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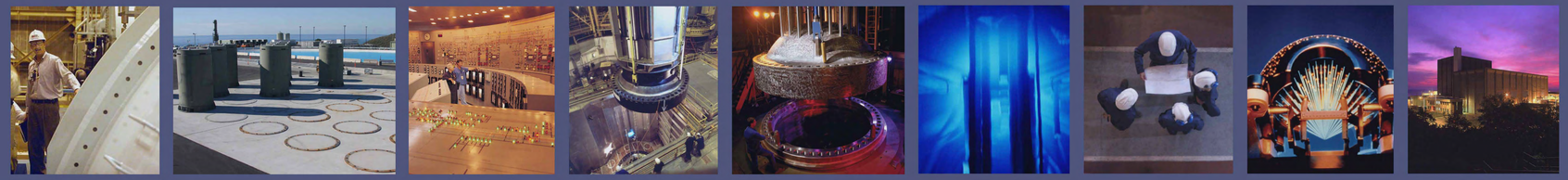
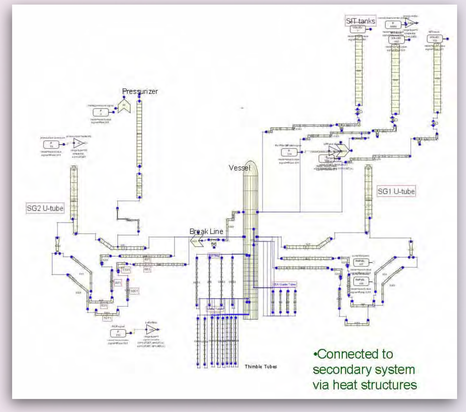


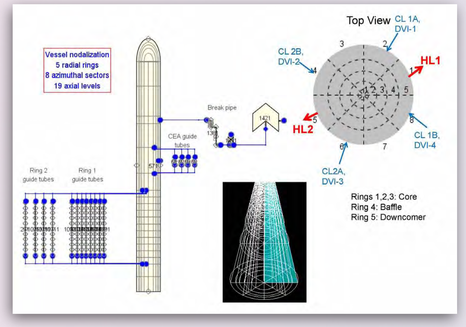
OFFICE OF NUCLEAR REGULATORY RESEARCH

ATLAS DVI Line Break: Comparison to Experimental Data, Implications for Advanced PWR TRACE Calculations, and the Value of 3D Modeling

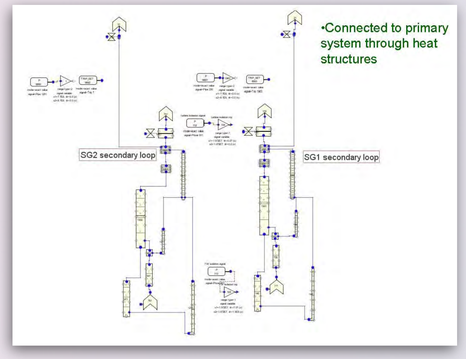
Primary System Nodalization



Vessel Nodalization



Secondary System Nodalization



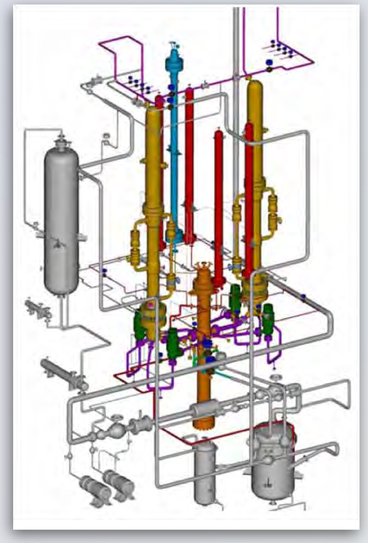
ISP-50, ATLAS 50% DVI Line Break

ATLAS (Advanced Thermal-Hydraulic Test Loop for Accident Simulation)

- 1/2-height and length
- 1/288-volume
- Full pressure integral test facility in Korea

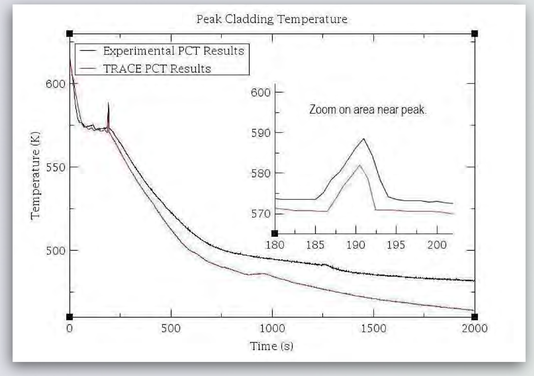
Simulated a direct vessel injection (DVI) line break

- Important in several new PWR designs such as APWR and AP1000
- Adds to very limited integral test data on DVI line breaks available to help understand the relevant thermal-hydraulic behavior and assess existing safety analysis codes



Summary and Conclusions

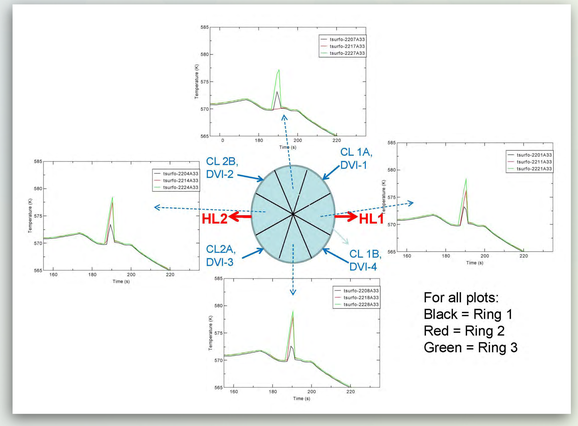
- A TRACE input deck was developed with a 3-D vessel component and calculations were performed with TRACE 5.333
- TRACE did well at predicting some key phenomena and results
- Helps agency sharpen tools used for confirmatory and regulation-informing analysis



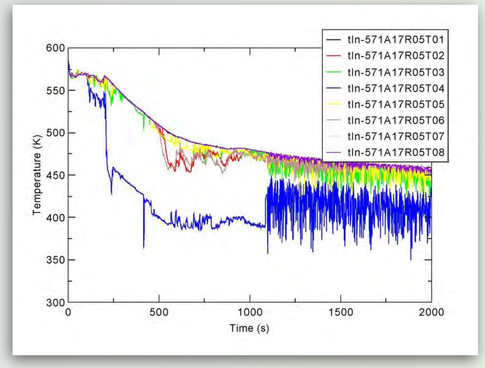
Value of 3-D Modeling in TRACE

- Detailed data from 3D VESSEL were interesting and it appears that TRACE partially captured the 3D effects
- The value of TRACE's 3D modeling capability can be seen both indirectly as phenomena that rely on 3D effects such as loop seal clearing, and directly in things like temperature distribution

3D Results–PCT



Downcomer Water Temperature Just Below DVI Connection Level



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