Recent RELAP5 Development Activities

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Abstract

Development of the RELAP5-3D© computer code is continuing at the Idaho National Engineering and Environmental Laboratory. RELAP5-3D© is a three-dimensional, coupled neutronics and thermal-hydraulics code designed for analyzing a wide range of transients in nuclear reactor plants and other systems. Ongoing code development activities include adding new capabilities, improving existing models, and addressing problems reported by code users.

Enhancements have been made to the nodal kinetics model. Researchers at Kyiv State University are developing a VVER plant model, which is the first large-scale application of the hexagonal geometry option in the code. Improved input capabilities have been added to assist the user, based on their experience. These enhancements include increasing the number of allowable compositions from 999 to 9999, increasing the input deck word limit to accommodate larger input decks, and providing for the rotation of boundary discontinuity factors in hexagonal geometry.

A growing area of interest is in linking RELAP5 to other computer codes. Users want to combine the whole system modeling capability of RELAP5 with more detailed calculations of specific areas of a plant, such as the containment or a subchannel of the core. To facilitate these connections, an executive program has been written for RELAP5-3D©. The executive program is based on the PVM software. It automatically sets up PVM for the codes being linked, and controls the time step sizes for the calculations. Required information is then passed between the code calculations. Modifications need to be made to the other computer code to allow the information to be transferred back and forth to RELAP5-3D©. The capability currently exists to link two RELAP5-3D© calculations together. This feature could be used to model very large systems, where there are not enough component numbers available for a single code calculation.

Another recent evolution was the moving of the RELAP5 home page; its new address is http:www.inel.gov/relap5. The web page provides users access to the RELAP5-3D© code manuals, information on code seminars and meetings (including papers from recent RELAP5 user meetings), and information on problems reported by code users.

Development has also continued on the RELAP5 Graphical User Interface. This tool is designed to provide users with the capability to run RELAP5-3D© and easily display results in a format that assists in the analysis and interpretation of the calculations. In the

last year, a screen has been added that displays detailed heat structure information; an example is shown in Figure 1. The structure temperatures are shown in color gradients, and information on the boundary volumes on both sides of the structure is provided. A detailed reactor vessel and core display has also been developed, driven by a desire to show core damage progression information from SCDAP/RELAP5 calculations. Figure 2 shows a conceptual design for this screen. The numerical values and some of the core damage animation are currently implemented. Several options are being considered for adding an input model building capability to the graphical interface tool.

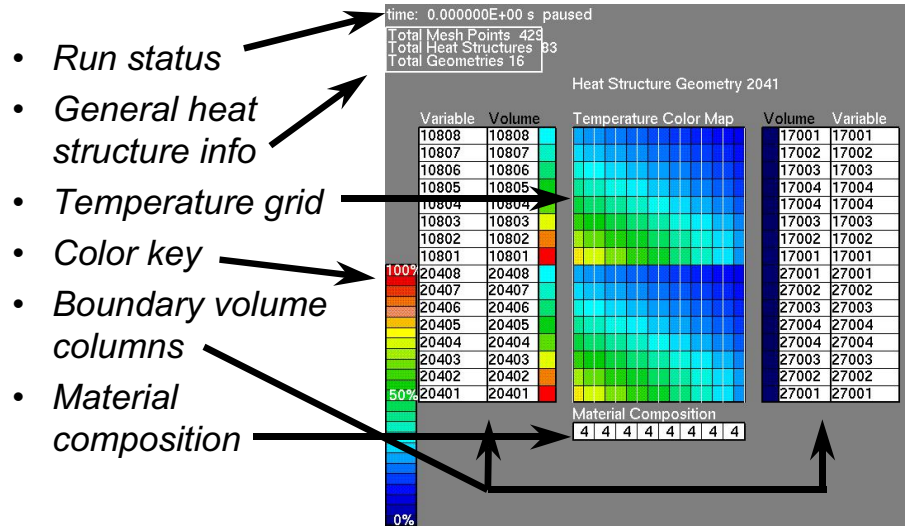

Figure 1. Heat structure screen example

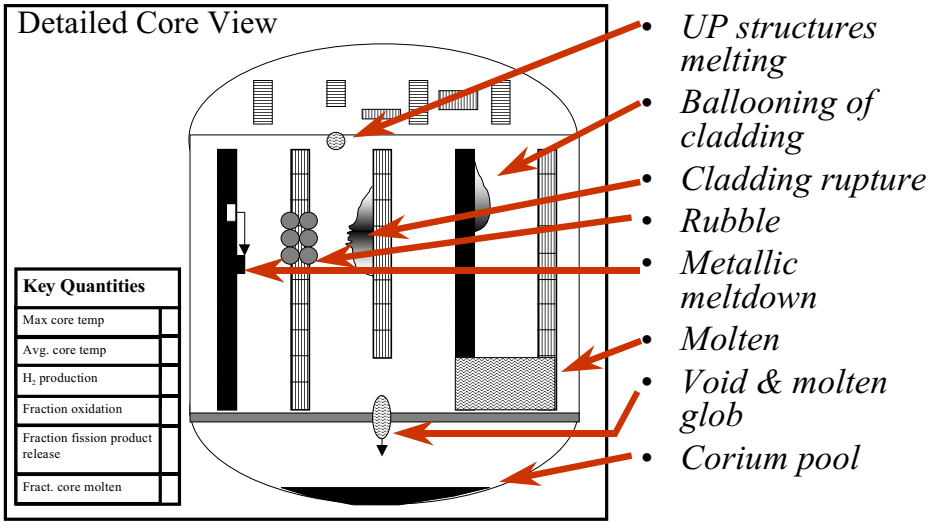

Figure 2. Core damage screen example