

1/03

# Assessment of NPP Vulnerabilities: *Accident Progression, Source Term and Consequence Estimates*

Charles Tinkler/Jason Schaperow  
Office of Nuclear Regulatory Research

Information in this record was deleted  
in accordance with the Freedom of Information  
Act, exemptions 2 & 5  
FOIA 2004-0226

~~Official Use Only~~

Portions Ex 2 & Ex 5  
Ex 2 only  
6/14  
ANN

# ***Accident Progression, Source Term and Consequence Estimates***

**Objective: Develop realistic accident progression, source term and consequence estimates to identify key vulnerability issues**

- **Methods**

- MELCOR - for analysis of accident progression; timing, extent of core damage and fission product release, mitigation
- MACCS - for analysis of offsite consequences

- **Major Tasks:**

- Review / improve fission product modeling
- Improve consequence modeling treatments
- Perform integrated reactor analysis - BWR & PWR
- Perform integrated SFP analyses
- Mitigation

Ex - 5

# ***Fission Product Modeling***

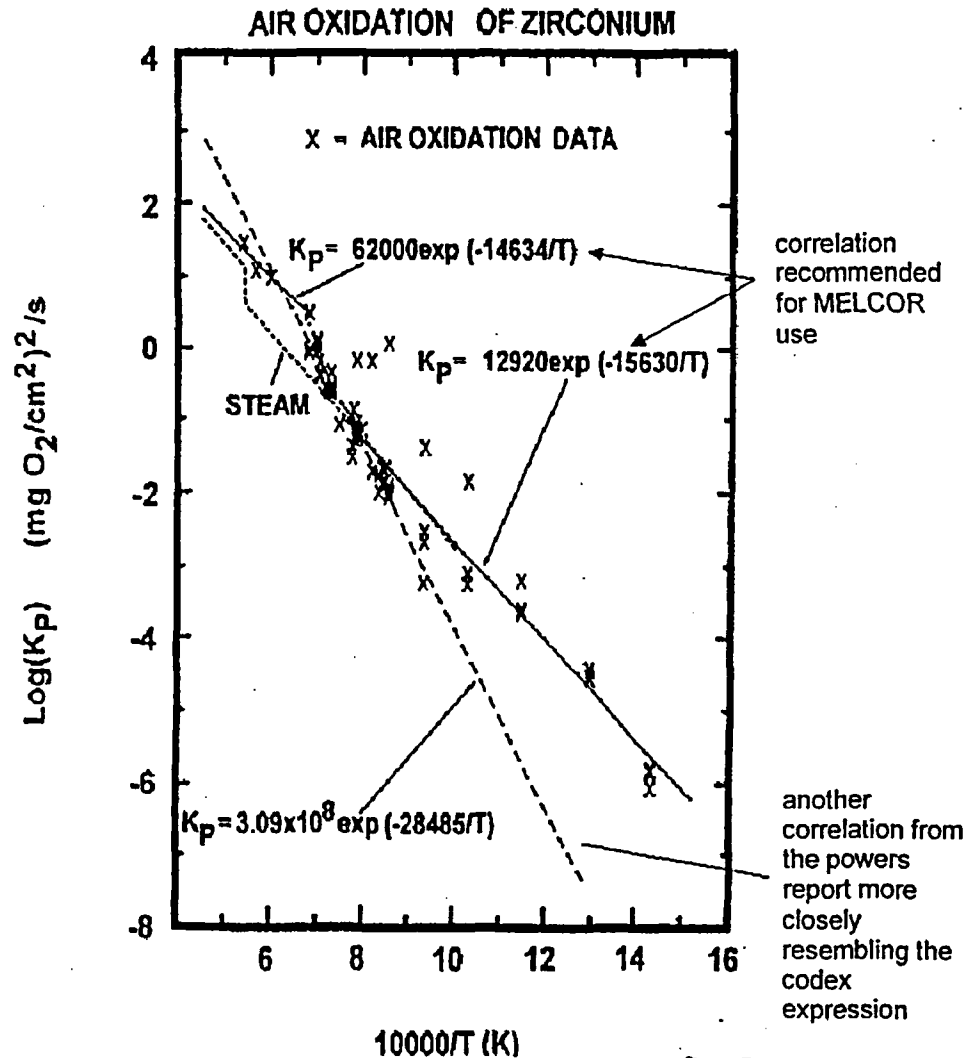
***Objective: Reflect Best-Estimate Fission Product  
Release, Transport and Deposition***

- Review and assess present MELCOR fission product source term modeling
- Update as appropriate for present applications



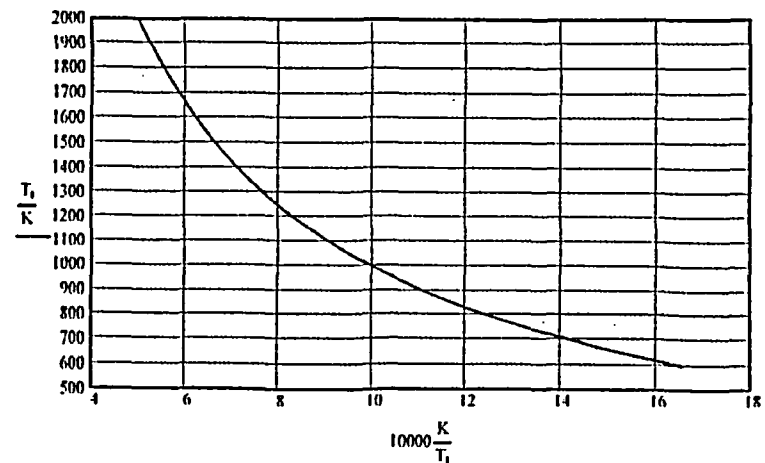
Ex.  
5

# Air Oxidation Correlations



~~Official Use Only~~

- Considerable uncertainty in estimates of low temperature behavior
- Testing underway at ANL
- Cooperation with Westinghouse and Framatome to test new alloys



# ***Spent Fuel Pool Analyses***

- Evaluate Response to Initiating Events in Terms of Heatup and Source Term Generation
  - Partial Pool Drainage
  - Complete Pool Drainage (Air Natural Circulation)

[

]

Ex. 5

- CFD Used to Evaluate
  - Details of Single Assembly in Air Circulation and Heat Flows
  - Details of Flow and Mixing Behavior in Pool and Building
  - Provide Benchmark for MELCOR Analyses
- MELCOR Will Analyze
  - Global Response of Pool and Assemblies,
  - Fuel Damage, Steam and Air Oxidation
  - Fission Product Source Term
  - Mitigation or Recovery Actions

# ***MELCOR SFP Modeling Approach***

- **2 Model Approach - Separate Effects and Whole Pool/Building Models**

- Subdivided into 2 Types of Scenarios

- **Complete Loss-of-Inventory**

- **Partial Loss-of Inventory**

] Ex 5  
Ex 5

- **Separate Effects Model**

[

- Developed to Guide Full SFP Model Development

- **Identify Sensitivities and Uncertainties**

- **Use Separate Effects Model to Develop Appropriate Modeling Approach and Code Improvements**

] Ex 5

- **Full SFP + Building Model**