

Manual to Code Comparisons

Hope Forsmann

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Comparison of RELAP5-3D Manuals to Coding in support of Small Modular Reactors

Background

An on-going effort is underway to provide verification of the RELAP5-3D code as compared to the Code Structure, System Models and Solution Methods (Vol. I), the User's Guide and Input Requirements (Vol. II), and the Models and Correlations (Vol. IV) manuals. This article summarizes the progress to date on this effort.

The models and correlations described in these manuals were reviewed and prioritized according to their importance for simulating small modular reactors that are cooled by water. Six important models and correlations were initially reviewed to verify that the manuals are consistent with the coding and original references from the literature. Any discrepancies between the manuals and the coding or between the manuals and the literature were identified. Some of the discrepancies were corrected as part of this work and others were identified for correction in the future.

Discussion

For each model identified in the Code Structure, System Models and Solution Methods and the Models and Correlations manuals the following are documented where applicable.

- a. The coding or subroutine where the model exists.
- b. Whether or not the documentation and coding agree.
- c. If they don't agree, what the discrepancy is.
- d. For referenceable models, whether the code and documentation agree with the reference.
- e. If they don't agree with the reference, what the discrepancy is.
- f. For non-referenceable models, the model's output will be compared to a referenceable model, if available, at two to five points over the range of application.

The computer code under review is RELAP5-3D Version 4.3.2, an internal version. The corrections noted in during this review will be implemented in the next externally released version, or noted as a user problem to be addressed later.

The chapters and models which were reviewed are listed below:

- Single and Two Phase Wall Friction Coefficients
- Wall-to-Fluid Heat Transfer
- Interphase Friction
- Choked Flow
- Numerical Viscosity and Volume Average Velocity Terms in the Semi-Implicit Scheme Difference Equations
- Volume Average Velocities

Future Effort

It is anticipated that additional important models and correlations will be reviewed as time and funding become available. The review of additional models and correlations in the future will result in the inclusion of additional chapters in Reference 1.

References

1. J. Hope Forsmann, "Verification of RELAP5-3D Manuals and Models", INL/MIS-16-37564 Rev. 0, January 2016.