

Presentation to the ACRS

Spent Fuel Pool Studies

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Charles G. Tinkler

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Revisions Ex 2 + Ex 5

6/27
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SFP Studies

- **Background**
- **Updated SFP analyses**
- **Mitigation**
- **SFP testing**
- **NAS review**
- **Ongoing and new analysis**

SFP Analysis Background

- **Past NRC generic studies often assumed “bounding” configuration for T/H heatup analysis, pool fully racked and full, minimal clearances, fuel of uniform (most limiting) decay power, fission product release fractions assumed.**
- **New analysis focused on phenomenological modeling, in greater detail, fluid flow and heat transfer, representative geometries and fuel loading configurations (based on detailed licensee info).**
 - **CFD calcs (laminar flow losses, mixing)**
 - **Separate effects MELCOR calcs**
 - **Integrated pool MELCOR calcs**
- **New analyses address mitigation strategies**
- **Oxidation kinetics testing at ANL completed**
 - **Recently completed testing of hydrided samples**

SFP Testing

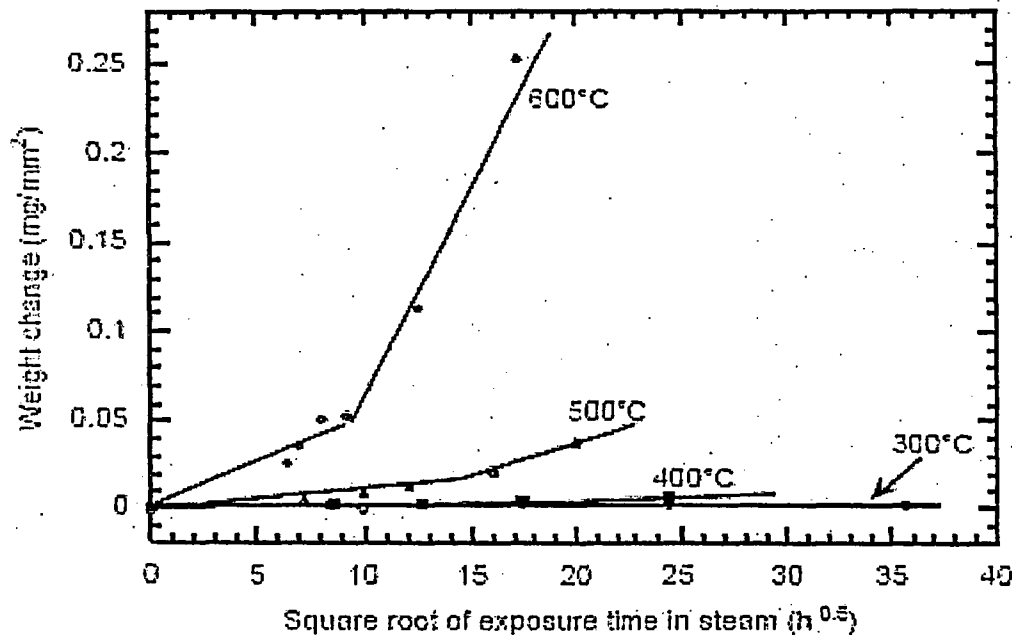
- Air oxidation rate kinetics testing at ANL
 - Testing completed, final report in preparation
 - Pre-oxidized, hydrided
 - Zircalloy and zirlo
- Spent Fuel Pool Heatup and Propagation Testing at SNL
 - Simulation of decay heat + air oxidation with non fueled prototypic assembly and sfp rack design
 - Confirmation of laminar flow modeling and convective cooling including interstitial bypass
 - Partial draindown and within-assembly countercurrent natural circulation

Ex 5 portions

Ex. 5

Ex. 5

Zr Air Oxidation Rate Measured by Isothermal Weight Gain Tests



- Zr samples oxidized in air at constant temperature
- Oxidation determined by weighing samples after different exposure times
- Weight gain appears linear against square root of time
- Parabolic expression of oxidation
 - $dw^2/dt = K(T)$
- Breakaway phenomena leads to step change in oxidation rate in late time

$$\frac{dw^2}{dt} = k(T)$$

$$W_{new}^2 = W_{old}^2 + k(T) \cdot \Delta t$$

NAS Review

- **Series of meetings held to brief ad-hoc Committee on safety and security of Commercial Spent Nuclear Fuel Storage**

- 12/03/03 Introductory mtg with Board (open mtg with presentations by Alvarez, von Hippel, NRC)
- 2/13/04 closed mtg with NRC staff []
- 3/5/04 closed mtg with NRC staff []
- 5/11/04 closed mtg with SNL staff and NRC

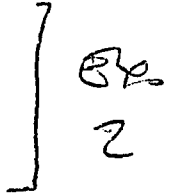
Ex 2 portions

Ex. 2

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NAS Review

- NAS review has focused on



Ex 2 portions

- NAS visit to plant sites

- Potential improvements

Ongoing and New Analysis (cont)

- Follow-up analysis of BWR pool

- Scenario variations

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- Mitigation strategies

- Consequence analysis

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Ex 5 portions