FRAMATOME ANP

Rod-to-Rod Radiation

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Rod-to-Rod Radiation

- *Issue*
  - *The S-RELAP5 code does not have a rod-to-rod radiation model*
  - *The assessments used to define model multipliers and uncertainties do contain rod-to-rod radiation*
  - *The fuel assemblies in the plant being analyzed have rod-to-rod radiation*
  - *What is the impact of not having a rod-to-rod radiation model on development of biases, uncertainties, and plant analyses?*

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- *Development of biases and uncertainties*
  - *Rod-to-rod radiation is important when there is little or no water present during DFFB*
  - *There is insufficient data to develop biases and uncertainties on the individual components of the total DFFB heat transfer coefficient*
    - *Thus, the individual component biases and uncertainties are lumped into a single bias and uncertainty on the total heat transfer coefficient.*
  - *This has been done using the FLECHT-SEASET and THTF test data*

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- *Development of biases and uncertainties*

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- *Code Biases and Uncertainties*
  - *Validated on independent CCTF, LOFT, and Semiscale data sets*
    - *Maximum PCT of approximately 1540 F*
    - *Minimum PCT of approximately 1000 F*

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- Plant Analyses
  - Rod-to-rod radiation analyses have been performed with the R2RRAD code to compare the rod-to-rod radiation in FLECHT-SEASET to that in a 17x17 fuel bundle
    - Analyses indicated that the rod-to-rod radiation in the 17x17 fuel bundle was greater than that in FLECHT-SEASET
      - 17x17 htc at time of PCT = 2.52 BTU/hr-ft2-R
      - FLECHT-SEASET htc at time of PCT =1.92 BTU/hr-ft2-R
  - Thus, the total heat transfer coefficient calculated by the S-RELAP5 model is conservative relative to what would exist in an actual bundle
    - There is more radiation in the plant fuel bundle then in the data used to benchmark the code

Rod-to-Rod Radiation

- Conclusions
  - Validation of code biases on independent data sets demonstrates that the total heat transfer coefficient is best estimate relative to the data
  - The total heat transfer coefficient calculated by the S-RELAP5 model is conservative relative to what would exist in an actual bundle