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RIC 2012
Thermal Hydraulics and Severe Accident Research

The NRC's Use of Computational Fluid Dynamics Codes

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Introduction

- ❑ **Computational fluid dynamics (CFD) is becoming more common.**
  - ❑ abundant codes and computers
  - ❑ reduces uncertainty; improves regulatory effectiveness
- ❑ **The NRC has a dedicated CFD capability.**
  - ❑ review simulations
  - ❑ confirmatory studies
  - ❑ complete analyses
- ❑ **The NRC is supporting developments.**
  - ❑ best practice guidelines and validation data bases
  - ❑ multi-phase CFD developments

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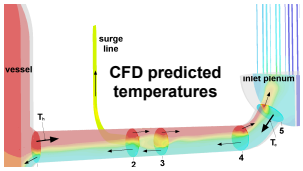
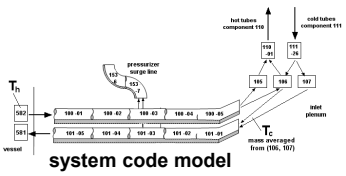
Severe Accident Studies





system code model

- ❑ **CFD extends test data**
  - ❑ full-scale
  - ❑ design details
- ❑ **CFD supports system codes**
  - ❑ flows
  - ❑ mixing
  - ❑ heat transfer

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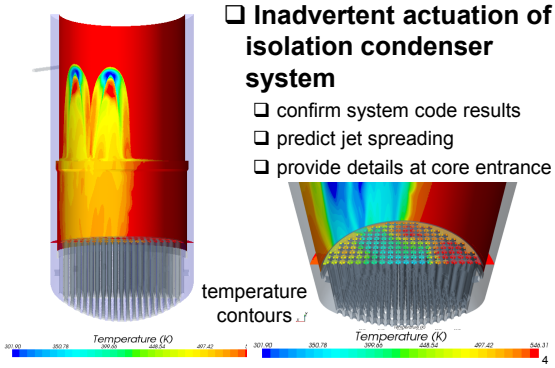
Confirmatory Analysis

- **Inadvertent actuation of isolation condenser system**
  - confirm system code results
  - predict jet spreading
  - provide details at core entrance



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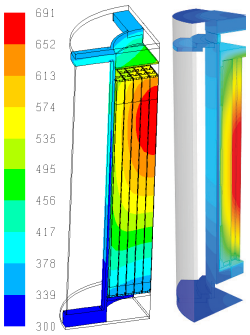
Dry Cask Applications

- **CFD is applied to review license applications.**
  - storage
  - transportation
  - vacuum drying
  - validation of methods
- **The NRC developed best practice guidance for dry cask analysis.**



Temperature Contours (K)

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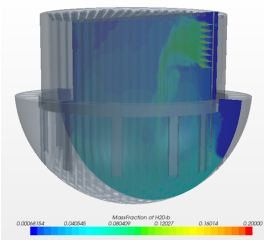
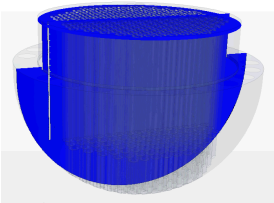
Improved Modeling

- **Standby liquid control system injects into BWR.**





- **Simulations help us understand stratification and mixing behavior.**

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CFD Developments

- **Development of Capabilities**
  - high speed computing
  - benchmark exercises
  - conferences and workshops
  - staff development
- **Multi-Phase CFD**
  - support for national and international programs
- **CFD Best-Practice Guidelines**
  - continued development and refinement

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Summary

- **CFD use is growing.**
- **CFD helps to reduce uncertainty and increase confidence in the NRC's regulatory decisions.**
- **The NRC participates in national and international programs to support best practice guidelines, benchmarking, and verification and validation issues.**
- **Significant work remains.**

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