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Overview of PLTEMP/ANL Verification and Validation

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ABSTRACT

PLTEMP/ANL is a steady-state single-phase (liquid H₂O or D₂O) thermal-hydraulic code used by ANL and by research laboratories in several other countries since 1980 to calculate temperature distribution and safety margins in research reactors whose cores contain fuel assemblies made of multiple fuel plates, nested fuel tubes, or fuel rods. Sixteen capabilities of the code were identified by research reactor analysts as frequently used in their thermal-hydraulic analysis. These include the calculation of channel flow rates in forced flow or in natural circulation, temperature distribution in the coolant, cladding and fuel, calculation of margins to the onset of nucleate boiling, to the onset of flow instability, to the critical heat flux calculated using one of the several built-in correlations. Over the last decade, the 16 capabilities have been verified and the verification has been documented. The verification was done by comparing the results of the code for dozens of test problems, with those obtained by hand or spreadsheet calculation, or by other computer codes. Model validation has also been done by comparing the code with experimental data.