

PACKAGE ID - 000735I037000 PARET-ANL

KWIC TITLE - Program for the Analysis of Reactor Transients

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LIMITATION CODE -UNL **AUDIENCE CODE** - UNL

COMPLETION DATE - 11/01/1984 **PUBLICATION DATE** - 11/01/1984

DESCRIPTION - PERET-ANL is designed for use in predicting the course and consequences of nondestructive reactivity accidents in research and test reactor cores. It can be used for both steady-state and transient analysis.

PACKAGE CONTENTS - NESC Tape Description and Implementation Instructions; Software Abstract; JCL Listing; IDO-17282; Excerpts from NRTS Environmental Subroutine Manual; The Paret Code and the Analysis of the SPERT I Transients; Media Includes Source Code, Sample Problem Input and Output, Properties Library, Auxiliary Routines;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 CD ROM

METHOD OF SOLUTION - PARET-ANL provides a hydrodynamic and point kinetics capability. The core can be represented by four or fewer regions, each having different power generation, coolant mass flow rate, and hydraulic parameters as represented by a single fuel pin or plate with its associated coolant channel. The heat transfer in each fuel element is computed on the basis of a one-dimensional conduction solution in each of up to a maximum of 21 axial sections. The hydrodynamic solution is also one-dimensional for each channel at each time node. The heat transfer may take place by natural or forced convection, nucleate, transition, or stable film boiling. The coolant is allowed to range from subcooled liquid, through the two-phase regime, up to and including superheated steam, and coolant flow reversal is allowed. PARET-ANL also has an optional voiding model which estimates the voiding produced by subcooled boiling.

COMPUTER - IBM370

OPERATING SYSTEMS - OS/MVT (IBM 370), MVS (IBM3033)

PROGRAMMING LANGUAGES - FORTRAN IV (91%), BAL (9%)

SOFTWARE LIMITATIONS - The PARET-ANL model is subject to several recognized limitations which may limit the applicability in any specific situation, depending on the nature of the transient under consideration. PARET-ANL employs steady-state heat heat

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SOFTWARE LIMITATIONS - (CONT) correlations throughout, possibly being unrealistic in certain transient situations. Any complete description of a severe transient must include provision for some sort of thermal or hydraulic crisis. PARET-ANL is limited in predicting such a crisis by the fact that it employs only steady-state correlations: no transient correlations with demonstrated reliability have been developed. Accurate description of hydraulic instability depends upon accurate calculation of transient pressure and flow fluctuations. PARET-ANL is limited in this respect because it employs an incompressible model and a simplified void volume generation equation. Also, the magnitude of local pressures predicted to accompany coolant expulsion is strongly affected by the number of axial sections chosen in the computations. As a result, the hydrodynamic output should be interpreted as a qualitative indication of a possible crisis rather than a reliable quantitative prediction. PARET-ANL is not applicable to either destructive excursions or situations in which there is a space-time effect in neutron flux.

SOURCE CODE AVAILABLE (Y/N) - Y

OTHER PROG/OPER SYS INFO - A generalized input processor in IBM assembly language is included. Auxiliary Fortran routines for processing and editing the summary plot files generated by PARET-ANL and for generating an updated properties library are also included. Subroutine INLK was compiled with the FORTX450 compiler with 450K. The normal compiler could not process OPT=2 because this routine is too large. The SIZE parameter of the linkage editor must be set to (300K,24K).

HARDWARE REQS - 240Kbytes plus one magnetic tape.

TIME REQUIREMENTS - The sample problem requires less than 18 seconds of CPU time to process 320 time-steps with 2 channels on an IBM3033.

REFERENCES - C.F. Obenchain, PARET, A Program for the Analysis of Reactor Transients, IDO-17282, January 1969; PARET-ANL Tape Description and Implementation Information, National Energy Software Center Note 85-02, October 4, 1984; Excerpts from NRTS Environmental Subroutine Manual; W.L.Woodruff, The PARET Code and the Analysis of the SPERT I Transients.

SUBJECT CLASS CODE - GH

KEYWORDS -

COMPUTER PROGRAM DOCUMENTATION
P CODES
HYDRAULICS
REACTIVITY INSERTIONS
TRANSIENT OVERPOWER ACCIDENTS
REACTOR SAFETY

E S T S C
ENERGY SCIENCE & TECHNOLOGY SOFTWARE CENTER
SOFTWARE ABSTRACT

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DATE 03/12/2002

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HEAT TRANSFER
HYDRODYNAMICS
REACTOR KINETICS
FEEDBACK

EDB SUBJECT CATEGORIES -
990200 220900

SPONSOR - DOE/NE

PACKAGE TYPE - AS - IS