dependent on decay power and fuel storage configuration.**
  
- ◆ **Operating practices may affect spent fuel heatup analysis results.**
  - ◇ **Increase in fuel burnup (higher decay power)**
  
  - ◇ **Denser fuel storage racking (reduced heat removal)**

## **Deterministic Assessment Results (cont.)**

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

## **Deterministic Assessment Results (cont.)**

### **Analysis for Air-Cooled Fuel**

- ◆ **One potential criterion for reviewing exemptions is the determination that a zirconium 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 reach a point where air cooling of the fuel is adequate.**

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

## **Deterministic Assessment Results (cont.)**

### **Analysis for Air-Cooled Fuel**

- ◆ **Plant-specific analysis may yield shorter time estimates.**
- ◆ **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 Zirconium Fire**

- ◆ **Another potential criterion for reviewing exemptions is the determination that sufficient time is available to take protective measures using local emergency response after the fuel is uncovered.**
- ◆ **TWG generic, bounding calculations correlated decay time to heatup time. The calculations were conservatively based on adiabatic (no heat loss) conditions using one fuel rod heating up from 30 to 900 °C.**

## **Deterministic Assessment Results (cont.)**

### **Estimated Heatup Time Prior to Zirconium Fire**

- ◆ **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 to take protective measures using local emergency response.**
- ◆ **More realistic, plant-specific calculations could yield shorter decay time estimates.**

# Frequency of Fuel Uncovery (FFU) at Decommissioned Plants

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- ◆ 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 this type of analysis is the amount of redundancy and diversity of SFP heat removal systems, SFP makeup systems, and their support systems.
- ◆ The configuration analyzed had a significantly reduced level of redundancy and diversity in these areas.

- EDG
- RHR
- Large-Capacity Make Up
- UPS

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

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- ◆ **No decommissioned plant today matches the conditions assumed in this risk assessment.**
- ◆ **The conditions assumed in the TWG analysis do not apply to operating plants.**
- ◆ **The frequency of fuel uncovery is not equivalent to the frequency of zirconium fires in SFPs at decommissioned plants.**

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

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

" Offsite consequences:  
- may be significant  
- cannot be generically dismissed "

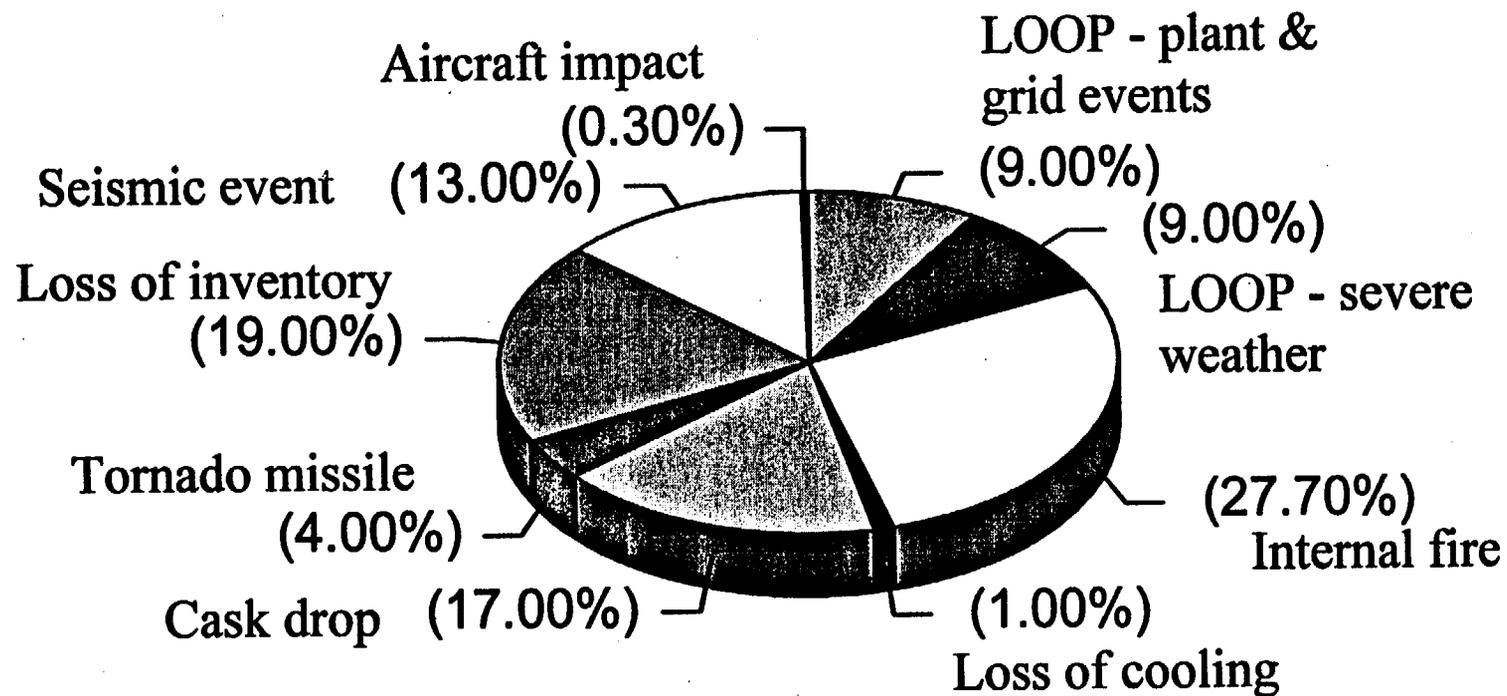
# Contribution of Initiating Events to the Frequency of Fuel Uncovery

**Scenario:** The SFP and its support systems are configured and operated in a manner similar to that found by the TWG in its site visits (sites where > 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

*rapid  
loss  
of  
inventory*

## Initiating Event Frequencies for Fuel Uncovery



# Summary

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- ◆ **Information presented today is preliminary and may change. Stakeholder interaction and independent review may refine data and assumptions.**
- ◆ **The spent fuel pool risk assessment is planned to be completed by 03/00.**
- ◆ **Rulemakings impacted by the spent fuel pool accidents (emergency planning, safeguards, and insurance) cannot be pursued until the assessment is complete.**

## Summary (cont.)

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- ◆ 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.

*• might allow 800°C vs. 565°C*