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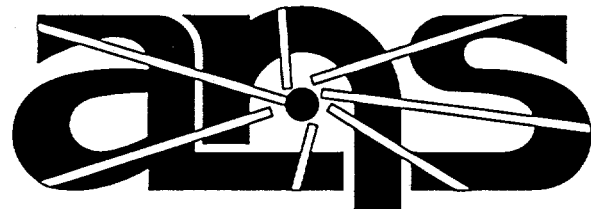
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**RELAP5 Model for
Advanced Neutron Source Reactor
Thermal-Hydraulic Transients,
Three-Element-Core Design**

N. C. J. Chen
M. W. Wendel
G. L. Yoder

November 1995

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Advanced Neutron Source

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Engineering Technology Division

RELAP5 Model for Advanced Neutron Source Reactor Thermal-Hydraulic Transients, Three-Element-Core Design

N. C. J. Chen
M. W. Wendel*
G. L. Yoder

*Computational Physics and Engineering Division

February 1996

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OAK RIDGE NATIONAL LABORATORY
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LIST OF ACROYNMS

ANS	Advanced Neutron Source
ANSR	Advanced Neutron Source Reactor
BOC	Beginning of Cycle
CHF	Critical Heat Flux
CPBT	Core Pressure Boundary Tube
EOC	End of Cycle
FE	Flow Excursion
HFIR	High Flux Isotope Reactor
NEPL	Non-Exceedance Probability Level
OSV	Onset of Significant Void
PSVAW	Primary Supply Vessel Weldment Adapter

NOMENCLATURE

Symbol	Definition	Units
A	Cross-sectional area	m^2
C_d	Discharge coefficient	-
d_h	Volume hydraulic diameter	m
dZ	Volume elevation rise	m
e	Surface roughness	m
f	Friction coefficient	-
g	Coolant gap dimension	m
K_f	Forward loss coefficient	-
K_r	Reverse loss coefficient	-
L	Volume length	m
r	Radial dimension	m
Re	Reynolds number	-
s	Fuel plate span	m
t_{oxide}	Oxide thickness	m
T_{sat}	Saturation temperature	K
T_w	Wall temperature	K
Δx	Fuel plate thickness	m

RELAP5 Model for Advanced Neutron Source Reactor Thermal-hydraulic Transients, Three-Element-Core Design

N. C. J. Chen
M. W. Wendel
G. L. Yoder

ABSTRACT

In order to utilize reduced enrichment fuel, the three-element-core design has been proposed. The proposed core configuration consists of inner, middle, and outer elements, with the middle element offset axially beneath the inner and outer elements, which are axially aligned. The three-element-core RELAP5 model assumes that the reactor hardware is changed only within the core region, so that the loop piping, heat exchangers, and pumps remain as assumed for the two-element-core configuration. However, the total flow rate through the core is greater and the pressure drop across the core is less so that the primary coolant pumps and heat exchangers are operating at a different point in their performance curves. This report describes the new RELAP5 input for the core components.

1. INTRODUCTION

As a supplement of the report, *RELAP5 Model for Advanced Neutron Source Thermal-Hydraulic Transients, Two-Element Core Design*,¹ this report documents only changes to the core region consistent with the three-element-core design. The extra-core components of the system remain unchanged, and their input description is not repeated here. The pre- and postprocessing FORTRAN programs were changed to accommodate the three-element-core configuration.

To better capture acoustic propagation phenomena and to quantify the safety margin during rapid depressurization accidents, a refined nodalization (comparable to that used in the two-element-core model) was developed for the three-element-core. The input model (listed in Appendix A) was developed for use with RELAP5/MOD3.1.1.1. The FORTRAN used to load the RELAP5 input file with fuel source terms is listed in Appendix B. This program calculates the source terms using the G1294-2d fuel grading power densities, peaking factors, and heat loading distribution within the metal and coolant components. The postprocessor and strip file input used in the three-element-core studies are listed in Appendixes C and D, respectively. In addition, steady-state and selected transient results are documented in the report, *Advanced Neutron Source Reactor Conceptual Safety Analysis Report, Three-Element-core Design*.²

2. INPUT DESCRIPTION

The nodalization diagram for the three-element-core RELAP5 model is shown in Fig. 1 (core region) and Fig. 2 (loop region). The core model consists of three fuel annuli regions, core bypass channels, and the central control rod region. The core is surrounded by the core pressure boundary tube (CPBT), which separates the high-pressure primary system from the low-pressure moderator tank.

2.1 FUEL ELEMENTS

Three fuel element channels are included for each of the inner, middle, and outer fuel elements: an average channel, and two hot channels corresponding to the 95% and 99.9% nonexceedance probability uncertainty levels in the power distribution. In each hot channel, two hot stripes are used to represent both the critical heat flux (CHF) and the Costa onset-of-significant-void (OSV), used in the ANSR analysis as a flow excursion (FE) correlation, peaking factors. The G1294-2d power distribution was used with peaking factors and power densities obtained at end-of-cycle (EOC) conditions for the inner core, beginning-of-cycle (BOC) conditions for the middle core, and one-day conditions for the outer core. These conditions correspond to the highest (most conservative) heat flux levels. Appendix B contains a listing of the FORTRAN computer program (power3E.f) that was used to directly insert the source terms into the RELAP5 input file. The source terms that represent heating in the CPBT and control rod region are not modified by power3E.f. The power densities and peaking factors that were used as input to power3E.f are supplied in this section.

The reactor contains three fuel annuli (cores). The core geometry is described in ref. 3. The inner fuel annulus consists of 252 fuel plates with a nominal thickness of 1.27 mm, inner radius, $r_i = 102$ mm, and outer radius, $r_o = 162$ mm. The middle (lower) fuel annulus consists of 418 fuel plates with a nominal thickness of 1.27 mm, $r_i = 169$ mm, and $r_o = 224$ mm. The outer fuel annulus consists of 571 fuel plates, also with a nominal thickness of 1.27 mm, $r_i = 231$ mm and $r_o = 281$ mm. One average channel is used in each fuel annulus to represent (as a lumped volume) all but two of the fuel channels. The two fuel channels excluded from the lumped volume serve as the 95% and 99.9% hot fuel channels, where the channel thickness is narrowed to account for uncertainties in the fuel plate manufacture. The fuel plate surface roughness was calibrated such that the pressure drop predicted by the ANSR steady-state code⁴ was obtained at a middle (lower)-core inlet velocity of 20 m/s.

The length of the fuel plates is different from the two-element design. The heated length for each element in the three-element-core design is 0.418 m instead of 0.507 m. The unheated length at each core inlet is 0.05 m instead of the two-element 0.01 m. The unheated length at the exit remains unchanged at 0.01 m. As with the two-element-core, the unheated fuel sections are modeled as a part of the unheated annular channels (inlet, mid-core, and exit annular regions). To compensate for the neglect of the frictional loss due to the presence of the fuel plates in the unheated fuel regions, loss coefficients at the inlet and exit of each core are included. The actual geometry of the unheated fuel channels is not used because the axial length of 0.01 m would severely limit the acceptable computational time step (material Courant limit, equal to the axial volume length divided by the coolant velocity).

The axial spacing between the upper end of the heated fuel in the middle (lower) core and the lower end of the heated fuel in the inner and outer (upper) cores is now 0.116 m instead of the two-element spacing of 0.050 m. This spacing does include the unheated fuel lengths. The total axial length from the bottom of the middle (lower) heated fuel section to the top of the inner and outer (upper) heated fuel section is now

Fig. 1. ANS three-element-core RELAP5 nodalization diagram: core region.

Fig. 2. ANS three-element-core RELAP5 nodalization diagram: cooling loop region.

0.952 m instead of 1.064 m. Since the total three-element heated axial span is shorter by 0.112 m, the inlet and outlet unfueled annular regions are lengthened by 0.076 m and 0.036 m, respectively. This same adjustment was made to the discretization in the control rod channels and the CPBT. Only the 0.076 m (inlet) adjustment was made in the CPBT annulus because the connection to the outer fuel channels is made below (in an axial sense) volume 557. The 0.036 m (outlet) adjustment was made in the outer fuel channels in volume 557.

2.1.1 Average Fuel Channels

Calculation of Span Length

$$s_i = (r_o^2 - r_i^2)/2r_i = (162^2 - 102^2)/(2 \times 169) = 77.647 \text{ mm}$$

$$s_m = (r_o^2 - r_i^2)/2r_i = (224^2 - 169^2)/(2 \times 102) = 63.950 \text{ mm}$$

$$s_o = (r_o^2 - r_i^2)/2r_i = (281^2 - 231^2)/(2 \times 231) = 55.411 \text{ mm}$$

Calculation of Oxidized Fuel Plate Thickness

The maximum oxide thickness is 10.55×10^{-6} m for the G1294 two-element fuel grading using 95% nonexceedance probabilities for the nominal power level of 303 MWt (ref. 5). Using the same assumption that the cladding is consumed during oxide formation such that the total fuel plate thickness is increased by only 28.6% of the oxide thickness⁶ gives the relation between oxidized and clean plates:

$$(\Delta x_{Alclad})_{oxidizedplate} = (\Delta x_{Alclad})_{cleanplate} - 0.714t_{oxide} ,$$

where the clean plate Δx is 0.254 mm and the oxide thickness, t_{oxide} , is 0.01055 mm. So the oxidized plate oxide thickness is $0.254 - 0.714(0.01055) = 0.24647$ mm.

Since the total fuel meat thickness is 0.762 mm, the total oxidized plate thickness is $2 \times (0.01055 + 0.24647) + 0.762 = 1.2760$ mm = 0.001276 m.

The gaps between the fuel plates for each core is therefore

$$g_{middle} = \frac{\pi(169 \times 2) - 418 \text{ plates} \times 1.2760}{418 \text{ plates}} = 1.2643 \text{ mm}$$

$$g_{outer} = \frac{\pi(231 \times 2) - 571 \text{ plates} \times 1.2760}{571 \text{ plates}} = 1.2659 \text{ mm}$$

$$g_{inner} = \frac{\pi(102 \times 2) - 252 \text{ plates} \times 1.2760}{252 \text{ plates}} = 1.2672 \text{ mm}$$

Pipe 510

Middle-core average channel,

$$\begin{aligned}
 L &= 0.0836 \text{ m for each of 5 nodes, giving 0.418 m total length} \\
 A &= 0.033635 \text{ m}^2 \text{ (total flow area in middle core, except two hot channels)} \\
 &= (416/418) \times [\pi(0.224^2 - 0.169^2) - (418)(1.276 \times 10^{-3})(63.950 \times 10^{-3})] \\
 dZ &= 0.0836 \text{ m, assumes vertical orientation of the core} \\
 e &= 1.772 \times 10^{-6} \text{ m, calibrated to get correct pressure drop over the core} \\
 dh &= 0.0024796 \text{ m} = 4(63.95)(1.2643) / 2(63.95 + 1.2643)
 \end{aligned}$$

The ANS rectangular-channel geometry updates are invoked on card 5101001, and the pitch and span are specified to be 0.00127 m and 0.06395 m, respectively, on card 5101501.

Three sets of heat structures are attached to the average channel. The first set represents the average fuel plate. The second set represents the inner side plate, and the third represents the outer side plate. The same method applies for the upper and inner fuel regions.

Pipe 540

Outer-core average channel,

$$\begin{aligned}
 L &= 0.0836 \text{ m for each of 5 nodes, giving 0.418 m total length} \\
 A &= 3.9912 \times 10^{-2} \text{ m}^2 \text{ (total flow area in outer core except two hot channels)} \\
 &= (569/571) \times [\pi(0.281^2 - 0.231^2) - (571)(1.276 \times 10^{-3})(55.411 \times 10^{-3})] \\
 dZ &= 0.0836 \text{ m (elevation)} \\
 e &= 1.772 \times 10^{-6} \text{ m, calibrated roughness to get correct pressure drop over the core} \\
 dh &= 0.0024722 \text{ m} = 4(55.41)(1.2643) / 2(55.41 + 1.2643)
 \end{aligned}$$

The ANS rectangular-channel geometry updates are invoked on card 5401001, and the pitch and span are specified to be 0.00127 m and 0.05541 m, respectively, on card 5401501.

Pipe 570

Inner-core average channel,

$$\begin{aligned}
 L &= 0.0836 \text{ m for each of 5 nodes, giving 0.418 m total length} \\
 A &= 2.4598 \times 10^{-2} \text{ m}^2 \text{ (total flow area in outer core except two hot channels)} \\
 &= (250/252) \times [\pi(0.162^2 - 0.102^2) - (252)(1.276 \times 10^{-3})(77.647 \times 10^{-3})] \\
 dZ &= 0.0836 \text{ m (elevation)} \\
 e &= 1.772 \times 10^{-6} \text{ m, calibrated roughness to get correct pressure drop over the core} \\
 dh &= 0.0024937 \text{ m} = 4(77.647)(1.2672) / 2(77.647 + 1.2672)
 \end{aligned}$$

The ANS rectangular-channel geometry updates are invoked on card 5701001, and the pitch and span are specified to be 0.00127 m and 0.07765 m, respectively, on card 5701501.

2.1.2 Hot Fuel Channels

Two hot channels are used in the lower fuel region to include uncertainties combined to produce the worst-case thermal-hydraulic conditions. Each hot channel is assumed to have a minimum channel gap of 1.14 mm (equal to 90% of nominal 1.27-mm gap).⁷ One of the hot channels is used to produce conditions at a 95% nonexceedance probability level (NEPL) for analysis of unlikely events, and the other at 99.9% nonexceedance probability level for analysis of anticipated events. The same method is used for the upper and inner fuel regions.

Pipes 515 and 516

Middle (lower) core 95% and 99.9% NEPL hot channel,

$$\begin{aligned}
 L &= 0.0836 \text{ m for each of 5 nodes, giving 0.418 m total length} \\
 A &= 8.0467 \times 10^{-5} \text{ m}^2 \text{ (flow area for the single channel)} \\
 &= (1/418) \times [\pi(0.224^2 - 0.169^2) - (418)(1.276 \times 10^{-3})(63.950 \times 10^{-3})] \\
 dZ &= 0.0836 \text{ m (elevation)} \\
 e &= 1.772 \times 10^{-6} \text{ m, calibrated roughness to get correct pressure drop} \\
 dh &= 0.002236 \text{ m} = 4 \times 90\% \times 1.2643 \times 63.95 / [2(63.95 + 90\% \times 1.2643)]
 \end{aligned}$$

The ANS rectangular-channel geometry updates are invoked on cards 5151001 and 5161001, and the pitch and span are specified to be 0.0011433 m and 0.06395 m, respectively, on cards 5151501 and 5161501.

Pipe 545 and 546

Upper core 95% and 99.9% NEPL hot channel,

$$\begin{aligned}
 L &= 0.0836 \text{ m for each of 5 nodes, giving 0.418 m total length} \\
 A &= 7.0145 \times 10^{-5} \text{ m}^2 \text{ (flow area for the single channel)} \\
 &= (1/571) \times [\pi(0.281^2 - 0.231^2) - (571)(1.276 \times 10^{-3})(55.411 \times 10^{-3})] \\
 dZ &= 0.0836 \text{ m (elevation)} \\
 e &= 1.772 \times 10^{-6} \text{ m, calibrated roughness to get correct pressure drop} \\
 dh &= 0.0022299 \text{ m} = 4 \times 90\% \times 1.2643 \times 55.41 / [2(55.41 + 90\% \times 1.2643)]
 \end{aligned}$$

The ANS rectangular-channel geometry updates are invoked on cards 5451001 and 5461001, and the pitch and span are specified to be 0.0011433 m and 0.05541 m, respectively, on cards 5451501 and 5461501.

Pipe 575 and 576

Inner core 95% and 99.9% NEPL hot channel,

$$\begin{aligned}
 L &= 0.0836 \text{ m for each of 5 nodes, giving 0.418 m total length} \\
 A &= 9.8398 \times 10^{-5} \text{ m}^2 \text{ (flow area for the single channel)} \\
 &= (1/252) \times [\pi(0.162^2 - 0.102^2) - (252)(1.276 \times 10^{-3})(77.647 \times 10^{-3})] \\
 dZ &= 0.0836 \text{ m (elevation)} \\
 e &= 1.772 \times 10^{-6} \text{ m, calibrated roughness to get correct pressure drop} \\
 dh &= 0.0022429 \text{ m} = 4 \times 90\% \times 1.2643 \times 77.647 / [2(77.647 + 90\% \times 1.2643)]
 \end{aligned}$$

The ANS rectangular-channel geometry updates are invoked on cards 5751001 and 5761001, and the pitch and span are specified to be 0.0011433 m and 0.07765 m, respectively, on cards 5751501 and 5761501.

2.1.3 Unheated Annular Channels

Several control volumes are defined to represent the annular channels upstream and downstream of each fuel element. Volumes 520, 535, and 572 are defined to represent the short (0.05-m) mid-core volumes.

Pipe 505

Lower (middle)-core inlet annulus

TOTAL LENGTH = 1.621 m = 1.545 m (ref. 8) + 0.076 m (see above discussion)

Segments 1-9, except segment 5

$$\begin{aligned} L &= 0.175 \text{ m (segmentation of inlet annulus to correspond to outer core segmentation)} \\ A &= 0.067906 \text{ m}^2 = \pi(0.224^2 - 0.169^2) \\ dZ &= 0.175 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1100 \text{ m} = 4 \times 0.067906 / [2\pi(0.224 + 0.169)] \end{aligned}$$

Segment 5

$$\begin{aligned} L &= 0.221 \text{ m} = 1.621 - 8 \times 0.175 \\ A &= 0.067906 \text{ m}^2 = \pi(0.224^2 - 0.169^2) \\ dZ &= 0.221 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1100 \text{ m} = 4 \times 0.067906 / [2\pi(0.224 + 0.169)] \end{aligned}$$

Pipe 520

Lower (middle)-core, mid-core volume

$$\begin{aligned} L &= 0.116 \text{ m (ref. 3)} \\ A &= 0.067906 \text{ m}^2 = \pi(0.224^2 - 0.169^2) \\ dZ &= 0.116 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1100 \text{ m} = 4 \times 0.067906 / [2\pi(0.224 + 0.169)] \end{aligned}$$

Pipe 525

Lower (middle)-core exit annulus (upper-core bypass)

TOTAL LENGTH = 2.5108 m = 2.5638 m (ref. 3) + 0.036 m + (0.418 - 0.507) m

Segment 1

$$\begin{aligned} L &= 0.1672 \text{ m} = 2 \times 0.0836 \text{ m, exit of volume aligned with exit of 2nd volume in upper-core fuel channels.} \\ A &= 0.067906 \text{ m}^2 = \pi(0.224^2 - 0.169^2) \\ dZ &= 0.1672 \text{ m (vertical orientation)} \end{aligned}$$

$$\begin{aligned} e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1100 \text{ m} = 4 \times 0.067906 / [2\pi(0.224 + 0.169)] \end{aligned}$$

Segments 2-12

$$\begin{aligned} L &= 0.1953 \text{ m} = (2.5108 - 0.1672)/12, \text{ entrance of volume aligned with exit of 2nd volume in upper-core fuel channels.} \\ A &= 0.067906 \text{ m}^2 = \pi(0.224^2 - 0.169^2) \\ dZ &= 0.1953 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1100 \text{ m} = 4 \times 0.067906 / [2\pi(0.224 + 0.169)] \end{aligned}$$

Pipe 530

Upper (outer)-core inlet annulus

The total length of this pipe is based on ref. 8. The discretization was selected to keep node lengths close to 0.2 m. The volume No. 5 must match up to the CPBT inlet orifice.

TOTAL LENGTH OF VOLUMES 1-9 = 1.621 m = 1.545 m (ref. 8) + 0.076 m (see above discussion)

Segments 1-9, except segment 5

$$\begin{aligned} L &= 0.175 \text{ m} \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.175 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1000 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Segment 5

$$\begin{aligned} L &= 0.221 \text{ m} = 1.621 - 8 \times 0.175 \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.221 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1000 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Segments 10-14

$$\begin{aligned} L &= 0.0836 \text{ m} = 0.418 \text{ m} / 5, \text{ aligned with lower-core fuel channel volumes} \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.1014 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1000 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Pipe 535

Upper (outer)-core mid-core volume

$$\begin{aligned} L &= 0.116 \text{ m (ref. 3)} \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.116 \text{ m (vertical orientation)} \end{aligned}$$

$$\begin{aligned} e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1000 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Pipe 555

Upper (outer)-core bottom exit annulus

Center volume is aligned to receive cross-flow from CPBT annulus (ref. 3).

Total length of pipe 555 is 0.7715 m, same as the two-element-core dimension. The additional length for unheated annular regions in the three-element-core is made up in pipe 557.

Segments 1-5

$$\begin{aligned} L &= 0.1543 \text{ m} = 0.7715/5 \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.1543 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1100 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Pipe 557

Outer-core top-exit annulus. The total length of this pipe, 1.3213 m, is equal to the two-element length of 1.2853 m plus one-half the difference in overall core length between the two-element and three-element-cores, 0.036 m. The length is segmented to keep all volume lengths near 0.2 m.

Segments 1-7

$$\begin{aligned} L &= 0.16 \text{ m} \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.16 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1000 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Segment 8

$$\begin{aligned} L &= 0.2013 \text{ m} = 1.3213 - 7 \times 0.16 \\ A &= 0.080425 \text{ m}^2 = \pi(0.281^2 - 0.231^2) \\ dZ &= 0.2013 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1000 \text{ m} = 4 \times 0.080425 / [2\pi(0.281 + 0.231)] \end{aligned}$$

Pipe 568

Inner-core inlet annulus

These volume lengths correspond one-to-one with the outer-core volumes.

Segments 1-9, except segment 5

$$\begin{aligned} L &= 0.175 \text{ m} \\ A &= 0.049763 \text{ m}^2 = \pi(0.162^2 - 0.102^2) \\ dZ &= 0.175 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.1200 \text{ m} = 4 \times 0.049763 / [2\pi(0.162 + 0.102)] \end{aligned}$$

Segment 5

$$\begin{aligned}
 L &= 0.221 \text{ m} \\
 A &= 0.049763 \text{ m}^2 = \pi(0.162^2 - 0.102^2) \\
 dZ &= 0.221 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.1200 \text{ m} = 4 \times 0.049763 / [2\pi(0.162 + 0.102)]
 \end{aligned}$$

Segments 10-14

$$\begin{aligned}
 L &= 0.0836 \text{ m} = 0.418 \text{ m} / 5, \text{ aligned with lower-core fuel channel volumes} \\
 A &= 0.049763 \text{ m}^2 = \pi(0.162^2 - 0.102^2) \\
 dZ &= 0.1014 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.1200 \text{ m} = 4 \times 0.049763 / [2\pi(0.162 + 0.102)]
 \end{aligned}$$

Pipe 572

Inner-core, mid-core volume

$$\begin{aligned}
 L &= 0.116 \text{ m (ref. 3)} \\
 A &= 0.049763 \text{ m}^2 = \pi(0.162^2 - 0.102^2) \\
 dZ &= 0.116 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.1200 \text{ m} = 4 \times 0.049763 / [2\pi(0.162 + 0.102)]
 \end{aligned}$$

Pipe 580

Inner-core-exit annulus

Total length is the same as total length of volumes 555 and 557 = 2.0928 m.

Discretization is made to keep volume lengths near 0.2 m.

$$\begin{aligned}
 L &= 0.20928 \text{ m, aligned to receive cross-flow from CPBT annulus (ref. 8)} \\
 A &= 0.049763 \text{ m}^2 = \pi(0.162^2 - 0.102^2) \\
 dZ &= 0.20928 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.1200 \text{ m} = 4 \times 0.049763 / [2\pi(0.162 + 0.102)]
 \end{aligned}$$

Core Flow Separation Shroud Heat Structures**Heat Structure 5052 (Separation shroud between middle and outer fuel annuli)**

Number of Heat Structures (NHS) = 9

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.224-m inner radius of core flow separation shroud between middle- and outer-fuel annuli

Right-boundary coordinate = 0.231 m outer radius of core flow separation shroud between middle- and outer-fuel annuli

Composition is No. 2 - Al 6061

Left boundary is Pipe 505

Right boundary is Pipe 530

Heat Structure 5053 (Separation shroud between inner- and middle-fuel annuli)

Number of Heat Structures (NHS) = 9

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.162-m inner radius of core flow separation shroud between inner- and middle-fuel annuli

Right-boundary coordinate = 0.169-m outer radius of core flow separation shroud between inner- and middle-fuel annuli

Composition is No. 2 - Al 6061

Left boundary is Pipe 568

Right boundary is Pipe 505

Heat Structure 5202 (Separation shroud between middle- and outer-core annuli in mid-core region)

Number of Heat Structures (NHS) = 1

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.224-m inner radius of core flow separation shroud (ref. 3)

Right-boundary coordinate = 0.231-m outer radius of core flow separation shroud (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Volume 520-01

Right boundary is Volume 535-01

Heat transfer length = 0.116 m (includes unheated fuel plate)

Heat Structure 5203 (Separation shroud between inner- and lower-core annuli in mid-core region)

Number of Heat Structures (NHS) = 1

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.162-m inner radius of core flow separation shroud (ref. 3)

Right-boundary coordinate = 0.169-m outer radius of core flow separation shroud (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Volume 572-01

Right boundary is Volume 520-01

Heat transfer length = 0.116 m (includes unheated fuel plate)

Heat Structure 5551 (Separation shroud between middle- and outer-core annuli in core exit region)

Number of Heat Structures (NHS) = 2

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.224-m inner radius of core flow separation shroud (ref. 3)

Right-boundary coordinate = 0.231-m outer radius of core flow separation shroud (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Volume 525-01

Right boundary is Volume 555-01

Heat transfer length = 0.7715 m, extends only to end of pipe 550

Heat Structure 5553 (Separation shroud between inner- and middle-core annuli in core exit region)

Number of Heat Structures (NHS) = 2

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.162 m inner radius of core flow separation shroud (ref. 3)

Right-boundary coordinate = 0.169 m outer radius of core flow separation shroud (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Volume 525-01

Right boundary is Volume 580-01

Heat transfer length = 0.7715 m, extends only to end of pipe 550

2.1.4 Fuel Channel Interconnecting JunctionsMultiple Junction 507**Junction 1**

Connects pipe 500 (core inlet plenum) to pipe 505 (middle-core inlet annulus)

A = 0.067906 m² (defaulted to area of 505)

Kf = 0.0

Kr = 0.0

Use abrupt area change model to represent sudden area contraction

dh = 0.110 m (same as the correct dh for 505)

Junction 2

Connects pipe 505 (middle-core inlet annulus) to pipe 510 (middle-core average channel)

A = 0.033635 m² (defaulted to area of 510)

Kf = 0.38 = 0.04 (taken from HFIR value)⁹ + 0.34 (fL/d, for smooth pipe, Re = 1.5 × 10⁵, f = 0.0169, L = 0.050 m unheated length)

Kr = 0.38

Use smooth area change model

dh = 0.0024796 m

Junction 3

Connects pipe 505 (middle-core inlet annulus) to pipe 515 (middle core 95% NEPL hot channel)

A = 0.000080467 m² (defaulted to area of 515)

Kf = 0.38 = 0.04 (taken from HFIR value)⁹ + 0.34 (fL/d, for smooth pipe, Re = 1.5 × 10⁵, f = 0.0169, L = 0.050 m unheated length)

Kr = 0.38

Use smooth area change model

dh = 0.002236 m

Junction 4

Connects pipe 505 (middle-core inlet annulus) to pipe 516 (middle-core 99.9% NEPL hot channel)

A = 0.000080467 m² (defaulted to area of 516)

Kf = 0.38 = 0.04 (taken from HFIR value)⁹ + 0.34 (fL/d, for smooth pipe, Re = 1.5 × 10⁵, f = 0.0169, L = 0.050 m unheated length)

Kr = 0.38
 Use smooth area change model
 dh = 0.002236 m

Multiple Junction 522

Junction 1

Connects pipe 510 (middle-core average channel) to pipe 520 (middle-core exit annulus)

A = 0.033635 m² (defaulted to area of 510)
 Kf = 0.068, fL/d for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.010$ m unheated length
 Kr = 0.068
 Use abrupt area change model to represent sudden expansion at core exit
 dh = 0.0024796 m, same as the dh for 510

Junction 2

Connects pipe 515 (middle-core 95% NEPL hot channel) to pipe 520 (middle-core-exit annulus)

A = 0.000080467 m² (defaulted to area of 515)
 Kf = 0.068, fL/d for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.010$ m unheated length
 Kr = 0.068
 Use abrupt area change model to represent sudden expansion at core exit
 dh = 0.002236 m, same as the dh for 515

Junction 3

Connects pipe 520 (middle-core mid-core volume) to pipe 525 (middle-core-exit annulus)

A = 0.067906 m² (defaulted to area of 520)
 Kf = 0.0
 Kr = 0.0
 Smooth area change model used
 dh = 0.110 m (same as the correct dh for 520)

Junction 4

Connects pipe 516 (middle-core 99.9% NEPL hot channel) to pipe 520 (middle-core-exit annulus)

A = 0.000080467 m² (defaulted to area of 516)
 Kf = 0.68, fL/d for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.010$ m unheated length
 Kr = 0.68
 Use abrupt area change model to represent sudden expansion at core exit
 dh = 0.002236 m, same as the dh for 515

Single Junction 529

Connects pipe 500 (core inlet plenum) to pipe 530 (middle-core bypass annulus)

A = 0.080425 m² (defaulted to area of 530)
 Kf = 0.0
 Kr = 0.0
 Use abrupt area change model to represent sudden area contraction
 dh = 0.1000 m (same as the correct dh for 530)

Multiple Junction 537

Junction 1

Connects pipe 530 (middle-core bypass annulus) to pipe 535 (outer-core mid-core volume)

$$A = 0.080425 \text{ m}^2 \text{ (defaulted to area of 530)}$$

$$K_f = 0.0$$

$$K_r = 0.0$$

Use smooth area change model

$$dh = 0.1000 \text{ m (same as the } dh \text{ for 530)}$$

Junction 2

Connects pipe 535 (outer-core mid-core volume) to pipe 540 (outer-core average channel)

$$A = 0.039912 \text{ m}^2 \text{ (defaulted to area of 540)}$$

$$K_f = 0.38 = 0.04 \text{ (taken from HFIR value)}^9 + 0.34 \text{ (fL/d, for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.050 \text{ m unheated length)}$$

$$K_r = 0.38$$

Use smooth area change model

$$dh = 0.0024722 \text{ m}$$

Junction 3

Connects pipe 535 (outer-core mid-core volume) to pipe 545 (outer-core 95% NEPL hot channel)

$$A = 0.000070145 \text{ m}^2 \text{ (defaulted to area of 545)}$$

$$K_f = 0.38 = 0.04 \text{ (taken from HFIR value)}^9 + 0.34 \text{ (fL/d, for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.050 \text{ m unheated length)}$$

$$K_r = 0.38$$

Use smooth area change model

$$dh = 0.0022299 \text{ m}$$

Junction 4

Connects pipe 535 (outer-core mid-core volume) to pipe 546 (outer-core 99.9% NEPL hot channel)

$$A = 0.000070145 \text{ m}^2 \text{ (defaulted to area of 546)}$$

$$K_f = 0.38 = 0.04 \text{ (taken from HFIR value, Ref. 9)} + 0.34 \text{ (fL/d, for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.050 \text{ m unheated length)}$$

$$K_r = 0.38$$

Use smooth area change model

$$dh = 0.0022299 \text{ m}$$

Multiple Junction 556

Junction 1

Connects pipe 540 (outer-core average channel) to pipe 555 (outer-core exit annulus)

$$A = 0.039912 \text{ m}^2 \text{ (defaulted to area of 540)}$$

$$K_f = 0.068 = fL/d, \text{ for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.010 \text{ m unheated length}$$

$$K_r = 0.068$$

Use abrupt area change model to represent sudden expansion at core exit

$$dh = 0.0024722 \text{ m, same as the } dh \text{ for 540}$$

Junction 2

Connects pipe 545 (outer-core 95% NEPL hot channel) to pipe 555 (outer-core exit annulus)

$$A = 0.000070145 \text{ m}^2 \text{ (defaulted to area of 545)}$$

$$Kf = 0.068 = fL/d, \text{ for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.010 \text{ m unheated length}$$

$$Kr = 0.068$$

Use abrupt area change model to represent sudden expansion at core exit

$$dh = 0.0022299 \text{ m, same as the } dh \text{ for 545}$$

Junction 3

Connects pipe 546 (outer-core 99.9% NEPL hot channel) to pipe 555 (outer-core exit annulus)

$$A = 0.000070145 \text{ m}^2 \text{ (defaulted to area of 545)}$$

$$Kf = 0.068 = fL/d, \text{ for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.010 \text{ m unheated length}$$

$$Kr = 0.068$$

Use abrupt area change model to represent sudden expansion at core exit

$$dh = 0.0022299 \text{ m, same as the } dh \text{ for 545}$$

Junction 4

Connects pipe 555 (outer-core bottom-exit annulus) to pipe 557 (outer-core top-exit annulus)

$$A = 0.080425 \text{ m}^2 \text{ (defaulted to area of 555)}$$

$$Kf = 0.0$$

$$Kr = 0.0$$

Use smooth area change model

$$dh = 0.1000 \text{ m, same as 557 and 555}$$

Multiple Junction 569**Junction 1**

Connects pipe 568 (middle-core bypass annulus) to pipe 572 (inner-core mid-core volume)

$$A = 0.049763 \text{ m}^2 \text{ (defaulted to area of 568)}$$

$$Kf = 0.0$$

$$Kr = 0.0$$

Use smooth area change model

$$dh = 0.1200 \text{ m (same as the } dh \text{ for 568)}$$

Junction 2

Connects pipe 572 (inner-core mid-core volume) to pipe 570 (inner-core average channel)

$$A = 0.024598 \text{ m}^2 \text{ (defaulted to area of 570)}$$

$$Kf = 0.38 = 0.04 \text{ (taken from HFIR value)}^9 + 0.34 (fL/d, \text{ for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.050 \text{ m unheated length})$$

$$Kr = 0.38$$

Use smooth area change model

$$dh = 0.0024937 \text{ m}$$

Junction 3

Connects pipe 572 (inner-core mid-core volume) to pipe 575 (inner-core 95% NEPL hot channel)

$$A = 0.000098398 \text{ m}^2 \text{ (defaulted to area of 575)}$$

$$Kf = 0.38 = 0.04 \text{ (taken from HFIR value)}^9 + 0.34 (fL/d, \text{ for smooth pipe, } Re = 1.5 \times 10^5, f = 0.0169, L = 0.050 \text{ m unheated length})$$

10^5 , $f = 0.0169$, $L = 0.050$ m unheated length)

Kr = 0.38
Use smooth area change model
dh = 0.0022429 m

Junction 4

Connects pipe 572 (inner-core mid-core volume) to pipe 576 (inner-core 99.9% NEPL hot channel)

A = 0.000098398 m² (defaulted to area of 576)
Kf = 0.38 = 0.04 (taken from HFIR value)⁹ + 0.34 (fL/d, for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.050$ m unheated length)
Kr = 0.38

Use smooth area change model
dh = 0.0022429 m

Junction 5

Connects pipe 500 (core inlet plenum) to pipe 568 (middle-core bypass annulus)

A = 0.049763 m² (defaulted to area of 568)
Kf = 0.0
Kr = 0.0

Use abrupt area change model to represent sudden area contraction
dh = 0.1200 m (same as the correct dh for 568)

Multiple Junction 581

Junction 1

Connects pipe 570 (inner-core average channel) to pipe 580 (inner-core exit annulus)

A = 0.039912 m² (defaulted to area of 570)
Kf = 0.068 = fL/d, for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.010$ m unheated length
Kr = 0.068

Use abrupt area change model to represent sudden expansion at core exit
dh = 0.0024937 m, same as the dh for 570

Junction 2

Connects pipe 575 (inner-core 95% NEPL hot channel) to pipe 580 (inner-core exit annulus)

A = 0.000098398 m² (defaulted to area of 575)
Kf = 0.068 = fL/d, for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.010$ m unheated length
Kr = 0.068

Use abrupt area change model to represent sudden expansion at core exit
dh = 0.0022429 m, same as the dh for 575

Junction 3

Connects pipe 576 (inner-core 99.9% NEPL hot channel) to pipe 580 (inner-core exit annulus)

A = 0.000098398 m² (defaulted to area of 576)
Kf = 0.068 = fL/d, for smooth pipe, $Re = 1.5 \times 10^5$, $f = 0.0169$, $L = 0.010$ m unheated length
Kr = 0.068

Use abrupt area change model to represent sudden expansion at core exit

dh = 0.0022429 m, same as the dh for 576

2.1.5 Average Channel Heat Structures

The fuel plates and side plates are modeled with slab (rectangular geometry) heat structures. Source terms are included within each heat structure based on neutronics calculations for the distribution of thermal power in the core. For illustration, a calculational procedure for the middle-core average fuel plates is described. The same procedure applies to upper- and inner-core fuel regions.

(A) Average Fuel Plates

Heat Structure 5101 (Lower-Core Average Fuel Plates)

Fuel plate geometry and response are symmetrical with respect to the plate centerline. Taking advantage of symmetry, the fuel plates are modeled as single-sided plates of half thickness with a convective boundary on one side and an adiabatic (symmetry) boundary on the other side.

The clean fuel plates are 1.27 mm (50 mils) thick with a 0.762-mm (30-mil)-thick fuel meat and a 0.254-mm (10-mil) aluminum 6061 clad on each side. During oxide formation, cladding is consumed such that the total plate thickness is increased by only 28.6% of the oxide thickness. For the G1294-2d fuel grading the maximum oxide thickness was 10.55×10^{-6} m. Therefore, the corroded plates consist of 0.762-mm fuel meat, 0.2465-mm clad on each side, and 0.01055-mm oxide on each side for a total thickness of 1.276-mm.

Fuel meat thickness (half plate) = 0.381 mm

Clad thickness = 0.2465 mm

Oxide thickness = 0.01055 mm

Heat Structure Group Number CCCG = 5101

Number of Heat Structures (NHS) = 5

Number of Mesh Points (NMP) = 11

2 intervals from the left boundary through right coordinate (RCOORD) = 1.055×10^{-5} m (oxide)

2 intervals through RCOORD = 2.57×10^{-4} m (cladding)

6 intervals through RCOORD = 6.38×10^{-4} m (fuel meat)

Composition No. 4 (Oxide) through interval 2

Composition No. 2 (Al 6061) through interval 4

Composition No. 5 (Fuel Meat) through interval 10

Power Distribution through the fuel plate thickness

Constant, uniform values for heat generation are specified in the fuel meat and cladding.

Because of lack of information for the three-element core, an averaged power split between the fuel meat and the clad is calculated based on the two-element core L7 fuel grading calculations. In the two-element core, power is distributed as shown here:

<u>Core</u>	<u>Fuel meat</u>	<u>Fuel clad</u>
Upper	99.33%	0.67%
Lower	99.41%	0.59%

The average distribution from this two-element-core result of 99.37%/0.63% is assumed for all three cores. For the three-element reactor, the distribution of power among the three cores at beginning of the cycle is 15.2% - Inner, 40.5% - Middle, and 44.3% - Outer, for the G1294-2d core, according to ref. 10:

Inner-core fuel meat source term = $0.152 \times 0.90757 \times 0.9937 = 0.13708$,
 Inner-core fuel clad source term = $0.152 \times 0.90757 \times 0.0063 = 0.00086909$,
 Middle-core fuel meat source term = $0.405 \times 0.90757 \times 0.9937 = 0.36525$,
 Middle-core fuel clad source term = $0.405 \times 0.90757 \times 0.0063 = 0.0023157$,
 Outer-core fuel meat source term = $0.443 \times 0.90757 \times 0.9937 = 0.39952$,
 Outer-core fuel clad source term = $0.443 \times 0.90757 \times 0.0063 = 0.0025329$,

where 0.90757 is the total power fraction deposited in the fuel meat and cladding.¹¹

The heat transfer area to the coolant per cell is calculated as follows:

axial heated length per cell $\times$ effective span $\times$ number of plates $\times$ 2 sides,

where the effective span is the total span length less 1.143 mm (45 mils) on both ends for the non-fuel regions. Although only half of the average fuel plate is modeled (taking advantage of symmetry), both sides of the fuel plate are included in the area calculation because the total power is used to generate the source term. The following calculations are done for the fuel plate heat structures to determine the total heat transfer area.

HS 5101	$0.418/5 \times (0.06395 - 2 \times 0.001143) \times (418-2) \times 2 = 4.29 \text{ m}^2$
HS 5151	$0.418/5 \times (0.06395 - 2 \times 0.001143) \times 1 \times 2 = 0.01031 \text{ m}^2$
HS 5161	$0.418/5 \times (0.06395 - 2 \times 0.001143) \times 1 \times 2 = 0.01031 \text{ m}^2$
HS 5401	$0.418/5 \times (0.05541 - 2 \times 0.001143) \times (571-2) \times 2 = 5.05 \text{ m}^2$
HS 5451	$0.418/5 \times (0.05541 - 2 \times 0.001143) \times 1 \times 2 = 0.00888 \text{ m}^2$
HS 5461	$0.418/5 \times (0.05541 - 2 \times 0.001143) \times 1 \times 2 = 0.00888 \text{ m}^2$
HS 5701	$0.418/5 \times (0.07765 - 2 \times 0.001143) \times (252-2) \times 2 = 3.15 \text{ m}^2$
HS 5751	$0.418/5 \times (0.07765 - 2 \times 0.001143) \times 1 \times 2 = 0.01260 \text{ m}^2$
HS 5761	$0.418/5 \times (0.07765 - 2 \times 0.001143) \times 1 \times 2 = 0.01260 \text{ m}^2$

A FORTRAN program (Appendix B: power3E.f) has been written to calculate source terms in heat structures according to RELAP5 input requirements. The procedure to calculate source terms requires the use of power allocation (Table 1), relative power density as derived from neutronic calculations (Table 2), and peaking factors (Table 3). For the power distribution within the structures, a flat radial profile in the fuel meat and clad is assumed, and a $1/r$ profile in the side plates, control rods, central hole wall, and CPBT walls is used. The source inputs for the heat structure 5101 within the fuel meat, clad, and oxide are 0.13708, 0.00086909, and 0, respectively.

Table 1. ANS heat loads for RELAP5 input

Component	Relative	Absolute (MW)
Outer fuel element	0.33917	112.13
Inner	0.13319	44.033
Middle	0.43521	143.882
Inner fuel element and plates and unheated zones	0.00080	0.264
Outer	0.00140	0.462
Middle	0.00140	0.463
Inner support tube	0.00072	0.238
Middle	0.00039	0.129
Outer	0.00050	0.166
Inner CPBT	0.00115	0.380
Outer CPBT	0.00391	1.291
Inner-fuel-element side plates	0.00129	0.426
Outer	0.00258	0.852
Middle	0.00263	0.868
Central hole D ₂ O (inside inner support)	0.00327	1.081
Inner D ₂ O channel [between M&O support (includes support structures and targets)]	0.00561	1.854
Middle D ₂ O channel [between M&O support (includes support structures and targets)]	0.00777	2.570
Outer D ₂ O channel [between M&O support (includes support structures and targets)]	0.00660	2.182
Core bypass (between CPBT walls)	0.00093	0.306
Central control rods and structures	0.00406	1.342
Reflector vessel wall	0.00206	0.682
Reflector (D ₂ O & components)	0.04537	14.999
Total	1.0000	330.600

**Table 2. Relative power densities in each node of the RELAP5 ANSR
three-element-core model**

Node	Avg channel	Hot channel	CHF hot stripe	FE hot stripe
Outer element 1 day into the cycle				
1 (Inlet)	1.351	1.622	1.710	1.664
2	1.285	1.618	1.658	1.554
3	1.165	1.495	1.546	1.415
4	1.026	1.348	1.405	1.266
5 (Outlet)	0.882	1.155	1.258	0.906
Middle element at beginning of cycle				
1 (Inlet)	1.217	1.654	1.759	1.648
2	1.257	1.624	1.647	1.573
3	1.260	1.523	1.566	1.459
4	1.244	1.408	1.452	1.335
5 (Outlet)	1.158	1.230	1.326	1.025
Inner element at end of cycle				
1 (Inlet)	0.862	1.518	1.569	1.379
2	0.732	1.254	1.351	1.156
3	0.668	1.115	1.150	1.029
4	0.563	0.956	1.018	0.868
5 (Outlet)	0.385	0.790	0.858	0.693

Table 3. Uncertainty factors in each node of the RELAP5 ANSR three-element-core model

Node	Hot channel	CHF hot stripe	FE hot stripe
95% Nonexceedance probability			
1 (Inlet)	1.074	1.631	1.305
2	1.074	1.554	1.305
3	1.074	1.554	1.305
4	1.074	1.554	1.305
5 (Outlet)	1.074	1.631	1.305
99.9% Nonexceedance probability			
1 (Inlet)	1.113	1.995	1.592
2	1.113	1.899	1.592
3	1.113	1.899	1.592
4	1.113	1.899	1.592
5 (Outlet)	1.113	1.995	1.592

Sample Calculation: Lower-core average and hot channel fuel plate source terms

1. Determine power fractions

In the lower fuel element, the model contains 250 plates for the average channels, one plate for the 95% hot channel, and one plate for the 99.9% hot channel. The power to the lower core is apportioned to the average and hot channels by applying the conservation of energy.

$$250/252 \times P + \frac{\text{averaged hot channel power density/averaged channel power density}}{\left(\frac{1}{252} \text{ peaking factor for the 95\% hot channel} + \frac{1}{252} \text{ peaking factor for the 99.9\% hot channel} \right)} = 1,$$

where P is the average channel peaking factor, which must be less than 1 to compensate for the increased heat load on the 95% and 99.9% hot fuel plates.

The above equation expressed using the FORTRAN variables is

$$\text{mavgl} + \text{ml95} + \text{ml99} = 1,$$

where

$$\begin{aligned} \text{mavgl} &= 250 \times P/252 = \text{average channel power fraction} \\ \text{ml95} &= 1 \times \text{averaged hot channel power density} / \text{averaged channel power density} \times \text{peaking factor} \\ &\quad \text{of the 95\% hot channel} / 252 = 95\% \text{ hot channel power fraction} \\ \text{ml99} &= 1 \times \text{averaged hot channel power density} / \text{averaged channel power density} \times \text{peaking factor} \\ &\quad \text{of the 99.9\% hot channel} / 252 = 99.9\% \text{ hot channel power fraction} \end{aligned}$$

2. Derive source terms for average fuel heat structures.

In power.f, the source multiplier (defined as W2) for the averaged fuel heat structure in the first cell of the lower core is expressed by:

$$W2 = 0.07351 \times \text{mavgl} \times \text{pdlcac}(n)/\text{avpdla} ,$$

where, in addition:

$\text{pdlcac}(n)$ = the n th-cell power density, lower core, average channel heat structure

avpdla = average power density in lower-core average fuel heat structure

and the leading constant is calculated as follows:

Lower-core power fraction $\times$ total fuel meat and clad power fraction / 5 cells

$$0.405 \times 0.90757/5 = 0.07351 .$$

A similar expression applies for calculating D₂O heating on the left side of the fuel structure (defined as W3 and called left heat):

$$W3 = 0.001554 \times \text{volume fraction} \times \text{mavgl} \times \text{pdlcac}(n)/\text{avpdla}$$

wherein the leading constant is computed as $0.00777/5 = 0.001554$ (0.00777, ref. 11) is the power fraction deposited in the coolant immediately next to the fuel element). Repeat the same procedure for the inner and outer side plates.

3. Load the calculated source terms into the RELAP5 input file.

As the source terms are inserted into the RELAP5 input, a summation of the itemized heat sources is performed as a check on total power conservation. For the lower-core average fuel plate (heat structure 5101), the right heat is inputted at zero because it is an adiabatic (symmetry) boundary at the fuel plate centerline.

(B) Average Channel Side Plates

Heat Structure 5102 (Middle-Core Average Channel Inner Side Plate)

The middle core average channel inner side plate is modeled with a two-sided structure that can pass heat from coolant between the average fuel plates (Pipe 510) to coolant in the inner fuel annulus middle fuel bypass (Pipe 568). RELAP5 does not allow conduction heat transfer between two heat structures. Therefore, fuel plate heat transfer cannot be modeled to flow spanwise to the side plates. In the model, heat must pass from the fuel plate to the coolant and then to the side plates. As a result, the side plate temperatures calculated will be low. The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.162 m

Right-boundary radius is 0.169 m

Composition is No. 2 - Al6061

Heat transfer length = $0.0416 \text{ m} = 0.5 \times 416/418 \times 0.418/5$

Heat Structure 5103 (Middle-Core Average Channel Outer Side Plate)

The middle-core average channel outer side plate is modeled with a two-sided structure that can pass heat from coolant between the average fuel plates (Pipe 510) to coolant in the outer fuel bypass annulus (Pipe 530). The method used for heat structure 5102 was also used here to calculate source terms. The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.224 m

Right-boundary radius is 0.231 m

Composition is No. 2 - Al6061

Heat transfer length = $0.0416 \text{ m} = 0.5 \times 416/418 \times 0.418/5$

Heat Structure 5402 (Outer-Core Average Channel Inner Side Plate)

The outer-core average channel inner side plate is modeled with a two-sided structure that can pass heat from coolant between the average fuel channel (Pipe 540) to coolant in the middle fuel exit annulus (Pipe 525). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.224 m

Right-boundary radius is 0.231 m

Composition is No. 2 - Al6061

Heat transfer length = $0.0417 \text{ m} = 0.5 \times 569/571 \times 0.418/5$

Heat Structure 5702 (Inner-Core Average Channel Inner Side Plate)

The inner-core average channel inner side plate is modeled with a two-sided structure that can pass heat from coolant between the average fuel channel (Pipe 570) to coolant in the control rod tube (Pipe 562). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.095 m

Right-boundary radius is 0.102 m

Composition is No. 2 - Al6061

Heat transfer length = $0.04147 \text{ m} = 0.5 \times 250/252 \times 0.418/5$

Heat Structure 5703 (Outer-Core Average Channel Inner Side Plate)

The inner-core average channel outer side plate is modeled with a two-sided structure that can pass heat from coolant between the average fuel channel (Pipe 570) to coolant in the middle core exit annulus (Pipe 525). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.162 m

Right-boundary radius is 0.169 m

Composition is No. 2 - Al6061

Heat transfer length = $0.04147 \text{ m} = 0.5 \times 250/252 \times 0.418/5$

2.1.6 Hot Channel Heat Structures

(A) Main Fuel Heat Structure

The peaking factors presented in Tables 3 is used to calculate the 95% and 99.9% non-exceedance probability hot channel power density distributions. Similar to the lower-core average channel, the lower-core hot channel contains heat structures 5151, 5152, and 5153 for the fuel plate, inner side plate, and outer side plate, respectively. The same procedure for calculating source terms applies.

Heat Structures 5151 and 5161 (Middle-Core 95% and 99.9% Hot Channel Main Fuel Plate)

The middle-core hot channel fuel plate has the same dimensions as the average fuel plate. The heat transfer area is different because only one fuel plate is modeled.

Left-boundary coordinate is 0.0 m

Right-boundary coordinates for each component are same as described for average fuel plate

Composition is the same as described for average channel fuel

Heat transfer area = $0.418/5 \times (0.06395 - 2 \times 0.001143) \times 1 \times 2 = 0.01031 \text{ m}^2$

Heat Structures 5451 and 5461 (Outer-Core 95% and 99.9% Hot Channel Main Fuel Plate)

The outer-core hot channel fuel plate has the same dimensions as the average fuel plate. The heat transfer area is different because only one fuel plate is modeled.

Left-boundary coordinate is 0.0 m

Right-boundary coordinates for each component are same as described for average fuel plate

Composition is the same as described for average channel fuel

Heat transfer area = $0.418/5 \times (0.05541 - 2 \times 0.001143) \times 1 \times 2 = 0.00888 \text{ m}^2$

Heat Structures 5751 and 5761 (Inner-Core 95% and 99.9% Hot Channel Main Fuel Plate)

The inner-core hot channel fuel plate has the same dimensions as the average fuel plate. The heat transfer area is different because only one fuel plate is modeled.

Left-boundary coordinate is 0.0 m

Right-boundary coordinates for each component are same as described for average fuel plate

Composition is the same as described for average channel fuel

$$\text{Heat transfer area} = 0.418/5 \times (0.07765 - 2 \times 0.001143) \times 1 \times 2 = 0.01260 \text{ m}^2$$

(B) Hot Channel Side Plates

Heat Structures 5152 and 5162 (Middle-Core 95% and 99.9% Hot Channel Inner Side Plate)

The middle-core average channel inner side plate is modeled with a two-sided structure that can pass heat from coolant between the hot fuel channels (Pipes 515 and 516) to coolant in the inner fuel annulus middle fuel bypass (Pipe 568). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.162 m

Right-boundary radius is 0.169 m

Composition is No. 2 - Al6061

$$\text{Heat transfer length} = 0.0001 \text{ m} = 0.5 \times 1/418 \times 0.418/5$$

Heat Structure 5153 and 5163 (Middle-Core 95% and 99.9% Hot Channel Outer Side Plate)

The middle-core hot channel outer side plate is modeled with a two-sided structure that can pass heat from coolant between the hot fuel channels (Pipes 515 and 516) to coolant in the outer fuel bypass annulus (Pipe 530). The method used for heat structure 5102 was also used here to calculate source terms. The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.224 m

Right-boundary radius is 0.231 m

Composition is No. 2 - Al6061

$$\text{Heat transfer length} = 0.0001 \text{ m} = 0.5 \times 1/418 \times 0.418/5$$

Heat Structures 5452 and 5462 (Outer-Core 95% and 99.9% Hot Channel Inner Side Plate)

The outer-core average channel inner side plate is modeled with a two-sided structure that can pass heat from coolant between the hot fuel channels (Pipes 545 and 546) to coolant in the middle fuel exit annulus (pipe 525). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.224 m

Right-boundary radius is 0.231 m

Composition is No. 2 - Al6061

$$\text{Heat transfer length} = 0.0000732 \text{ m} = 0.5 \times 1/571 \times 0.418/5$$

Heat Structures 5752 and 5762 (Inner-Core 95% and 99.9% Hot Channel Inner Side Plate)

The inner-core average channel inner side plate is modeled with a two-sided structure that can pass heat from coolant between the hot fuel channels (Pipes 575 and 576) to coolant in the control rod pipe (Pipe 562). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.095 m

Right-boundary radius is 0.102 m

Composition is No. 2 - Al6061

Heat transfer length = $0.0001659 \text{ m} = 0.5 \times 1/252 \times 0.418/5$

Heat Structures 5753 and 5763 (Inner-Core 95% and 99.9% Hot Channel Outer Side Plate)

The inner-core average channel outer side plate is modeled with a two-sided structure that can pass heat from coolant between the hot fuel channels (Pipes 575 and 576) to coolant in the middle fuel exit annulus (Pipe 525). The same procedure that was used above was used to compute source terms.

Left-boundary radius is 0.162 m

Right-boundary radius is 0.169 m

Composition is No. 2 - Al6061

Heat transfer length = $0.0001659 \text{ m} = 0.5 \times 1/252 \times 0.418/5$

(C) Hot Stripe Heat Structures

Two separate hot-spot factors are incorporated in each of the hot channels, one for CHF (heat structures 5154, 5164, 5454, 5464, 5754, and 5764) and one for Costa OSV (FE) (heat structure 5155, 5165, 5455, 5465, 5755 and 5765).¹ These hot spots are modeled as extremely small heat structures (heat transfer area is 1/100th of that for the main hot channel fuel plate) at each axial node. The areas of these heat structures are small enough so they do not affect the hot-channel bulk coolant temperature; however, the peaking factors (Table 3) are applied to elevate the local heat flux appropriately.

Heat Structures 5154, 5155, 5164, 5165 (Middle-Core 95% and 99.9% CHF and FE Hot Stripe)

The middle-core hot stripes have the same dimensions as the average fuel plate. The heat transfer area is only 1/100th of that for a single fuel plate.

Left-boundary radius is 0.0 m

Right-boundary radii for each component are same as described for average fuel plate

Composition is the same as described for average channel fuel

Heat transfer area = $0.0001031 \text{ m}^2 = 0.01031/100 \text{ m}^2$

Heat Structures 5454, 5455, 5464, 5465 (Outer-Core 95% and 99.9% CHF and FE Hot Stripe)

The outer-core hot stripes have the same dimensions as the average fuel plate. The heat transfer area is only 1/100th of that for a single fuel plate.

Left-boundary radius is 0.0 m

Right-boundary radii for each component are same as described for average fuel plate

Composition is the same as described for average channel fuel

Heat transfer area = $0.0000888 \text{ m}^2 = 0.00888/100 \text{ m}^2$

¹ Additionally, in the postprocessor, three thermal limit heat fluxes are calculated based on the Costa OSV hot spot fluxes for the $T_w = T_{\text{sat}}$, the incipient boiling (IB), and the modified Saha-Zuber OSV at the 95% and 99.9% non-exceedance probability levels.

Heat Structures 5754, 5755, 5764, 5765 (Inner-Core 95% and 99.9% CHF and FE Hot Stripe)

The outer-core hot stripes have the same dimensions as the average fuel plate. The heat transfer area is only 1/100th of that for a single fuel plate.

Left-boundary radius is 0.0 m

Right-boundary radii for each component are same as described for average fuel plate

Composition is the same as described for average channel fuel

Heat transfer area = $0.0001260 \text{ m}^2 = 0.01260/100. \text{ m}^2$

2.2 CONTROL ROD CHANNELS

Dimensions are left the same as the two-element-core model, except for the axial discretization, which is modified to match up with the axial discretization in the fuel channels.

Pipe 560

Control rod inlet

Total length of pipe 560 is $2.419 + 0.036 + 0.04 = 2.495 \text{ m}$.

Segments 1-9, except 5

$$\begin{aligned} L &= 0.175 \text{ m} \\ A &= 0.03485 \text{ m}^2 = \pi(0.130^2 - 3 \times 0.044^2) \\ dZ &= 0.175 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.08468 \text{ m} = 4 \times 0.03485 / 2\pi / (3 \times 0.044 + 0.130) \end{aligned}$$

Segment 5

$$\begin{aligned} L &= 0.221 \text{ m (aligned with core inlet volumes)} \\ A &= 0.03485 \text{ m}^2 = \pi(0.130^2 - 3 \times 0.044^2) \\ dZ &= 0.221 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.08468 \text{ m} = 4 \times 0.03485 / 2\pi / (3 \times 0.044 + 0.130) \end{aligned}$$

Segments 10-14

$$\begin{aligned} L &= 0.1748 \text{ m} = (2.495 - 8 \times 0.175 - 0.221) / 5 \\ A &= 0.03485 \text{ m}^2 = \pi(0.130^2 - 3 \times 0.044^2) \\ dZ &= 0.1748 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.08468 \text{ m} = 4 \times 0.03485 / 2\pi / (3 \times 0.044 + 0.130) \end{aligned}$$

Pipe 561

Coolant in control rod tube

Segments 1-11, except 6

$$\begin{aligned} L &= 0.0836 \text{ m corresponds to fuel volumes} \\ A &= 0.00456159 \text{ m}^2 = 3 \times \pi \times 0.022^2 \\ dZ &= 0.0836 \text{ m (vertical orientation)} \end{aligned}$$

$$\begin{aligned} e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.044 \text{ m} = 2 \times 0.022 \end{aligned}$$

Segment 6

$$\begin{aligned} L &= 0.116 \text{ m (ref. 3)}, \text{ corresponds to mid-core volume} \\ A &= 0.00456159 \text{ m}^2 = 3 \times \pi \times 0.022^2 \\ dZ &= 0.116 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.044 \text{ m} = 2 \times 0.022 \end{aligned}$$

Pipe 562

Coolant around control rod tube

Segments 1-11, except 6

$$\begin{aligned} L &= 0.0836 \text{ m, corresponds to fuel volumes} \\ A &= 0.0164753 \text{ m}^2 = \pi(0.095^2 - 3 \times 0.0355^2) \\ dZ &= 0.0836 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.0520521 \text{ m} = 4 \times 0.0164753 / 2\pi / (0.095 + 3 \times 0.0355) \end{aligned}$$

Segment 6

$$\begin{aligned} L &= 0.116 \text{ m, corresponds to mid-core volume} \\ A &= 0.0164753 \text{ m}^2 = \pi(0.095^2 - 3 \times 0.0355^2) \\ dZ &= 0.116 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.0520521 \text{ m} = 4 \times 0.0164753 / 2\pi / (0.095 + 3 \times 0.0355) \end{aligned}$$

Pipe 563

Coolant in control rod gap

Segments 1-11, except 6

$$\begin{aligned} L &= 0.0836 \text{ m, corresponds to fuel volumes} \\ A &= 0.0013195 \text{ m}^2 = \pi(0.0315^2 - 0.0285^2) \times 8 \times 35^\circ / 360^\circ \times 3 \\ dZ &= 0.0836 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.006 \text{ m} = 4 \times 0.0013195 / [2\pi \times 8 \times 35^\circ / 360^\circ \times 3(0.0315 + 0.0285)] \end{aligned}$$

Segment 6

$$\begin{aligned} L &= 0.116 \text{ m, corresponds to mid-core volume} \\ A &= 0.0013195 \text{ m}^2 = \pi(0.0315^2 - 0.0285^2) \times 8 \times 35^\circ / 360^\circ \times 3 \\ dZ &= 0.116 \text{ m (vertical orientation)} \\ e &= 1.52 \times 10^{-6} \text{ m} \\ dh &= 0.006 \text{ m} = 4 \times 0.0013195 / [2\pi \times 8 \times 35^\circ / 360^\circ \times 3(0.0315 + 0.0285)] \end{aligned}$$

Pipe 564

Control rod outlet

Segments 1-12

$$\begin{aligned}
 L &= 0.1744 \text{ m} = (2.0568 + 0.036)/12 \\
 A &= 0.03485 \text{ m}^2 = \pi(0.130^2 - 3 \times 0.044^2) \\
 dZ &= 0.1744 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.08468 \text{ m} = 4 \times 0.03485/2\pi/(3 \times 0.044 + 0.130)
 \end{aligned}$$

Heat Structure 5051 (Control rod shroud in the inlet region)

Number of Heat Structures (NHS) = 14
 Number of Mesh Points (NMP) = 4
 Left-boundary coordinate = 0.130-m inner radius of control rod shroud⁸
 Right-boundary coordinate = 0.1365-m outer radius of control rod shroud⁸
 Composition is No. 2 - Al 6061
 Left boundary is Pipe 560
 Right boundary is Pipe 568

Heat Structure 5201 (Control rod shroud in mid-core region)

Number of Heat Structures (NHS) = 1
 Number of Mesh Points (NMP) = 4
 Left-boundary coordinate = 0.095 m (ref. 8)
 Right-boundary coordinate = 0.102 m (ref. 8)
 Composition is No. 2 - Al 6061
 Left boundary is Volume 562-06
 Right boundary is Volume 572-01

Heat Structure 5251 (Control rod shroud in mid-core region)

This heat structure has been removed because it is identical to the inner-core inner-side plate structure.

2.3 CORE PRESSURE BOUNDARY TUBE (CPBT)

The CPBT is a double-walled containment for the fuel assemblies. Coolant flows between the inner and outer walls in the CPBT annulus (pipe 550) to keep the exterior of the inner wall pressurized. This pressurization is accomplished by sizing the inner wall orifices at the bottom (inlet) and top (outlet) appropriately. The CPBT annulus is modeled as an annular flow channel with a 3-mm gap in the axial region defined by the upper core and a 5-mm gap at all other axial locations. The steady-state-design coolant velocity in the 3-mm gap region is 7 m/s. Previous RELAP5 studies have shown that if the outer wall completely disappears, an inlet orifice diameter of 0.076 m (3 in.) and an outlet orifice diameter of 0.0508 m (2 in.) is an acceptable combination to prevent fuel damage. These orifices are represented by single junctions 531 and 532.

The outer wall has an inside radius of 0.291 m, and the inner wall has an outside radius of 0.286 m, except at the axial level of the inner and outer cores, where it is 0.288 m.

2.3.1 CPBT Volumes

Junction 531

Connects center (via crossflow junction) of 530-01 to center of 550-01

$$A = 0.00454 \text{ m}^2 \text{ (0.076-m-diam circular orifices)}$$

$$K_f = 2.79 \text{ (orifice with } C_D = 0.6)$$

$$K_r = 2.79 \text{ (orifice with } C_D = 0.6)$$

Use smooth area change model

Invoke crossflow option for both volumes

$$dh = 0.01 \text{ m (assume 1-cm hole diameters)}$$

Junction 532

Connects center (via crossflow junction) of 530-01 to center of 550-01

$$A = 0.00204 \text{ m}^2 \text{ (0.051-m-diam circular orifices)}$$

$$K_f = 2.78 \text{ (orifice with } C_D = 0.6)$$

$$K_r = 2.78 \text{ (orifice with } C_D = 0.6)$$

Use smooth area change model

Invoke crossflow option for both volumes

$$dh = 0.0024787 \text{ m}$$

Pipe 550 (CPBT annulus)

Segments 1-9, except 5

$$L = 0.175 \text{ m (same as in two-element core)}$$

$$A = 0.0090635 \text{ m}^2 = \pi(0.291^2 - 0.286^2)$$

$$dZ = 0.175 \text{ m}$$

$$e = 1.52 \times 10^{-6} \text{ m}$$

$$dh = 0.0100 \text{ m} = 4 \times 0.0090635 / 2\pi(0.291 + 0.286)$$

Segment 5

$$L = 0.221 \text{ m} = 1.545 - 8 \times 0.175 + 0.076$$

$$A = 0.0090635 \text{ m}^2 = \pi(0.291^2 - 0.286^2)$$

$$dZ = 0.221 \text{ m}$$

$$e = 1.52 \times 10^{-6} \text{ m}$$

$$dh = 0.0100 \text{ m} = 4 \times 0.0090635 / 2\pi(0.291 + 0.286)$$

Segments 10-14

$$L = 0.0836 \text{ m} = 0.418/5 \text{ (in middle fuel axial region)}$$

$$A = 0.0090635 \text{ m}^2 = \pi(0.291^2 - 0.286^2)$$

$$dZ = 0.0836 \text{ m}$$

$$e = 1.52 \times 10^{-6} \text{ m}$$

$$dh = 0.0100 \text{ m} = 4 \times 0.0090635 / 2\pi(0.291 + 0.286)$$

Segment 15

$$\begin{aligned}
 L &= 0.116 \text{ m, aligned with mid-core volumes} \\
 A &= 0.0054570 \text{ m}^2 = \pi(0.291^2 - 0.288^2) \\
 dZ &= 0.0836 \text{ m} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.0060 \text{ m} = 4 \times 0.0054570 / 2\pi(0.291 + 0.288)
 \end{aligned}$$

Segments 16–20

$$\begin{aligned}
 L &= 0.0836 \text{ m, aligned with upper-core fuel channel volumes} \\
 A &= 0.0054570 \text{ m}^2 = \pi(0.291^2 - 0.288^2) \\
 dZ &= 0.0836 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.006 \text{ m} = 4 \times 0.0054570 / 2\pi(0.291 + 0.288)
 \end{aligned}$$

Segments 21–30

$$\begin{aligned}
 L &= 0.1543 \text{ m} = 1.543 \text{ m}/10, \text{ (same total length as in two-element-core model)} \\
 A &= 0.0090635 \text{ m}^2 = \pi(0.291^2 - 0.286^2) \\
 dZ &= 0.7715 \text{ m (vertical orientation)} \\
 e &= 1.52 \times 10^{-6} \text{ m} \\
 dh &= 0.010 \text{ m} = 4 \times 0.0090635 / 2\pi(0.291 + 0.286)
 \end{aligned}$$

All junctions have default areas with smooth area change option.

2.3.2 CPBT Heat Structures**Heat Structure 5001 (Reactor vessel wall at vessel inlet)**

Note: This heat structure is not part of the AI CPBT wall.

Number of Heat Structures (NHS) = 1

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.2265 m (inner radius of pipe leading to CPBT)

Right-boundary coordinate = 0.2465 m (outer radius of pipe leading to CPBT)

Composition is No. 1 - SS304

Left boundary is Pipe 500

Right boundary is natural circulation to pool, heat transfer coefficient given by general table 581

Heat Structure 5351 (CPBT inner wall in mid-core region)

Number of Heat Structures (NHS) = 1

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.281 m (ref. 3)

Right-boundary coordinate = 0.286 m (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Volume 535-01

Right boundary is Volume 550-15

Heat transfer length = 0.116 m, includes unheated fuel length

Heat Structure 5501 (CPBT outer wall in fueled axial regions)

Number of Heat Structures (NHS) = 10

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.291 m (ref. 3)

Right-boundary coordinate = 0.301 m (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Pipe 550 (Volumes 2-6, 8-12)

Right boundary is Pipe 595 (Moderator Tank)

Heat transfer length = 0.0836 m = 0.418/5

Heat sources are calculated separate from the point kinetics model, and involve a complicated calculation using control variables and general tables.¹²

Heat Structure 5502 (CPBT inner wall in middle core axial region)

Number of Heat Structures (NHS) = 5

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.281 m (ref. 3)

Right-boundary coordinate = 0.286 m (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Pipe 550 (Volumes 2-6, 8-12)

Right boundary is Pipe 595 (Moderator Tank)

Heat transfer length = 0.0836 m = 0.418/5

Heat Structure 5503 (CPBT inner wall in outer-core axial region)

Number of Heat Structures (NHS) = 5

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.281 m (ref. 3)

Right-boundary coordinate = 0.288 m (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Pipe 540 (Volumes 1-5)

Right boundary is Pipe 560 (Volumes 16-20)

Heat transfer length = 0.0836 m = 0.418/5

Heat Structure 5552 (CPBT inner wall in core exit region)

Number of Heat Structures (NHS) = 10

Number of Mesh Points (NMP) = 4

Left-boundary coordinate = 0.281 m (ref. 3)

Right-boundary coordinate = 0.286 m (ref. 3)

Composition is No. 2 - Al 6061

Left boundary is Pipes 555 (Volumes 1-5), 557 (Volumes 1-5)

Right boundary is Pipe 560 (Volumes 21-31)

Heat transfer length = 0.1543 m

3. REFERENCES

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APPENDIX A: RELAP5 INPUT FOR ANSR THREE-ELEMENT CORE MODEL (rfd50195in)

```

0000105 30. 40. 50000.
*-----*
0000110 nitrogen
*-----*
*
0000120 520010000 0. d2o primary
0000121 130010000 0. h2o mhx1sec
0000122 230010000 0. h2o mhx2sec
0000123 330010000 0. h2o mhx3sec
0000124 138010000 0. h2o ehx1sec
0000125 238010000 0. h2o ehx2sec
0000126 338010000 0. h2o ehx3sec
*-----*
*
* time-step and output frequency information
*-----*
0000201 10.00 1.e-7 0.0160 03 60 100000 100000
*0000201 9000.0 1.e-7 0.0033 03 1000 100000 100000
*-----*
* expanded edit/plot variables
*-----*
20800001 htemp 550100204 * max cpbt temp
20800002 htemp 562100306 * max cr- al temp
20800003 htemp 562100307 * max cr- hf temp
20800004 fwalf 505090000
20800005 fwalf 520010000
20800006 fwalf 535010000
20800007 fwalf 555010000
20800008 fwalf 510010000
20800009 fwalf 572010000
20800010 fwalf 580010000
* variables for modified saha-zuber correlation
20800011 csbupf 510010000
20800012 csbupf 510020000
20800013 csbupf 510030000
20800014 csbupf 510040000
20800015 csbupf 510050000
20800016 csbupf 510060000
20800017 csbupf 510070000
20800018 csbupf 510080000
20800019 csbupf 510090000
20800020 csbupf 510100000
20800021 csbupf 510110000
20800022 csbupf 510120000
20800023 csbupf 510130000
20800024 csbupf 510140000
20800025 csbupf 510150000
20800026 csbupf 510160000
20800027 csbupf 510170000
20800028 csbupf 510180000
20800029 csbupf 510190000
20800030 csbupf 510200000
20800031 csbupf 510210000
20800032 csbupf 510220000
20800033 csbupf 510230000
20800034 csbupf 510240000
20800035 csbupf 510250000
20800036 csbupf 510260000
20800037 csbupf 510270000
20800038 csbupf 510280000
20800039 csbupf 510290000
20800040 csbupf 510300000
20800041 csbupf 510310000
20800042 csbupf 510320000
20800043 csbupf 510330000

```

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-ansr relap5 system model - fine discretization - mod3.1.1.1 - 11/17/94
* 3 Element-core MODEL
*-----*
***** perturbed conditions case transient - first 10 s *****
*
* 1. PRESSURE AT CORE EXIT
* Control upper core average channel exit pressure so that the
* exit pressure is at 94.9% (95% uncertainty) of the best-estimate
* case and the pressure drop is 1.54 MPa (95% uncertainties).
*
* Pexit = 1.90735 * 0.949 = 1.810 MPa
*
* 2. temperature at core inlet
* hold secondary flow constant based on steady-state run
* to 45.6 deg C (318.75 K).
*
* 3. velocity at core inlet
* primary coolant pump speed is held constant until tripped.
*
* 4. reactor power
* set total power in point kinetics model at 1.0424*330 = 344 mw
*
* 5. letdown valve area
* calibrate letdown valve area to be 0.5 open at a pressurizing
* flow rate of 14.6 kg/s at nominal pressure.
*
* 6. pressurizing flow
* pressurizer pump speed is held constant until tripped
*
* 7. core roughness
* core roughness is calibrated based on ans steady-state code
* (assuming 20 m/s) core pressure drop at perturbed
* conditions. this pressure drop is imposed on the middle core
* to get the calibrated nominal core roughness.
*
* 8. velocity in control rods and cpbt
* loss coefficients on junctions 550-12, 564-01, 564-02, and
* 564-03 are calibrated to get velocities in the control rod
* channels to be 6.0 m/s and the entrance velocity in the cpbt
* annulus to be 4.3 m/s.
*
* 9. control rod position
* the control rod position at steady-state is ??????????????
*
* 10. reactor trips
* trips on ffr, high temperature and low pressure are enabled.
*
* 11. heat structure heat capacities
* heat capacities are set to their true values.
*
* 12. loss-of-offsite power
* trips of the pressurizer pump and secondary coolant flow are
* set to occur at 10 s.
*-----*
0000001 8 10
0000100 new transient
0000101 run
0000102 si si
*-----*

```

20800044	caubpf 570040000	20800109	viscf 515040000
20800045	caubpf 570050000	20800110	viscf 515050000
20800046	caubpf 575010000	20800111	viscf 516010000
20800047	caubpf 575020000	20800112	viscf 516020000
20800048	caubpf 575030000	20800113	viscf 516030000
20800049	caubpf 575040000	20800114	viscf 516040000
20800050	caubpf 575050000	20800115	viscf 516050000
20800051	caubpf 576010000	20800116	viscf 540010000
20800052	caubpf 576020000	20800117	viscf 540020000
20800053	caubpf 576030000	20800118	viscf 540030000
20800054	caubpf 576040000	20800119	viscf 540040000
20800055	caubpf 576050000	20800120	viscf 540050000
20800056	thcnf 510010000	20800121	viscf 545010000
20800057	thcnf 510020000	20800122	viscf 545020000
20800058	thcnf 510030000	20800123	viscf 545030000
20800059	thcnf 510040000	20800124	viscf 545040000
20800060	thcnf 510050000	20800125	viscf 545050000
20800061	thcnf 515010000	20800126	viscf 546010000
20800062	thcnf 515020000	20800127	viscf 546020000
20800063	thcnf 515030000	20800128	viscf 546030000
20800064	thcnf 515040000	20800129	viscf 546040000
20800065	thcnf 515050000	20800130	viscf 546050000
20800066	thcnf 516010000	20800131	viscf 570010000
20800067	thcnf 516020000	20800132	viscf 570020000
20800068	thcnf 516030000	20800133	viscf 570030000
20800069	thcnf 516040000	20800134	viscf 570040000
20800070	thcnf 516050000	20800135	viscf 570050000
20800071	thcnf 540010000	20800136	viscf 575010000
20800072	thcnf 540020000	20800137	viscf 575020000
20800073	thcnf 540030000	20800138	viscf 575030000
20800074	thcnf 540040000	20800139	viscf 575040000
20800075	thcnf 540050000	20800140	viscf 575050000
20800076	thcnf 545010000	20800141	viscf 576010000
20800077	thcnf 545020000	20800142	viscf 576020000
20800078	thcnf 545030000	20800143	viscf 576030000
20800079	thcnf 545040000	20800144	viscf 576040000
20800080	thcnf 545050000	20800145	viscf 576050000
20800081	thcnf 546010000		
20800082	thcnf 546020000		
20800083	thcnf 546030000		
20800084	thcnf 546040000		
20800085	thcnf 546050000		
20800086	thcnf 570010000		
20800087	thcnf 570020000		
20800088	thcnf 570030000		
20800089	thcnf 570040000		
20800090	thcnf 570050000		
20800091	thcnf 575010000		
20800092	thcnf 575020000		
20800093	thcnf 575030000		
20800094	thcnf 575040000		
20800095	thcnf 575050000		
20800096	thcnf 576010000		
20800097	thcnf 576020000		
20800098	thcnf 576030000		
20800099	thcnf 576040000		
20800100	thcnf 576050000		
20800101	viscf 510010000		
20800102	viscf 510020000		
20800103	viscf 510030000		
20800104	viscf 510040000		
20800105	viscf 510050000		
20800106	viscf 515010000		
20800107	viscf 515020000		
20800108	viscf 515030000		

----- minor edit requests *-----*	
0000301	mflowj 567010400
0000302	p 505010000
0000303	vefj 507010200
0000304	vefj 537010200
0000305	vefj 550020000
0000306	vefj 550070000
0000308	vefj 559010100
0000309	vefj 559010200
0000310	vefj 559010300
0000311	cntrivar 827
0000312	cntrivar 828
0000313	cntrivar 829
0000314	cntrivar 830
0000315	cntrivar 831
0000316	cntrivar 832
0000317	rktpow 0
0000318	tempf 490020000
0000321	mflowj 156010000
0000322	mflowj 256010000
0000323	mflowj 356010000
0000327	htmr 515400500
0000328	htchf 515400500
0000336	pmgvel 815
0000337	pmgvel 124
0000338	cntrivar 840

```

0000339 mflowj 865010000
0000340 mflowj 825000000
0000341 cntrlvar 860
0000342 tempf 505010000
0000343 cntrlvar 598
*
*-----$
* trip input
*
*-----$
* high power-to-flow ratio trips
0000501 cntrlvar 940 gt null 0 1.20 1 -1.
0000502 time 0 gt timeof 501 0.200 1 -1.
*0000502 time 0 gt null 0 1.e6 1 -1.
* high temperature = 1.22*45 deg c = 54.8 deg c
0000503 tempf 500010000 gt null 0 328.05 1 -1.
0000504 time 0 gt timeof 503 2.0 1 -1. *high temp
*0000504 time 0 gt null 0 1.e6 1 -1.
*
* low-pressure trip is 80% of nominal at sensor location.
* sensor location is in volume 645-15, 2.44 m downstream of hotleg riser
* nominal pressure taken from 645-01 in "nom41795in" to be 1.751778 MPa
* therefore, the setpoint pressure is 1.401 MPa.
*
0000506 cntrlvar 839 lt null 0 1.401e6 1 -1.
*0000506 time 0 gt null 0 1.e6 1 -1.
* reactor trip
0000508 time 0 gt null 0 1.e6 1 -1. *manual trip
0000510 time 0 gt timeof 603 0.030 1 -1.
*0000510 time 0 gt null 0 1.e6 1 -1.
0000515 time 0 lt null 0 1.e6 1 0. *loop1 isolation
0000516 time 0 lt null 0 1.e6 1 0. *loop2 isolation
0000517 time 0 lt null 0 1.e6 1 0. *loop3 isolation
* pump cavitation model trips
0000528 time 0 gt null 0 1.e6 1 -1. *begin the transient if true
0000540 time 0 gt null 0 1.e6 1 -1. *loss of offsite power
* pressurizer pump trips
0000541 time 0 gt null 0 1.e6 n -1. *standby przz pump
0000542 time 0 gt null 0 1.e6 n -1. *emergency przz pump
0000550 time 0 gt null 0 1.e6 1 -1. *standby speed table trip
0000551 cntrlvar 804 gt null 0 8358.4 1 -1. *mu tank empty
0000552 time 0 gt timeof 551 11.0 1 -1. *przz sys isolate
* lose power to primary coolant pumps (use torque balance)
*0000555 time 0 gt null 0 1800. 1 -1.
*
0000560 P 850010000 ge null 0 4.428e6 n -1. *safety valve
0000561 P 850010000 ge null 0 4.600e6 n -1. *safety valve
*
0000599 time 0 gt null 0 1.e6 1 -1.
0000600 599
0000601 502 or 504 1 -1.
0000602 601 or 506 1 -1.
0000603 602 or 508 1 -1.
0000610 560 and 611 n -1.
0000611 561 or 610 n -1.
0000615 -552 or -552 n 0.
0000619 -555 and -555 n 0.
0000620 -540 and -540 n 0.
0000621 -541 and -541 n 0.
0000635 506 or 540 1 -1.0
*
*-----$
* hydrodynamic component input
*
*-----$

```

```

*
* core region
*
*-----$
*hydro component name component type
4900000 "cvgywa" pipe
*-----$
4900001 3
*
*hydro vol area vol
4900101 0.1993 3
*
*hydro length vol
4900301 0.2 1
4900302 0.143 2
4900303 0.2 3
*
*hydro volume vol
4900401 0.0 3
*
*hydro vert angle vol
4900601 90. 3
*
*hydro delta z vol
4900701 0.2 1
4900702 0.143 2
4900703 0.2 3
*
*hydro roughness hyd diam
4900801 0.0000457 0.2999 3
*
*hydro fe vol
4901001 00 3
*
*hydro vcabs jun
4901101 01000 2
*
*hydro ebt pressure tempe vol
4901201 0 2610280. 176859. 2419054. 0. 0. 1
4901202 0 2610428. 176859. 2419054. 0. 0. 2
4901203 0 2551046. 176859.4 2418864. 0. 0. 3
*
*hydro f velocity g velocity j velocity jun
4901300 0
4901301 -.675027 -.85093 0. 1 * -147.844
4901302 10.04618 10.79978 0. 2 * 2200.31
*
*-----$
*hydro component name component type
4920000 "cvgywa" mtrpljun
*-----$
*hydro no. juns vel/flw
4920001 7 0
*
*hydro from to area f loss r loss vcabs
4920011 174020002 490020003 0. 0. 0. 01101
4920012 1.0 1.0 1.0 0 0 1
4920021 274020002 490020003 0. 0. 0. 01101
4920022 1.0 1.0 1.0 0 0 2
4920031 374020002 490020003 0. 0. 0. 01101
4920032 1.0 1.0 1.0 0 0 3
4920041 490010000 500000000 0. 0. 0. 01100
4920042 1.0 1.0 1.0 0 0 4
*
* kentrance = 152 - 4.3 m/s in cr

```


*hydro	z velocity	g velocity	j velocity	jun	*hydro	component name	component type	pipe
5101300 0	20.07342	26.10264	0.	1 * 739.229	5160000	"lchotch2"		
5101301	20.159	26.23567	0.	2 * 739.229	5160001	5		
5101302	20.2553	26.38304	0.	3 * 739.229				
5101303	20.36026	26.5422	0.	4 * 739.229				
*hydro jun hyd diam				jun				
5101401	0.0024796	0.0 1.0 1.0		4				
*hydro pitch span vol								
5103101 1.27e-3	63.95e-3	5						
*hydro component name component type								
5150000	"lchotch1"	pipe						
5150001	5							
*hydro vol area								
5150101	0.000080467			vol				
*hydro length				5				
5150301	0.0836			vol				
*hydro volume				5				
5150401	0.			vol				
*hydro vert angle				5				
5150601	90.			vol				
*hydro delta z				5				
5150701	0.0836			vol				
*hydro roughness hyd diam				5				
5150801	1.0000e-10	0.002236		vol				
*hydro fe				5				
5151001	200	00		vol				
*hydro vcahs				5				
5151101	01000			jun				
*hydro ebt pressure tempe				4				
5151201	0	2263691.	234098.	vol				
5151202	0	2123599.	290208.	1				
5151203	0	1987242.	342823.	2				
5151204	0	1853695.	391454.	3				
5151205	0	1722236.	433900.	4				
*hydro vel/flw				5				
5151300 0				vol				
*hydro f velocity g velocity j velocity				jun				
5151301	19.13817	24.8762	0.	1 * 1.681777				
5151302	19.2794	25.08016	0.	2 * 1.681777				
5151303	19.43305	25.3007	0.	3 * 1.681777				
5151304	19.5927	25.52974	0.	4 * 1.681777				
*hydro jun hyd diam				jun				
5151401	0.002236	0.0 1.0 1.0		4				
*hydro pitch span vol								
5151101 1.14330e-3	63.95e-3	5						
*hydro component name component type								
5200000	"lchotch1"	pipe						
5200001	1							
*hydro vol area								
5200101	0.067906			vol				
*hydro length				1				
5200301	0.116			vol				

*hydro	5200401	volume	0.0	vol	1
*					
*hydro	5200601	vert angle	90.	vol	1
*					
*hydro	5200701	delta z	0.116	vol	1
*					
*hydro	5200801	roughness	hyd diam	vol	1
*					
*hydro	5201001	fe	00	vol	1
*					
*hydro	5201101	vcabs	01100	jun	1
*					
*hydro	5201201	ebc pressure	tempe	vol	1
*					
*hydro	5201300	f velocity	g velocity	jun	1
*					
*hydro	5201301	f velocity	j velocity	jun	2
*					
*hydro	5220000	component name	component type		
*		"lcout1"	mtpljun		
*					
*hydro	5220001	area	f loss	vcabs	
*					
*hydro	5220011	510010000	520000000	0.	0.068
*					
*hydro	5220012	1.0	1.0	0.0	0.000
*					
*hydro	5220021	515010000	520000000	0.	0.068
*					
*hydro	5220022	1.0	1.0	0.0	0.000
*					
*hydro	5220031	520010000	525000000	0.	0.0
*					
*hydro	5220032	1.0	1.0	0.0	0.0
*					
*hydro	5220041	516010000	520000000	0.	0.063
*					
*hydro	5220042	1.0	1.0	0.0	0.000
*					
*hydro	5221011	20.46654	26.70386	1	739.229
*					
*hydro	5221021	19.6835	25.67	2	1.679565
*					
*hydro	5221031	10.18342	10.70162	3	742.59
*					
*hydro	5221041	19.74594	25.7514	4	1.681777
*					
*hydro	5222011	0.0024796	0.0	1.0	1.0
*					
*hydro	5222021	0.002236	0.0	1.0	1.0
*					
*hydro	5222031	0.1100	0.0	1.0	1.0
*					
*hydro	5222041	0.002236	0.0	1.0	1.0
*					
*hydro	5250000	component name	component type		
*		"lcoutlet"	pipe		
*					
*hydro	5250001	13			
*					
*hydro	5250101	vol area	0.067906	vol	13
*					
*hydro	5250301	length	1	vol	1
*					
*hydro	5250302	0.1672	0.1953	vol	13
*					
*hydro	5250401	volume	0.	vol	13
*					
*hydro	5250601	vert angle	90.	vol	13
*					
*hydro	5250701	delta z	0.1672	vol	1
*					
*hydro	5250702	0.1953		vol	13
*					
*hydro	5250801	roughness	hyd diam	vol	13
*					
*hydro	5251001	fe	00	vol	13
*					
*hydro	5251101	vcabs	01000	jun	12
*					
*hydro	5251201	ebc pressure	tempe	vol	1
*					
*hydro	5251202	0	1804571.	352540.	2414175.
*					
*hydro	5251203	0	1801709.	353318.	2414148.
*					
*hydro	5251204	0	1798625.	354084.	2414120.
*					
*hydro	5251205	0	1795543.	354749.	2414091.
*					
*hydro	5251206	0	1792462.	355266.6	2414062.
*					
*hydro	5251207	0	1789387.	355078.5	2414034.
*					
*hydro	5251208	0	1786321.	355079.4	2414005.
*					
*hydro	5251209	0	1783252.	355080.	2413976.
*					
*hydro	5251210	0	1780183.	355081.	2413941.
*					
*hydro	5251211	0	1777114.	355082.	2413906.
*					
*hydro	5251212	0	1774045.	355083.	2413871.
*					
*hydro	5251213	0	1770976.	355084.	2413836.
*					
*hydro	5251300	0	1767907.	355085.	2413801.
*					
*hydro	5251301	f velocity	g velocity	j velocity	jun
*					
*hydro	5251302	10.1846	10.72861	0.	1 * 742.59
*					
*hydro	5251303	10.1859	10.73	0.	2 * 742.59
*					
*hydro	5251304	10.18717	10.73136	0.	3 * 742.59
*					
*hydro	5251305	10.18829	10.73256	0.	4 * 742.59
*					
*hydro	5251306	10.18916	10.7335	0.	5 * 742.59
*					
*hydro	5251307	10.18886	10.73325	0.	6 * 742.59
*					
*hydro	5251308	10.1888	10.73332	0.	7 * 742.59
*					
*hydro	5251309	10.1889	10.73339	0.	8 * 742.59
*					
*hydro	5251310	10.18891	10.73345	0.	9 * 742.59
*					
*hydro	5251311	10.18893	10.73352	0.	10 * 742.59
*					
*hydro	5251312	10.18894	10.7336	0.	11 * 742.59
*					
*hydro	5251313	10.18896	10.73366	0.	12 * 742.59
*					
*hydro	5251401	jun hyd diam	0.132	0.0	1.0
*					
*hydro	5290000	component name	component type		
*		"ucinet"	angljun		
*					

*hydro	from	to	area	f loss	r loss	vcchs
5290101	500010000	530000000	0.	0.	0.	01100
*hydro	jun hyd diam	0.1000	0.0 1.0 1.0			
5290110	0.1000	0.0 1.0 1.0				
*hydro	vel/flw	f velocity	g velocity	j velocity		
5290201	0	10.36976	10.87009	0. * 916.475		
*hydro	component name	component type				
5300000	"ucinlet"	pipe				
*hydro	component name	component type				
5300001	14					
*hydro	vol area					vol
5300101	0.080425					14
*hydro	length					vol
5300301	0.175					4
5300302	0.221					5
5300303	0.175					9
5300304	0.0836					14
*hydro	volume					vol
5300401	0.					14
*hydro	vert angle					vol
5300601	90.					14
*hydro	delta z					vol
5300701	0.175					4
5300702	0.221					5
5300703	0.175					9
5300704	0.0836					14
*hydro	roughness	hyd diam				vol
5300801	0.00000152	0.1000				14
*hydro	fe					vol
5301001	00					14
*hydro	vcchs					jun
5301101	01000					13
*hydro	ebt pressure	tempe				vol
5301201	0	2538334.	176861.5	2418822. 0. 0.		1
5301202	0	2535291.	176862.6	2418812. 0. 0.		2
5301203	0	2532248.	176863.6	2418802. 0. 0.		3
5301204	0	2529204.	176864.7	2418792. 0. 0.		4
5301205	0	2527095.	176866.	2418786. 0. 0.		5
5301206	0	252587.	176867.	2418787. 0. 0.		6
5301207	0	2524639.	176868.	2418778. 0. 0.		7
5301208	0	2521690.	176868.8	2418768. 0. 0.		8
5301209	0	2518742.	176869.8	2418758. 0. 0.		9
5301210	0	2516562.	177225.8	2418751. 0. 0.		10
5301211	0	2515150.	177596.	2418747. 0. 0.		11
5301212	0	2513738.	177969.5	2418742. 0. 0.		12
5301213	0	2512326.	178343.3	2418738. 0. 0.		13
5301214	0	2510914.	178702.	2418733. 0. 0.		14
*hydro	vel/flw					jun
5301300	0					
*hydro	f velocity	g velocity	j velocity			jun

5301301	10.36974	10.86997	0.	1 * 916.475
5301302	10.36975	10.87002	0.	2 * 916.475
5301303	10.36977	10.87008	0.	3 * 916.475
5301304	10.36978	10.87014	0.	4 * 916.475
5301305	9.9065	10.39483	0.	5 * 875.529
5301306	9.90649	10.39482	0.	6 * 875.529
5301307	9.9065	10.39487	0.	7 * 875.529
5301308	9.90652	10.39493	0.	8 * 875.529
5301309	9.90653	10.39498	0.	9 * 875.529
5301310	9.90687	10.39536	0.	10 * 875.529
5301311	9.90723	10.39574	0.	11 * 875.529
5301312	9.90758	10.39612	0.	12 * 875.529
5301313	9.90794	10.3965	0.	13 * 875.529
*hydro	jun hyd diam			jun
5301401	0.1000	0.0 1.0 1.0		13
*hydro	component name	component type		
5310000	"gapinlet"	angljun		
*hydro	from	to	area	f loss
5310101	530050003	550050003	0.004540	2.79
*hydro	jun hyd diam			vcchs
5310110	0.010	0.0 1.0 1.0		01003
*hydro	vel/flw	f velocity	g velocity	j velocity
5310201	0	8.20724	8.20724	0. * 40.9461
*hydro	component name	component type		
5350000	"ucinlet"	pipe		
5350001	1			
*hydro	vol area			vol
5350101	0.080425			1
*hydro	length			vol
5350301	0.116			1
*hydro	volume			vol
5350401	0.0000			1
*hydro	vert angle			vol
5350601	90.			1
*hydro	delta z			vol
5350701	0.116			1
*hydro	roughness	hyd diam		vol
5350801	0.00000152	0.1000		1
*hydro	fe			vol
5351001	00			1
*hydro	vcchs			jun
5351101	01100			1
*hydro	ebt pressure	tempe		vol
5351201	0	2509230.	178788.7	2418727. 0. 0.
*hydro	f velocity	g velocity	j velocity	jun

-----	component name	component type	sgl:jun	area	f loss	r loss	vcchs	-----*
*hydro	"gapout1"							
5320000								

*hydro	from	to	area	f loss	r loss	vcchs		
5320101	550230003	555030003	0.00204	2.78	2.78	01003		
*hydro	jun hyd diam							
*5320110	0.0024787	0.0 1.0 1.0						
*5320110	0.01	0.0 1.0 1.0						
*hydro	vel/flw	f velocity	g velocity	j velocity				
5320201	0	18.39152	18.39152	0. * 40.9462				

*hydro	component name	component type						
5570000	"ucoutlt2"	pipe						

5570001	8							
*hydro	vol area							
5570101	0.080425							
*hydro	length							
5570301	0.16							
5570302	0.2013							
*hydro	volume							
5570401	0.							
*hydro	vert angle							
5570601	90.							
*hydro	delta z							
5570701	0.16							
5570702	0.2013							
*hydro	roughness	hyd diam						
5570801	0.00000152	0.1000						
*hydro	fe							
5571001	00							
*hydro	vcchs							
5571101	01000							
*hydro	ebt pressure	tempe						
5571201	0	1783487.	335688.	2413979. 0. 0.				
5571202	0	1780791.	335689.	2413948. 0. 0.				
5571203	0	1778096.	335690.	2413918. 0. 0.				
5571204	0	1775400.	335691.	2413886. 0. 0.				
5571205	0	1772704.	335691.6	2413856. 0. 0.				
5571206	0	1770009.	335692.6	2413825. 0. 0.				
5571207	0	1767313.	335693.5	2413794. 0. 0.				
5571208	0	1764270.	335695.	2413759. 0. 0.				
*hydro	f velocity	g velocity	j velocity					
5571300	0							
5571301	10.5845	11.28711	0.					
5571302	10.5845	11.28719	0.					
5571303	10.58452	11.28726	0.					
5571304	10.58453	11.28733	0.					
5571305	10.58455	11.2874	0.					
5571306	10.58456	11.28748	0.					

-----	component name	component type	sgl:jun	area	f loss	r loss	vcchs	-----*
*hydro	"crinlet"	pipe						
5600000								

5600001	14							
*hydro	vol area							
5600101	0.03485							
*hydro	length							
5600301	0.175							
5600302	0.221							
5600303	0.175							
5600304	0.1748							
*hydro	volume							
5600401	0.							
*hydro	vert angle							
5600501	90.							
*hydro	delta z							
5600701	0.175							
5600702	0.221							
5600703	0.175							
5600704	0.1748							
*hydro	roughness	hyd diam						
5600801	0.00000152	0.08468						
*hydro	fe							
5601001	00							
*hydro	vcchs							
5601101	01000							
*hydro	ebt pressure	tempe						
5601201	0	2315028.	176859.	2417722. 0. 0.				
5601202	0	2312914.	176859.3	2417710. 0. 0.				
5601203	0	2310802.	176859.5	2417699. 0. 0.				
5601204	0	2308690.	176859.8	2417687. 0. 0.				
5601205	0	2306300.	176860.	2417674. 0. 0.				
5601206	0	2303910.	176860.3	2417661. 0. 0.				
5601207	0	2301798.	176860.5	2417650. 0. 0.				
5601208	0	2299686.	176860.8	2417638. 0. 0.				
5601209	0	2297574.	176861.	2417627. 0. 0.				
5601210	0	2295462.	176861.2	2417615. 0. 0.				
5601211	0	2293353.	176861.4	2417604. 0. 0.				
5601212	0	2291243.	176861.6	2417592. 0. 0.				
5601213	0	2289134.	176862.	2417580. 0. 0.				
5601214	0	2287024.	176862.	2417569. 0. 0.				
*hydro	f velocity	g velocity	j velocity					
5601300	0							
5601301	3.86084	4.22279	0.					
5601302	3.86084	4.22281	0.					
5601303	3.860845	4.22284	0.					
5601304	3.86085	4.22286	0.					
5601305	3.86085	4.22289	0.					
5601306	3.86086	4.22292	0.					
5601307	3.86086	4.22295	0.					
5601308	3.860865	4.22297	0.					
5601309	3.86087	4.223	0.					

5601310	3.86087	4.22302	0.	10 * 147.844	
5601311	3.860875	4.22305	0.	11 * 147.844	
5601312	3.86088	4.22307	0.	12 * 147.844	
5601313	3.86088	4.2231	0.	13 * 147.844	
*					
-----\$-----					
*hydro	component name	component type			
5590000	"crnt"	mtpljun			
*					
-----\$-----					
5590001	3	0			
*hydro	from	to	area	f loss	r loss
5590011	560010000	561000000	0.	0.	0.
5590012	1.0	1.0	0	0	1
5590021	560010000	562000000	0.	0.	0.
5590022	1.0	1.0	0	0	2
5590031	560010000	563000000	0.	0.	0.
5590032	1.0	1.0	0	0	3
*					
*hydro	f flowrate	g flowrate	j flowrate		
5591011	5.99335	5.99335	1 * 30.04		
5591021	6.02416	6.02416	2 * 109.0545		
5591031	6.03478	6.03478	3 * 8.74953		
*					
*hydro	jun hyd diam				
5592011	0.044	0.0	1.0	1.0	1
5592021	0.0520521	0.0	1.0	1.0	2
5592031	0.006	0.0	1.0	1.0	3
*					
-----\$-----					
*hydro	component name	component type			
5610000	"innercr"	pipe	*flow within control tube		
*					
-----\$-----					
*hydro	no. volumes				
5610001	11				
*					
*hydro	vol area				vol
5610101	0.00456159				11
*					
*hydro	length				vol
5610301	0.0836				5
5610302	0.116				6
5610303	0.0836				11
*					
*hydro	volume				vol
5610401	0.				11
*					
*hydro	vert angle				vol
5610601	90.				11
*					
*hydro	roughness	hyd diam			vol
5610801	1.52e-6	0.044			11
*					
*hydro	fe				vol
5611001	00				11
*					
*hydro	vcabs				jun
5611101	01000				10
*					
*hydro	ebt pressure	tempe			vol
5611201	0	2273800.			1
5611202	0	227367.	180051.5	0.0	2
5611203	0	2270934.	181893.	0.0	3
5611204	0	2269501.	183746.5	0.0	4
5611205	0	2268069.	185603.8	0.0	5
5611206	0	2266362.	185659.	0.0	6

5611207	0	2264661.	185769.	2417446.	0.0	7
5611208	0	2263236.	185878.	2417438.	0.0	8
5611209	0	2261810.	185986.3	2417430.	0.0	9
5611210	0	2260386.	186093.8	2417422.	0.0	10
5611211	0	2258960.	186200.5	2417414.	0.0	11
*						
*hydro	vel/flw					
5611300	0					
*						
*hydro	f flowrate	g flowrate	j flowrate	jun		
5611301	5.99419	5.99419	0.	1 * 30.04		
5611302	5.9952	5.9952	0.	2 * 30.04		
5611303	5.99627	5.99627	0.	3 * 30.04		
5611304	5.99735	5.99735	0.	4 * 30.04		
5611305	5.99844	5.99844	0.	5 * 30.04		
5611306	5.99848	5.99848	0.	6 * 30.04		
5611307	5.99855	5.99855	0.	7 * 30.04		
5611308	5.99862	5.99862	0.	8 * 30.04		
5611309	5.99868	5.99868	0.	9 * 30.04		
5611310	5.99875	5.99875	0.	10 * 30.04		
*						
*hydro	jun hyd diam					jun
5611401	0.044	0.0	1.0	1.0		10
*						
-----\$-----						
*hydro	component name	component type				
5620000	"outercr"	pipe	*flow around control tube			
*						
-----\$-----						
*hydro	no. volumes					
5620001	11					
*						
*hydro	vol area					vol
5620101	0.0164753					11
*						
*hydro	length					vol
5620301	0.0836					5
5620302	0.116					6
5620303	0.0836					11
*						
*hydro	volume					vol
5620401	0.					11
*						
*hydro	vert angle					vol
5620601	90.					11
*						
*hydro	roughness	hyd diam				vol
5620801	1.52e-6	0.0520521				11
*						
*hydro	fe					vol
5621001	00					11
*						
*hydro	vcabs					jun
5621101	01000					10
*						
*hydro	ebt pressure	tempe				vol
5621201	0	2273583.	180702.7	2417495.	0.0	1
5621202	0	2272234.	184311.7	2417488.	0.0	2
5621203	0	2270886.	187742.	2417480.	0.0	3
5621204	0	2269540.	190817.	2417473.	0.0	4
5621205	0	2268197.	193283.7	2417466.	0.0	5
5621206	0	2266600.	193284.4	2417456.	0.0	6
5621207	0	2265008.	196442.6	2417448.	0.0	7
5621208	0	226337.6	200337.6	2417440.	0.0	8
5621209	0	2262320.	204344.	2417433.	0.0	9
5621210	0	2260976.	208329.8	2417426.	0.0	10


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5641304 3.873755 4.24053 0. 4 * 147.844
5641305 3.87376 4.24056 0. 5 * 147.844
5641306 3.87376 4.24058 0. 6 * 147.844
5641307 3.87377 4.24061 0. 7 * 147.844
5641308 3.87377 4.24064 0. 8 * 147.844
5641309 3.87377 4.24065 0. 9 * 147.844
5641310 3.87378 4.24069 0. 10 * 147.844
5641311 3.87378 4.24072 0. 11 * 147.844
*
*-----$
*hydro component name component type
* "crlnt" mtpljun
*-----$
5660000 3 0
5660001 3 0
*
* calibrated exit losses to get velocity to 6 m/s in cr channels
*
* 21.58/21.40/18.30 ***** nominal steady state
* 19.58/19.40/16.30 ***** 5.83263/5.85857/5.86511
*
*hydro from to area f loss r loss vcahs
5660011 561010000 564000000 0. 17.58 17.58 01000
5660012 1.0 1.0 1.0 0 0 1 17.58 17.58 01000
5660021 562010000 564000000 0. 17.40 17.40 01000
5660022 1.0 1.0 1.0 0 0 2 17.40 17.40 01000
5660031 563010000 564000000 0. 14.30 14.30 01000
5660032 1.0 1.0 1.0 0 0 3 14.30 14.30 01000
*
*hydro f flowrate g flowrate j flowrate
5661011 5.99882 6.35841 1 * 30.04
5661021 6.04609 6.04609 2 * 109.0545
5661031 6.06999 6.06999 3 * 8.74953
*
*hydro jun hyd diam
5662011 0.08468 0.0 1.0 1.0 1
5662021 0.0520521 0.0 1.0 1.0 2
5662031 0.006 0.0 1.0 1.0 3
*
*-----$
*hydro component name component type
* "cpbtex" pipe
*-----$
5650000 5
5650001 5
*
*hydro vol area
5650101 0.24663
*
*hydro length
5650301 0.1836
*
*hydro volume
5650401 0.
*
*hydro vert angle
5650601 90.
5650602 0.
*
*hydro delta z
5650701 0.180
5650702 0.
*
*hydro roughness hyd diam
5650801 0.0000457 0.56037
*
*hydro fe
5650901 0.

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5651001 00
*
*hydro vcahs
5651101 01000
*
*hydro ebt pressure tempe
5651201 0 1778325. 319133.5 2413920. 0. 0. 1
5651202 0 1776227. 319133.6 2413896. 0. 0. 2
5651203 0 1774161. 319134. 2413872. 0. 0. 3
5651204 0 1773047. 319134. 2413860. 0. 0. 4
5651205 0 1772886. 319134. 2413858. 0. 0. 5
*
*hydro f velocity g velocity j velocity
5651300 0
5651301 8.821 9.5611 0. 1 * 2348.155
5651302 8.821 9.56116 0. 2 * 2348.155
5651303 8.82102 9.56121 0. 3 * 2348.155
5651304 8.82102 8.82102 0. 4 * 2348.155
*
*hydro component name component type
* "cpbtex" mtpljun
*-----$
5670001 5 0
*
*hydro from to area f loss r loss vcahs
5670011 557010000 565000000 0. 0. 0. 01100
5670012 1.0 1.0 1.0 0 0 1 0. 0. 01100
5670021 525010000 565000000 0. 0. 0. 01100
5670022 1.0 1.0 1.0 0 0 2 0. 0. 01100
*
* kexit = 0.15*kentrance = 5.25
*
5670031 564010000 565000000 0.0250354 5.25 5.25 01000
5670032 1.0 1.0 1.0 0 0 3 0.24 0.24 01100
5670041 565010000 640000000 0. 0. 0. 01100
5670042 1.0 1.0 1.0 0 0 4 0. 0. 01100
5670051 580010000 565000000 0. 0. 0. 01100
5670052 1.0 1.0 1.0 0 0 5 0. 0. 01100
*
*hydro f velocity g velocity j velocity
5671011 10.58459 11.09873 1 * 916.475
5671021 10.18897 10.70605 2 * 742.59
5671031 5.39242 5.81871 3 * 147.844
5671041 8.82102 8.82102 4 * 2348.155
5671051 10.00963 10.53437 5 * 541.245
*
*hydro jun hyd diam
5672011 0.100 0.0 1.0 1.0 1
5672021 0.110 0.0 1.0 1.0 2
5672031 0.190 0.0 1.0 1.0 3
5672041 0.5604 0.0 1.0 1.0 4
5672051 0.120 0.0 1.0 1.0 5
*
* inner core input
*
*hydro component name component type
* "icinit" mtpljun
*-----$
5690001 5 0
*
* inlet loss coefficients are:
* 0.04 (from hfir data) + 0.34 (50 mm unheated length)
*
*hydro from to area f loss r loss vcahs
5690011 568010000 572000000 0. 0. 0. 01000
5690012 1.0 1.0 1.0 0 0 1 0.207 0.207 01000
5690021 572010000 570000000 0. 0.207 0.207 01000

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*hydro          fe          00          vol
*noans**5761001          200          5
5761001          vcabs          5
*hydro          01000          jun
5761101          01000          4
*hydro          ebt pressure      tempe      vol
5761201          0          2257800.          1
5761202          0          2118362.          2
5761203          0          1982191.          3
5761204          0          1848402.          4
5761205          0          1716444.          5
*hydro          vel/flw          jun
5761300          0          0          4
*hydro          f velocity      g velocity      j velocity      jun
5761301          19.07656          24.79676          0.1 * 2.050595
5761302          19.1822          24.95473          0.2 * 2.050595
5761303          19.28795          25.1133          0.3 * 2.050595
5761304          19.3873          25.26426          0.4 * 2.050595
*hydro          jun hyd diam          jun
5761401          0.0022429          0.0 1.0 1.0          4
*hydro          pitch      span      vol
5763101          1.14300e-3          77.65e-3          5
*hydro          component name      component type      pipe
5800000          "icoutlt"          -----
5800001          10          -----
*hydro          vol area          vol
5800101          0.049763          10
*hydro          length          vol
5800301          0.20928          10
*hydro          volume          vol
5800401          0.0          10
*hydro          vert angle          vol
5800601          90.          10
*hydro          delta z          vol
5800701          0.20928          10
*hydro          roughness      hyd diam          vol
5800801          0.00000152          0.120          10
*hydro          fe          00          vol
5801001          00          10
*hydro          vcabs          jun
5801101          01000          9
*hydro          ebt pressure      tempe      vol
5801201          0          1798511.          1
5801202          0          271824.7          2
5801203          0          1792077.          3
5801204          0          1788858.          4
5801205          0          1785539.          5

5801206          0          1782419.          272087.6          2413967.0.0.          6
5801207          0          1779197.          272088.5          2413930.0.0.          7
5801208          0          1775978.          272089.4          2413893.0.0.          8
5801209          0          1772759.          272090.3          2413856.0.0.          9
5801210          0          1769540.          272091.          2413820.0.0.          10
*hydro          f velocity      g velocity      j velocity      jun
5801300          0          10.00914          10.6494          0.1 * 541.245
5801301          10.00916          10.6494          0.2 * 541.245
5801302          10.00917          10.6495          0.3 * 541.245
5801303          10.00919          10.6496          0.4 * 541.245
5801304          10.0092          10.6497          0.5 * 541.245
5801305          10.00956          10.65015          0.6 * 541.245
5801306          10.00958          10.65023          0.7 * 541.245
5801307          10.0096          10.65031          0.8 * 541.245
5801308          10.00961          10.6504          0.9 * 541.245
5801309          10.00961          10.6504          0.9 * 541.245
*hydro          component name      component type
5810000          "icoutlt"          mtrpljun
5810001          3          0
*loss coefficient at fuel channel exit = 0.068 (10 mm unheated length)
*hydro          from          to          area          f loss          r loss          vcabs
5810011          570010000          580000000          0.          0.068          0.068          01100
5810012          1.0          1.0          0          0          1          0.000          0.000          01000
5810021          575010000          580000000          0.          0.068          0.068          01100
5810022          1.0          1.0          0          0          2          0.000          0.000          01000
5810031          576010000          580000000          0.          0.068          0.068          01100
5810032          1.0          1.0          0          0          3          0.000          0.000          01000
*hydro          f velocity      g velocity      j velocity
5811011          20.09383          26.2198          1 * 537.147
5811021          19.4276          25.33905          2 * 2.048088
5811031          19.47543          25.4015          3 * 2.050595
5812011          0.0024937          0.0 1.0 1.0 1
5812021          0.0022429          0.0 1.0 1.0 2
5812031          0.0022429          0.0 1.0 1.0 3
moderator tank
*hydro          component name      component type
1670000          "Connect"          singljun
*hydro          from          to          area          f loss          r loss          fvcabs          disch
1670101          530050003          595020003          0.0000001          1.e6          1.e6          031000          1.0
1670110          0.3255          0.0 1.0 1.0
*hydro          vel/flw          f massrate          g massrate          j massrate
1670201          0          .061264          .061264          0. * 6.73232-6
*hydro          component name      component type

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5900000										5951101									
"modcool"										01000									
*hydro	area	length	volume							*hydro	ebt	pressure	tempe						
5900101	1.e6	.0	1.0e+06							5951201	0	143458.5	98228.6	2339196.0	0.0	0.1			
*hydro	horz angle	vert angle	delta z							5951202	0	128232.2	98228.6	2335630.0	0.0	2			
5900102	.0	.0	.0							5951203	0	114107.6	98228.6	2331943.0	0.0	3			
*hydro	roughness	hyd diam	fe							5951204	0	104170.7	98228.6	2329100.0	0.0	4			
5900103	.0	.0	1.0							5951301	.10406	.124206	0.0	1	* 316.4				
*hydro	trip no.	alpha vrc	numeric vrc							5951302	.1040607	.124207	0.0	2	* 316.4				
5900200	003									5951303	.1040614	.1242078	0.0	3	* 316.4				
*hydro	time	pressure	tempe							*hydro	component name	component type							
5900201	0.	1.e5	300.							5960000	"tankout"	angljun							
*hydro	component name	component type								*hydro	from	to	area	f loss	r loss	vcabs			
5910000	"tankcool"	tmppjun								5960101	595010000	600000000	0.028603	0.0	0.0	01000			
*hydro	from	to	area							*hydro	vel/flow	f velocity	g velocity	j velocity					
5910101	590000000	595000000	0.0286							5960201	0	10.01909	10.66446	0.0	* 316.4				
*hydro	vel/flow	trip no.	alpha vrc	numeric vrc							*hydro	component name	component type						
5910200	1										6000000	"modtankp"	tmppvol						
*hydro	time	f flow	g flow	j flow							*hydro	area	length	volume					
5910201	0.	316.4	0.	0							6000101	1.e6	.0	1.0e+06					
5910202	1.e6	316.4	0.	0							*hydro	horz angle	vert angle	delta z					
*hydro	component name	component type								6000102	.0	.0	.0						
5950000	"modtank"	pipe								*hydro	roughness	hyd diam	fe						
5950001	4									6000103	.0	.0	10						
*hydro	vol area			vol							*hydro	ebt	trip no.	alpha vrc	numeric vrc				
5950101	2.7539			4							6000200	003							
*hydro	length			vol							*hydro	time	pressure	tempe					
5950301	1.2675			1							6000201	0.	1.e5	300.					
5950302	1.545			2							6000202	1.e6	1.e5	300.					
5950303	1.064			3							hot leg main header								
5950304	0.7715			4															
*hydro	volume			vol															
5950401	0.			4															
*hydro	vert angle			vol							*hydro	component name	component type						
5950601	90.			4							6400000	"corecut"	pipe						
*hydro	delta z			vol							6400001	10							
5950701	1.2675			1							*hydro	vol area							
5950702	1.545			2							6400101	0.24663							
5950703	1.064			3							*hydro	length							
5950704	0.7715			4							6400301	0.18801							
*hydro	roughness	hyd diam			vol							*hydro	volume						
5950801	0.0000457	0.532			4							6400401	0.						
*hydro	fe			vol							*hydro	volume							
5951001	00			4							6400501	0.							
*hydro	vcabs			jun															

*hydro 6400601	vert angle 0.	vol 10	*hydro 6410301	length 0.1947225	vol 36
*hydro 6400701	vert length 0.00	vol 10	*hydro 6410401	volume 0.	vol 36
*hydro 6400801	roughness 0.0000457	vol 10	*hydro 6410501	volume 0.	vol 36
*hydro 6400901	f loss 0.00	jun 9	*hydro 6410601	vert angle 90.	vol 36
*hydro 6401001	fe 00	vol 10	*hydro 6410701	vert length 0.1947225	vol 36
*hydro 6401101	vcahs 01000	jun 9	*hydro 6410801	roughness 0.0000457	vol 36
*hydro 6401201	ebt pressure tempe	vol 1	*hydro 6410901	f loss 0.	jun 35
6401202	0 1762634.	2	*hydro 6411001	fe 00	vol 36
6401203	0 1762468.	3	*hydro 6411101	vcahs 01000	jun 35
6401204	0 1762139.	4	*hydro 6411201	ebt pressure tempe	vol 1
6401205	0 1761974.	5	6411202	0 1743135.	2
6401206	0 1761809.	6	6411203	0 1740903.	3
6401207	0 1761644.	7	6411204	0 1738672.	4
6401208	0 1761479.	8	6411205	0 1736440.	5
6401209	0 1761314.	9	6411206	0 1734208.	6
6401210	0 1761150.	10	6411207	0 1731976.	7
*hydro 6401300	vel/flw 0	jun 1	6411208	0 1729744.	8
*hydro 6401301	f flowrate g flowrate	jun 1	6411209	0 1727512.	9
6401302	8.82105 8.82105	2 * 2348.155	6411210	0 1725280.	10
6401303	8.82104 8.82104	3 * 2348.155	6411211	0 1723048.	11
6401304	8.82103 8.82103	4 * 2348.155	6411212	0 1720816.	12
6401305	8.82103 8.82103	5 * 2348.155	6411213	0 1718584.	13
6401306	8.82104 8.82104	6 * 2348.155	6411214	0 1716352.	14
6401307	8.82104 8.82104	7 * 2348.155	6411215	0 1714120.	15
6401308	8.82104 8.82104	8 * 2348.155	6411216	0 1711888.	16
6401309	8.82104 8.82104	9 * 2348.155	6411217	0 1709657.	17
*hydro 1640000	component name "riser"	component type engljun	6411218	0 1707425.	18
*hydro 1640101	from to area f loss	area f loss	6411219	0 1705193.	19
1640101	640010000 641000000	0. 0.4	6411220	0 1702961.	20
*hydro 1640201	hyd diam 0.56037	0. 1. 1.	6411221	0 1700729.	21
*hydro 1640201	vel/flw f velocity g velocity j velocity	0. 8.82104 0. * 2348.155	6411222	0 1698497.	22
1640201	0 8.82104 8.82104	0. 8.82104 0. * 2348.155	6411223	0 1696265.	23
*hydro 6410000	component name "hliser"	component type pipe	6411224	0 1694033.	24
6410001	36	36	6411225	0 1691801.	25
*hydro 6410101	vol area 0.24663	vol 36	6411226	0 1689569.	26
6410101	0.24663	0.24663	6411227	0 1687338.	27
6410101	0.24663	0.24663	6411228	0 1685106.	28
6410101	0.24663	0.24663	6411229	0 1682874.	29
6410101	0.24663	0.24663	6411230	0 1680642.	30
6410101	0.24663	0.24663	6411231	0 1678410.	31
6410101	0.24663	0.24663	6411232	0 1676178.	32
6410101	0.24663	0.24663	6411233	0 1673946.	33
6410101	0.24663	0.24663	6411234	0 1671714.	34
6410101	0.24663	0.24663	6411235	0 1669482.	35
6410101	0.24663	0.24663	6411236	0 1667250.	36
6410101	0.24663	0.24663	6411237	0 1665019.	36

6501228	0	1622223.	317560.7	2412072.	0. 0.	28	6501340	2.699214	2.699214	0.	40 * 718.674
6501229	0	1622069.	317546.7	2412070.	0. 0.	29	6501341	2.699214	2.699214	0.	41 * 718.674
6501230	0	1621933.	317547.	2412068.	0. 0.	30	6501342	2.699214	2.699214	0.	42 * 718.674
6501231	0	1621798.	317547.	2412066.	0. 0.	31	6501343	2.699214	2.699214	0.	43 * 718.674
6501232	0	1621663.	317547.	2412065.	0. 0.	32	6501344	2.699214	2.699214	0.	44 * 718.674
6501233	0	1621527.	317547.	2412063.	0. 0.	33	6501345	2.699214	2.699214	0.	45 * 718.674
6501234	0	1621392.	317547.	2412062.	0. 0.	34	6501346	2.699214	2.699214	0.	46 * 718.674
6501235	0	1621256.	317547.4	2412060.	0. 0.	35	6501347	2.699214	2.699214	0.	47 * 718.674
6501236	0	1621121.	317547.5	2412058.	0. 0.	36					
6501237	0	1620986.	317547.7	2412057.	0. 0.	37					
6501238	0	1620850.	317548.	2412055.	0. 0.	38					
6501239	0	1620609.	317480.6	2412514.	0. 0.	39					
6501240	0	1620593.	317480.7	2412514.	0. 0.	40					
6501241	0	1620578.	317480.7	2412514.	0. 0.	41					
6501242	0	1620562.	317481.	2412514.	0. 0.	42					
6501243	0	1620547.	317481.	2412514.	0. 0.	43					
6501244	0	1620531.	317481.	2412514.	0. 0.	44					
6501245	0	1620516.	317481.	2412514.	0. 0.	45					
6501246	0	1620500.	317481.	2412513.	0. 0.	46					
6501247	0	1620485.	317481.	2412513.	0. 0.	47					
6501248	0	1620470.	317481.	2412513.	0. 0.	48					
*hydro	vel/flw										
6501300	0										
*hydro	f flowrate	g flowrate	j flowrate								
6501301	24.50554	24.50554	0.	1 * 2348.154	jun						
6501302	24.50557	24.50557	0.	2 * 2348.154							
6501303	24.65305	24.65305	0.	3 * 2362.76							
6501304	24.6531	24.6531	0.	4 * 2362.76							
6501305	24.6531	24.6531	0.	5 * 2362.76							
6501306	24.65314	24.65314	0.	6 * 2362.76							
6501307	24.65317	24.65317	0.	7 * 2362.76							
6501308	24.6532	24.6532	0.	8 * 2362.76							
6501309	24.65323	24.65323	0.	9 * 2362.76							
6501310	24.65326	24.65326	0.	10 * 2362.76							
6501311	8.87434	8.87434	0.	11 * 2362.76							
6501312	8.87435	8.87435	0.	12 * 2362.76							
6501313	8.87435	8.87435	0.	13 * 2362.76							
6501314	8.87435	8.87435	0.	14 * 2362.76							
6501315	8.87435	8.87435	0.	15 * 2362.76							
6501316	8.87435	8.87435	0.	16 * 2362.76							
6501317	8.87435	8.87435	0.	17 * 2362.76							
6501318	8.87435	8.87435	0.	18 * 2362.76							
6501319	8.87435	8.87435	0.	19 * 2362.76							
6501320	8.87435	8.87435	0.	20 * 2362.76							
6501321	8.87435	8.87435	0.	21 * 2362.76							
6501322	8.87435	8.87435	0.	22 * 2362.76							
6501323	8.87436	8.87436	0.	23 * 2362.76							
6501324	8.87436	8.87436	0.	24 * 2362.76							
6501325	8.87436	8.87436	0.	25 * 2362.76							
6501326	8.87436	8.87436	0.	26 * 2362.76							
6501327	8.87436	8.87436	0.	27 * 2362.76							
6501328	8.87436	8.87436	0.	28 * 2362.76							
6501329	8.87434	8.87434	0.	29 * 2362.76							
6501330	8.87434	8.87434	0.	30 * 2362.76							
6501331	8.87434	8.87434	0.	31 * 2362.76							
6501332	8.87434	8.87434	0.	32 * 2362.76							
6501333	8.87434	8.87434	0.	33 * 2362.76							
6501334	8.87434	8.87434	0.	34 * 2362.76							
6501335	8.87435	8.87435	0.	35 * 2362.76							
6501336	8.87435	8.87435	0.	36 * 2362.76							
6501337	8.87435	8.87435	0.	37 * 2362.76							
6501338	2.699286	2.699286	0.	38 * 718.674							
6501339	2.699214	2.699214	0.	39 * 718.674							
*hydro	val/flw										
6501340	2.699214	2.699214	0.	40 * 718.674							
6501341	2.699214	2.699214	0.	41 * 718.674							
6501342	2.699214	2.699214	0.	42 * 718.674							
6501343	2.699214	2.699214	0.	43 * 718.674							
6501344	2.699214	2.699214	0.	44 * 718.674							
6501345	2.699214	2.699214	0.	45 * 718.674							
6501346	2.699214	2.699214	0.	46 * 718.674							
6501347	2.699214	2.699214	0.	47 * 718.674							
*hydro	val/flw										
6501348	2.699214	2.699214	0.	48 * 718.674							
*hydro	val/flw										
6501349	2.699214	2.699214	0.	49 * 718.674							
*hydro	val/flw										
6501350	2.699214	2.699214	0.	50 * 718.674							
*hydro	val/flw										
6501351	2.699214	2.699214	0.	51 * 718.674							
*hydro	val/flw										
6501352	2.699214	2.699214	0.	52 * 718.674							
*hydro	val/flw										
6501353	2.699214	2.699214	0.	53 * 718.674							
*hydro	val/flw										
6501354	2.699214	2.699214	0.	54 * 718.674							
*hydro	val/flw										
6501355	2.699214	2.699214	0.	55 * 718.674							
*hydro	val/flw										
6501356	2.699214	2.699214	0.	56 * 718.674							
*hydro	val/flw										
6501357	2.699214	2.699214	0.	57 * 718.674							
*hydro	val/flw										
6501358	2.699214	2.699214	0.	58 * 718.674							
*hydro	val/flw										
6501359	2.699214	2.699214	0.	59 * 718.674							
*hydro	val/flw										
6501360	2.699214	2.699214	0.	60 * 718.674							
*hydro	val/flw										
6501361	2.699214	2.699214	0.	61 * 718.674							
*hydro	val/flw										
6501362	2.699214	2.699214	0.	62 * 718.674							
*hydro	val/flw										
6501363	2.699214	2.699214	0.	63 * 718.674							
*hydro	val/flw										
6501364	2.699214	2.699214	0.	64 * 718.674							
*hydro	val/flw										
6501365	2.699214	2.699214	0.	65 * 718.674							
*hydro	val/flw										
6501366	2.699214	2.699214	0.	66 * 718.674							
*hydro	val/flw										
6501367	2.699214	2.699214	0.	67 * 718.674							
*hydro	val/flw										
6501368	2.699214	2.699214	0.	68 * 718.674							
*hydro	val/flw										
6501369	2.699214	2.699214	0.	69 * 718.674							
*hydro	val/flw										
6501370	2.699214	2.699214	0.	70 * 718.674							
*hydro	val/flw										
6501371	2.699214	2.699214	0.	71 * 718.674							
*hydro	val/flw										
6501372	2.699214	2.699214	0.	72 * 718.674							
*hydro	val/flw										
6501373	2.699214	2.699214	0.	73 * 718.674							
*hydro	val/flw										
6501374	2.699214	2.699214	0.	74 * 718.674							
*hydro	val/flw										
6501375	2.699214	2.699214	0.	75 * 718.674							
*hydro	val/flw										
6501376	2.699214	2.699214	0.	76 * 718.674							
*hydro	val/flw										
6501377	2.699214	2.699214	0.	77 * 718.674							
*hydro	val/flw										
6501378	2.699214	2.699214	0.	78 * 718.674							
*hydro	val/flw										
6501379	2.699214	2.699214	0.	79 * 718.674							
*hydro	val/flw										
6501380	2.699214	2.699214	0.	80 * 718.674							
*hydro	val/flw										
6501381	2.699214	2.699214	0.	81 * 718.674							
*hydro	val/flw										
6501382	2.699214	2.699214	0.	82 * 718.674							

```

*hydro component name component type
8150000 mainprz pump
*-----
*hydro area length volume
8150101 0.00811 0. .0203
*
8150102 0. 0. 0.
*
*hydro equil flag
8150103 00
*
*hydro from jun area f loss r loss vcahs
8150108 810010000 0.00811 0.16 0.16 01000
*
*hydro to jun area f loss r loss vcahs
8150109 820000000 0.00811 0.16 0.16 01000
*
*hydro ebt pressure tempe 100867.4 2398547. 0.
8150200 0 933854.
*
*hydro vel/flw f velocity g velocity j velocity
8150201 0 0 1.630937 1.630937 0. * 14.6041
*
*hydro ptdi 2fazi diff i tork i pvel i trip no. rurs i
8150301 0 -1 -3 -1 0 540 0
*
*hydro rated pump vel. init/rated vel. rated flow rated head
8150302 221.55 1.11034 0.01366 106.39
*
*hydro rated torque mom of inertia rated dens mtr torque
8150303 217.82 2.381 1098. .0
*
*hydro coeff. tf2 coeff. tf0 coeff. tf1 coeff. tf3
8150304 2.1782 2.1782 0. 0.
*
*-----
* single phase homologous curves
*-----
*
* han homologous data
8151100 1 1 0.000 1.228 0.050 1.226 0.100 1.225
8151101 0.150 1.224 0.200 1.223 0.250 1.223
8151102 0.300 1.222 0.350 1.220 0.400 1.218
8151103 0.450 1.214 0.500 1.209 0.550 1.202
8151104 0.600 1.192 0.650 1.180 0.700 1.165
8151105 0.750 1.147 0.800 1.126 0.850 1.101
8151106 0.900 1.072 0.950 1.038 1.000 1.000
*
* hvn homologous data
8151200 1 2 0.513 -270 0.526 -.433 0.541 -.195
8151201 0.556 -.155 0.571 -.113 0.588 -.069
8151202 0.606 -.023 0.625 0.025 0.645 0.076
8151203 0.667 0.130 0.690 0.187 0.714 0.249
8151204 0.741 0.316 0.769 0.388 0.800 0.466
8151205 0.833 0.551 0.870 0.646 0.909 0.751
8151206 0.952 0.868 1.000 1.000
*
* had homologous data taken from bingham pump in relap
8151300 1 3 -1.2 5 -9 2.28 -.63 2. -.55 1.74
8151301 -.5 1.68 -.42 1.6 -.15 1.4 0. 1.228
*
* hvd homologous data taken from bingham pump in relap
8151400 1 4 -1.2 5 -9 2.28 -.63 2. -.55 1.74
8151401 -.5 1.68 -.42 1.6 -.15 1.4 0. 1.228
*
* han homologous data
8151500 2 1 0.000 0.470 0.050 0.500 0.100 0.529

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8151501 0.150 0.559 0.200 0.589 0.250 0.618
8151502 0.300 0.648 0.350 0.677 0.400 0.706
8151503 0.450 0.734 0.500 0.762 0.550 0.789
8151504 0.600 0.816 0.650 0.842 0.700 0.867
8151505 0.750 0.892 0.800 0.915 0.850 0.938
8151506 0.900 0.960 0.950 0.980 1.000 1.000
*
* bvn homologous data
8151600 2 2 0.513 0.283 0.526 0.302 0.541 0.321
8151601 0.556 0.342 0.571 0.364 0.588 0.388
8151602 0.606 0.413 0.625 0.439 0.645 0.468
8151603 0.667 0.498 0.690 0.531 0.714 0.566
8151604 0.741 0.604 0.769 0.645 0.800 0.691
8151605 0.833 0.740 0.870 0.795 0.909 0.856
8151606 0.952 0.924 1.000 1.000
*
* bad homologous data taken from bingham pump in relap
8151700 2 3 -1.2 5 -.8 2. -.6 1.45 -.46 1.15
8151701 -.3 95 -.13 8 0. .8
*
* bvd homologous data taken from bingham pump in relap
8151800 2 4 -1.2 5 -.65 2.15 -.4 1.79 -.30 1.61
8151801 -.13 1.5 0. 1.44
*
* pump trip
8151900 620 cntrivar 815
*
*8156100 0 cntrivar 591
8156101 -1.e6 -1.e6
8156102 1.e6 1.e6
*
*-----
*hydro component name component type
8200000 "maindisc" singlvol
*-----
*hydro area length volume
8200101 0.00811 30.48 0.
*
*hydro horz angle vert angle delta z
8200102 0. 0. 0.
*
*hydro roughness hyd diam fe
8200103 0.0000457 0.1016 00
*
*hydro ebt pressure tempe
8200200 0 1702409. 100875.4 2413038. 0.
*
*-----
*hydro component name component type
8250000 "mainpump" valve
*-----
*hydro from to area f loss r loss vcahs
8250101 820010000 850000000 0.00811 1.28 1.28 01000
*
*hydro vel/flw f velocity g velocity j velocity
8250201 0 1.630025 1.630025 0. * 14.60408
*
*hydro valve type
8250300 chkvlv
*
*hydro chkvlv type init. poen back press leak ratio
8250301 0 0 0. 0.
*
*-----
*hydro component name component type
8260000 "mutank" tndpvol
*-----
*hydro area length volume
8260101 1.e6 .0 1.0e+06
*

```

*hydro	8260102	horz angle	vert angle	delta z	
		.0	.0	.0	
*hydro	8260103	roughness	hyd diam	fe	
		.0	.0	10	
*hydro	8260200	trip no.	alpha vrc	numeric vrc	
		003			
*hydro	8260201	time	pressure	tempe	
		0.	0.165e6	300.	
*hydro	8270000	isolate valve			
		0	5.41742-42	-2.614093-21	0. * 4.8513-41
*hydro	8270001	trip no.	alpha vrc	numeric vrc	
		615			
*hydro	8280000	component name	component type		
		"suction"	branch		
*hydro	8280001	no. juns	vel/flw		
		0	0		
*hydro	8280101	area	length	volume	
		0.00811	6.096	0.	
*hydro	8280102	horz angle	vert angle	delta z	
		0.	0.	0.	
*hydro	8280103	roughness	hyd diam	fe	
		0.0000457	0.1016	00	
*hydro	8280200	ebt pressure	uf	voidg	
		0	1.65+5	172710.5 2343686. 0.	
*hydro	8300000	component name	component type		
		"standby"	pump		
*hydro	8300101	area	length	volume	
		0.00811	0.	0.0232	
*hydro	8300102	horz angle	vert angle	delta z	
		0.	0.	0.	
*hydro	8300103	equil flag			
		00			
*hydro	8300108	from	jun area	f loss	r loss
		828010000	0.00811	0.16	0.16
*hydro	8300109	to	jun area	f loss	r loss
		835000000	0.00811	0.16	0.16
*hydro	8300200	ebt pressure	tempe		
		0	1.65+5	173854.8 2343686. 0.	
*hydro	8300201	vel/flw	f velocity	g velocity	j velocity
		0	0.	0.	0.
*hydro	8300301	chkvlv type	init. posn	back press	leak ratio
		0	1	0.	0.
*hydro	8300302	rated pump vel.	init./rated vel.	rated flow	rated head
		221.55	0.	0.01366	106.39
*hydro	8300303	rated torque	mom of inertia	rated dens	mtr torque
		217.82	2.381	1098.	.0
*hydro	8300304	coeff. tf2	coeff. tf0	coeff. tf1	coeff. tf3
		2.1782	2.1782	0.	0.
*hydro	8306100	trip no.	alpha vrc	numeric vrc	
		621	cntrlvar	817	
*hydro	8306101	search arg	pump vel.		
		-1.e6			
*hydro	8306102	coeff. tf2	coeff. tf0	coeff. tf1	coeff. tf3
		1.e6	1.e6	0.	0.
*hydro	8350000	component name	component type		
		"sbdisc"	sgnlvol		
*hydro	8350101	area	length	volume	
		0.00811	30.48	0.	
*hydro	8350102	horz angle	vert angle	delta z	
		0.	0.	0.	
*hydro	8350103	roughness	hyd diam	fe	
		0.0000457	0.1016	00	
*hydro	8350200	ebt pressure	tempe		
		0	1.65+5	173871.5 2343686. 0.	
*hydro	8400000	component name	component type		
		"sbpump"	valve		
*hydro	8400101	from	to	area	f loss
		835010000	850000000	0.00811	1.28
*hydro	8400201	vel/flw	f velocity	g velocity	j velocity
		0	0.	0.	0. * 0.
*hydro	8400300	valve type	chkvlv		
*hydro	8400301	chkvlv type	init. posn	back press	leak ratio
		0	1	0.	0.
*hydro	8450000	component name	component type		
		"emerpump"	tmppjun		


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8700200 003
*
*hydro time pressure temps
8700201 0. 0.1e6 356.5
*
*-----$
* primary coolant system safety pressure relief valve
*-----$
*hydro component name component type
8800000 "relief" valve
*-----$
*hydro from to area f loss r loss vchhs
8800101 880010000 895000000 2.456e-4 0. 0. 01100
*
*hydro vel/flw f flowrate g flowrate j flowrate
8800201 0 0. 0. 0. 0. * 0.
*
*hydro valve type
8800300 tripvlv
*
*hydro trip no.
8800301 611
*
*-----$
*hydro component name component type
8950000 "vlsink" tndpvol
*-----$
*hydro area length volume
8950101 1.e6 .0 1.0e+06
*
*hydro horz angle vert angle delta z
8950102 .0 .0 .0
*
*hydro roughness hyd diam fe
8950103 .0 .0 10
*
*hydro ebt trip no. alpha vrc numeric vrc
8950200 002
*
*hydro time pressure quale
8950201 0. 0.1e6 1.
*
*-----$
* >>>>> individual heat exchanger/pump loops <<<<<<
*-----$
* components lxx - heat exchanger coolant loop 1
*
*hydro component name component type
1010000 "hlepliti" pipe
*-----$
1010001 36
*
*hydro vol area
1010101 0.08322
*
*hydro length
1010301 0.214
1010302 0.183
1010303 0.2
vol 36
vol 5
vol 25
vol 35

```

```

1010304 0.21
*
*hydro volume
1010401 0.0
*
*hydro vert angle
1010601 0.
*
*hydro delta z
1010701 0.
*
*hydro roughness hyd diam
1010801 0.0000457 0.3255
*
*hydro kf kr
1010901 0.0 0.0
1010902 0.182 0.182
1010903 0.0 0.0
1010904 0.182 0.182
1010905 0.0 0.0
*
*hydro fe
1011001 00
*
*hydro vchhs
1011101 01000
*
*hydro ebt pressure temps
1011201 0 1613056. 317520. 2411959. 0. 0. 1
1011202 0 1612681. 317520. 2411954. 0. 0. 2
1011203 0 1612305. 317520.4 2411950. 0. 0. 3
1011204 0 1611929. 317521. 2411945. 0. 0. 4
1011205 0 1611553. 317521. 2411940. 0. 0. 5
1011206 0 1603178. 317424. 2411837. 0. 0. 6
1011207 0 1602857. 317424.6 2411833. 0. 0. 7
1011208 0 1602536. 317425. 2411829. 0. 0. 8
1011209 0 1602214. 317425. 2411825. 0. 0. 9
1011210 0 1601892. 317425.5 2411821. 0. 0. 10
1011211 0 1601571. 317426. 2411817. 0. 0. 11
1011212 0 1601250. 317426. 2411813. 0. 0. 12
1011213 0 1600928. 317426.4 2411809. 0. 0. 13
1011214 0 1600606. 317427. 2411805. 0. 0. 14
1011215 0 1600285. 317427. 2411801. 0. 0. 15
1011216 0 1599963. 317427. 2411797. 0. 0. 16
1011217 0 1599642. 317427.6 2411793. 0. 0. 17
1011218 0 1599320. 317428. 2411789. 0. 0. 18
1011219 0 1599+6 317428. 2411785. 0. 0. 19
1011220 0 1598677. 317428.5 2411781. 0. 0. 20
1011221 0 1598356. 317429. 2411777. 0. 0. 21
1011222 0 1598034. 317429. 2411773. 0. 0. 22
1011223 0 1597713. 317429.4 2411769. 0. 0. 23
1011224 0 1597391. 317429.7 2411765. 0. 0. 24
1011225 0 1597070. 317430. 2411761. 0. 0. 25
1011226 0 1588707. 317372. 2411657. 0. 0. 26
1011227 0 1588356. 317372. 2411653. 0. 0. 27
1011228 0 1588005. 317372.3 2411648. 0. 0. 28
1011229 0 1587653. 317373. 2411644. 0. 0. 29
1011230 0 1587302. 317373. 2411640. 0. 0. 30
1011231 0 1586951. 317373.3 2411635. 0. 0. 31
1011232 0 1586599. 317373.7 2411631. 0. 0. 32
1011233 0 1586248. 317374. 2411626. 0. 0. 33
1011234 0 1585896. 317374. 2411622. 0. 0. 34
1011235 0 1585545. 317374.6 2411618. 0. 0. 35
1011236 0 1585185. 317375. 2411613. 0. 0. 36

```



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1300200 003
*
*hydro time pressure tempe
1300201 0. 5.000e5 302.55
*
*-----*
*hydro component name component type
1320000 "sectdji" tmdpjun
*
*hydro from to area
1320101 13000000 13400000 0.7122
*
*hydro vel/flw trip no. alpha vrc numeric vrc
1320200 1 -1.e6 0 0.7122 598
*
*hydro time f flow g flow j flow
1320201 -1.e6 -1.e6 0. 0
1320202 1.e6 1.e6 0. 0
*
*-----*
*hydro component name component type
1340000 "mhx-sec" pipe
*
*-----*
1340001 10
*
*hydro vol area vol
1340101 0.776 10
*
*hydro length vol
1340301 1.314 10
*
*hydro volume vol
1340401 0. 10
*
*hydro vert angle vol
1340601 0. 10
*
*hydro delta z vol
1340701 0.0 10
*
*hydro roughness hyd diam vol
1340801 0.0000457 0.01588 10
*
*hydro fe vol
1341001 00 10
*
*hydro vcas jun
1341101 01000 9
*
*hydro ebt pressure tempe vol
1341201 0 499089. 131802.2 2559869. 0. 0. 1
1341202 0 493515. 141690. 2559514. 0. 0. 2
1341203 0 487959. 152982.3 2559156. 0. 0. 3
1341204 0 482423. 165942.8 2558796. 0. 0. 4
1341205 0 476906. 180898. 2558434. 0. 0. 5
1341206 0 471395.5 182158. 2558069. 0. 0. 6
1341207 0 465889. 183554.2 2557700. 0. 0. 7
1341208 0 460385. 185102.7 2557329. 0. 0. 8
1341209 0 454882. 186822. 2556954. 0. 0. 9
1341210 0 449381. 188732.7 2556576. 0. 0. 10
*
*hydro f velocity g velocity j velocity jun
1341300 0 2.176145 2.176145 0. 1 * 1681.036
1341301 2.177846 2.177846 0. 2 * 1681.036
1341302

```

```

1341303 2.179917 2.179917 0. 3 * 1681.036
1341304 2.182453 2.182453 0. 4 * 1681.036
1341305 2.185586 2.185586 0. 5 * 1681.036
1341306 2.185864 2.185864 0. 6 * 1681.036
1341307 2.186174 2.186174 0. 7 * 1681.036
1341308 2.18652 2.18652 0. 8 * 1681.036
1341309 2.186904 2.186904 0. 9 * 1681.036
*
*hydro jun hyd diam jun
1341401 0.01588 0.0 1.0 1.0 9
*
*-----*
*hydro component name component type
1350000 "tubeout" sngljun
*
*hydro from to area f loss r loss vcas
1350101 134010000 136000000 0.0 0. 0. 01000
*
*hydro hyd diam
1350110 0.01588 0.0 1.0 1.0
*
*hydro vel/flw f velocity g velocity j velocity
1350201 0 2.187335 2.187335 0. * 1681.036
*
*-----*
*hydro component name component type
1360000 "secnkl" tmdpvol
*
*hydro area length volume
1360101 1.e6 .0 1.0e+06
*
*hydro horz angle vert angle delta z
1360102 .0 .0 .0
*
*hydro roughness hyd diam fe
1360103 .0 .0 10
*
*hydro ebt trip no. alpha vrc numeric vrc
1360200 003
*
*hydro time pressure tempe
1360201 0. 4.490e5 319.
*
*-----*
* emergency heat exchanger - loop 1
*
*-----*
*hydro component name component type
1400000 hxp1n1 branch
*
*hydro no. juns vel/flw
1400001 2 0
*
*hydro area length volume
140101 0.08322 1.0 0.
*
*hydro horz angle vert angle delta z
140102 0. 0.
*
*hydro roughness hyd diam fe
140103 0.0000457 0.3255 0

```


*hydro	vel/flw	f velocity	g velocity	j velocity	
1400201	0	.1070562	.1070562	0. * 45.333	
*hydro	component name	component type			
1420000	"ehx-sec"	pipe			
1420001	2				
*hydro	vol area			vol	
1420101	0.4264			2	
*hydro	length			vol	
1420301	0.7622			2	
*hydro	volume			vol	
1420401	0.			2	
*hydro	vert angle			vol	
1420601	0.			2	
*hydro	delta z			vol	
1420701	0.0			2	
*hydro	roughness	hyd diam		vol	
1420801	0.0000457	0.4573		2	
*hydro	fe			vol	
1421001	00			2	
*hydro	vcabs			jun	
1421101	01000			1	
*hydro	ebt pressure	tempe		vol	
1421201	0	179992.	159067.4	0.0.	1
1421202	0	179991.7	159067.4	0.0.	2
*hydro	f velocity	g velocity	j velocity		
1421300	0	.1070562	0.	1 * 45.333	
*hydro	jun hyd diam			jun	
1421401	0.4573	0.0 1.0 1.0		1	
*hydro	component name	component type			
1440000	"tubein"	snrljun			
*hydro	from	to	area	f loss	vcabs
1440101	142010000	146000000	0.0	0.	01100
*hydro	hyd diam				
1440110	0.01905	0.0	1.0	1.0	
*hydro	vel/flw	f velocity	g velocity	j velocity	
1480201	0	.225633	.225633	0. * 45.333	
*hydro	hyd diam				
1480110	0.01905	0.0	1.0	1.0	
*hydro	vel/flw	f velocity	g velocity	j velocity	
1480201	0	.225633	.225633	0. * 45.333	
*hydro	component name	component type			
1500000	"chimney"	pipe			
1500001	4				
*hydro	vol area			vol	
1500101	0.203			4	
*hydro	length			vol	
1500301	0.75			4	
*hydro	volume			vol	
1500401	0.			4	

```

*
* accumulator and surge line - loop 1
* assembled from normal relaps components.
* a tank wall heat structure (#1561) has been defined
*
*-----$
*hydro      component name      component type
1500601     "accum"              pipe
*hydro      no. volumes
1500001     6
*
*hydro      vol area
1560101     1.65
1560102     0.08322
*
*hydro      length
1560301     4.09
1560302     0.12
1560303     4.88
*
*hydro      volume
1560401     0.
*
*hydro      vert angle
1560601     -90.
*
*hydro      roughness      hyd diam
1560801     0.000457      1.449
1560802     0.000457      0.3255
*
*hydro      f loss      r loss
1560901     0.           0.
1560902     0.5         1.0
*
*hydro      fe
1561001     00000
*
*hydro      vcabs
1561101     00000
*
*hydro ebt
1561201 6 1544923. 107025. 373137. .076731 .998377 1
1561202 0 1566045. 160330.4 2411373. 0. 0. 2
1561203 0 1567339. 172367.7 2411389. 0. 0. 3
1561204 0 1568632. 173881. 2411406. 0. 0. 4
1561205 0 1569925. 175438. 2411422. 0. 0. 5
1561206 0 1596826. 188547.5 2411758. 0. 0. 6
*
*hydro      vel/flw
1561300     0
*
*hydro      f velocity      g velocity      j velocity
1561301     2.37322-6      -.576589      0.
1561302     2.191466-6      2.19152-6      0.
1561303     2.19341-6      2.19346-6      0.
1561304     2.195416-6      2.19547-6      0.
1561305     4.3568-5       4.35892-5      0.
*-----$
*hydro      component name      component type
1570000     "accumout"          angljun
*
*hydro      from      to      area      f loss      r loss      vcabs
*-----$

```


1244200	1	2	\$normal	(+q, +n)	1244609	0.90	-0.91	
*hydro	a/v	head			1244610	1.00	-1.47	
1244201	0.00	0.00			*hydro	curve type	regime	
1244202	0.10	-0.04			1244700	1	7	
1244203	0.20	0.0			*hydro	v/a	head	\$reverse (+q, -n)
1244204	0.30	0.10			1244701	-1.00	0.00	
1244205	0.40	0.21			1244702	0.00	0.00	
1244206	0.80	0.67			*hydro	curve type	regime	
1244207	0.90	0.80			1244800	1	8	
1244208	1.00	1.00			*hydro	a/v	head	\$reverse (+q, -n)
*hydro	curve type	regime			1244801	-1.00	0.00	
1244300	1	3	\$dissipation (-q, +n)		1244802	0.00	0.00	
*hydro	v/a	head			*hydro	curve type	regime	
1244301	-1.00	-1.16			1244900	2	1	
1244302	-0.90	-1.24			*hydro	v/a	head	\$normal (+q, +n)
1244303	-0.80	-1.77			1244901	0.00	0.00	
1244304	-0.70	-2.36			1244907	1.00	0.00	
1244305	-0.60	-2.79			*hydro	curve type	regime	
1244306	-0.50	-2.91			1245000	2	2	
1244307	-0.40	-2.67			*hydro	a/v	head	\$normal (+q, +n)
1244308	-0.25	-1.69			1245001	0.00	0.00	
1244309	-0.10	-0.50			1245008	1.00	0.00	
1244310	0.00	0.00			*hydro	curve type	regime	
*hydro	curve type	regime			1245100	2	3	
1244400	1	4	\$dissipation (-q, +n)		*hydro	v/a	head	\$dissipation (-q, +n)
*hydro	a/v	head			1245101	-1.00	0.00	
1244401	-1.0	-1.16			1245110	0.00	0.00	
1244402	-0.90	-0.78			*hydro	curve type	regime	
1244403	-0.80	-0.50			1245200	2	4	
1244404	-0.70	-0.31			*hydro	a/v	head	\$dissipation (-q, +n)
1244405	-0.60	-0.17			1245201	-1.0	0.00	
1244406	-0.50	-0.08			1245210	0.00	0.00	
1244407	-0.35	0.00			*hydro	curve type	regime	
1244408	-0.20	0.05			1245300	2	5	
1244409	-0.10	0.08			*hydro	v/a	head	\$turbine (-q, -n)
1244410	0.00	0.11			1245301	0.00	0.00	
*hydro	curve type	regime			1245306	1.00	0.00	
1244500	1	5	\$turbine (-q, -n)		*hydro	curve type	regime	
*hydro	v/a	head			1245400	2	6	
1244501	0.00	0.00			*hydro	a/v	head	\$turbine (-q, -n)
1244502	0.20	-0.34			1245401	0.00	0.00	
1244503	0.40	-0.65			1245410	1.00	0.00	
1244504	0.60	-0.95			*hydro	curve type	regime	
1244505	0.80	-1.19			1245500	2	7	
1244506	1.00	-1.47			*hydro	v/a	head	\$reverse (+q, -n)
*hydro	curve type	regime			1245501	-1.00	0.00	
1244600	1	6	\$turbine (-q, -n)		1245502	0.00	0.00	
*hydro	a/v	head						
1244601	0.00	0.11						
1244602	0.10	0.13						
1244603	0.25	0.15						
1244604	0.40	0.13						
1244605	0.50	0.07						
1244606	0.60	-0.04						
1244607	0.70	-0.23						
1244608	0.80	-0.51						

		-----\$		-----\$		-----\$	
		*-----		*-----		*-----	
		*hydro		component name		component type	
		1580000		"coldleg"		pipe	
		*-----		50		-----	
1291212	0	2827306.	178268.5	2419492.0.	0.	12	
1291213	0	2826959.	178268.8	2419491.0.	0.	13	
1291214	0	2826612.	178269.	2419491.0.	0.	14	
1291215	0	2826265.	178269.4	2419490.0.	0.	15	
1291216	0	2825918.	178269.7	2419490.0.	0.	16	
1291217	0	2825571.	178270.	2419489.0.	0.	17	
1291218	0	2825224.	178270.4	2419488.0.	0.	18	
1291219	0	2824877.	178270.7	2419488.0.	0.	19	
1291220	0	2824530.	178271.	2419487.0.	0.	20	
1291221	0	2824183.	178271.3	2419486.0.	0.	21	
1291222	0	2823836.	178271.6	2419486.0.	0.	22	
1291223	0	2823489.	178272.	2419485.0.	0.	23	
1291224	0	2823142.	178272.2	2419484.0.	0.	24	
1291225	0	2822795.	178272.6	2419484.0.	0.	25	
1291226	0	2822448.	178273.	2419483.0.	0.	26	
1291227	0	2822101.	178273.2	2419483.0.	0.	27	
1291228	0	2821754.	178273.5	2419482.0.	0.	28	
1291229	0	2821407.	178274.	2419482.0.	0.	29	
1291230	0	2821060.	178274.	2419481.0.	0.	30	
1291231	0	2820714.	178274.5	2419480.0.	0.	31	
*hydro		vel/flw					
1291300		0					
*hydro							
1291301	8.82182	0.	8.82182	0.	1 * 806.763	jun	
1291302	8.82182	0.	8.82182	0.	2 * 806.763		
1291303	8.82182	0.	8.82182	0.	3 * 806.763		
1291304	8.82183	0.	8.82183	0.	4 * 806.763		
1291305	8.82183	0.	8.82183	0.	5 * 806.763		
1291306	8.82183	0.	8.82183	0.	6 * 806.763		
1291307	8.82183	0.	8.82183	0.	7 * 806.763		
1291308	8.82183	0.	8.82183	0.	8 * 806.763		
1291309	8.82183	0.	8.82183	0.	9 * 806.763		
1291310	8.82183	0.	8.82183	0.	10 * 806.763		
1291311	8.82184	0.	8.82184	0.	11 * 806.763		
1291312	8.82184	0.	8.82184	0.	12 * 806.763		
1291313	8.82184	0.	8.82184	0.	13 * 806.763		
1291314	8.82184	0.	8.82184	0.	14 * 806.763		
1291315	8.82184	0.	8.82184	0.	15 * 806.763		
1291316	8.82184	0.	8.82184	0.	16 * 806.763		
1291317	8.82185	0.	8.82185	0.	17 * 806.763		
1291318	8.82185	0.	8.82185	0.	18 * 806.763		
1291319	8.82185	0.	8.82185	0.	19 * 806.763		
1291320	8.82185	0.	8.82185	0.	20 * 806.763		
1291321	8.82185	0.	8.82185	0.	21 * 806.763		
1291322	8.82185	0.	8.82185	0.	22 * 806.763		
1291323	8.82185	0.	8.82185	0.	23 * 806.763		
1291324	8.82186	0.	8.82186	0.	24 * 806.763		
1291325	8.82186	0.	8.82186	0.	25 * 806.763		
1291326	8.82186	0.	8.82186	0.	26 * 806.763		
1291327	8.82186	0.	8.82186	0.	27 * 806.763		
1291328	8.82186	0.	8.82186	0.	28 * 806.763		
1291329	8.82186	0.	8.82186	0.	29 * 806.763		
1291330	8.82187	0.	8.82187	0.	30 * 806.763		
*hydro							
1310000							
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1310100							
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1310101							
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1310101							
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1310201							
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1581228	0	2804229.	178245.	2419450.	0. 0.	28	1581338	8.82192	8.82192	0.	38 * 806.763
1581229	0	2803919.	178245.2	2419450.	0. 0.	29	1581339	8.82192	8.82192	0.	39 * 806.763
1581230	0	2803610.	178245.5	2419450.	0. 0.	30	1581340	8.82192	8.82192	0.	40 * 806.763
1581231	0	2803300.	178245.8	2419449.	0. 0.	31	1581341	8.82192	8.82192	0.	41 * 806.763
1581232	0	2802990.	178246.	2419448.	0. 0.	32	1581342	8.82193	8.82193	0.	42 * 806.763
1581233	0	2802680.	178246.4	2419448.	0. 0.	33	1581343	8.82193	8.82193	0.	43 * 806.763
1581234	0	2802370.	178246.6	2419447.	0. 0.	34	1581344	8.82193	8.82193	0.	44 * 806.763
1581235	0	2802060.	178247.	2419447.	0. 0.	35	1581345	8.82193	8.82193	0.	45 * 806.763
1581236	0	2801751.	178247.2	2419446.	0. 0.	36	1581346	8.82193	8.82193	0.	46 * 806.763
1581237	0	2801441.	178247.5	2419446.	0. 0.	37	1581347	8.82193	8.82193	0.	47 * 806.763
1581238	0	2801131.	178247.8	2419445.	0. 0.	38	1581348	8.82193	8.82193	0.	48 * 806.763
1581239	0	2800821.	178248.	2419444.	0. 0.	39	1581349	8.82193	8.82193	0.	49 * 806.763
1581240	0	2800512.	178248.3	2419444.	0. 0.	40					
1581241	0	2800202.	178248.6	2419443.	0. 0.	41					
1581242	0	2799892.	178249.	2419443.	0. 0.	42					
1581243	0	2799582.	178249.2	2419442.	0. 0.	43					
1581244	0	2799272.	178249.5	2419442.	0. 0.	44					
1581245	0	2798962.	178249.8	2419441.	0. 0.	45					
1581246	0	2798653.	178250.	2419440.	0. 0.	46					
1581247	0	2798343.	178250.3	2419440.	0. 0.	47					
1581248	0	2798033.	178250.6	2419440.	0. 0.	48					
1581249	0	2797723.	178251.	2419439.	0. 0.	49					
1581250	0	2797414.	178251.	2419438.	0. 0.	50					
*hydro	vel/flw										
1581300	0										
*hydro	vol/flw	8.82188	8.82188	0.	1 * 806.763						
1581301	8.82188	8.82188	8.82188	0.	2 * 806.763						
1581302	8.82188	8.82189	8.82189	0.	3 * 806.763						
1581303	8.82189	8.82189	8.82189	0.	4 * 806.763						
1581304	8.82189	8.82189	8.82189	0.	5 * 806.763						
1581305	8.82189	8.82189	8.82189	0.	6 * 806.763						
1581306	8.82189	8.82189	8.82189	0.	7 * 806.763						
1581307	8.8219	8.8219	8.8219	0.	8 * 806.763						
1581308	8.8219	8.8219	8.8219	0.	9 * 806.763						
1581309	8.8219	8.8219	8.8219	0.	10 * 806.763						
1581310	8.8219	8.8219	8.8219	0.	11 * 806.763						
1581311	8.8219	8.8219	8.8219	0.	12 * 806.763						
1581312	8.8219	8.8219	8.8219	0.	13 * 806.763						
1581313	8.8219	8.8219	8.8219	0.	14 * 806.763						
1581314	8.8219	8.8219	8.8219	0.	15 * 806.763						
1581315	8.8219	8.8219	8.8219	0.	16 * 806.763						
1581316	8.8219	8.8219	8.8219	0.	17 * 806.763						
1581317	8.8219	8.8219	8.8219	0.	18 * 806.763						
1581318	8.8219	8.8219	8.8219	0.	19 * 806.763						
1581319	8.8219	8.8219	8.8219	0.	20 * 806.763						
1581320	8.82191	8.82191	8.82191	0.	21 * 806.763						
1581321	8.82191	8.82191	8.82191	0.	22 * 806.763						
1581322	8.82191	8.82191	8.82191	0.	23 * 806.763						
1581323	8.82191	8.82191	8.82191	0.	24 * 806.763						
1581324	8.82192	8.82192	8.82192	0.	25 * 806.763						
1581325	8.82192	8.82192	8.82192	0.	26 * 806.763						
1581326	8.8219	8.8219	8.8219	0.	27 * 806.763						
1581327	8.8219	8.8219	8.8219	0.	28 * 806.763						
1581328	8.8219	8.8219	8.8219	0.	29 * 806.763						
1581329	8.8219	8.8219	8.8219	0.	30 * 806.763						
1581330	8.8219	8.8219	8.8219	0.	31 * 806.763						
1581331	8.82191	8.82191	8.82191	0.	32 * 806.763						
1581332	8.82191	8.82191	8.82191	0.	33 * 806.763						
1581333	8.82191	8.82191	8.82191	0.	34 * 806.763						
1581334	8.82191	8.82191	8.82191	0.	35 * 806.763						
1581335	8.82192	8.82192	8.82192	0.	36 * 806.763						
1581336	8.82192	8.82192	8.82192	0.	37 * 806.763						
1581337	8.82192	8.82192	8.82192	0.							
*hydro	vol/flw										
1581300	0										
*hydro	vol area	vol area	vol area	vol area	vol area	vol area					
1581301	0.08322	0.08322	0.08322	0.08322	0.08322	0.08322					
*hydro	length	length	length	length	length	length					
1581301	0.183	0.183	0.183	0.183	0.183	0.183					
1581302	0.19625	0.19625	0.19625	0.19625	0.19625	0.19625					
1581303	0.18125	0.18125	0.18125	0.18125	0.18125	0.18125					
1581304	0.2	0.2	0.2	0.2	0.2	0.2					
1581305	0.10439	0.10439	0.10439	0.10439	0.10439	0.10439					
*hydro	volume	volume	volume	volume	volume	volume					
1581301	0.	0.	0.	0.	0.	0.					
*hydro	horz angle	horz angle	horz angle	horz angle	horz angle	horz angle					
1581301	0.	0.	0.	0.	0.	0.					
*hydro	vert angle	vert angle	vert angle	vert angle	vert angle	vert angle					
1581301	-90.	-90.	-90.	-90.	-90.	-90.					
1581302	0.	0.	0.	0.	0.	0.					
1581303	-0.183	-0.183	-0.183	-0.183	-0.183	-0.183					
1581304	0.	0.	0.	0.	0.	0.					
1581305	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2					
*hydro	delta z	delta z	delta z	delta z	delta z	delta z					
1581301	-0.183	-0.183	-0.183	-0.183	-0.183	-0.183					
1581302	0.	0.	0.	0.	0.	0.					
1581303	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2					
1581304	-0.10439	-0.10439	-0.10439	-0.10439	-0.10439	-0.10439					
*hydro	roughness	roughness	roughness	roughness	roughness	roughness					
1581301	0.0000457	0.0000457	0.0000457	0.0000457	0.0000457	0.0000457					
*hydro	hyd diam	hyd diam	hyd diam	hyd diam	hyd diam	hyd diam					
1581301	0.3255	0.3255	0.3255	0.3255	0.3255	0.3255					
*hydro	kr	kr	kr	kr	kr	kr					
1581301	0.0	0.0	0.0	0.0	0.0	0.0					
1581302	0.182	0.182	0.182	0.182	0.182	0.182					
1581303	0.0	0.0	0.0	0.0	0.0	0.0					
1581304	0.13	0.13	0.13	0.13	0.13	0.13					
1581305	0.0	0.0	0.0	0.0	0.0	0.0					

[illegible]

*hydro	jun hyd diam	0.1985	0.0 1.0 1.0	g velocity	j velocity	0. * 806.762
1720110						
*hydro	vel/flw	f velocity	23.71984	24.6401		
1720201	0					
*hydro	component name	component type				
1710000	"ifdthrot"	pipe				
1710001	24					
*hydro	vol area					vol
1710101	0.03095					24
*hydro	length					vol
1710301	0.15					2
1710302	0.20					12
1710303	0.19					24
*hydro	volume					vol
1710401	0.					24
*hydro	volume					vol
1710501	0.					24
*hydro	vert angle					vol
1710601	-90.0					2
1710602	0.0					24
*hydro	delta z					vol
1710701	-0.15					2
1710702	0.0					24
*hydro	roughness	hyd diam				vol
1710801	0.0000457	0.1985				24
*hydro	f loss	r loss				jun
1710901	0.0	0.0				1
1710902	0.196	0.196				2
1710903	0.0	0.0				11
1710904	0.196	0.196				12
1710905	0.0	0.0				23
*hydro	fe					vol
1711001	00					24
*hydro	vcabs					jun
1711101	01000					23
*hydro	ebt pressure	tempe				vol
1711201	0	2558306.	178210.6	2418887.0	0.0	1
1711202	0	2556522.	178213.6	2418881.0	0.0	2
1711203	0	2492810.	178210.3	2418660.0	0.0	3
1711204	0	2488354.	178214.3	2418637.0	0.0	4
1711205	0	2483909.	178218.3	2418614.0	0.0	5
1711206	0	2479464.	178222.4	2418592.0	0.0	6
1711207	0	2475019.	178226.4	2418568.0	0.0	7
1711208	0	2470574.	178230.5	2418546.0	0.0	8
1711209	0	2466129.	178234.5	2418523.0	0.0	9
1711210	0	2461684.	178238.5	2418500.0	0.0	10
1711211	0	2457239.	178242.6	2418477.0	0.0	11
1711212	0	2452794.	178246.6	2418454.0	0.0	12
1711213	0	2387826.	178242.	2418112.0	0.0	13

*hydro	component name	component type			
1720000	"inlet"	sngrjun			
*hydro	from	to	area	f loss	vcabs
1720101	162010000	171000000	0.03095	0.2062	0.4513 01000

2131211	0	1488172.	181309.5	2410339.	0. 0.	11
2131212	0	1488894.	181309.8	2410350.	0. 0.	12
2131213	0	1489616.	181310.	2410362.	0. 0.	13
2131214	0	1490338.	181310.5	2410373.	0. 0.	14
2131215	0	1491060.	181310.8	2410385.	0. 0.	15
2131216	0	1491782.	181311.	2410396.	0. 0.	16
2131217	0	1484847.	181311.5	2410286.	0. 0.	17
2131218	0	1486667.	181311.8	2410315.	0. 0.	18
2131219	0	1488486.	181312.	2410344.	0. 0.	19
*hydro	vel/flw					
2131300	0					
*hydro	f flowrate	g flowrate	j flowrate			jun
2131301	9.05798	9.05798	0.	1 * 827.633		
2131302	9.05798	9.05798	0.	2 * 827.633		
2131303	9.05798	9.05798	0.	3 * 827.633		
2131304	9.05798	9.05798	0.	4 * 827.633		
2131305	9.05797	9.05797	0.	5 * 827.633		
2131306	9.05797	9.05797	0.	6 * 827.633		
2131307	9.05797	9.05797	0.	7 * 827.633		
2131308	9.05797	9.05797	0.	8 * 827.633		
2131309	9.05797	9.05797	0.	9 * 827.633		
2131310	9.05797	9.05797	0.	10 * 827.633		
2131311	9.058	9.058	0.	11 * 827.633		
2131312	9.058	9.058	0.	12 * 827.633		
2131313	9.05799	9.05799	0.	13 * 827.633		
2131314	9.05799	9.05799	0.	14 * 827.633		
2131315	9.05798	9.05798	0.	15 * 827.633		
2131316	9.05798	9.05798	0.	16 * 827.633		
2131317	9.05801	9.71495	0.	17 * 827.633		
2131318	9.058	9.7149	0.	18 * 827.633		
*main heat exchanger secondary flow system (tube side)						
*hydro	component name	component type				
2300000	"searc2"	tmdpvol				
*hydro	area	length	volume			
2300101	1.66	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
2300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
2300103	.0	.0	10			
*hydro	ebt	trip no.	alpha vrc	numeric vrc		
2300200 003						
*hydro	time	pressure	tempe			
2300201 0.	5.000e5	302.55				
*hydro	component name	component type				
2320000	"sectdjl"	tmdpjun				
*hydro	from	to	area			
2320101	230000000	234000000	0.7122			
*hydro	vel/flw	trip no.	alpha vrc	numeric vrc		
2320200	1	0	cntrlvar	598		
*hydro	f flow	g flow	j flow			
2320201	-1.e6	0.	0			
2320202	1.e6	0.	0			
*hydro	component name	component type				
2340000	"mix-sec"	pipe				
*hydro	vol area	length	volume			
2340101	0.776	1.314	0.			
*hydro	vert angle	delta z				
2340601	0.	0.0				
*hydro	roughness	hyd diam				
2340701	0.0000457	0.01588				
*hydro	fe					
2341001	00					
*hydro	vcahs					
2341101	01000					
*hydro	ebt pressure	tempe				
2341201	0	499077.	132035.	2559868.	0. 0.	1
2341202	0	493504.	142154.	2559513.	0. 0.	2
2341203	0	487950.	153670.	2559155.	0. 0.	3
2341204	0	482415.	166838.3	2558795.	0. 0.	4
2341205	0	476899.	181973.3	2558433.	0. 0.	5
2341206	0	471389.5	183256.3	2558068.	0. 0.	6
2341207	0	465884.5	184673.4	2557700.	0. 0.	7
2341208	0	460381.	186240.4	2557329.	0. 0.	8
2341209	0	454880.	187974.5	2556954.	0. 0.	9
2341210	0	449380.	189895.8	2556576.	0. 0.	10
*hydro	f velocity	g velocity	j velocity			jun
2341300 0						
2341301	2.176183	2.176183	0.	1 * 1681.036		
2341302	2.17793	2.17793	0.	2 * 1681.036		
2341303	2.180047	2.180047	0.	3 * 1681.036		
2341304	2.182634	2.182634	0.	4 * 1681.036		
2341305	2.18582	2.18582	0.	5 * 1681.036		
2341306	2.186104	2.186104	0.	6 * 1681.036		
2341307	2.18642	2.18642	0.	7 * 1681.036		
2341308	2.18677	2.18677	0.	8 * 1681.036		
2341309	2.18716	2.18716	0.	9 * 1681.036		
*hydro	jun hyd diam					jun
2341401	0.01588	0.0 1.0 1.0				9
*hydro	component name	component type				
2350000	"tubeout"	engljun				

```

*-----*
*hydro from to area f loss r loss vcabs
*2350101 234010000 236000000 0.0 0. 0. 01000
*
*hydro hyd diam
*2350110 0.01588 0.0 1.0 1.0
*
*hydro vel/flw f velocity g velocity j velocity
*2350201 0 2.187596 2.187596 0. * 1681.036
*
*-----*
*hydro component name component type
*2360000 "secank1" tndpvol
*
*hydro area length volume
*2360101 1.e6 .0 1.0e+06
*
*hydro horz angle vert angle delta z
*2360102 .0 .0 .0
*
*hydro roughness hyd diam fe
*2360103 .0 .0 10
*
*hydro ebt trip no. alpha vrc numeric vrc
*2360200 003
*
*hydro time pressure tempe
*2360201 0. 4.490e5 319.
*
*-----*
* emergency heat exchanger - loop 2
*
*-----*
*hydro component name component type
*2140000 hxp1n1 branch
*
*hydro no. juns vel/flw
*2140001 2 0
*
*hydro area length volume
*2140101 0.08322 1.0 0.
*
*hydro horz angle vert angle delta z
*2140102 0. 0. 0.
*
*hydro roughness hyd diam fe
*2140103 0.0000457 0.3255 0
*
*hydro ebt pressure tempe
*2140200 0 1532647. 181313.8 2410948. 0.
*
*hydro from to area f loss r loss vcabs
*2141101 214000000 216000000 0. 0.15 0.15 01000
*2142101 213010000 214000000 0. 0. 0. 01000
*
*hydro hyd diam
*2141110 0.3255 0.0 1.0 1.0
*2142110 0.3255 0.0 1.0 1.0
*
*hydro f velocity g velocity j velocity
*2141201 9.05782 9.71485 0. * 827.633
*2142201 9.058 9.71485 0. * 827.633

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*-----*
*hydro component name component type
*2160000 "ehx-prim" pipe
*
*2160001 4
*
*hydro vol area vol
*2160101 0.894 4
*
*hydro length vol
*2160301 1.6 4
*
*hydro volume vol
*2160401 0. 4
*
*hydro vert angle vol
*2160601 0. 4
*
*hydro delta z vol
*2160701 0.0 4
*
* calibrated hydraulic diameter to match pressure drop
*
*hydro roughness hyd diam vol
*2160801 0.0000457 0.0346 4
*2160801 0.0000457 0.00170 4
*
*hydro f loss r loss jun
*2160901 0.0 0.0 3
*
*hydro fe vol
*2161001 00 4
*
*hydro vcabs jun
*2161101 01000 3
*
*hydro ebt pressure tempe vol
*2161201 0 1517779. 179262.7 2410756. 0. 0. 1
*2161202 0 1505956. 179075. 2410603. 0. 0. 2
*2161203 0 1494156. 179048. 2410434. 0. 0. 3
*2161204 0 1482360. 179038.6 2410247. 0. 0. 4
*
*hydro f velocity g velocity j velocity jun
*2161300 0
*2161301 .843008 .843008 0. 1 * 827.632
*2161302 .842997 .842997 0. 2 * 827.632
*2161303 .842999 .842999 0. 3 * 827.632
*
*hydro jun hyd diam jun
*2161401 0.00170 0.0 1.0 1.0 3
*
*-----*
*hydro component name component type
*2200000 hxp1out1 branch
*
*hydro no. juns vel/flw
*2200001 2 0
*
*hydro area length volume
*2200101 0.08322 1.0 0.
*
*hydro horz angle vert angle delta z
*2200102 0. 0. 0.

```


* hydro	vel/flw	f velocity	g velocity	j velocity	j velocity
2310201	0	9.05107	9.05107	0. * 827.631	0. * 827.631

* hydro	component name	component type			
2580000	"coldleg"	pipe			

2580001	50				
* hydro	vol area				
2580101	0.08322				
* hydro	length				
2580301	0.180				
* hydro	volume				
2580401	0.				
* hydro	horz angle				
2580501	0.				
* hydro	vert angle				
2580601	0.				
* hydro	delta z				
2580701	0.				
* hydro	roughness	hyd diam			
2580801	0.000457	0.3255			
* hydro	kf	kr			
2580901	0.0	0.0			
* hydro	fe				
2581001	00				
* hydro	vcas				
2581101	01000				
* hydro	ebt pressure	tempe			
2581201	0	2741264.	179094.7	2419336. 0. 0.	1
2581202	0	2740938.	179076.3	2419336. 0. 0.	2
2581203	0	2740612.	179076.6	2419335. 0. 0.	3
2581204	0	2740286.	179077.7	2419335. 0. 0.	4
2581205	0	2739960.	179077.2	2419334. 0. 0.	5
2581206	0	2739634.	179077.5	2419334. 0. 0.	6
2581207	0	2739308.	179077.8	2419333. 0. 0.	7
2581208	0	2738983.	179078.	2419332. 0. 0.	8
2581209	0	2738657.	179078.4	2419332. 0. 0.	9
2581210	0	2738331.	179078.7	2419331. 0. 0.	10
2581211	0	2738005.	179079.	2419330. 0. 0.	11
2581212	0	2737679.	179079.3	2419330. 0. 0.	12
2581213	0	2737354.	179079.6	2419329. 0. 0.	13
2581214	0	2737028.	179080.	2419328. 0. 0.	14
2581215	0	2736702.	179080.2	2419328. 0. 0.	15
2581216	0	2736376.	179080.5	2419328. 0. 0.	16
2581217	0	2736050.	179080.8	2419327. 0. 0.	17
2581218	0	2735724.	179081.	2419326. 0. 0.	18
2581219	0	2735398.	179081.4	2419326. 0. 0.	19
2581220	0	2735072.	179081.7	2419325. 0. 0.	20
2581221	0	2734746.	179082.	2419324. 0. 0.	21
2581222	0	2734421.	179082.2	2419324. 0. 0.	22
2581223	0	2734095.	179082.5	2419323. 0. 0.	23
2581224	0	2733769.	179083.	2419323. 0. 0.	24

2581225	0	2733443.	179083.	2419322. 0. 0.	25
2581226	0	2733117.	179083.4	2419322. 0. 0.	26
2581227	0	2732791.	179083.7	2419321. 0. 0.	27
2581228	0	2732466.	179084.	2419320. 0. 0.	28
2581229	0	2732140.	179084.3	2419320. 0. 0.	29
2581230	0	2731814.	179084.6	2419319. 0. 0.	30
2581231	0	2731488.	179085.	2419318. 0. 0.	31
2581232	0	2731162.	179085.2	2419318. 0. 0.	32
2581233	0	2730836.	179085.5	2419317. 0. 0.	33
2581234	0	2730510.	179085.8	2419317. 0. 0.	34
2581235	0	2730184.	179086.	2419316. 0. 0.	35
2581236	0	2729858.	179086.4	2419316. 0. 0.	36
2581237	0	2729533.	179086.7	2419315. 0. 0.	37
2581238	0	2729207.	179087.	2419314. 0. 0.	38
2581239	0	2728881.	179087.3	2419314. 0. 0.	39
2581240	0	2728555.	179087.6	2419313. 0. 0.	40
2581241	0	2728229.	179088.	2419312. 0. 0.	41
2581242	0	2727903.	179088.2	2419312. 0. 0.	42
2581243	0	2727578.	179088.5	2419311. 0. 0.	43
2581244	0	2727252.	179088.8	2419311. 0. 0.	44
2581245	0	2726926.	179089.	2419310. 0. 0.	45
2581246	0	2726600.	179089.4	2419310. 0. 0.	46
2581247	0	2726274.	179089.7	2419309. 0. 0.	47
2581248	0	2725948.	179090.	2419308. 0. 0.	48
2581249	0	2725622.	179090.2	2419308. 0. 0.	49
2581250	0	2725296.	179090.5	2419307. 0. 0.	50
* 2581300	0				
2581301	9.05109	9.05109	9.05109	0.	1 * 827.631
2581302	9.05107	9.05107	9.05107	0.	2 * 827.631
2581303	9.05107	9.05107	9.05107	0.	3 * 827.631
2581304	9.05108	9.05108	9.05108	0.	4 * 827.631
2581305	9.05108	9.05108	9.05108	0.	5 * 827.631
2581306	9.05108	9.05108	9.05108	0.	6 * 827.631
2581307	9.05108	9.05108	9.05108	0.	7 * 827.631
2581308	9.05108	9.05108	9.05108	0.	8 * 827.631
2581309	9.05108	9.05108	9.05108	0.	9 * 827.631
2581310	9.05108	9.05108	9.05108	0.	10 * 827.631
2581311	9.05109	9.05109	9.05109	0.	11 * 827.631
2581312	9.05109	9.05109	9.05109	0.	12 * 827.631
2581313	9.05109	9.05109	9.05109	0.	13 * 827.631
2581314	9.05109	9.05109	9.05109	0.	14 * 827.631
2581315	9.0511	9.0511	9.0511	0.	15 * 827.631
2581316	9.0511	9.0511	9.0511	0.	16 * 827.631
2581317	9.0511	9.0511	9.0511	0.	17 * 827.631
2581318	9.0511	9.0511	9.0511	0.	18 * 827.631
2581319	9.0511	9.0511	9.0511	0.	19 * 827.631
2581320	9.0511	9.0511	9.0511	0.	20 * 827.631
2581321	9.0511	9.0511	9.0511	0.	21 * 827.631
2581322	9.0511	9.0511	9.0511	0.	22 * 827.631
2581323	9.0511	9.0511	9.0511	0.	23 * 827.631
2581324	9.0511	9.0511	9.0511	0.	24 * 827.631
2581325	9.0511	9.0511	9.0511	0.	25 * 827.631
2581326	9.0511	9.0511	9.0511	0.	26 * 827.631
2581327	9.0511	9.0511	9.0511	0.	27 * 827.631
2581328	9.0511	9.0511	9.0511	0.	28 * 827.631
2581329	9.0511	9.0511	9.0511	0.	29 * 827.631
2581330	9.0511	9.0511	9.0511	0.	30 * 827.631
2581331	9.0511	9.0511	9.0511	0.	31 * 827.631
2581332	9.0511	9.0511	9.0511	0.	32 * 827.631
2581333	9.0511	9.0511	9.0511	0.	33 * 827.631
2581334	9.0511	9.0511	9.0511	0.	34 * 827.631
2581335	9.0511	9.0511	9.0511	0.	35 * 827.631
2581336	9.0511	9.0511	9.0511	0.	36 * 827.631
2581337	9.0511	9.0511	9.0511	0.	37 * 827.631

2621264	0	2816047.	179052.8	2419472.0	0.0	64	2621353	9.05083	9.68323	0.	53 * 827.631		
2621265	0	2817840.	179053.	2419475.0	0.0	65	2621354	9.05082	9.6832	0.	54 * 827.631		
2621266	0	2819633.	179053.5	2419478.0	0.0	66	2621355	9.05081	9.68316	0.	55 * 827.631		
2621267	0	2821426.	179053.8	2419482.0	0.0	67	2621356	9.0508	9.68312	0.	56 * 827.631		
2621268	0	2823220.	179054.	2419485.0	0.0	68	2621357	9.0508	9.68309	0.	57 * 827.631		
2621269	0	2825013.	179054.5	2419488.0	0.0	69	2621358	9.0508	9.68305	0.	58 * 827.631		
2621270	0	2826806.	179054.8	2419491.0	0.0	70	2621359	9.05079	9.68301	0.	59 * 827.631		
2621271	0	2828599.	179055.	2419494.0	0.0	71	2621360	9.05078	9.68298	0.	60 * 827.631		
2621272	0	2830392.	179055.5	2419498.0	0.0	72	2621361	9.05077	9.68294	0.	61 * 827.631		
2621273	0	2831891.	179055.7	2419500.0	0.0	73	2621362	9.05076	9.6829	0.	62 * 827.631		
* hydro							2621363	9.05076	9.68287	0.	63 * 827.631		
2621300 0							2621364	9.05075	9.68283	0.	64 * 827.631		
2621301	9.05118	9.05118	0.		1 * 827.631		2621365	9.05074	9.6828	0.	65 * 827.631		
2621302	9.05118	9.05118	0.		2 * 827.631		2621366	9.05074	9.68276	0.	66 * 827.631		
2621303	9.05118	9.05118	0.		3 * 827.631		2621367	9.05073	9.68273	0.	67 * 827.631		
2621304	9.05116	9.68502	0.		4 * 827.631		2621368	9.05072	9.68269	0.	68 * 827.631		
2621305	9.05116	9.68498	0.		5 * 827.631		2621369	9.05072	9.68265	0.	69 * 827.631		
2621306	9.05115	9.68494	0.		6 * 827.631		2621370	9.05071	9.68262	0.	70 * 827.631		
2621307	9.05114	9.6849	0.		7 * 827.631		2621371	9.0507	9.68258	0.	71 * 827.631		
2621308	9.05113	9.68487	0.		8 * 827.631		2621372	9.0507	9.68255	0.	72 * 827.631		
2621309	9.05113	9.68483	0.		9 * 827.631		*						
2621310	9.05112	9.6848	0.		10 * 827.631		*hydro	component name	component type				
2621311	9.05111	9.68476	0.		11 * 827.631		2720000	"inlet"	sngrjun				
2621312	9.0511	9.68472	0.		12 * 827.631		*						
2621313	9.0511	9.68469	0.		13 * 827.631		*hydro	from	to	area	f loss	r loss	vcabs
2621314	9.0511	9.68465	0.		14 * 827.631		2720101	262010000	271000000	0.03095	0.2062	0.4513	01000
2621315	9.05109	9.68462	0.		15 * 827.631		*						
2621316	9.05108	9.68458	0.		16 * 827.631		*hydro	jun hyd diam		0.0 1.0 1.0			
2621317	9.05107	9.68454	0.		17 * 827.631		2720110	0.1985					
2621318	9.05107	9.6845	0.		18 * 827.631		*						
2621319	9.05106	9.68447	0.		19 * 827.631								
2621320	9.05105	9.68443	0.		20 * 827.631		*hydro	vel/fiw	f velocity	g velocity	j velocity		
2621321	9.05105	9.6844	0.		21 * 827.631		2720201	0	24.336	25.27005	0. * 827.631		
2621322	9.05104	9.68436	0.		22 * 827.631		*						
2621323	9.05103	9.68432	0.		23 * 827.631		*hydro	component name	component type				
2621324	9.05102	9.68429	0.		24 * 827.631		2710000	"ifdthrot"	pipe				
2621325	9.05102	9.68425	0.		25 * 827.631		*						
2621326	9.05101	9.68421	0.		26 * 827.631								
2621327	9.051	9.68418	0.		27 * 827.631		2710001	9					
2621328	9.051	9.68414	0.		28 * 827.631		*					vol	
2621329	9.05099	9.6841	0.		29 * 827.631		*hydro	vol area		0.03095		9	
2621330	9.05098	9.68407	0.		30 * 827.631		2710101						
2621331	9.05098	9.68403	0.		31 * 827.631		*						
2621332	9.05097	9.684	0.		32 * 827.631		*hydro	length				vol	
2621333	9.05096	9.68396	0.		33 * 827.631		2710301	0.15				2	
2621334	9.05096	9.68392	0.		34 * 827.631		2710302	0.145				4	
2621335	9.05095	9.68389	0.		35 * 827.631		2710303	0.188				9	
2621336	9.05094	9.68385	0.		36 * 827.631		*						
2621337	9.05094	9.68381	0.		37 * 827.631		*hydro	volume				vol	
2621338	9.05093	9.68378	0.		38 * 827.631		2710401	0.				9	
2621339	9.05092	9.68374	0.		39 * 827.631		*						
2621340	9.05091	9.6837	0.		40 * 827.631		*hydro	volume				vol	
2621341	9.0509	9.68367	0.		41 * 827.631		2710501	0.				9	
2621342	9.0509	9.68363	0.		42 * 827.631		*						
2621343	9.0509	9.6836	0.		43 * 827.631		*hydro	vert angle				vol	
2621344	9.05089	9.68356	0.		44 * 827.631		2710601	-90.0				2	
2621345	9.05088	9.68352	0.		45 * 827.631		2710602	0.0				9	
2621346	9.05087	9.68349	0.		46 * 827.631		*						
2621347	9.05087	9.68345	0.		47 * 827.631		*hydro	delta z				vol	
2621348	9.05086	9.68341	0.		48 * 827.631		2710701	-0.15				2	
2621349	9.05085	9.68338	0.		49 * 827.631		2710702	0.0				9	
2621350	9.05085	9.68334	0.		50 * 827.631		*						
2621351	9.05084	9.6833	0.		51 * 827.631		*hydro	roughness				vol	
2621352	9.05083	9.68327	0.		52 * 827.631		2710801	0.0000457				9	

*hydro	2710901	f loss	0.0	r loss	0.0	jun	1
*hydro	2710902	0.196	0.196	0.196	0.196	2	2
*hydro	2710903	0.0	0.0	0.0	0.0	3	3
*hydro	2710904	0.196	0.196	0.196	0.196	4	4
*hydro	2710905	0.0	0.0	0.0	0.0	8	8
*hydro	2711001	fe	0.0	0.0	0.0	vol	9
*hydro	2711101	vcabs	01000	01000	01000	jun	8
*hydro	2711201	ebc pressure	tempe	179057.5	2418615.0	0.0	1
*hydro	2711202	0	2484067.0	179060.7	2418605.0	0.0	2
*hydro	2711203	0	2415646.0	179062.6	2418260.0	0.0	3
*hydro	2711204	0	2412241.0	179065.7	2418242.0	0.0	4
*hydro	2711205	0	2344530.0	179066.2	2417881.0	0.0	5
*hydro	2711206	0	2340120.0	179070.2	2417858.0	0.0	6
*hydro	2711207	0	2335723.0	179074.2	2417834.0	0.0	7
*hydro	2711208	0	2331326.0	179078.2	2417810.0	0.0	8
*hydro	2711209	0	2326930.0	179082.2	2417786.0	0.0	9
*hydro	2711300	vel/flw	0	0	0	0	0
*hydro	2711301	f flowrate	g flowrate	j flowrate	1 * 827.631	jun	1
*hydro	2711302	24.3397	25.2823	0.0	2 * 827.631	2 * 827.631	2
*hydro	2711303	24.3397	25.2824	0.0	3 * 827.631	3 * 827.631	3
*hydro	2711304	24.34043	24.34043	0.0	4 * 827.631	4 * 827.631	4
*hydro	2711305	24.34047	24.34047	0.0	5 * 827.631	5 * 827.631	5
*hydro	2711306	24.3412	24.3412	0.0	6 * 827.631	6 * 827.631	6
*hydro	2711307	24.34125	24.34125	0.0	7 * 827.631	7 * 827.631	7
*hydro	2711308	24.3413	24.3413	0.0	8 * 827.631	8 * 827.631	8
*hydro	2730000	component name	component type	angljun	-----	-----	-----
*hydro	2730101	from	to	area	f loss	r loss	vcabs
*hydro	2730101	271010000	274000000	0.03095	0.1028	0.04696	01000
*hydro	2730110	jun hyd diam	0.1985	0.0	1.0	1.0	0.0
*hydro	2730201	vel/flw	f velocity	g velocity	j velocity	0.0	827.631
*hydro	2740000	component name	component type	psvaw-2"	pipe	-----	-----
*hydro	2740001	2	2	2	2	2	2
*hydro	2740101	vol area	0.08322	0.08322	0.08322	0.08322	0.08322
*hydro	2740301	length	0.25	0.25	0.25	0.25	0.25
*hydro	2740401	volume	0.0	0.0	0.0	0.0	0.0
*hydro	2740501	volume	0.0	0.0	0.0	0.0	0.0
*hydro	2740601	vert angle	45.0	45.0	45.0	45.0	45.0
*hydro	2740701	delta z	0.25	0.25	0.25	0.25	0.25
*hydro	2740801	roughness	0.0000457	0.0000457	0.0000457	0.0000457	0.0000457
*hydro	2740901	f loss	0.0	0.0	0.0	0.0	0.0
*hydro	2741001	fe	0.0	0.0	0.0	0.0	0.0
*hydro	2741101	vcabs	01000	01000	01000	01000	01000
*hydro	2741201	ebc pressure	tempe	179080.8	2418925.0	0.0	1
*hydro	2741202	0	2570131.0	179081.2	2418915.0	0.0	2
*hydro	2741300	vel/flw	0	0	0	0	0
*hydro	2741301	f flowrate	g flowrate	j flowrate	1 * 827.631	jun	1
*hydro	2741301	9.05175	9.39183	0.0	2 * 827.631	2 * 827.631	2
*hydro	2741301	components 3xx - heat exchanger coolant loop 3	-----	-----	-----	-----	-----
*hydro	3010000	component name	component type	"hlsplit3"	pipe	-----	-----
*hydro	3010001	16	16	16	16	16	16
*hydro	3010101	vol area	0.08322	0.08322	0.08322	0.08322	0.08322
*hydro	3010301	length	0.205	0.205	0.205	0.205	0.205
*hydro	3010401	volume	0.0	0.0	0.0	0.0	0.0
*hydro	3010601	vert angle	0.0	0.0	0.0	0.0	0.0
*hydro	3010701	delta z	0.0	0.0	0.0	0.0	0.0
*hydro	3010801	roughness	0.0000457	0.0000457	0.0000457	0.0000457	0.0000457
*hydro	3011001	fe	0.0	0.0	0.0	0.0	0.0
*hydro	3011101	vcabs	01000	01000	01000	01000	01000

*hydro	horz angle	vert angle	delta z	tempe	ebc pressure	vol
3120102	0.	0.	0.	1549689.	175077.5	1
*hydro				1550243.	175077.8	2
3120103	roughness	hyd diam	fe	1550796.	175078.3	3
	0.0000457	0.3255	0	1551349.	175078.5	4
*hydro	ebc pressure	tempe		1551902.	175078.8	5
3120200	0	1550090.	175077.3 2411171. 0.	1552455.	175078.8	6
*hydro	from	to	area	1554115.	175079.2	7
3121101	308010000	312000000	0.	1554668.	175079.5	8
3121102	308010000	312000000	0.15	15549252.	175080.	9
*hydro	hyd diam		0.08322	1555069.	175080.2	10
3122110	0.3255 0.0 1.0 1.0			1555086.	175080.5	11
3122110	0.3255 0.0 1.0 1.0			1551703.	175080.7	12
*hydro	hyd diam			1552520.	175081.	13
3121101	0.3255 0.0 1.0 1.0			1553337.	175081.2	14
3121102	0.3255 0.0 1.0 1.0			1553562.	175081.5	15
*hydro	f velocity	g velocity	j velocity	1550516.	175081.7	16
3121201	7.80691	7.80681	0. * 713.764	1552431.	175082.	17
3122201	7.80694	7.80694	0. * 713.764			18
*hydro						19
3130000	component name	component type				
3130001	"joinbx"	pipe				
*hydro						
3130101	vol area					
*hydro	length					
3130301	0.1981					
3130302	0.205					
3130303	0.2032					
*hydro	volume					
3130401	0.					
*hydro	vert angle					
3130601	-22.6					
3130602	-29.7					
3130603	-90.					
*hydro	elev. change					
3130701	-0.0762					
3130702	-0.10155					
3130703	-0.2032					
*hydro	roughness	hyd diam				
3130801	0.0000457	0.3255				
*hydro	f loss	r loss				
3130901	0.0	0.0				
3130902	0.182	0.182				
3130903	0.0	0.0				
3130904	0.182	0.182				
3130905	0.0	0.0				
*hydro	fe					
3131001	00					
*hydro	vcabs					
3131101	01000					
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			
3300000	component name	component type				
3300101	"secsrc3"	tmppval				
*hydro	area	length	volume			
3300101	1.e6	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3300102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3300103	.0	.0	10			
*hydro	ebc	trip no.	alpha vrc	numeric vrc		
3300200	003					
*hydro	time	pressure	tempe			

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3300201 0. 5.000e5 302.55
*-----*
*hydro component name component type
3320000 "sectdjl" tmdpjun
*-----*
*hydro from to area
3320101 330000000 334000000 0.7122
*-----*
*hydro vel/flow trip no. alpha vrc numeric vrc
3320200 1 0 0 598
*-----*
*hydro time f flow g flow j flow
3320201 -1.e6 -1.e6 0. 0
3320202 1.e6 1.e6 0. 0
*-----*
*hydro component name component type
3340000 "mxx-sec" pipe
3340001 10
*-----*
*hydro vol area
3340101 0.776
*-----*
*hydro length
3340301 1.314
*-----*
*hydro volume
3340401 0.
*-----*
*hydro vert angle
3340601 0.
*-----*
*hydro delta z
3340701 0.0
*-----*
*hydro roughness hyd diam
3340801 0.0000457 0.01588
*-----*
*hydro fe
3341001 00
*-----*
*hydro vcabs
3341101 01000
*-----*
*hydro ebt pressure tempe
3341201 0 499142. 130761. 2559873. 0. 0. 1
3341202 0 493565. 139600.5 2559517. 0. 0. 2
3341203 0 488005. 149861.3 2559158. 0. 0. 3
3341204 0 482463.5 161844.8 2558798. 0. 0. 4
3341205 0 476941. 175932.5 2558436. 0. 0. 5
3341206 0 471424. 177084. 2558070. 0. 0. 6
3341207 0 465912. 178378.3 2557702. 0. 0. 7
3341208 0 460401. 179834.7 2557330. 0. 0. 8
3341209 0 454892. 181475.7 2556955. 0. 0. 9
3341210 0 449385.5 183327.6 2556576. 0. 0. 10
*-----*
*hydro f velocity g velocity j velocity
3341300 0
3341301 2.175972 2.175972 0. 1 * 1681.036
3341302 2.17748 2.17748 0. 2 * 1681.036
3341303 2.179332 2.179332 0. 3 * 1681.036
3341304 2.181634 2.181634 0. 4 * 1681.036
3341305 2.184523 2.184523 0. 5 * 1681.036

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3341306 2.184773 2.184773 0. 6 * 1681.036
3341307 2.185054 2.185054 0. 7 * 1681.036
3341308 2.18537 2.18537 0. 8 * 1681.036
3341309 2.18573 2.18573 0. 9 * 1681.036
*-----*
*hydro jun hyd diam
3341401 0.01588 0.0 1.0 1.0
*-----*
*hydro component name component type
3350000 "tubeout" enljun
*-----*
*hydro from to area f loss r loss vcabs
3350101 334010000 336000000 0.0 0. 0. 01000
*-----*
*hydro hyd diam
3350110 0.01588 0.0 1.0 1.0
*-----*
*hydro vel/flow f velocity g velocity j velocity
3350201 0 2.18614 2.18614 0. * 1681.036
*-----*
*hydro component name component type
3360000 "secsnk1" tmdpvol
*-----*
*hydro area length volume
3360101 1.e6 .0 1.0e+06
*-----*
*hydro horz angle vert angle delta z
3360102 .0 .0 .0
*-----*
*hydro roughness hyd diam fe
3360103 .0 .0 10
*-----*
*hydro ebt trip no. alpha vrc numeric vrc
3360200 003
*-----*
*hydro time pressure tempe
3360201 0. 4.490e5 319.
*-----*
*-----*
* emergency heat exchanger - loop 3
*-----*
*-----*
*hydro component name component type
3140000 hxpini branch
*-----*
*hydro no. juns vel/flow
3140001 2 0
*-----*
*hydro area length volume
3140101 0.08322 1.0 0.
*-----*
*hydro horz angle vert angle delta z
3140102 0. 0. 0.
*-----*
*hydro roughness hyd diam fe
3140103 0.0000457 0.3255 0
*-----*
*hydro ebt pressure tempe
3140200 0 1585533. 175083.2 2411618. 0.
*-----*

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*hydro	from	to	area	f loss	r loss	vcabs
3141101	314000000	316000000	0.	0.15	0.15	01000
3142101	313010000	314000000	0.	0.	0.	01000
*hydro	hyd diam					
3141110	0.3255	0.0 1.0 1.0				
3142110	0.3255	0.0 1.0 1.0				
*hydro	f velocity	g velocity	j velocity			
3141201	7.80682	7.80682	0. * 713.764			
3142201	7.80694	8.41282	0. * 713.764			
*hydro	component name	component type	pipe			
3160000	"ehx-prim"					
3160001	4					
*hydro	vol area					vol
3160101	0.894					4
*hydro	length					vol
3160301	1.6					4
*hydro	volume					vol
3160401	0.					4
*hydro	vert angle					vol
3160601	0.					4
*hydro	delta z					vol
3160701	0.0					4
*calibrated hydraulic diameter to match pressure drop						
*hydro	roughness	hyd diam				vol
3160801	0.0000457	0.0346				4
3160801	0.0000457	0.00170				4
*hydro	f loss	r loss				jun
3160901	0.0	0.0				3
*hydro	fe					vol
3161001	00					4
*hydro	vcabs					jun
3161101	01000					3
*hydro	ebt pressure	tempe				vol
3161201	0	1574261.	172956.	2411476.	0. 0.	1
3161202	0	1565020.	172757.	2411360.	0. 0.	2
3161203	0	1555773.	172727.5	2411243.	0. 0.	3
3161204	0	1546526.	172716.4	2411125.	0. 0.	4
*hydro	f velocity	g velocity	j velocity			jun
3161300	0					
3161301	.726576	.726576	0.	1 * 713.763		
3161302	.726565	.726565	0.	2 * 713.763		
3161303	.726566	.726566	0.	3 * 713.763		
*hydro	jun hyd diam					jun
3161401	0.00170	0.0 1.0 1.0				3
*hydro	component name	component type				
3400000						
*hydro	from	to	area	f loss	r loss	vcabs
3400101	338000000	342000000	0.0	0.	0.	01100
*hydro	hyd diam					
3400110	0.4573	0.0	1.0	1.0		
*hydro	vel/flw	f velocity	g velocity	j velocity		
3400201	0	-.0806497	-.0806497	0. * -34.0615		
*hydro	no. juns	branch				
3200000	2	0				
*hydro	area	length	volume			
3200001	0.08322	1.0	0.			
*hydro	horz angle	vert angle	delta z			
3200101	0.	0.	0.			
*hydro	roughness	hyd diam	fe			
3200103	0.0000457	0.3255	0			
*hydro	ebt pressure	tempe				
3200200	0	1503018.	172717.7	2410565.	0.	
*hydro	from	to	area	f loss	r loss	vcabs
3201101	316010000	320000000	0.	0.15	0.15	01000
3202101	320010000	322000000	0.08322	0.	0.	01000
*hydro	hyd diam					
3201110	0.3255	0.0 1.0 1.0				
3202110	0.3255	0.0 1.0 1.0				
*hydro	f velocity	g velocity	j velocity			
3201201	7.80523	7.80523	0. * 713.763			
3202201	7.80539	7.80539	0. * 713.763			
*emergency heat exchanger secondary flow system (tube side)						
*hydro	component name	component type				
3380000	"secsrcl"	tmppvol				
*hydro	area	length	volume			
3380101	1.66	.0	1.0e+06			
*hydro	horz angle	vert angle	delta z			
3380102	.0	.0	.0			
*hydro	roughness	hyd diam	fe			
3380103	.0	.0	10			
*hydro	ebt	trip no.	alpha vrc	numeric vrc		
3380200	003					
*hydro	time	pressure	tempe			
3380201	0.	1.800e5	311.15			
*hydro	component name	component type				
3400000	"tubein"	angljun				
*hydro	from	to	area	f loss	r loss	vcabs
3400101	338000000	342000000	0.0	0.	0.	01100
*hydro	hyd diam					
3400110	0.4573	0.0	1.0	1.0		
*hydro	vel/flw	f velocity	g velocity	j velocity		
3400201	0	-.0806497	-.0806497	0. * -34.0615		


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*          a tank wall heat structure (#3561) has been defined
*-----$
*hydro      elev. change      hyd diam      vol
3500701      0.75              0.508          4
*
*hydro      roughness      hyd diam      vol
3500801      0.0000457      0.508          4
*
*hydro      f loss      r loss      jun
3500901      0.          0.          3
*
*hydro      fe      00          vol
3501001      00          00          4
*
*hydro      vcabs      01000      jun
3501101      01000          3
*
*hydro      ebt pressure      tempe      vol
3501201      0      176363.      137691.      2524855.      0.      0.      1
3501202      0      169046.      137656.7      2523412.      0.      0.      2
3501203      0      161729.2      137622.3      2521918.      0.      0.      3
3501204      0      154412.3      137587.9      2520367.      0.      0.      4
*
*hydro      vel/flw      0          vol
3501300      0          0
*
*hydro      f flowrate      g flowrate      j flowrate      jun
3501301      -.1686557      -.2051964      0.          1 * -34.06153
3501302      -.1686558      -.2051965      0.          2 * -34.06153
3501303      -.168656      -.2051966      0.          3 * -34.06153
*
*hydro      component name      component type
3520000      "tubeout"      angl:jun
*
*hydro      from      to      area      f loss      r loss      vcabs
3520101      350010000      354000000      0.0      0.          0.          01100
*
*hydro      hyd diam      0.0      1.0      1.0
3520110      0.508
*
*hydro      vel/flw      f velocity      g velocity      j velocity
3520201      0      -.1686557      -.1686557      0. * -34.06153
*
*hydro      component name      component type
3540000      "secsnk1"      tmpdvol
*
*hydro      area      length      volume
3540101      1.e6      .0      1.0e+06
*
*hydro      horz angle      vert angle      delta z
3540102      .0      .0      .0
*
*hydro      roughness      hyd diam      fe
3540103      .0      .0      10
*
*hydro      ebt      trip no.      alpha vrc      numeric vrc
3540200      003
*
*hydro      time      pressure      tempe
3540201      0.      150773.66      306.
*
*-----$
*          accumulator and surge line - loop 3
*          assembled from normal relap5 components.
*-----$

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*-----$
*hydro      component name      component type
3560000      "accum3"      pipe
*
*hydro      no. volumes      6
3560001
*
*hydro      vol area      1.65      vol
3560101      0.08322      6
3560102
*
*hydro      length      vol
3560301      4.09      1
3560302      0.12      5
3560303      4.88      6
*
*hydro      volume      0.          vol
3560401      0.          6
3560401
*
*hydro      vert angle      -90.          vol
3560601
*
*hydro      roughness      hyd diam      vol
3560801      0.0000457      1.52      5
3560802      0.0000457      0.3255      6
*
*hydro      f loss      r loss      jun
3560901      0.          0.          4
3560902      0.5      1.0      5
*
*hydro      fe      00000      vol
3561001
*
*hydro      vcabs      00000      jun
3561101
*
*hydro      ebt      1574359.      107023.9      373079.5      .0767345      .998407      1
3561201      6
3561202      0      1595482.      160395.3      2411742.      0.      0.      2
3561203      0      1596776.      172385.4      2411758.      0.      0.      3
3561204      0      1598069.      173928.      2411774.      0.      0.      4
3561205      0      1599362.      175752.5      2411790.      0.      0.      5
3561206      0      1626260.      189765.      2412121.      0.      0.      6
*
*hydro      vel/flw      0
3561300
*
*hydro      f velocity      g velocity      j velocity      jun
3561301      2.59546-6      -.57638      0.          1 * .004366285
3561302      2.396596-6      2.39666-6      0.          2 * .00435016
3561303      2.398644-6      2.39871-6      0.          3 * .004349235
3561304      2.400764-6      2.40083-6      0.          4 * .00435246
3561305      4.76416-5      4.76669-5      0.          5 * .00435554
*
*-----$
*hydro      component name      component type
3570000      "accumout"      angl:jun
*
*hydro      from      to      area      f loss      r loss      vcabs
3570101      356060002      304040001      0.08322      0.          0.          01000

```

* hydro	vel/flw	f velocity	g velocity	j velocity	
3570201	0	4.76046-5	4.76046-5	0. * .0043463	
* hydro	component name	component type			
3220000	"coldleg"	pipe			
3220001	26				
* hydro	length				
3220101	0.08322				
* hydro	volume				
3220301	0.1925				
3220302	0.213				
3220303	0.1905				
* hydro	volume				
3220401	0.				
* hydro	volume				
3220501	0.				
* hydro	vert angle				
3220601	-7.6				
3220602	0.				
3220603	90.				
* hydro	delta z				
3220701	-0.0254				
3220702	-0.0256				
3220703	0.				
3220704	0.1905				
* hydro	roughness	hyd diam			
3220801	0.0000457	0.3255			
* hydro	f loss	r loss			
3220901	0.0	0.0			
3220902	0.182	0.182			
3220903	0.0	0.0			
3220904	0.182	0.182			
3220905	0.0	0.0			
* hydro	fe				
3221001	00				
* hydro	vcahs				
3221101	01000				
* hydro	ebt pressure	tempe			
3221201	0	1502347.	172709.	2410556. 0. 0.	1
3221202	0	1502361.	172709.	2410556. 0. 0.	2
3221203	0	1502374.	172709.4	2410556. 0. 0.	3
3221204	0	1502388.	172709.6	2410556. 0. 0.	4
3221205	0	1502401.	172710.	2410557. 0. 0.	5
3221206	0	1502415.	172710.	2410557. 0. 0.	6
3221207	0	1502428.	172710.3	2410557. 0. 0.	7
3221208	0	1502442.	172710.6	2410557. 0. 0.	8
3221209	0	1502455.	172710.8	2410558. 0. 0.	9
3221210	0	1502468.	172711.	2410558. 0. 0.	10
3221211	0	1502482.	172711.3	2410558. 0. 0.	11
3221212	0	1502496.	172711.5	2410558. 0. 0.	12
3221213	0	1496260.	172703.5	2410467. 0. 0.	13
3221214	0	1495972.	172703.8	2410462. 0. 0.	14
* hydro	vel/flw				
3221300	0				
* hydro	f flowrate	g flowrate	j flowrate		jun
3221301	7.80538	7.80538	0.	1 * 713.763	15
3221302	7.80538	7.80538	0.	2 * 713.763	16
3221303	7.80538	7.80538	0.	3 * 713.763	17
3221304	7.80538	7.80538	0.	4 * 713.763	18
3221305	7.80538	7.80538	0.	5 * 713.763	19
3221306	7.80538	7.80538	0.	6 * 713.763	20
3221307	7.80538	7.80538	0.	7 * 713.763	21
3221308	7.80538	7.80538	0.	8 * 713.763	22
3221309	7.80538	7.80538	0.	9 * 713.763	23
3221310	7.80538	7.80538	0.	10 * 713.763	24
3221311	7.80538	7.80538	0.	11 * 713.763	25
3221312	7.80538	7.80538	0.	12 * 713.763	26
3221313	7.8054	7.8054	0.	13 * 713.763	
3221314	7.8054	7.8054	0.	14 * 713.763	
3221315	7.8054	7.8054	0.	15 * 713.763	
3221316	7.8054	7.8054	0.	16 * 713.763	
3221317	7.8054	7.8054	0.	17 * 713.763	
3221318	7.8054	7.8054	0.	18 * 713.763	
3221319	7.8054	7.8054	0.	19 * 713.763	
3221320	7.8054	7.8054	0.	20 * 713.763	
3221321	7.8054	7.8054	0.	21 * 713.763	
3221322	7.80541	7.80541	0.	22 * 713.763	
3221323	7.80543	8.41258	0.	23 * 713.763	
3221324	7.80544	8.41263	0.	24 * 713.763	
3221325	7.80545	8.41269	0.	25 * 713.763	
* primary coolant pump - loop 3					
* hydro	component name	component type			
3240000	"rcpump3"	pump			
* hydro	area	length		volume	
3240101	0.	0.500		0.7739	
* hydro	horz angle	vert angle		delta z	
3240102	0.	0.		0.	
* hydro	equil flag				
3240103	00				
* hydro	from	jun area	f loss	r loss	vcahs
3240108	322010000	0.	0.00	0.00	01000

* Assume k=2.0 for strainer loss coefficient									
*hydro	to	jun area	f loss	r loss	vcchs				
3240109	33600000	0.	2.0	2.0	01000				
*hydro	ebt pressure	tempe							vol
3261201	0	3151684.			172745.7	2419673.	0.0.		1
3261202	0	3151454.			172746.	2419673.	0.0.		2
3261203	0	3151207.			172746.	2419674.	0.0.		3
3261204	0	3150960.			172746.3	2419674.	0.0.		4
3261205	0	3150713.			172746.6	2419674.	0.0.		5
*hydro	vel/flw								
3261300	0								
*hydro	f flowrate	g flowrate	j flowrate						jun
3261301	7.79975	7.79975	0.						1 * 713.762
3261302	7.79975	7.79975	0.						2 * 713.762
3261303	7.79975	7.79975	0.						3 * 713.762
3261304	7.79975	7.79975	0.						4 * 713.762
*hydro	from	to	area	f loss	r loss				
3280101	326010000	329000000	0.08317	0.98	0.98				vcchs
3280101	326010000	329000000	0.08317	0.98	0.98				01100
*hydro	vel/flw	f flowrate	g flowrate	j flowrate					
3280201	0	7.79975	7.79975	0.					0. * 713.762
*hydro	valve type								
3280300	chkv								
*hydro	chkv type	init. posn	back press	leak ratio					
3280301	0	0	0.	0.					
*hydro	component name	component type							
3290000	"eljoin"	pipe							
3290001	31								
*hydro	vol area								vol
3290101	0.08122								31
*hydro	length								vol
3290301	0.2016								31
*hydro	volume								vol
3290401	0.								31
*hydro	volume								vol
3290501	0.								31
*hydro	vert angle								vol
3290601	0.0								31
*hydro	delta z								vol
3290701	0.0								31
*hydro	roughness	hyd diam							vol
3290801	0.0000457	0.3255							31
*hydro	f loss	r loss							jun
3290901	0.0	0.0							30
*hydro	fe								vol
3261001	vcchs								

3581211	0	3100661.	172675.6	2419713.0	0.0	11	3581276	0	3084766.	172690.	2419726.0	0.0	76
3581212	0	3100416.	172676.	2419713.0	0.0	12	3581277	0	3084521.	172690.3	2419726.0	0.0	77
3581213	0	3100172.	172676.	2419714.0	0.0	13	3581278	0	3084277.	172690.5	2419726.0	0.0	78
3581214	0	3099927.	172676.3	2419714.0	0.0	14	3581279	0	3084032.	172690.8	2419726.0	0.0	79
3581215	0	3099682.	172676.5	2419714.0	0.0	15	3581280	0	3083788.	172691.	2419726.0	0.0	80
3581216	0	3099438.	172676.8	2419714.0	0.0	16	*						
3581217	0	3099194.	172677.	2419714.0	0.0	17	3581300	0					
3581218	0	3098949.	172677.2	2419714.0	0.0	18	3581301	7.79988	7.79988	0.	7.79988	0.	1 * 713.762
3581219	0	3098704.	172677.4	2419714.0	0.0	19	3581302	7.79986	7.79986	0.	7.79986	0.	2 * 713.762
3581220	0	3098460.	172677.6	2419715.0	0.0	20	3581303	7.79986	7.79986	0.	7.79986	0.	3 * 713.762
3581221	0	3098216.	172678.	2419715.0	0.0	21	3581304	7.79986	7.79986	0.	7.79986	0.	4 * 713.762
3581222	0	3097971.	172678.	2419715.0	0.0	22	3581305	7.79986	7.79986	0.	7.79986	0.	5 * 713.762
3581223	0	3097726.	172678.3	2419715.0	0.0	23	3581306	7.79987	7.79987	0.	7.79987	0.	6 * 713.762
3581224	0	3097482.	172678.5	2419716.0	0.0	24	3581307	7.79987	7.79987	0.	7.79987	0.	7 * 713.762
3581225	0	3097237.	172678.8	2419716.0	0.0	25	3581308	7.79987	7.79987	0.	7.79987	0.	8 * 713.762
3581226	0	3096993.	172679.	2419716.0	0.0	26	3581309	7.79987	7.79987	0.	7.79987	0.	9 * 713.762
3581227	0	3096748.	172679.2	2419716.0	0.0	27	3581310	7.79987	7.79987	0.	7.79987	0.	10 * 713.762
3581228	0	3096504.	172679.4	2419716.0	0.0	28	3581311	7.79987	7.79987	0.	7.79987	0.	11 * 713.762
3581229	0	3096259.	172679.6	2419716.0	0.0	29	3581312	7.79987	7.79987	0.	7.79987	0.	12 * 713.762
3581230	0	3096014.	172680.	2419717.0	0.0	30	3581313	7.79987	7.79987	0.	7.79987	0.	13 * 713.762
3581231	0	3095770.	172680.	2419717.0	0.0	31	3581314	7.79987	7.79987	0.	7.79987	0.	14 * 713.762
3581232	0	3095526.	172680.3	2419717.0	0.0	32	3581315	7.79987	7.79987	0.	7.79987	0.	15 * 713.762
3581233	0	3095281.	172680.5	2419717.0	0.0	33	3581316	7.79987	7.79987	0.	7.79987	0.	16 * 713.762
3581234	0	3095036.	172680.8	2419718.0	0.0	34	3581317	7.79987	7.79987	0.	7.79987	0.	17 * 713.762
3581235	0	3094792.	172681.	2419718.0	0.0	35	3581318	7.79988	7.79988	0.	7.79988	0.	18 * 713.762
3581236	0	3094547.	172681.2	2419718.0	0.0	36	3581319	7.79988	7.79988	0.	7.79988	0.	19 * 713.762
3581237	0	3094303.	172681.4	2419718.0	0.0	37	3581320	7.79988	7.79988	0.	7.79988	0.	20 * 713.762
3581238	0	3094058.	172681.6	2419718.0	0.0	38	3581321	7.79988	7.79988	0.	7.79988	0.	21 * 713.762
3581239	0	3093814.	172682.	2419718.0	0.0	39	3581322	7.79988	7.79988	0.	7.79988	0.	22 * 713.762
3581240	0	3093569.	172682.	2419719.0	0.0	40	3581323	7.79988	7.79988	0.	7.79988	0.	23 * 713.762
3581241	0	3093325.	172682.3	2419719.0	0.0	41	3581324	7.79988	7.79988	0.	7.79988	0.	24 * 713.762
3581242	0	3093080.	172682.5	2419719.0	0.0	42	3581325	7.79988	7.79988	0.	7.79988	0.	25 * 713.762
3581243	0	3092836.	172682.8	2419719.0	0.0	43	3581326	7.79988	7.79988	0.	7.79988	0.	26 * 713.762
3581244	0	3092591.	172683.	2419720.0	0.0	44	3581327	7.79988	7.79988	0.	7.79988	0.	27 * 713.762
3581245	0	3092346.	172683.2	2419720.0	0.0	45	3581328	7.79989	7.79989	0.	7.79989	0.	28 * 713.762
3581246	0	3092102.	172683.4	2419720.0	0.0	46	3581329	7.79989	7.79989	0.	7.79989	0.	29 * 713.762
3581247	0	3091858.	172683.6	2419720.0	0.0	47	3581330	7.79989	7.79989	0.	7.79989	0.	30 * 713.762
3581248	0	3091613.	172684.	2419720.0	0.0	48	3581331	7.79989	7.79989	0.	7.79989	0.	31 * 713.762
3581249	0	3091368.	172684.	2419720.0	0.0	49	3581332	7.79989	7.79989	0.	7.79989	0.	32 * 713.762
3581250	0	3091124.	172684.3	2419720.0	0.0	50	3581333	7.79989	7.79989	0.	7.79989	0.	33 * 713.762
3581251	0	3090879.	172684.5	2419721.0	0.0	51	3581334	7.79989	7.79989	0.	7.79989	0.	34 * 713.762
3581252	0	3090635.	172684.8	2419721.0	0.0	52	3581335	7.79989	7.79989	0.	7.79989	0.	35 * 713.762
3581253	0	3090390.	172685.	2419721.0	0.0	53	3581336	7.7999	7.7999	0.	7.7999	0.	36 * 713.762
3581254	0	3090146.	172685.2	2419721.0	0.0	54	3581337	7.7999	7.7999	0.	7.7999	0.	37 * 713.762
3581255	0	3089901.	172685.4	2419722.0	0.0	55	3581338	7.7999	7.7999	0.	7.7999	0.	38 * 713.762
3581256	0	3089657.	172685.6	2419722.0	0.0	56	3581339	7.7999	7.7999	0.	7.7999	0.	39 * 713.762
3581257	0	3089412.	172686.	2419722.0	0.0	57	3581340	7.7999	7.7999	0.	7.7999	0.	40 * 713.762
3581258	0	3089168.	172686.	2419722.0	0.0	58	3581341	7.7999	7.7999	0.	7.7999	0.	41 * 713.762
3581259	0	3088923.	172686.3	2419722.0	0.0	59	3581342	7.7999	7.7999	0.	7.7999	0.	42 * 713.762
3581260	0	3088678.	172686.5	2419722.0	0.0	60	3581343	7.7999	7.7999	0.	7.7999	0.	43 * 713.762
3581261	0	3088434.	172686.8	2419723.0	0.0	61	3581344	7.7999	7.7999	0.	7.7999	0.	44 * 713.762
3581262	0	3088190.	172687.	2419723.0	0.0	62	3581345	7.7999	7.7999	0.	7.7999	0.	45 * 713.762
3581263	0	3087945.	172687.2	2419723.0	0.0	63	3581346	7.7999	7.7999	0.	7.7999	0.	46 * 713.762
3581264	0	3087700.	172687.4	2419723.0	0.0	64	3581347	7.7999	7.7999	0.	7.7999	0.	47 * 713.762
3581265	0	3087456.	172687.6	2419724.0	0.0	65	3581348	7.7999	7.7999	0.	7.7999	0.	48 * 713.762
3581266	0	3087211.	172688.	2419724.0	0.0	66	3581349	7.7999	7.7999	0.	7.7999	0.	49 * 713.762
3581267	0	3086967.	172688.	2419724.0	0.0	67	3581350	7.7999	7.7999	0.	7.7999	0.	50 * 713.762
3581268	0	3086722.	172688.3	2419724.0	0.0	68	3581351	7.79991	7.79991	0.	7.79991	0.	51 * 713.762
3581269	0	3086478.	172688.5	2419724.0	0.0	69	3581352	7.79991	7.79991	0.	7.79991	0.	52 * 713.762
3581270	0	3086233.	172688.8	2419724.0	0.0	70	3581353	7.79991	7.79991	0.	7.79991	0.	53 * 713.762
3581271	0	3085988.	172689.	2419725.0	0.0	71	3581354	7.79991	7.79991	0.	7.79991	0.	54 * 713.762
3581272	0	3085744.	172689.2	2419725.0	0.0	72	3581355	7.79991	7.79991	0.	7.79991	0.	55 * 713.762
3581273	0	3085500.	172689.4	2419725.0	0.0	73	3581356	7.79991	7.79991	0.	7.79991	0.	56 * 713.762
3581274	0	3085255.	172689.6	2419725.0	0.0	74	3581357	7.79991	7.79991	0.	7.79991	0.	57 * 713.762
3581275	0	3085010.	172690.	2419726.0	0.0	75	3581358	7.79991	7.79991	0.	7.79991	0.	58 * 713.762

3620901	7.79992	0.	59 * 713.762	3620901	0.0	0.0	172686.4	2419732.0	0.0	1
3620902	7.79992	0.	60 * 713.762	3620902	0.182	0.182	172633.7	2419732.0	0.0	2
3620903	7.79992	0.	61 * 713.762	3620903	0.182	0.182	172634.	2419732.0	0.0	3
*	7.79992	0.	62 * 713.762	*			172634.	2419732.0	0.0	4
*hydro	7.79992	0.	63 * 713.762	*hydro	fe		172634.3	2419732.0	0.0	5
3621001	7.79992	0.	64 * 713.762	3621001	00		172634.7	2419732.0	0.0	6
*	7.79992	0.	65 * 713.762	*			172635.	2419732.0	0.0	7
*hydro	7.79992	0.	66 * 713.762	*hydro	vcas		172635.2	2419732.0	0.0	8
3621101	7.79992	0.	67 * 713.762	3621101	01000		172635.5	2419744.0	0.0	9
*	7.79992	0.	68 * 713.762	*			172635.7	2419744.0	0.0	10
*hydro	7.79993	0.	69 * 713.762	*hydro	ebc pressure	tempe	172636.	2419747.0	0.0	11
3621201	7.79993	0.	70 * 713.762	3621201	0	3077452.	172636.2	2419750.0	0.0	12
3621202	7.79993	0.	71 * 713.762	3621202	0	3077218.	172636.4	2419754.0	0.0	13
3621203	7.79993	0.	72 * 713.762	3621203	0	3076983.	172636.7	2419757.0	0.0	14
3621204	7.79993	0.	73 * 713.762	3621204	0	3076748.	172637.4	2419760.0	0.0	15
3621205	7.79993	0.	74 * 713.762	3621205	0	3076514.	172637.6	2419763.0	0.0	16
3621206	7.79993	0.	75 * 713.762	3621206	0	3076278.	172638.3	2419767.0	0.0	17
3621207	7.79993	0.	76 * 713.762	3621207	0	3076044.	172639.	2419770.0	0.0	18
3621208	7.79993	0.	77 * 713.762	3621208	0	3070774.	172640.3	2419774.0	0.0	19
3621209	7.79993	0.	78 * 713.762	3621209	0	3066565.	172641.2	2419777.0	0.0	20
3621210	7.79993	0.	79 * 713.762	3621210	0	3062356.	172641.5	2419778.0	0.0	21
3621211	7.79993	0.		3621211	0	3058146.	172642.2	2419780.0	0.0	22
3621212	7.79993	0.		3621212	0	3053937.	172643.4	2419784.0	0.0	23
3621213	7.79993	0.		3621213	0	3049728.	172643.6	2419787.0	0.0	24
3621214	7.79993	0.		3621214	0	3045518.	172643.7	2419791.0	0.0	25
3621215	7.79993	0.		3621215	0	3041309.	172644.1	2419792.0	0.0	26
3621216	7.79993	0.		3621216	0	3037100.	172644.4	2419785.0	0.0	27
3621217	7.79993	0.		3621217	0	3032890.	172644.6	2419778.0	0.0	28
3621218	7.79993	0.		3621218	0	3028681.	172644.8	2419770.0	0.0	29
3621219	7.79993	0.		3621219	0	3024472.	172645.1	2419763.0	0.0	30
3621220	7.79993	0.		3621220	0	3020262.	172645.3	2419756.0	0.0	31
3621221	7.79993	0.		3621221	0	3016053.	172645.5	2419749.0	0.0	32
3621222	7.79993	0.		3621222	0	3011844.	172645.7	2419742.0	0.0	33
3621223	7.79993	0.		3621223	0	3007634.	172646.1	2419734.0	0.0	34
3621224	7.79993	0.		3621224	0	3003424.	172646.2	2419727.0	0.0	35
3621225	7.79993	0.		3621225	0	2999215.	172646.4	2419720.0	0.0	36
3621226	7.79993	0.		3621226	0	2995006.	172646.7	2419712.0	0.0	37
3621227	7.79993	0.		3621227	0	2990796.	172647.1	2419705.0	0.0	38
3621228	7.79993	0.		3621228	0	2986586.	172647.2	2419698.0	0.0	39
3621229	7.79993	0.		3621229	0	2982377.	172647.4	2419691.0	0.0	40
3621230	7.79993	0.		3621230	0	2978167.	172647.7	2419684.0	0.0	41
3621231	7.79993	0.		3621231	0	2973958.	172648.1	2419676.0	0.0	42
3621232	7.79993	0.		3621232	0	2969748.	172648.3	2419669.0	0.0	43
3621233	7.79993	0.		3621233	0	2965538.	172648.4	2419662.0	0.0	44
3621234	7.79993	0.		3621234	0	2961329.	172648.6	2419654.0	0.0	45
3621235	7.79993	0.		3621235	0	2957119.	172648.7	2419647.0	0.0	46
3621236	7.79993	0.		3621236	0	2952910.	172648.8	2419640.0	0.0	47
3621237	7.79993	0.		3621237	0	2948700.	172648.9	2419632.0	0.0	48
3621238	7.79993	0.		3621238	0	2944490.	172649.1	2419625.0	0.0	49
3621239	7.79993	0.		3621239	0	2940280.	172649.2	2419617.0	0.0	50
3621240	7.79993	0.		3621240	0	2936071.	172649.3	2419610.0	0.0	51
3621241	7.79993	0.		3621241	0	2931861.	172649.4	2419602.0	0.0	52
3621242	7.79993	0.		3621242	0	2927652.	172649.5	2419595.0	0.0	53
3621243	7.79993	0.		3621243	0	2923442.	172649.6	2419588.0	0.0	54
3621244	7.79993	0.		3621244	0	2919232.	172649.7	2419580.0	0.0	55
3621245	7.79993	0.		3621245	0	2915022.	172649.8	2419572.0	0.0	56
3621246	7.79993	0.		3621246	0	2910812.	172649.9	2419564.0	0.0	57
3621247	7.79993	0.		3621247	0	2906602.	172650.0	2419556.0	0.0	58
3621248	7.79993	0.		3621248	0	2902392.	172650.1	2419548.0	0.0	59
3621249	7.79993	0.		3621249	0	2898183.	172650.2	2419540.0	0.0	60
3621250	7.79993	0.		3621250	0	2893973.	172650.3	2419532.0	0.0	61
3621251	7.79993	0.		3621251	0	2889763.	172650.4	2419524.0	0.0	62
3621252	7.79993	0.		3621252	0	2885553.	172650.5	2419516.0	0.0	63
3621253	7.79993	0.		3621253	0	2881343.	172650.6	2419508.0	0.0	64
3621254	7.79993	0.		3621254	0	2877133.	172650.7	2419500.0	0.0	65

3621255	0	2872923.	172646.3	2419573.	0. 0.	55	3621340	7.8004	8.38282	0.	40 * 713.762		
3621256	0	2868713.	172646.5	2419566.	0. 0.	56	3621341	7.80042	8.3829	0.	41 * 713.762		
3621257	0	2864503.	172646.8	2419558.	0. 0.	57	3621342	7.80043	8.38298	0.	42 * 713.762		
3621258	0	2860293.	172647.	2419550.	0. 0.	58	3621343	7.80045	8.38306	0.	43 * 713.762		
3621259	0	2856083.	172647.3	2419543.	0. 0.	59	3621344	7.80046	8.38313	0.	44 * 713.762		
3621260	0	2851873.	172647.5	2419536.	0. 0.	60	3621345	7.80048	8.38321	0.	45 * 713.762		
3621261	0	2847663.	172647.8	2419528.	0. 0.	61	3621346	7.8005	8.38329	0.	46 * 713.762		
3621262	0	2843453.	172648.	2419521.	0. 0.	62	3621347	7.8005	8.38337	0.	47 * 713.762		
3621263	0	2839243.	172648.2	2419513.	0. 0.	63	3621348	7.80052	8.38344	0.	48 * 713.762		
3621264	0	2835033.	172648.5	2419506.	0. 0.	64	3621349	7.80054	8.38352	0.	49 * 713.762		
3621265	0	2830823.	172648.7	2419498.	0. 0.	65	3621350	7.80055	8.3836	0.	50 * 713.762		
3621266	0	2826612.	172649.	2419491.	0. 0.	66	3621351	7.80057	8.38368	0.	51 * 713.762		
3621267	0	2822402.	172649.2	2419483.	0. 0.	67	3621352	7.80058	8.38375	0.	52 * 713.762		
3621268	0	2818192.	172649.4	2419476.	0. 0.	68	3621353	7.8006	8.38383	0.	53 * 713.762		
3621269	0	2813982.	172649.7	2419468.	0. 0.	69	3621354	7.80061	8.38391	0.	54 * 713.762		
3621270	0	2809772.	172650.	2419460.	0. 0.	70	3621355	7.80062	8.38399	0.	55 * 713.762		
3621271	0	2805562.	172650.	2419453.	0. 0.	71	3621356	7.80064	8.38406	0.	56 * 713.762		
3621272	0	2801352.	172650.4	2419446.	0. 0.	72	3621357	7.80065	8.38414	0.	57 * 713.762		
3621273	0	2797141.	172650.6	2419438.	0. 0.	73	3621358	7.80067	8.38422	0.	58 * 713.762		
3621274	0	2792931.	172651.	2419430.	0. 0.	74	3621359	7.80068	8.3843	0.	59 * 713.762		
3621275	0	2788721.	172651.	2419423.	0. 0.	75	3621360	7.8007	8.38437	0.	60 * 713.762		
3621276	0	2784510.	172651.4	2419415.	0. 0.	76	3621361	7.80071	8.38445	0.	61 * 713.762		
3621277	0	2779991.	172651.5	2419407.	0. 0.	77	3621362	7.80073	8.38453	0.	62 * 713.762		
* hydro							3621363	7.80074	8.38461	0.	63 * 713.762		
3621300	0						3621364	7.80075	8.38469	0.	64 * 713.762		
3621301	7.79995	7.79995	0.	0.	1 * 713.762		3621365	7.80077	8.38476	0.	65 * 713.762		
3621302	7.79992	7.79992	0.	0.	2 * 713.762		3621366	7.80078	8.38484	0.	66 * 713.762		
3621303	7.79992	7.79992	0.	0.	3 * 713.762		3621367	7.8008	8.38492	0.	67 * 713.762		
3621304	7.79992	7.79992	0.	0.	4 * 713.762		3621368	7.80081	8.385	0.	68 * 713.762		
3621305	7.79992	7.79992	0.	0.	5 * 713.762		3621369	7.80083	8.38508	0.	69 * 713.762		
3621306	7.79992	7.79992	0.	0.	6 * 713.762		3621370	7.80084	8.38516	0.	70 * 713.762		
3621307	7.79992	7.79992	0.	0.	7 * 713.762		3621371	7.80086	8.38523	0.	71 * 713.762		
3621308	7.79994	8.38038	0.	0.	8 * 713.762		3621372	7.80087	8.38531	0.	72 * 713.762		
3621309	7.79995	8.38045	0.	0.	9 * 713.762		3621373	7.80089	8.38539	0.	73 * 713.762		
3621310	7.79997	8.38053	0.	0.	10 * 713.762		3621374	7.8009	8.38547	0.	74 * 713.762		
3621311	7.79998	8.3806	0.	0.	11 * 713.762		3621375	7.80091	8.38555	0.	75 * 713.762		
3621312	7.8	8.38068	0.	0.	12 * 713.762		3621376	7.80093	8.38563	0.	76 * 713.762		
* hydro													
3621313	7.80001	8.38076	0.	0.	13 * 713.762		* hydro	component name	component type				
3621314	7.80003	8.38083	0.	0.	14 * 713.762		3720000	"inlet"	sngl jun				
3621315	7.80004	8.3809	0.	0.	15 * 713.762		* hydro	from	to	area	f loss	r loss	vcahs
3621316	7.80006	8.38098	0.	0.	16 * 713.762		3720101	362010000	371000000	0.03095	0.2062	0.4513	01000
3621317	7.80007	8.38106	0.	0.	17 * 713.762		* hydro	jun hyd diam					
3621318	7.80009	8.38114	0.	0.	18 * 713.762		3720110	0.1985	0.0 1.0 1.0				
3621319	7.8001	8.38121	0.	0.	19 * 713.762		* hydro	vel/flw	f velocity	g velocity	j velocity		
3621320	7.80011	8.38129	0.	0.	20 * 713.762		3720201	0	20.9756	21.84074	0. * 713.762		
3621321	7.80013	8.38137	0.	0.	21 * 713.762		* hydro	component name	component type				
3621322	7.80014	8.38144	0.	0.	22 * 713.762		3710000	"ifdthrot"	pipe				
3621323	7.80016	8.38152	0.	0.	23 * 713.762		3710001	9					
3621324	7.80017	8.3816	0.	0.	24 * 713.762		* hydro	vol area				vol	
3621325	7.80019	8.38167	0.	0.	25 * 713.762		3710101	0.03095				9	
3621326	7.8002	8.38175	0.	0.	26 * 713.762		* hydro	length				vol	
3621327	7.80022	8.38183	0.	0.	27 * 713.762		3710301	0.15				2	
3621328	7.80023	8.3819	0.	0.	28 * 713.762		* hydro	0.255				4	
3621329	7.80025	8.38198	0.	0.	29 * 713.762		3710302	0.196				9	
3621330	7.80026	8.38205	0.	0.	30 * 713.762		* hydro						
3621331	7.80027	8.38213	0.	0.	31 * 713.762		3710303						
3621332	7.80029	8.38221	0.	0.	32 * 713.762		* hydro						
3621333	7.8003	8.38229	0.	0.	33 * 713.762		3710101						
3621334	7.80032	8.38236	0.	0.	34 * 713.762		* hydro						
3621335	7.80033	8.38244	0.	0.	35 * 713.762		3710301						
3621336	7.80035	8.38252	0.	0.	36 * 713.762		3710302						
3621337	7.80036	8.3826	0.	0.	37 * 713.762		3710303						
3621338	7.80038	8.38267	0.	0.	38 * 713.762		* hydro						
3621339	7.80039	8.38275	0.	0.	39 * 713.762								

*hydro	3710401	volume	0.	vol	9	3730201	0	20.97913	20.97913	0. * 713.762	
*						*					
*hydro	3710501	volume	0.	vol	9	*hydro	3740000	component name	component type		
*						*		"psvaw-3"	pipe		
*hydro	3710601	vert angle	-90.0	vol	2	*hydro	3740001	2			
*						*					
*hydro	3710602	delta z	-0.15	vol	2	*hydro	3740101	vol area	0.08322	vol	2
*						*					
*hydro	3710701	delta z	0.0	vol	2	*hydro	3740301	length	0.25	vol	2
*						*					
*hydro	3710702	roughness	0.0000457	vol	9	*hydro	3740401	volume	0.	vol	2
*						*					
*hydro	3710801	f loss	0.0	jun	1	*hydro	3740501	volume	0.	vol	2
*						*					
*hydro	3710901	r loss	0.0	2		*hydro	3740601	vert angle	45.0	vol	2
*						*					
*hydro	3710902	f loss	0.196	3		*hydro	3740701	delta z	0.25	vol	2
*						*					
*hydro	3710903	r loss	0.0	4		*hydro	3740801	roughness	0.0000457	vol	2
*						*					
*hydro	3710904	f loss	0.0	8		*hydro	3740901	f loss	0.0	jun	1
*						*					
*hydro	3711001	fe	00	vol	9	*hydro	3741001	fe	00	vol	2
*						*					
*hydro	3711101	vcchs	01000	jun	8	*hydro	3741101	vcchs	01000	jun	1
*						*					
*hydro	3711201	ebt pressure	tempe	vol	1	*hydro	3741201	ebt pressure	tempe	vol	1
*						*					
*hydro	3711301	f flowrate	g flowrate	jun		*hydro	3741301	f flowrate	g flowrate	jun	
*						*					
*hydro	3711401	area	0.03095	vol	1	*hydro	3741501	area	0.03095	vol	1
*						*					
*hydro	3711501	length	3.28	vol	1	*hydro	3741601	length	3.28	vol	1
*						*					
*hydro	3711601	roughness	0.0000457	vol	9	*hydro	3741701	roughness	0.0000457	vol	9
*						*					
*hydro	3711701	vcchs	01000	jun	8	*hydro	3741801	vcchs	01000	jun	8
*						*					
*hydro	3711801	ebt pressure	tempe	vol	1	*hydro	3741901	ebt pressure	tempe	vol	1
*						*					
*hydro	3711901	f flowrate	g flowrate	jun		*hydro	3742001	f flowrate	g flowrate	jun	
*						*					
*hydro	3712001	area	0.03095	vol	1	*hydro	3742101	area	0.03095	vol	1
*						*					
*hydro	3712101	length	3.28	vol	1	*hydro	3742201	length	3.28	vol	1
*						*					
*hydro	3712201	roughness	0.0000457	vol	9	*hydro	3742301	roughness	0.0000457	vol	9
*						*					
*hydro	3712301	vcchs	01000	jun	8	*hydro	3742401	vcchs	01000	jun	8
*						*					
*hydro	3712401	ebt pressure	tempe	vol	1	*hydro	3742501	ebt pressure	tempe	vol	1
*						*					
*hydro	3712501	f flowrate	g flowrate	jun		*hydro	3742601	f flowrate	g flowrate	jun	
*						*					
*hydro	3712601	area	0.03095	vol	1	*hydro	3742701	area	0.03095	vol	1
*						*					
*hydro	3712701	length	3.28	vol	1	*hydro	3742801	length	3.28	vol	1
*						*					
*hydro	3712801	roughness	0.0000457	vol	9	*hydro	3742901	roughness	0.0000457	vol	9
*						*					
*hydro	3712901	vcchs	01000	jun	8	*hydro	3743001	vcchs	01000	jun	8
*						*					
*hydro	3713001	ebt pressure	tempe	vol	1	*hydro	3743101	ebt pressure	tempe	vol	1
*						*					
*hydro	3713101	f flowrate	g flowrate	jun		*hydro	3743201	f flowrate	g flowrate	jun	
*						*					
*hydro	3713201	area	0.03095	vol	1	*hydro	3743301	area	0.03095	vol	1
*						*					
*hydro	3713301	length	3.28	vol	1	*hydro	3743401	length	3.28	vol	1
*						*					
*hydro	3713401	roughness	0.0000457	vol	9	*hydro	3743501	roughness	0.0000457	vol	9
*						*					
*hydro	3713501	vcchs	01000	jun	8	*hydro	3743601	vcchs	01000	jun	8
*						*					
*hydro	3713601	ebt pressure	tempe	vol	1	*hydro	3743701	ebt pressure	tempe	vol	1
*						*					
*hydro	3713701	f flowrate	g flowrate	jun		*hydro	3743801	f flowrate	g flowrate	jun	
*						*					
*hydro	3713801	area	0.03095	vol	1	*hydro	3743901	area	0.03095	vol	1
*						*					
*hydro	3713901	length	3.28	vol	1	*hydro	3744001	length	3.28	vol	1
*						*					
*hydro	3714001	roughness	0.0000457	vol	9	*hydro	3744101	roughness	0.0000457	vol	9
*						*					
*hydro	3714101	vcchs	01000	jun	8	*hydro	3744201	vcchs	01000	jun	8
*						*					
*hydro	3714201	ebt pressure	tempe	vol	1	*hydro	3744301	ebt pressure	tempe	vol	1
*						*					
*hydro	3714301	f flowrate	g flowrate	jun		*hydro	3744401	f flowrate	g flowrate	jun	
*						*					
*hydro	3714401	area	0.03095	vol	1	*hydro	3744501	area	0.03095	vol	1
*						*					
*hydro	3714501	length	3.28	vol	1	*hydro	3744601	length	3.28	vol	1
*						*					
*hydro	3714601	roughness	0.0000457	vol	9	*hydro	3744701	roughness	0.0000457	vol	9
*						*					
*hydro	3714701	vcchs	01000	jun	8	*hydro	3744801	vcchs	01000	jun	8
*						*					
*hydro	3714801	ebt pressure	tempe	vol	1	*hydro	3744901	ebt pressure	tempe	vol	1
*						*					
*hydro	3714901	f flowrate	g flowrate	jun		*hydro	3745001	f flowrate	g flowrate	jun	
*						*					
*hydro	3715001	area	0.03095	vol	1	*hydro	3745101	area	0.03095	vol	1
*						*					
*hydro	3715101	length	3.28	vol	1	*hydro	3745201	length	3.28	vol	1
*						*					
*hydro	3715201	roughness	0.0000457	vol	9	*hydro	3745301	roughness	0.0000457	vol	9
*						*					
*hydro	3715301	vcchs	01000	jun	8	*hydro	3745401	vcchs	01000	jun	8
*						*					
*hydro	3715401	ebt pressure	tempe	vol	1	*hydro	3745501	ebt pressure	tempe	vol	1
*						*					
*hydro	3715501	f flowrate	g flowrate	jun		*hydro	3745601	f flowrate	g flowrate	jun	
*						*					
*hydro	3715601	area	0.03095	vol	1	*hydro	3745701	area	0.03095	vol	1
*						*					
*hydro	3715701	length	3.28	vol	1	*hydro	3745801	length	3.28	vol	1
*						*					
*hydro	3715801	roughness	0.0000457	vol	9	*hydro	3745901	roughness	0.0000457	vol	9
*						*					
*hydro	3715901	vcchs	01000	jun	8	*hydro	3746001	vcchs	01000	jun	8
*						*					
*hydro	3716001	ebt pressure	tempe	vol	1	*hydro	3746101	ebt pressure	tempe	vol	1
*						*					
*hydro	3716101	f flowrate	g flowrate	jun		*hydro	3746201	f flowrate	g flowrate	jun	
*						*					
*hydro	3716201	area	0.03095	vol	1	*hydro	3746301	area	0.03095	vol	1
*						*					
*hydro	3716301	length	3.28	vol	1	*hydro	3746401	length	3.28	vol	1
*						*					
*hydro	3716401	roughness	0.0000457	vol	9	*hydro	3746501	roughness	0.0000457	vol	9
*						*					
*hydro	3716501	vcchs	01000	jun	8	*hydro	3746601	vcchs	01000	jun	8
*						*					
*hydro	3716601	ebt pressure	tempe	vol	1	*hydro	3746701	ebt pressure	tempe	vol	1
*						*					
*hydro	3716701	f flowrate	g flowrate	jun		*hydro	3746801	f flowrate	g flowrate	jun	
*						*					
*hydro	3716801	area	0.03095	vol	1	*hydro	3746901	area	0.03095	vol	1
*						*					
*hydro	3716901	length	3.28	vol	1	*hydro	3747001	length	3.28	vol	1
*						*					
*hydro	3717001	roughness	0.0000457	vol	9	*hydro	3747101	roughness	0.0000457	vol	9
*						*					
*hydro	3717101	vcchs	01000	jun	8	*hydro	3747201	vcchs	01000	jun	8
*						*					
*hydro	3717201	ebt pressure	tempe	vol	1	*hydro	3747301	ebt pressure	tempe	vol	1
*						*					
*hydro	3717301	f flowrate	g flowrate	jun		*hydro	3747401	f flowrate	g flowrate	jun	
*						*					
*hydro	3717401	area	0.03095	vol	1	*hydro	3747501	area	0.03095	vol	1
*						*					
*hydro	3717501	length	3.28	vol	1	*hydro	3747601	length	3.28	vol	1
*						*					
*hydro	3717601	roughness	0.0000457	vol	9	*hydro	3747701	roughness	0.0000457	vol	9
*						*					
*hydro	3717701	vcchs	01000	jun	8	*hydro	3747801	vcchs	01000	jun	8
*						*					
*hydro	3717801	ebt pressure	tempe	vol	1	*hydro	3747901	ebt pressure	tempe	vol	1
*						*					
*hydro	3717901	f flowrate	g flowrate	jun		*hydro	3748001	f flowrate	g flowrate	jun	
*											

4291319	-5.28798-7	-5.28798-7	0.	19	* -4.837115-5	4581206	0	2462377.	173872.	2418503. 0. 0.	6
4291320	-5.56643-7	-5.56643-7	0.	20	* -5.09183-5	4581207	0	2462377.	173872.4	2418503. 0. 0.	7
4291321	-5.84494-7	-5.84494-7	0.	21	* -5.34659-5	4581208	0	2462377.	173873.	2418503. 0. 0.	8
4291322	-6.12351-7	-6.12351-7	0.	22	* -5.6014-5	4581209	0	2462377.	173873.	2418503. 0. 0.	9
4291323	-6.40213-7	-6.40213-7	0.	23	* -5.85627-5	4581210	0	2462377.	173873.	2418503. 0. 0.	10
4291324	-6.68082-7	-6.68082-7	0.	24	* -6.1112-5	4581211	0	2462377.	173873.	2418503. 0. 0.	11
4291325	-6.95958-7	-6.95958-7	0.	25	* -6.36619-5	4581212	0	2462377.	173873.	2418503. 0. 0.	12
4291326	-7.2384-7	-7.2384-7	0.	26	* -6.62124-5	4581213	0	2462377.	173873.	2418503. 0. 0.	13
4291327	-7.5173-7	-7.5173-7	0.	27	* -6.87635-5	4581214	0	2462377.	173873.	2418503. 0. 0.	14
4291328	-7.79626-7	-7.79626-7	0.	28	* -7.13153-5	4581215	0	2462377.	173873.	2418503. 0. 0.	15
4291329	-8.0753-7	-8.0753-7	0.	29	* -7.38684-5	4581216	0	2462377.	173873.	2418503. 0. 0.	16
4291330	-8.35443-7	-8.35443-7	0.	30	* -7.64343-5	4581217	0	2462377.	173873.	2418503. 0. 0.	17
4291331	-8.63545-7	-8.63545-7	0.	31	* -7.91886-5	4581218	0	2462377.	173873.	2418503. 0. 0.	18
4291332	-8.91886-5	-8.91886-5	0.	32	* -8.21886-5	4581219	0	2462377.	173873.	2418503. 0. 0.	19
4291333	-9.21886-5	-9.21886-5	0.	33	* -8.52188-5	4581220	0	2462377.	173873.	2418503. 0. 0.	20
4291334	-9.52188-5	-9.52188-5	0.	34	* -8.82521-5	4581221	0	2462377.	173873.	2418503. 0. 0.	21
4291335	-9.82521-5	-9.82521-5	0.	35	* -9.12854-5	4581222	0	2462377.	173873.	2418503. 0. 0.	22
4291336	-10.12854-5	-10.12854-5	0.	36	* -9.43187-5	4581223	0	2462377.	173873.	2418503. 0. 0.	23
4291337	-10.43187-5	-10.43187-5	0.	37	* -9.73520-5	4581224	0	2462377.	173873.	2418503. 0. 0.	24
4291338	-10.73520-5	-10.73520-5	0.	38	* -10.03853-5	4581225	0	2462377.	173873.	2418503. 0. 0.	25
4291339	-11.03853-5	-11.03853-5	0.	39	* -10.34186-5	4581226	0	2462377.	173873.	2418503. 0. 0.	26
4291340	-11.34186-5	-11.34186-5	0.	40	* -10.64519-5	4581227	0	2462377.	173873.	2418503. 0. 0.	27
4291341	-11.64519-5	-11.64519-5	0.	41	* -10.94852-5	4581228	0	2462377.	173873.	2418503. 0. 0.	28
4291342	-11.94852-5	-11.94852-5	0.	42	* -11.25185-5	4581229	0	2462377.	173873.	2418503. 0. 0.	29
4291343	-12.25185-5	-12.25185-5	0.	43	* -11.55518-5	4581230	0	2462377.	173873.	2418503. 0. 0.	30
4291344	-12.55518-5	-12.55518-5	0.	44	* -11.85851-5	4581231	0	2462377.	173873.	2418503. 0. 0.	31
4291345	-12.85851-5	-12.85851-5	0.	45	* -12.16184-5	4581232	0	2462377.	173873.	2418503. 0. 0.	32
4291346	-13.16184-5	-13.16184-5	0.	46	* -12.46517-5	4581233	0	2462377.	173873.	2418503. 0. 0.	33
4291347	-13.46517-5	-13.46517-5	0.	47	* -12.76850-5	4581234	0	2462377.	173873.	2418503. 0. 0.	34
4291348	-13.76850-5	-13.76850-5	0.	48	* -13.07183-5	4581235	0	2462377.	173873.	2418503. 0. 0.	35
4291349	-14.07183-5	-14.07183-5	0.	49	* -13.37516-5	4581236	0	2462377.	173873.	2418503. 0. 0.	36
4291350	-14.37516-5	-14.37516-5	0.	50	* -13.67849-5	4581237	0	2462377.	173873.	2418503. 0. 0.	37
4291351	-14.67849-5	-14.67849-5	0.	51	* -13.98182-5	4581238	0	2462377.	173873.	2418503. 0. 0.	38
4291352	-14.98182-5	-14.98182-5	0.	52	* -14.28515-5	4581239	0	2462377.	173873.	2418503. 0. 0.	39
4291353	-15.28515-5	-15.28515-5	0.	53	* -14.58848-5	4581240	0	2462377.	173873.	2418503. 0. 0.	40
4291354	-15.58848-5	-15.58848-5	0.	54	* -14.89181-5	4581241	0	2462377.	173873.	2418503. 0. 0.	41
4291355	-15.89181-5	-15.89181-5	0.	55	* -15.19514-5	4581242	0	2462377.	173873.	2418503. 0. 0.	42
4291356	-16.19514-5	-16.19514-5	0.	56	* -15.49847-5	4581243	0	2462377.	173873.	2418503. 0. 0.	43
4291357	-16.49847-5	-16.49847-5	0.	57	* -15.80180-5	4581244	0	2462377.	173873.	2418503. 0. 0.	44
4291358	-16.80180-5	-16.80180-5	0.	58	* -16.10513-5	4581245	0	2462377.	173873.	2418503. 0. 0.	45
4291359	-17.10513-5	-17.10513-5	0.	59	* -16.40846-5	4581246	0	2462377.	173873.	2418503. 0. 0.	46
4291360	-17.40846-5	-17.40846-5	0.	60	* -16.71179-5	4581247	0	2462377.	173873.	2418503. 0. 0.	47
4291361	-17.71179-5	-17.71179-5	0.	61	* -17.01512-5	4581248	0	2462377.	173873.	2418503. 0. 0.	48
4291362	-18.01512-5	-18.01512-5	0.	62	* -17.31845-5	4581249	0	2462377.	173873.	2418503. 0. 0.	49
4291363	-18.31845-5	-18.31845-5	0.	63	* -17.62178-5	4581250	0	2462377.	173873.	2418503. 0. 0.	50
4291364	-18.62178-5	-18.62178-5	0.	64	* -17.92511-5	4581251	0	2462377.	173873.	2418503. 0. 0.	51
4291365	-18.92511-5	-18.92511-5	0.	65	* -18.22844-5	4581252	0	2462377.	173873.	2418503. 0. 0.	52
4291366	-19.22844-5	-19.22844-5	0.	66	* -18.53177-5	4581253	0	2462377.	173873.	2418503. 0. 0.	53
4291367	-19.53177-5	-19.53177-5	0.	67	* -18.83510-5	4581254	0	2462377.	173873.	2418503. 0. 0.	54
4291368	-19.83510-5	-19.83510-5	0.	68	* -19.13843-5	4581255	0	2462377.	173873.	2418503. 0. 0.	55
4291369	-20.13843-5	-20.13843-5	0.	69	* -19.44176-5	4581256	0	2462377.	173873.	2418503. 0. 0.	56
4291370	-20.44176-5	-20.44176-5	0.	70	* -19.74509-5	4581257	0	2462377.	173873.	2418503. 0. 0.	57
4291371	-20.74509-5	-20.74509-5	0.	71	* -20.04842-5	4581258	0	2462377.	173873.	2418503. 0. 0.	58
4291372	-21.04842-5	-21.04842-5	0.	72	* -20.35175-5	4581259	0	2462377.	173873.	2418503. 0. 0.	59
4291373	-21.35175-5	-21.35175-5	0.	73	* -20.65508-5	4581260	0	2462377.	173873.	2418503. 0. 0.	60
4291374	-21.65508-5	-21.65508-5	0.	74	* -20.95841-5	4581261	0	2462377.	173873.	2418503. 0. 0.	61
4291375	-21.95841-5	-21.95841-5	0.	75	* -21.26174-5	4581262	0	2462377.	173873.	2418503. 0. 0.	62
4291376	-22.26174-5	-22.26174-5	0.	76	* -21.56507-5	4581263	0	2462377.	173873.	2418503. 0. 0.	63
4291377	-22.56507-5	-22.56507-5	0.	77	* -21.86840-5	4581264	0	2462377.	173873.	2418503. 0. 0.	64
4291378	-22.86840-5	-22.86840-5	0.	78	* -22.17173-5	4581265	0	2462377.	173873.	2418503. 0. 0.	65
4291379	-23.17173-5	-23.17173-5	0.	79	* -22.47506-5	4581266	0	2462377.	173873.	2418503. 0. 0.	66
4291380	-23.47506-5	-23.47506-5	0.	80	* -22.77839-5	4581267	0	2462377.	173873.	2418503. 0. 0.	67
4291381	-23.77839-5	-23.77839-5	0.	81	* -23.08172-5	4581268	0	2462377.	173873.	2418503. 0. 0.	68
4291382	-24.08172-5	-24.08172-5	0.	82	* -23.38505-5	4581269	0	2462377.	173873.	2418503. 0. 0.	69
4291383	-24.38505-5	-24.38505-5	0.	83	* -23.68838-5	4581270	0	2462377.	173873.	2418503. 0. 0.	70
4291384	-24.68838-5	-24.68838-5	0.	84	* -23.99171-5						
4291385	-24.99171-5	-24.99171-5	0.	85	* -24.29504-5						
4291386	-25.29504-5	-25.29504-5	0.	86	* -24.59837-5						
4291387	-25.59837-5	-25.59837-5	0.	87	* -24.90170-5						
4291388	-25.90170-5	-25.90170-5	0.	88	* -25.20503-5						
4291389	-26.20503-5	-26.20503-5	0.	89	* -25.50836-5						
4291390	-26.50836-5	-26.50836-5	0.	90	* -25.81169-5						
4291391	-26.81169-5	-26.81169-5	0.	91	* -26.11502-5						
4291392	-27.11502-5	-27.11502-5	0.	92	* -26.41835-5						
4291393	-27.41835-5	-27.41835-5	0.	93	* -26.72168-5						
4291394	-27.72168-5	-27.72168-5	0.	94	* -27.02501-5						
4291395	-28.02501-5	-28.02501-5	0.	95	* -27.32834-5						
4291396	-28.32834-5	-28.32834-5	0.	96	* -27.63167-5						
4291397	-28.63167-5	-28.63167-5	0.	97	* -27.93500-5						
4291398	-28.93500-5	-28.93500-5	0.	98	* -28.23833-5						
4291399	-29.23833-5	-29.23833-5	0.	99	* -28.54166-5						
4291400	-29.54166-5	-29.54166-5	0.	100	* -28.84499-5						

4581271	0	2462376.	173873.	2418503.	0. 0.	71	4581354	-2.23065-6	0.	54	* -2.04046-4		
4581272	0	2462376.	173873.	2418503.	0. 0.	72	4581355	-2.25612-6	0.	55	* -2.063757-4		
4581273	0	2462376.	173873.	2418503.	0. 0.	73	4581356	-2.281593-6	0.	56	* -2.08706-4		
4581274	0	2462376.	173873.	2418503.	0. 0.	74	4581357	-2.30707-6	0.	57	* -2.110365-4		
4581275	0	2462376.	173872.6	2418503.	0. 0.	75	4581358	-2.332554-6	0.	58	* -2.133675-4		
4581276	0	2462376.	173872.	2418503.	0. 0.	76	4581359	-2.35804-6	0.	59	* -2.15699-4		
4581277	0	2462376.	173865.4	2418503.	0. 0.	77	4581360	-2.383533-6	0.	60	* -2.180307-4		
4581278	0	2462376.	173818.7	2418503.	0. 0.	78	4581361	-2.40903-6	0.	61	* -2.20363-4		
4581279	0	2462376.	173489.2	2418503.	0. 0.	79	4581362	-2.434527-6	0.	62	* -2.226953-4		
4581280	0	2462376.	170644.5	2418503.	0. 0.	80	4581363	-2.46003-6	0.	63	* -2.25028-4		
4581300	0						4581364	-2.485534-6	0.	64	* -2.27361-4		
4581301	-8.89682-7	-8.89682-7	-8.89682-7	0.	1	* -8.15854-5	4581365	-2.51104-6	0.	65	* -2.296944-4		
4581302	-9.1602-7	-9.1602-7	-9.1602-7	0.	2	* -8.38083-5	4581366	-2.53655-6	0.	66	* -2.32028-4		
4581303	-9.41131-7	-9.41131-7	-9.41131-7	0.	3	* -8.60898-5	4581367	-2.562065-6	0.	67	* -2.343617-4		
4581304	-9.66226-7	-9.66226-7	-9.66226-7	0.	4	* -8.83843-5	4581368	-2.58758-6	0.	68	* -2.366956-4		
4581305	-9.91326-7	-9.91326-7	-9.91326-7	0.	5	* -9.06803-5	4581369	-2.613095-6	0.	69	* -2.390296-4		
4581306	-1.016433-6	-1.016433-6	-1.016433-6	0.	6	* -9.2977-5	4581370	-2.63861-6	0.	70	* -2.41364-4		
4581307	-1.041547-6	-1.041547-6	-1.041547-6	0.	7	* -9.52742-5	4581371	-2.66413-6	0.	71	* -2.43698-4		
4581308	-1.066669-6	-1.066669-6	-1.066669-6	0.	8	* -9.75722-5	4581372	-2.68965-6	0.	72	* -2.460323-4		
4581309	-1.091798-6	-1.091798-6	-1.091798-6	0.	9	* -9.98708-5	4581373	-2.71517-6	0.	73	* -2.483667-4		
4581310	-1.116934-6	-1.116934-6	-1.116934-6	0.	10	* -1.021701-4	4581374	-2.74069-6	0.	74	* -2.50701-4		
4581311	-1.142078-6	-1.142078-6	-1.142078-6	0.	11	* -1.044701-4	4581375	-2.76621-6	0.	75	* -2.530354-4		
4581312	-1.16723-6	-1.16723-6	-1.16723-6	0.	12	* -1.067708-4	4581376	-2.791726-6	0.	76	* -2.5537-4		
4581313	-1.192388-6	-1.192388-6	-1.192388-6	0.	13	* -1.090722-4	4581377	-2.817243-6	0.	77	* -2.57705-4		
4581314	-1.217555-6	-1.217555-6	-1.217555-6	0.	14	* -1.113743-4	4581378	-2.84276-6	0.	78	* -2.60047-4		
4581315	-1.24273-6	-1.24273-6	-1.24273-6	0.	15	* -1.136772-4	4581379	-2.868284-6	0.	79	* -2.624507-4		
4581316	-1.267913-6	-1.267913-6	-1.267913-6	0.	16	* -1.159807-4	*						
4581317	-1.293103-6	-1.293103-6	-1.293103-6	0.	17	* -1.18285-4	*hydro	component name	component type				
4581318	-1.318302-6	-1.318302-6	-1.318302-6	0.	18	* -1.2059-4	4600000	"elbow3"	sngljun				
4581319	-1.343508-6	-1.343508-6	-1.343508-6	0.	19	* -1.228957-4							
4581320	-1.368723-6	-1.368723-6	-1.368723-6	0.	20	* -1.252022-4	*hydro	from	to	area	f loss	r loss	vcchs
4581321	-1.393946-6	-1.393946-6	-1.393946-6	0.	21	* -1.275094-4	4600101	458010000	462000000	0.083220	0.182	0.182	01000
4581322	-1.419177-6	-1.419177-6	-1.419177-6	0.	22	* -1.298174-4		vel/flw	f velocity	g velocity	j velocity		
4581323	-1.444416-6	-1.444416-6	-1.444416-6	0.	23	* -1.32126-4	4600201	0	-2.894313-6	-2.894313-6	0.	* -2.654107-4	
4581324	-1.469663-6	-1.469663-6	-1.469663-6	0.	24	* -1.344356-4							
4581325	-1.494918-6	-1.494918-6	-1.494918-6	0.	25	* -1.367457-4							
4581326	-1.52018-6	-1.52018-6	-1.52018-6	0.	26	* -1.390567-4							
4581327	-1.545453-6	-1.545453-6	-1.545453-6	0.	27	* -1.413684-4							
4581328	-1.570733-6	-1.570733-6	-1.570733-6	0.	28	* -1.436808-4							
4581329	-1.59602-6	-1.59602-6	-1.59602-6	0.	29	* -1.45994-4							
4581330	-1.621316-6	-1.621316-6	-1.621316-6	0.	30	* -1.48308-4							
4581331	-1.64662-6	-1.64662-6	-1.64662-6	0.	31	* -1.506225-4							
4581332	-1.671932-6	-1.671932-6	-1.671932-6	0.	32	* -1.52938-4							
4581333	-1.697252-6	-1.697252-6	-1.697252-6	0.	33	* -1.55254-4							
4581334	-1.72258-6	-1.72258-6	-1.72258-6	0.	34	* -1.57571-4							
4581335	-1.747916-6	-1.747916-6	-1.747916-6	0.	35	* -1.598884-4							
4581336	-1.77326-6	-1.77326-6	-1.77326-6	0.	36	* -1.622066-4							
4581337	-1.79861-6	-1.79861-6	-1.79861-6	0.	37	* -1.645256-4							
4581338	-1.82397-6	-1.82397-6	-1.82397-6	0.	38	* -1.668453-4							
4581339	-1.849335-6	-1.849335-6	-1.849335-6	0.	39	* -1.691656-4							
4581340	-1.87471-6	-1.87471-6	-1.87471-6	0.	40	* -1.714866-4							
4581341	-1.90009-6	-1.90009-6	-1.90009-6	0.	41	* -1.738083-4							
4581342	-1.925478-6	-1.925478-6	-1.925478-6	0.	42	* -1.761307-4							
4581343	-1.950873-6	-1.950873-6	-1.950873-6	0.	43	* -1.784537-4							
4581344	-1.976276-6	-1.976276-6	-1.976276-6	0.	44	* -1.807773-4							
4581345	-2.001685-6	-2.001685-6	-2.001685-6	0.	45	* -1.831016-4							
4581346	-2.0271-6	-2.0271-6	-2.0271-6	0.	46	* -1.854265-4							
4581347	-2.052523-6	-2.052523-6	-2.052523-6	0.	47	* -1.87752-4							
4581348	-2.07795-6	-2.07795-6	-2.07795-6	0.	48	* -1.90078-4							
4581349	-2.103387-6	-2.103387-6	-2.103387-6	0.	49	* -1.924047-4							
4581350	-2.12883-6	-2.12883-6	-2.12883-6	0.	50	* -1.94732-4							
4581351	-2.154275-6	-2.154275-6	-2.154275-6	0.	51	* -1.970596-4							
4581352	-2.17973-6	-2.17973-6	-2.17973-6	0.	52	* -1.99388-4							
4581353	-2.205187-6	-2.205187-6	-2.205187-6	0.	53	* -2.017167-4							

* *hydro 4620801	roughness 0.0000457	hyd diam 0.3255	vol 77	4621250 4621251 4621252 4621253 4621254 4621255 4621256 4621257 4621258 4621259 4621260 4621261 4621262 4621263 4621264 4621265 4621266 4621267 4621268 4621269 4621270 4621271 4621272 4621273 4621274 4621275 4621276 4621277 *	temp 144965.2	pressure 0	ebt 0	*hydro 4621201 4621202 4621203 4621204 4621205 4621206 4621207 4621208 4621209 4621210 4621211 4621212	temp 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2463454. 24655610. 2467766. 2469922. 2472078. 2474234. 2476390. 2478545. 2480701. 2482857. 2485013. 2487169. 2489325. 2491480. 2493636. 2495792. 2497948. 2500104. 2502260. 2504416. 2506572. 2508728. 2510884. 2513039. 2515195. 2517351. 2519507. 2521663. 2523819. 2525975. 2528131. 2530286. 2532442. 2534598. 2536754. 2538910. 2541066. 2543222. 2545378. 2547534. 2549690. 2551846.	roughness 0.0000457	hyd diam 0.3255	vol 77	4621250 4621251 4621252 4621253 4621254 4621255 4621256 4621257 4621258 4621259 4621260 4621261 4621262 4621263 4621264 4621265 4621266 4621267 4621268 4621269 4621270 4621271 4621272 4621273 4621274 4621275 4621276 4621277 *	temp 144965.2	pressure 0	ebt 0	*hydro 4621201 4621202 4621203 4621204 4621205 4621206 4621207 4621208 4621209 4621210 4621211 4621212	temp 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2463454. 24655610. 2467766. 2469922. 2472078. 2474234. 2476390. 2478545. 2480701. 2482857. 2485013. 2487169. 2489325. 2491480. 2493636. 2495792. 2497948. 2500104. 2502260. 2504416. 2506572. 2508728. 2510884. 2513039. 2515195. 2517351. 2519507. 2521663. 2523819. 2525975. 2528131. 2530286. 2532442. 2534598. 2536754. 2538910. 2541066. 2543222. 2545378. 2547534. 2549690. 2551846.	roughness 0.0000457	hyd diam 0.3255	vol 77	4621250 4621251 4621252 4621253 4621254 4621255 4621256 4621257 4621258 4621259 4621260 4621261 4621262 4621263 4621264 4621265 4621266 4621267 4621268 4621269 4621270 4621271 4621272 4621273 4621274 4621275 4621276 4621277 *	temp 144965.2	pressure 0	ebt 0	*hydro 4621201 4621202 4621203 4621204 4621205 4621206 4621207 4621208 4621209 4621210 4621211 4621212	temp 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2463454. 24655610. 2467766. 2469922. 2472078. 2474234. 2476390. 2478545. 2480701. 2482857. 2485013. 2487169. 2489325. 2491480. 2493636. 2495792. 2497948. 2500104. 2502260. 2504416. 2506572. 2508728. 2510884. 2513039. 2515195. 2517351. 2519507. 2521663. 2523819. 2525975. 2528131. 2530286. 2532442. 2534598. 2536754. 2538910. 2541066. 2543222. 2545378. 2547534. 2549690. 2551846.	roughness 0.0000457	hyd diam 0.3255	vol 77	4621250 4621251 4621252 4621253 4621254 4621255 4621256 4621257 4621258 4621259 4621260 4621261 4621262 4621263 4621264 4621265 4621266 4621267 4621268 4621269 4621270 4621271 4621272 4621273 4621274 4621275 4621276 4621277 *	temp 144965.2	pressure 0	ebt 0	*hydro 4621201 4621202 4621203 4621204 4621205 4621206 4621207 4621208 4621209 4621210 4621211 4621212	temp 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2462376. 2463454. 24655610. 2467766. 2469922. 2472078. 2474234. 2476390. 2478545. 2480701. 2482857. 2485013. 2487169. 2489325. 2491480. 2493636. 2495792. 2497948. 2500104. 2502260. 2504416. 2506572. 2508728. 2510884. 2513039. 2515195. 2517351. 2519507. 2521663. 2523819. 2525975. 2528131. 2530286. 2532442. 2534598. 2536754. 2538910. 2541066. 2543222. 2545378. 2547534. 2549690. 2551846.	roughness 0.0000457	hyd diam 0.3255	vol 77	4621250 4621251 4621252 4621253 4621254 4621255 4621256 4621257 4621258 4621259 4621260 4621261 4621262 4621263 4621264 4621265 4621266 4621267 4621268 4621269 4621270 4621271 4621272 4621273 4621274 4621275 4621276 4621277
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[illegible]


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* thermal properties of composition 3 - hafnium
*-----$
*compxn composition th.con fig ht.cap fig material
*      tbl/ctn      1      1      1      hafnium
*
*compxn temperature th. cond.
20100301 250. 23.6
20100302 273.2 23.3
20100303 300. 23.0
20100304 400. 22.3
20100305 600. 21.3
20100306 800. 20.8
20100307 1200. 20.9
20100308 1600. 21.5
20100309 2000. 22.6
20100310 2000. 22.6
*
*compxn temperature vol ht cap
20100351 252.9 1.870e6
20100352 278. 1.898e6
20100353 315.5 1.924e6
20100354 400. 1.975e6
20100355 500. 2.031e6
20100356 600. 2.087e6
20100357 800. 2.199e6
20100358 1000. 2.314e6
20100359 1350. 2.514e6
20100360 1400. 2.514e6
20100361 2000. 2.514e6
*
* thermal properties of composition 4 - boehmite
*-----$
*compxn composition th.con fig ht.cap fig material
*      tbl/ctn      1      1      1      boehmite
*
*compxn temperature th. cond.
20100401 273. 2.25
20100402 373. 2.25
*
*compxn temperature vol ht cap
20100451 273. 2.198e6
20100452 373. 2.739e6
20100453 473. 3.096e6
20100454 573. 3.316e6
20100455 673. 3.453e6
20100456 773. 3.554e6
20100457 873. 3.638e6
20100458 973. 3.707e6
20100459 1073. 3.759e6
20100460 1173. 3.803e6
20100461 1200. 3.803e6
20100462 2000. 3.803e6
*
* thermal properties of composition 5 - u3si2-al
*-----$
*compxn composition th.con fig ht.cap fig material
*      tbl/ctn      1      1      1      u3si2-al
*
*compxn temperature th. cond.
20100501 273. 51.86
20100502 333. 59.0
20100503 1333. 178.0
20100504 2000. 178.0
*
*compxn temperature vol ht cap
20100551 273. 2.176e6
20100552 373. 2.289e6
20100553 473. 2.402e6
20100554 673. 2.628e6
20100555 873. 2.854e6
20100556 1073. 3.080e6
20100557 1273. 3.306e6
20100558 1300. 3.306e6
20100559 2000. 3.306e6
*
$ thermal properties of composition 6 - heavy water
$-----$
*compxn composition th.con fig ht.cap fig material
*      tbl/ctn      1      1      1      heavy water
*
*compxn th. cond.
20100601 0.627
*
*compxn vol ht cap
20100651 4.56e6
*
*-----$
* heat structure input
*-----$
*
* loop1*loop1*loop1*loop1*loop1*loop1*loop1*loop1*loop1*loop1
*
$-----$
$ ht str no. 1081 bx shell
$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
11081000 10 4 2 1 1.009 0 0 0
*
*htstr mesh locn mesh fmt
11081100 0 1
*
*htstr intervals rt. coord
11081101 3 1.054
*
*htstr compxn no. interval
11081201 1 3
*
*htstr source interval
11081301 0. 3
*
*htstr temp flag
11081400 0
*
*htstr temp mesh pt.
11081401 302. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
11081501 108010000 10000 1 1 0.555 5
11081502 108070000 10000 1 1 0.555 10
*
*htstr right vol incr b.cond sa code area/factor ht str no.
11081601 -501 0 4599 1 0.555 10
*
*htstr s. type s. mult left heat right heat ht str no.
11081701 0 0 0 0 0 10
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.

```



```

*htstr ht str m pts geom init l.coord refl b.vol axl. incr
11163000 4 4 2 1 8.636e-3 0 0 0
*
*htstr mesh locn mesh fmt
11163100 0 1
*
*htstr intervals rt. coord
11163101 3 9.525e-3
*
*htstr compxn no. interval
11163201 1 3
*
*htstr source interval
11163301 0 3
*
*htstr temp mesh pt.
11163401 302. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
11163501 116010000 10000 1 1 2672. 4
*
*htstr right vol incr b.cond sa code area/factor ht str no.
11163601 146040000 -10000 1 1 2672. 4
*
*htstr s. type s. mult left heat right heat ht str no.
11163701 0 0 0 0 0
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
11163801 0. 10. 10. 0. 0. 0. 1. 4
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
11163901 0. 10. 10. 0. 0. 0. 1. 4
*
$-----$
$ ht str no. 1501 chimney $
$-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
11501000 4 4 2 1 0.2287 0 0 0
*
*htstr mesh locn mesh fmt
11501100 0 1
*
*htstr intervals rt. coord
11501101 3 0.2541
*
*htstr compxn no. interval
11501201 1 3
*
*htstr source interval
11501301 0 3
*
*htstr temp mesh pt.
11501401 302. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
11501501 150010000 10000 1 1 0.75 4
*
*htstr right vol incr b.cond sa code area/factor ht str no.
11501601 -501 0 4581 1 0.75 4
*
*
*htstr s. type s. mult left heat right heat ht str no.
11501701 0 0 0 0 0
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
11501801 0. 10. 10. 0. 0. 0. 1. 5
*
*loop2*loop2*loop2*loop2*loop2*loop2*loop2*loop2*loop2*loop2
$-----$
$ ht str no. 2081 hx shell $
$-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
12081000 10 4 2 1 1.009 0 0 0
*
*htstr mesh locn mesh fmt
12081100 0 1
*
*htstr intervals rt. coord
12081101 3 1.054
*
*htstr compxn no. interval
12081201 1 3
*

```

```

*-----$
*      ht str no. 2083      hx tube
*-----$
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
12083000 10 4 2 1 7.049e-3 0 0 0
*
*htstr mesh locn mesh fnt
12083100 0 1
*
*htstr intervals rt. coord
12083101 3 7.938e-3
*
*htstr compxn no. interval
12083201 1 3
*
*htstr source interval
12083301 0. 3
*
*htstr temp mesh pt.
12083400 302. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
12083501 208010000 10000 1 1 8700.4 5
12083502 208070000 10000 1 1 8700.4 10
*
*htstr right vol incr b.cond sa code area/factor ht str no.
12083601 234050000 -10000 1 1 8700.4 5
12083602 234100000 -10000 1 1 8700.4 10
*
*htstr s. type s. mult left heat right heat ht str no.
12083701 0 0 0 0 0 10
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12083801 0. 10. 10. 0. 0. 0. 1. 10
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12083901 0. 10. 10. 0. 0. 0. 1. 10
*
* tube and shell heat structures for emergency heat exchanger
*
*-----$
*      ht str no. 2161      hx shell
*-----$
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
12161000 4 4 2 1 0.5334 0 0 0
*
*htstr mesh locn mesh fnt
12161100 0 1
*
*htstr intervals rt. coord
12161101 3 0.5556
*
*htstr compxn no. interval
12161201 1 3
*
*htstr source interval
12161301 0. 3
*
*htstr temp mesh pt.
12161400 302. 4
*
*-----$
*      ht str no. 2082      hx shell
*-----$
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
12082000 1 4 1 1 0.00 0 0 0
*
*htstr mesh locn mesh fnt
12082100 0 1
*
*htstr intervals rt. coord
12082101 3 0.0445
*
*htstr compxn no. interval
12082201 1 3
*
*htstr source interval
12082301 0. 3
*
*htstr temp mesh pt.
12082400 302. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
12082501 208060000 00000 1 1 3.49 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
12082601 -501 0 4581 1 3.49 1
*
*htstr s. type s. mult left heat right heat ht str no.
12082701 0 0 0 0 0 1
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12082801 0. 10. 10. 0. 0. 0. 1. 1
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12082901 0. 10. 10. 0. 0. 0. 1. 1
*

```

```

12161401 302. 4
*htstr left vol incr b.cond sa code area/factor ht str no.
12501101 10000 1 1.6 4
*htstr right vol incr b.cond sa code area/factor ht str no.
12501201 0 4591 1 1.6 4
*htstr s. type s. mult left heat right heat ht str no.
12501301 0 0 0 0 4
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12501401 0. 10. 10. 0. 0. 0. 1. 4
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12501501 0. 10. 10. 0. 0. 0. 1. 4
*htstr ht str no. 2163 ht tube
12501601 4 4 2 1 8.636e-3 0 0 0 0
*htstr mesh locn mesh fmt
12501701 0 1
*htstr intervals rt. coord
12501801 3 9.525e-3
*htstr compxn no. interval
12501901 1 3
*htstr source interval
12502001 0. 3
*htstr temp mesh pt.
12502101 302. 4
*htstr left vol incr b.cond sa code area/factor ht str no.
12502201 250010000 10000 1 1 0.75 4
*htstr right vol incr b.cond sa code area/factor ht str no.
12502301 -501 0 4581 1 0.75 4
*htstr s. type s. mult left heat right heat ht str no.
12502401 0 0 0 0 4
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12502501 0. 10. 10. 0. 0. 0. 1. 4
*htstr chf flag hyd diam equiv diam ch. len ht str no.
12502601 0. 10. 10. 0. 0. 0. 1. 4
*htstr ht str no. 2561 tankwall
12502701 5 4 2 1 0.7245 0 0 0 0
*htstr mesh locn mesh fmt
12502801 0 1
*htstr intervals rt. coord
12502901 3 0.7396
*htstr compxn no. interval
12503001 1 3
*htstr source interval
12503101 0. 3
*htstr temp mesh pt.
12503201 302. 4
*htstr left vol incr b.cond sa code area/factor ht str no.
12503301 256010000 10000 1 1 4.09 1
12503401 256020000 10000 1 1 0.12 5
*htstr right vol incr b.cond sa code area/factor ht str no.
12503501 0 0 0 1 4.09 1
12503601 0 0 0 1 0.12 5
*htstr s. type s. mult left heat right heat ht str no.
12503701 0 0 0 0 4

```



```

$-----$
*htstr  right vol  incr b.cond sa code area/factor  ht str no.
13163601 346040000 -10000 1 1 2672. 4
*
*htstr  s. type  s. mult  left heat  right heat  ht str no.
13163701 0 0 0 0 0 4
*
*htstr  chf flag  hyd diam  equiv diam  ch. len  ht str no.
13163801 0. 10. 10. 0. 0. 0. 1. 4
*
*htstr  chf flag  hyd diam  equiv diam  ch. len  ht str no.
13163901 0. 10. 10. 0. 0. 0. 1. 4
*
$-----$
$ ht str no. 3501 chimney $
*
*htstr  ht str m pts geom init 1.coord refl b.vol axl. incr
13501000 4 4 2 1 0.2287 0 0 0
*
*htstr  mesh locn  mesh fmt
13501100 0 1
*
*htstr  intervals  rt. coord
13501101 3 0.2541
*
*htstr  compxn no.  interval
13501201 1 3
*
*htstr  source  interval
13501301 0. 3
*
*htstr  temp flg
13501400 0
*
*htstr  temp  mesh pt.
13501401 302. 4
*
*htstr  left vol  incr b.cond sa code area/factor  ht str no.
13501501 350010000 10000 1 1 0.75 4
*
*htstr  right vol  incr b.cond sa code area/factor  ht str no.
13501601 -501 0 4581 1 0.75 4
*
*htstr  s. type  s. mult  left heat  right heat  ht str no.
13501701 0 0 0 0 0 4
*
*htstr  chf flag  hyd diam  equiv diam  ch. len  ht str no.
13501801 0. 10. 10. 0. 0. 0. 1. 4
*
*htstr  chf flag  hyd diam  equiv diam  ch. len  ht str no.
13501901 0. 10. 10. 0. 0. 0. 1. 4
*
* accumulator heat structure - loop 3
$-----$
$ ht str no. 3561 tankwall $
*
*htstr  ht str m pts geom init 1.coord refl b.vol axl. incr
13561000 5 4 2 1 0.7245 0 0 0
*
*htstr  mesh locn  mesh fmt
13561100 0 1
*
*htstr  intervals  rt. coord
13561101 3 0.7396
*

```

```

$-----$
*htstr  ht str no. 3161 hx shell
13161000 4 4 2 1 0.5334 0 0 0
*
*htstr  mesh locn  mesh fmt
13161100 0 1
*
*htstr  intervals  rt. coord
13161101 3 0.5556
*
*htstr  compxn no.  interval
13161201 1 3
*
*htstr  source  interval
13161301 0. 3
*
*htstr  temp flg
13161400 0
*
*htstr  temp  mesh pt.
13161401 302. 4
*
*htstr  left vol  incr b.cond sa code area/factor  ht str no.
13161501 316010000 10000 1 1 1.6 4
*
*htstr  right vol  incr b.cond sa code area/factor  ht str no.
13161601 -501 0 4591 1 1.6 4
*
*htstr  s. type  s. mult  left heat  right heat  ht str no.
13161701 0 0 0 0 0 4
*
*htstr  chf flag  hyd diam  equiv diam  ch. len  ht str no.
13161801 0. 10. 10. 0. 0. 0. 1. 4
*
*htstr  chf flag  hyd diam  equiv diam  ch. len  ht str no.
13161901 0. 10. 10. 0. 0. 0. 1. 4
*
$-----$
$ ht str no. 3163 hx tube $
*
*htstr  ht str m pts geom init 1.coord refl b.vol axl. incr
13163000 4 4 2 1 8.636e-3 0 0 0
*
*htstr  mesh locn  mesh fmt
13163100 0 1
*
*htstr  intervals  rt. coord
13163101 3 9.525e-3
*
*htstr  compxn no.  interval
13163201 1 3
*
*htstr  source  interval
13163301 0. 3
*
*htstr  temp flg
13163400 0
*
*htstr  temp  mesh pt.
13163401 302. 4
*
*htstr  left vol  incr b.cond sa code area/factor  ht str no.
13163501 316010000 10000 1 1 2672. 4
*

```

```

*-----*
* ht str no. 1041 hotleg $
*-----*
* hstr ht str m pts geom init 1.coord refl b.vol axl. incr
* 11041000 3 4 2 1 0.1627 0 0 0
*
* hstr mesh locn mesh fmt
* 11041100 0 1
*
* hstr intervals rt. coord
* 11041101 3 0.1778
*
* hstr compxn no. interval
* 11041201 1 3
*
* hstr source interval
* 11041301 0 3
*
* 11041401 400. 4
*
* hstr left vol incr b.cond sa code area/factor ht str no.
* 11041501 104010000 0 1 1 0.69 1
* 11041502 104040000 0 1 1 12.96 2
* 11041503 104800000 0 1 1 2.51 3
*
* hstr right vol incr b.cond sa code area/factor ht str no.
* 11041601 -501 0 4511 1 0.69 1
* 11041602 -501 0 4511 1 12.96 2
* 11041603 -501 0 4581 1 2.51 3
*
* hstr s. type s. mult left heat right heat ht str no.
* 11041701 0 0 0 0 3
*
* hstr
* mod2.5*11041801 0 0.0 0.0 0.0 0.3
* 11041801 0. 10. 10. 0. 0. 0. 1. 3
* mod2.5*11041901 0 0.0 0.0 0.0 0.3
* 11041901 0. 10. 10. 0. 0. 0. 1. 3
*
*-----*
* ht str no. 1221 coldleg $
*-----*
* hstr ht str m pts geom init 1.coord refl b.vol axl. incr
* 11221000 3 4 2 1 0.1627 0 0 0
*
* hstr mesh locn mesh fmt
* 11221100 0 1
*
* hstr intervals rt. coord
* 11221101 3 0.1778
*
* hstr compxn no. interval
* 11221201 1 3
*
* hstr source interval
* 11221301 0 3
*
* 11221401 400. 4
*
* hstr left vol incr b.cond sa code area/factor ht str no.
* 11221501 122010000 0 1 1 2.31 1
* 11221502 122130000 0 1 1 2.13 2
* 11221503 122230000 0 1 1 0.762 3
*
* hstr right vol incr b.cond sa code area/factor ht str no.
* 11221601 -501 0 4511 1 2.31 1
* 11221602 -501 0 4511 1 2.13 2
* 11221603 -501 0 4581 1 0.762 3
*
*-----*

```

```

*-----*
* ht str no. 1011 hotleg $
*-----*
* hstr ht str m pts geom init 1.coord refl b.vol axl. incr
* 11011000 3 4 2 1 0.1627 0 0 0
*
* hstr mesh locn mesh fmt
* 11011100 0 1
*
* hstr intervals rt. coord
* 11011101 3 0.1778
*
* hstr compxn no. interval
* 11011201 1 3
*
* hstr source interval
* 11011301 0 3
*
* 11011401 400. 4
*
* hstr left vol incr b.cond sa code area/factor ht str no.
* 11011501 101010000 0 1 1 1.07 1
* 11011502 101060000 0 1 1 3.66 2
* 11011503 101260000 0 1 1 2.21 3
*
* hstr right vol incr b.cond sa code area/factor ht str no.
* 11011601 -501 0 4511 1 1.07 1
* 11011602 -501 0 4511 1 3.66 2
* 11011603 -501 0 4511 1 2.21 3
*
* hstr s. type s. mult left heat right heat ht str no.
* 11011701 0 0 0 0 3
*
* hstr
* mod2.5*11011801 0 0.0 0.0 0.0 0.3
* 11011801 0. 10. 10. 0. 0. 0. 1. 3
* mod2.5*11011901 0 0.0 0.0 0.0 0.3
* 11011901 0. 10. 10. 0. 0. 0. 1. 3
*
*-----*

```



```

11621401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
11621501 162010000 0 1 1.83 1
11621601 16210000 0 1 1.57 2
11621701 16210000 0 1 1.45 3
11621801 16210000 0 1 1.45 3
11621901 16210000 0 1 1.45 3
11622001 162270000 0 1 12.10439 4
*
*htstr right vol incr b.cond sa code area/factor ht str no.
11621601 -501 0 4581 1 1.83 1
11621602 -501 0 4511 1 1.57 2
11621603 -501 0 4511 1 1.45 3
11621604 -501 0 4581 1 12.10439 4
*
*htstr s. type s. mult left heat right heat ht str no.
11621701 0 0 0 0 0 0 4
*
*mod2.5*11581901 0 0.0 0.0 0.0 0.4
11621801 0. 10. 10. 0. 0. 0. 1. 4
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 0.4
11621901 0. 10. 10. 0. 0. 0. 1. 4
*
*-----
* ht str no. 1711 8-in cdleg
*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
11711000 3 4 2 1 0.09925 0 0 0
*
*htstr mesh locn mesh fmt
11711100 0 1
*
*htstr intervals rt. coord
11711101 3 0.1016
*
*htstr compxn no. interval
11711201 1 3
*
*htstr source interval
11711301 0. 3
11711401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
11711501 171010000 0 1 0.300 1
11711502 171030000 0 1 2.000 2
11711503 171130000 0 1 2.280 3
*
*htstr right vol incr b.cond sa code area/factor ht str no.
11711601 -501 0 4581 1 0.300 1
11711602 -501 0 4531 1 2.000 2
11711603 -501 0 4531 1 2.280 3
*
*htstr s. type s. mult left heat right heat ht str no.
11711701 0 0 0 0 0 0 3
*
*mod2.5*11711801 0 0.0 0.0 0.0 0.3
11711801 0. 10. 10. 0. 0. 0. 1. 3
*
*htstr
*mod2.5*11711901 0 0.0 0.0 0.0 0.3
11711901 0. 10. 10. 0. 0. 0. 1. 3
*
*-----
* ht str no. 1741 14-in cdleg
*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
11741000 1 4 2 1 0.1627 0 0 0
*
*htstr mesh locn mesh fmt
11741100 0 1
*
*htstr intervals rt. coord
11741101 3 0.1778
*
*htstr compxn no. interval
11741201 1 3
*
*htstr source interval
11741301 0. 3
11741401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
11741501 174010000 0 1 0.50 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
11741601 -501 0 4511 1 0.50 1
*
*htstr s. type s. mult left heat right heat ht str no.
11741701 0 0 0 0 0 0 1
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 0.1
11741801 0. 10. 10. 0. 0. 0. 1. 1
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 0.1
11741901 0. 10. 10. 0. 0. 0. 1. 1
*
*-----
* ht str no. 2011 hotleg
*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
12011000 3 4 2 1 0.1627 0 0 0
*
*htstr mesh locn mesh fmt
12011100 0 1
*
*htstr intervals rt. coord
12011101 3 0.1778
*
*htstr compxn no. interval
12011201 1 3
*
*htstr source interval
12011301 0. 3
12011401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
12011501 201010000 0 1 1.07 1
12011502 201060000 0 1 3.66 2
12011503 201260000 0 1 2.21 3
*
*htstr right vol incr b.cond sa code area/factor ht str no.
12011601 -501 0 4511 1 1.07 1
12011602 -501 0 4511 1 3.66 2
12011603 -501 0 4511 1 2.21 3
*

```



```

*mod2.5*12711801 0.0.0.0.0.0.0.3
12711801 0.10.10.0.0.0.0.1.1.3
*
*htstr
*mod2.5*12711901 0.0.0.0.0.0.0.3
12711901 0.10.10.0.0.0.0.1.1.3
*
*-----
*      ht str no. 2741      14-in cdleg      $
*-----
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
12711000 1 4 2 1      0.1627 0 0 0
*
*htstr mesh locn mesh fnt
12711100 0 1
*
*htstr intervals rt. coord
12711101 3 0.1778
*
*htstr compxn no. interval
12711201 1 3
*
*htstr source interval
12711301 0 3
12711401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
12711501 274010000 0 1 1 0.50
*
*htstr right vol incr b.cond sa code area/factor ht str no.
12711601 -501 0 4511 1 0.50
*
*htstr s. type s. mult left heat right heat ht str no.
12711701 0 0 0 0 0
*
*htstr
*mod2.5*11581901 0.0.0.0.0.0.1
12711801 0.10.10.0.0.0.0.1.1
*
*htstr
*mod2.5*11581901 0.0.0.0.0.0.1
12711901 0.10.10.0.0.0.0.1.1
*
*-----
*      ht str no. 3011      hotleg      $
*-----
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
13011000 1 4 2 1      0.1627 0 0 0
*
*htstr mesh locn mesh fnt
13011100 0 1
*
*htstr intervals rt. coord
13011101 3 0.1778
*
*htstr compxn no. interval
13011201 1 3
*
*htstr source interval
13011301 0 3
13011401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13011501 301010000 0 1 1 3.28
*
*mod2.5*12711801 0.0.0.0.0.0.3
12711801 0.10.10.0.0.0.0.1.1.3
*
*htstr
*mod2.5*12711901 0.0.0.0.0.0.3
12711901 0.10.10.0.0.0.0.1.1.3
*
*-----
*      ht str no. 3041      hotleg      $
*-----
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
13041000 3 4 2 1      0.1627 0 0 0
*
*htstr mesh locn mesh fnt
13041100 0 1
*
*htstr intervals rt. coord
13041101 3 0.1778
*
*htstr compxn no. interval
13041201 1 3
*
*htstr source interval
13041301 0 3
13041401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13041501 304010000 0 1 1 0.69
13041502 304040000 0 1 1 12.96
13041503 304800000 0 1 1 2.51
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13041601 -501 0 4511 1 0.69
13041602 -501 0 4511 1 12.96
13041603 -501 0 4581 1 2.51
*
*htstr s. type s. mult left heat right heat ht str no.
13041701 0 0 0 0 0
*
*htstr
*mod2.5*13041801 0.0.0.0.0.0.3
13041801 0.10.10.0.0.0.0.1.1.3
*
*mod2.5*13041901 0.0.0.0.0.0.3
13041901 0.10.10.0.0.0.0.1.1.3
*
*-----
*      ht str no. 3221      coldleg      $
*-----
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
13221000 3 4 2 1      0.1627 0 0 0
*
*htstr mesh locn mesh fnt
13221100 0 1
*
*htstr intervals rt. coord
13221101 3 0.1778
*
*htstr compxn no. interval
13221201 1 3

```

```

*htstr source interval
1321301 0.
1321401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
1321501 322010000 0 1 1 2.31 1
1321502 322130000 0 1 1 2.13 2
1321503 322230000 0 1 1 0.762 3
*
*htstr right vol incr b.cond sa code area/factor ht str no.
1321601 -501 0 4511 1 2.31 1
1321602 -501 0 4511 1 2.13 2
1321603 -501 0 4581 1 0.762 3
*
*htstr s. type s. mult left heat right heat ht str no.
1321701 0 0 0 0 0 3
*
*mod2.5*1321801 0 0.0 0.0 0.0 3
1321801 0. 10. 10. 0. 0. 0. 1. 3
*mod2.5*1321901 0 0.0 0.0 0.0 3
1321901 0. 10. 10. 0. 0. 0. 1. 3
*
*-----coldleg-----$
*htstr ht str no. 3261
*htstr ht str no. 3261
*
*htstr mesh locn mesh fmt
1326100 0 1
*
*htstr intervals rt. coord
1326101 3 0.1778
*
*htstr compan no. interval
13261201 1 3
*
*htstr source interval
13261301 0.
13261401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13261501 326010000 0 1 1 0.9146 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13261601 -501 0 4511 1 0.9146 1
*
*htstr s. type s. mult left heat right heat ht str no.
13261701 0 0 0 0 0 1
*
*htstr
*mod2.5*13261801 0 0.0 0.0 0.0 1
13261801 0. 10. 10. 0. 0. 0. 1. 1
*mod2.5*13261901 0 0.0 0.0 0.0 1
13261901 0. 10. 10. 0. 0. 0. 1. 1
*
*-----14-incldleg-----$
*htstr ht str no. 3291
*htstr ht str no. 3291
*
*htstr mesh locn mesh fmt
1329100 0 1

```

```

*
*htstr intervals rt. coord
13291101 3 0.1778
*
*htstr compan no. interval
13291201 1 3
*
*htstr source interval
13291301 0.
13291401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13291501 329010000 0 1 1 6.25 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13291601 -501 0 4511 1 6.25 1
*
*htstr s. type s. mult left heat right heat ht str no.
13291701 0 0 0 0 0 1
*
*mod2.5*13291801 0 0.0 0.0 0.0 1
13291801 0. 10. 10. 0. 0. 0. 1. 1
*mod2.5*13291901 0 0.0 0.0 0.0 1
13291901 0. 10. 10. 0. 0. 0. 1. 1
*
*-----14-in cdleg-----$
*htstr ht str no. 3581
*htstr ht str no. 3581
*
*htstr mesh locn mesh fmt
13581100 0 1
*
*htstr intervals rt. coord
13581101 3 0.1778
*
*htstr compan no. interval
13581201 1 3
*
*htstr source interval
13581301 0.
13581401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13581501 358010000 10000 1 1 7.24 2
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13581601 -501 0 4511 1 7.24 2
*
*htstr s. type s. mult left heat right heat ht str no.
13581701 0 0 0 0 0 2
*
*mod2.5*13581801 0 0.0 0.0 0.0 2
13581801 0. 10. 10. 0. 0. 0. 1. 2
13581801 0. 10. 10. 0. 0. 0. 1. 2
*
*htstr
*mod2.5*13581901 0 0.0 0.0 0.0 2
13581901 0. 10. 10. 0. 0. 0. 1. 2
*
*-----14-in cdleg-----$
*htstr ht str no. 3621
*htstr ht str no. 3621

```

```

*htstr ht str m pts geom init l.coord refl b.vol axl. incr
13621000 2 4 2 1 0 0.1627 0 0 0 3
*
*htstr mesh locn mesh fmt
13621100 0 1
*
*htstr intervals rt. coord
13621101 3 0.1778
*
*htstr compxn no. interval
13621201 1 3
*
*htstr source interval
13621301 0. 3
13621401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13621501 362010000 0 1 1.2166 1
13621502 362020000 0 1 13.93439 2
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13621601 -501 0 4511 1 1.2166 1
13621602 -501 0 4581 1 13.93439 2
*
*htstr s. type s. mult left heat right heat ht str no.
13621701 0 0 0 0 0 2
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 2
13621801 0. 10. 10. 0. 0. 0. 1. 2
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 2
13621901 0. 10. 10. 0. 0. 0. 1. 2
*
*-----$
* ht str no. 3711 8-in cdleg
*-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
13711000 3 4 2 1 0 0.0925 0 0 0 0
*
*htstr mesh locn mesh fmt
13711100 0 1
*
*htstr intervals rt. coord
13711101 3 0.1016
*
*htstr compxn no. interval
13711201 1 3
*
*htstr source interval
13711301 0. 3
13711401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13711501 371010000 0 1 1 0.300 1
13711502 371030000 0 1 1 0.510 2
13711503 371050000 0 1 1 0.980 3
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13711601 -501 0 4581 1 0.300 1
13711602 -501 0 4531 1 0.510 2
13711603 -501 0 4531 1 0.980 3
*
*htstr s. type s. mult left heat right heat ht str no.

```

```

13711701 0 0 0 0 0 0 3
*
*htstr
*mod2.5*13711801 0 0.0 0.0 0.0 3
13711801 0. 10. 10. 0. 0. 0. 1. 3
*
*htstr
*mod2.5*13711901 0 0.0 0.0 0.0 3
13711901 0. 10. 10. 0. 0. 0. 1. 3
*
*-----$
* ht str no. 3741 14-in cdleg
*-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
13741000 1 4 2 1 0 0.1627 0 0 0 0
*
*htstr mesh locn mesh fmt
13741100 0 1
*
*htstr intervals rt. coord
13741101 3 0.1778
*
*htstr compxn no. interval
13741201 1 3
*
*htstr source interval
13741301 0. 3
13741401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
13741501 374010000 0 1 1 0.50 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
13741601 -501 0 4511 1 0.50 1
*
*htstr s. type s. mult left heat right heat ht str no.
13741701 0 0 0 0 0 1
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 1
13741801 0. 10. 10. 0. 0. 0. 1. 1
*
*htstr
*mod2.5*11581901 0 0.0 0.0 0.0 1
13741901 0. 10. 10. 0. 0. 0. 1. 1
*
*-----$
* ht str no. 4011 hotleg
*-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
14011000 1 4 2 1 0 0.1627 0 0 0 0
*
*htstr mesh locn mesh fmt
14011100 0 1
*
*htstr intervals rt. coord
14011101 3 0.1778
*
*htstr compxn no. interval
14011201 1 3
*
*htstr source interval
14011301 0. 3
14011401 400. 4
*

```

```

*htstr left vol incr b.cond sa code area/factor ht str no.
14011501 451010000 0 1 3.28 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
14011601 -501 0 4511 1 3.28 1
*
*htstr s. type s. mult left heat right heat ht str no.
14011701 0 0 0 0 0 0 1
*
*htstr
*mod2.5*14011801 0 0.0 0.0 0.0 1
14011801 0 10. 10. 0. 0. 0. 1. 1
*mod2.5*14011901 0 0.0 0.0 0.0 1
14011901 0 10. 10. 0. 0. 0. 1. 1
*
*-----
* ht str no. 4291 14-in cdleg $
*-----
*htstr ht str mpts geom init l.coord refl b.vol axl. incr
14291000 1 4 2 1 0.1627 0 0 0
*
*htstr mesh locn mesh fmt
14291100 0 1
*
*htstr intervals rt. coord
14291101 3 0.1778
*
*htstr compxn no. interval
14291201 1 3
*
*htstr source interval
14291301 0.
14291401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
14291501 429010000 0 1 6.25 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
14291601 -501 0 4511 1 6.25 1
*
*htstr s. type s. mult left heat right heat ht str no.
14291701 0 0 0 0 0 0 1
*
*htstr
*mod2.5*14291801 0 0.0 0.0 0.0 1
14291801 0 10. 10. 0. 0. 0. 1. 1
*mod2.5*14291901 0 0.0 0.0 0.0 1
14291901 0 10. 10. 0. 0. 0. 1. 1
*
*-----
* ht str no. 4581 14-in cdleg $
*-----
*htstr ht str mpts geom init l.coord refl b.vol axl. incr
14581000 2 4 2 1 0.1627 0 0 0
*
*htstr mesh locn mesh fmt
14581100 0 1
*
*htstr intervals rt. coord
14581101 3 0.1778
*
*htstr compxn no. interval
14581201 1 3
*
*htstr source interval
14581301 0.
14581401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
14581501 458010000 0 1 7.24 2
*
*htstr right vol incr b.cond sa code area/factor ht str no.
14581601 -501 0 4511 1 7.24 2
*
*htstr s. type s. mult left heat right heat ht str no.
14581701 0 0 0 0 0 0 2
*
*htstr
*mod2.5*14581801 0 0.0 0.0 0.0 2
14581801 0 10. 10. 0. 0. 0. 1. 2
*
*-----
* ht str no. 4621 14-in cdleg $
*-----
*htstr ht str mpts geom init l.coord refl b.vol axl. incr
14621000 2 4 2 1 0.1627 0 0 0
*
*htstr mesh locn mesh fmt
14621100 0 1
*
*htstr intervals rt. coord
14621101 3 0.1778
*
*htstr compxn no. interval
14621201 1 3
*
*htstr source interval
14621301 0.
14621401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
14621501 462010000 0 1 1.2166 1
14621502 462020000 0 1 13.93439 2
*
*htstr right vol incr b.cond sa code area/factor ht str no.
14621601 -501 0 4511 1 1.2166 1
14621602 -501 0 4581 1 13.93439 2
*
*htstr s. type s. mult left heat right heat ht str no.
14621701 0 0 0 0 0 0 2
*
*htstr
*mod2.5*14581901 0 0.0 0.0 0.0 2
14621801 0 10. 10. 0. 0. 0. 1. 2
*
*htstr
*mod2.5*14581901 0 0.0 0.0 0.0 2
14621901 0 10. 10. 0. 0. 0. 1. 2
*
*-----
* ht str no. 4711 8-in cdleg $
*-----
*htstr ht str mpts geom init l.coord refl b.vol axl. incr
14711000 3 4 2 1 0.09925 0 0 0
*
*htstr mesh locn mesh fmt

```

```

14711100      0      1
*
*htstr
*mod2.5*14711801 0 0.0 0.0 0.0 1
14711901 0. 10. 10. 0. 0. 0. 1. 1
*
*-----
*      ht str no. 4951      cpbt bottom      $
*-----
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
14951000 1 4 2 1      0.2865 0 0 0
*
*htstr mesh locn mesh fnt
14951100 0 1
*
*htstr intervals rt. coord
14951101 3 0.3165
*
*htstr compxn no. interval
14951201 1 3
*
*htstr source interval
14951301 0 3
*
14951401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
14951501 495010000 0 1 1.800 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
14951601 -501 0 4581 1 1.800 1
*
*htstr s. type s. mult left heat right heat ht str no.
14951701 0 0 0 0 0
*
*htstr
*mod2.5*14951801 0 0.0 0.0 0.0 1
14951801 0. 10. 10. 0. 0. 0. 1. 1
*
*mod2.5*14951901 0 0.0 0.0 0.0 1
14951901 0. 10. 10. 0. 0. 0. 1. 1
*
*core*core*core*core*core*core*core*core*core*core*core*c
*
*      heat structures in core region
*
*
*      ht str 5001 - core inlet pipe wall (lower cpbt wall)
*-----
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15001000 3 4 2 1      0.2265 0 0 0
*
*htstr mesh locn mesh fnt
15001100 0 1
*
*htstr intervals rt. coord
15001101 3 0.2465
*
*htstr compxn no. interval
15001201 1 3
*
*htstr source interval
15001301 0 3
*
15001401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15001501 500010000 0 1 1 0.110 2
15001502 500030000 0 1 1 0.111 3
*

```

```

14711100      0      1
*
*htstr
*mod2.5*14711801 0 0.0 0.0 0.0 3
14711801 0. 10. 10. 0. 0. 0. 1. 3
*
*htstr
*mod2.5*14711901 0 0.0 0.0 0.0 3
14711901 0. 10. 10. 0. 0. 0. 1. 3
*
*-----
*      ht str no. 4741      14-in cdleg
*-----
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
14741000 1 4 2 1      0.1627 0 0 0
*
*htstr mesh locn mesh fnt
14741100 0 1
*
*htstr intervals rt. coord
14741101 3 0.1778
*
*htstr compxn no. interval
14741201 1 3
*
*htstr source interval
14741301 0 3
*
14741401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
14741501 474010000 0 1 1 0.50 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
14741601 -501 0 4511 1 0.50 1
*
*htstr s. type s. mult left heat right heat ht str no.
14741701 0 0 0 0 0
*
*htstr
*mod2.5*14741801 0 0.0 0.0 0.0 1
14741801 0. 10. 10. 0. 0. 0. 1. 1
*

```



```

*
*htstr
*mod2.5*15103901 0 0.0 0.0 0.0 5
15103901 0. 10. 10. 0. 0. 0. 1. 5
*
*-----*
* ht str 5151 - lower core hot channel fuel plates
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15151000 5 11 1 1 0. 0. 0 0 0
*
*htstr mesh locn mesh fmt
15151100 0 1
*
*htstr intervals rt. coord
15151101 2 1.055e-5
15151102 2 2.5700e-4
15151103 6 6.3800e-4
*
*htstr compun no. interval
15151201 4 2
15151202 2 4
15151203 5 10
*
*htstr source interval
15151301 0. 2
15151302 0.0023234 4
15151303 0.36647 10
*
15151401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15151501 515010000 10000 1 0 0.01031 5
15151501 515010000 10000 102 0 0.01031
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15151601 0 0 0 0 0.01031
*
*htstr s.type s.mult left heat right heat ht str
15151701 1000 2.5457355d-04 5.3814481d-06 0.0000000d+00 1
15151702 1000 2.4995613d-04 5.2838402d-06 0.0000000d+00 2
15151703 1000 2.3441083d-04 4.9552270d-06 0.0000000d+00 3
15151704 1000 2.1671073d-04 4.5810634d-06 0.0000000d+00 4
15151705 1000 1.8931407d-04 4.0019233d-06 0.0000000d+00 5
*htstr
*mod2.5*15151801 0 0.0 0.0 0.0 5
15151801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15151901 0 0.0 0.0 0.0 5
15151901 0. 10. 10. 0. 0. 0. 1. 5
*
*-----*
* ht str 5152 - lower core hot channel inner side plate - (95%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15152000 5 4 2 1 0.162 0 0
*
*htstr mesh locn mesh fmt
15152100 0 1
*
*htstr intervals rt. coord
15152101 3 0.169
*
*htstr compun no. interval
15152201 2 3
*
*htstr source interval
15152301 1. 3
15152401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15152501 568100000 10000 1 1 0.0001 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15152601 515010000 10000 1 1 0.0001 5
*
*htstr s.type s.mult left heat right heat ht str no.
15152701 1000 7.6721999d-07 1.9392606d-06 0.0000000d+00 1
15152702 1000 7.5330427d-07 1.9040866d-06 0.0000000d+00 2
15152703 1000 7.0645468d-07 1.7856674d-06 0.0000000d+00 3
15152704 1000 6.5311109d-07 1.6508337d-06 0.0000000d+00 4
15152705 1000 5.7054449d-07 1.4421346d-06 0.0000000d+00 5
*
*htstr
*mod2.5*15152801 0 0.0 0.0 0.0 5
15152801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15152901 0 0.0 0.0 0.0 5
15152901 0. 10. 10. 0. 0. 0. 1. 5
*
*-----*
* ht str 5153 - lower core hot channel outer side plate (95%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15153000 5 4 2 1 0.224 0 0
*
*htstr mesh locn mesh fmt
15153100 0 1
*
*htstr intervals rt. coord
15153101 3 0.231
*
*htstr compun no. interval
15153201 2 3
*
*htstr source interval
15153301 1. 3
15153401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15153501 515010000 10000 1 1 0.0001 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15153601 530100000 10000 1 1 0.0001 5
*
*htstr s.type s.mult left heat right heat ht str no.
15153701 1000 1.0542998d-06 0.0000000d+00 2.2786312d-06 1
15153702 1000 1.0351771d-06 0.0000000d+00 2.2373018d-06 2
15153703 1000 9.7079723d-07 0.0000000d+00 2.0981592d-06 3
15153704 1000 8.9749344d-07 0.0000000d+00 1.9397296d-06 4
15153705 1000 7.8403191d-07 0.0000000d+00 1.6945081d-06 5
*
*htstr
*mod2.5*15153801 0 0.0 0.0 0.0 5
15153801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15153901 0 0.0 0.0 0.0 5

```

```

15153901 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*-----*
* ht str 5154 - lower core hot stripe - 95t probability - chf *
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15154000 5 11 1 1 0. 0 0 0 0
*
*htstr mesh locn mesh fmt
15154100 0 1
*
*htstr intervals rt. coord
15154101 2 1.055e-5
15154102 2 2.5700e-4
15154103 6 6.3800e-4
*
*htstr compxn no. interval
15154201 4 2
15154202 2 4
15154203 5 10
*
*htstr source interval
15154301 0. 2
15154302 0.0023234 4
15154303 0.36647 10
*
15154401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15154501 515010000 10000 1 0 0.0001031 5
15154501 515010000 10000 102 0 0.0001031
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15154601 0 0 0 0 0.0001031
*
*htstr s.type s.mult left heat right heat ht str
15154701 1000 3.9945971d-06 0.0000000d+00 0.0000000d+00 1
15154702 1000 3.7402509d-06 0.0000000d+00 0.0000000d+00 2
15154703 1000 3.5563042d-06 0.0000000d+00 0.0000000d+00 3
15154704 1000 3.2974161d-06 0.0000000d+00 0.0000000d+00 4
15154705 1000 3.0112767d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15154801 0 0 0 0 0.0 0.5
15154801 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15154901 0 0 0 0 0.0 0.5
15154901 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*-----*
* ht str 5155 - lower core hot stripe - 95t probability - fe *
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15155000 5 11 1 1 0. 0 0 0 0
*
*htstr mesh locn mesh fmt
15155100 0 1
*
*htstr intervals rt. coord
15155101 2 1.055e-5
15155102 2 2.5700e-4
15155103 6 6.3800e-4
*
*htstr compxn no. interval
15155201 4 2
15155202 2 4
15155203 5 10
*
*htstr source interval
15155301 0. 2
15155302 0.0023234 4
15155303 0.36647 10
*
15155401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15155501 515010000 10000 1 0 0.0001031 5
15155501 515010000 10000 102 0 0.0001031
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15155601 0 0 0 0 0.0001031
*
*htstr s.type s.mult left heat right heat ht str
15155701 1000 3.0820611d-06 0.0000000d+00 0.0000000d+00 1
15155702 1000 2.9417974d-06 0.0000000d+00 0.0000000d+00 2
15155703 1000 2.7285965d-06 0.0000000d+00 0.0000000d+00 3
15155704 1000 2.4966939d-06 0.0000000d+00 0.0000000d+00 4
15155705 1000 1.9169373d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15155801 0 0 0 0 0.0 0.5
15155801 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15155901 0 0 0 0 0.0 0.5
15155901 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*-----*
* ht str 5161 - lower core hot channel fuel plates (99.9t probability)*
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15161000 5 11 1 1 0. 0 0 0 0
*
*htstr mesh locn mesh fmt
15161100 0 1
*
*htstr intervals rt. coord
15161101 2 1.055e-5
15161102 2 2.5700e-4
15161103 6 6.3800e-4
*
*htstr compxn no. interval
15161201 4 2
15161202 2 4
15161203 5 10
*
*htstr source interval
15161301 0. 2
15161302 0.0023234 4
15161303 0.36647 10
*
15161401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15161501 516010000 10000 1 0 0.01031 5
15161501 516010000 10000 102 0 0.01031
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15161601 0 0 0 0 0.01031

```

```

*
*htstr s.type s.mult left heat right heat ht str
15161701 1000 2.6381783d-04 5.5768637d-06 0.0000000d+00 1
15161702 1000 2.5903275d-04 5.4757114d-06 0.0000000d+00 2
15161703 1000 2.4292295d-04 5.1315653d-06 0.0000000d+00 3
15161704 1000 2.2458012d-04 4.7474148d-06 0.0000000d+00 4
15161705 1000 1.9618860d-04 4.1472445d-06 0.0000000d+00 5
*htstr
*mod2.5*15161801 0 0 0 0 0 0 5
15161801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15161901 0 0 0 0 0 0 5
15161901 0. 10. 10. 0. 0. 0. 1. 5
*
*
*-----
* ht str 5162 - lower core hot channel inner side plate (99.9%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15162000 5 4 2 1 0.095 0 0 0
*
*htstr mesh locn mesh fnt
15162100 0 1
*
*htstr intervals rt. coord
15162101 3 0.102
*
*htstr compxn no. interval
15162201 2 3
*
*htstr source interval
15162301 1. 3
15162401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15162501 568100000 10000 1 1 0.0001 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15162601 516010000 10000 1 1 0.0001 5
*
*htstr s.type s.mult left heat right heat ht str no.
15162701 1000 7.9507992d-07 2.0096950d-06 0.0000000d+00 1
15162702 1000 7.8065888d-07 1.9732435d-06 0.0000000d+00 2
15162703 1000 7.3210895d-07 1.8505233d-06 0.0000000d+00 3
15162704 1000 6.7682740d-07 1.7107924d-06 0.0000000d+00 4
15162705 1000 5.9126257d-07 1.4945132d-06 0.0000000d+00 5
*htstr
*mod2.5*15162801 0 0 0 0 0 0 5
15162801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15162901 0 0 0 0 0 0 5
15162901 0. 10. 10. 0. 0. 0. 1. 5
*
*
*-----
* ht str 5163 - lower core hot channel outer side plate (99.9%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15163000 5 4 2 1 0.168 0 0 0
*
*htstr mesh locn mesh fnt
15163100 0 1
*
*htstr s.type s.mult left heat right heat ht str
15163101 intervals 3 rt. coord 0.175
*
*htstr compxn no. interval
15163201 2 3
*
*htstr source interval
15163301 1. 3
15163401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15163501 516010000 10000 1 1 0.0001 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15163601 530100000 10000 1 1 0.0001 5
*
*htstr s.type s.mult left heat right heat ht str no.
15163701 1000 1.0925844d-06 0.0000000d+00 2.3613748d-06 1
15163702 1000 1.0727673d-06 0.0000000d+00 2.3185445d-06 2
15163703 1000 1.0060496d-06 0.0000000d+00 2.1743493d-06 3
15163704 1000 9.3008397d-07 0.0000000d+00 2.0101667d-06 4
15163705 1000 8.1250233d-07 0.0000000d+00 1.7560405d-06 5
*
*htstr
*mod2.5*15163801 0 0 0 0 0 0 5
15163801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15163901 0 0 0 0 0 0 5
15163901 0. 10. 10. 0. 0. 0. 1. 5
*
*-----
* ht str 5164 - lower core hot stripe - 99.9% probability - chf
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15164000 5 11 1 1 0. 0 0 0
*
*htstr mesh locn mesh fnt
15164100 0 1
*
*htstr intervals rt. coord
15164101 2 1.055e-5
15164102 2 2.5700e-4
15164103 6 6.3800e-4
*
*htstr compxn no. interval
15164201 4 2
15164202 2 4
15164203 5 10
*
*htstr source interval
15164301 0. 2
15164302 0.0023234 4
15164303 0.36647 10
*
15164401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15164501 516010000 10000 1 0 0.0001031 5
15164501 516010000 10000 102 0 0.0001031
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15164601 0 0 0 0 0.0001031 5
*
*htstr s.type s.mult left heat right heat ht str

```

```

15164701 1000 4.8833404d-06 0.0000000d+00 0.0000000d+00 1
15164702 1000 4.5724057d-06 0.0000000d+00 0.0000000d+00 2
15164703 1000 4.3475333d-06 0.0000000d+00 0.0000000d+00 3
15164704 1000 4.0310462d-06 0.0000000d+00 0.0000000d+00 4
15164705 1000 3.6812446d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15164801 0 0 0 0 0 0 5
15164801 0.10.10.0.0.0.1.1.5
*
*htstr
*mod2.5*15164901 0 0 0 0 0 0 5
15164901 0.10.10.0.0.0.1.1.5
*
* ht str 5165 - lower core hot stripe - 99.9% probability - fe
*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15165000 5 11 1 1 0.0.0.0 0 0 0
*
*htstr mesh locn mesh fmt
15165100 0 1
*
*htstr intervals rt. coord
15165101 2 1.055e-5
15165102 2 2.5700e-4
15165103 6 6.3800e-4
*
*htstr compxn no. interval
15165201 4 2
15165202 2 4
15165203 5 10
*
*htstr source interval
15165301 0. 2
15165302 0.0023234 4
15165303 0.36647 10
*
15165401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15165501 516010000 10000 1 0 0.0001031 5
15165501 516010000 10000 102 0 0.0001031
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15165601 0 0 0 0 0 0.0001031 5
*
*htstr s.type s.mult left heat right heat ht str
15165701 1000 3.7598783d-06 0.0000000d+00 0.0000000d+00 1
15165702 1000 3.5887673d-06 0.0000000d+00 0.0000000d+00 2
15165703 1000 3.3286786d-06 0.0000000d+00 0.0000000d+00 3
15165704 1000 3.0457752d-06 0.0000000d+00 0.0000000d+00 4
15165705 1000 2.3385165d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15165801 0 0 0 0 0 0 5
15165801 0.10.10.0.0.0.1.1.5
*
*htstr
*mod2.5*15165901 0 0 0 0 0 0 5
15165901 0.10.10.0.0.0.1.1.5
*
* ht str 5201 - control rod shroud in mid core region
*

```

```

*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15201000 1 4 2 1 0.095 0 0 0
*
*htstr mesh locn mesh fmt
15201100 0 1
*
*htstr intervals rt. coord
15201101 3 0.102
*
*htstr compxn no. interval
15201201 2 3
*
*htstr source interval
15201301 0. 3
15201401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15201501 562060000 0 1 1 0.116 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15201601 572010000 0 1 1 0.116 1
*
*htstr s.type s.mult left heat right heat ht str no.
15201701 0 0. 0. 0.
*
*htstr
*mod2.5*15201801 0 0 0 0 0 0 1
15201801 0.19.10.10.0.0.0.1.1
*
*htstr
*mod2.5*15201901 0 0 0 0 0 0 1
15201901 0.10.10.0.0.0.0.1.1
*
* ht str 5202 - lower/upper core separation shroud in mid core region *
*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15202000 1 4 2 1 0.224 0 0 0
*
*htstr mesh locn mesh fmt
15202100 0 1
*
*htstr intervals rt. coord
15202101 3 0.231
*
*htstr compxn no. interval
15202201 2 3
*
*htstr source interval
15202301 0. 3
15202401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15202501 520010000 0 1 1 0.116 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15202601 535010000 0 1 1 0.116 1
*
*htstr s.type s.mult left heat right heat ht str no.
15202701 0 0. 0. 0.
*
*htstr
*mod2.5*15202801 0 0 0 0 0 0 1
15202801 0.10.10.0.0.0.0.1.1
*

```

```

* include all of the d2o heating in cpbt annulus here
*htstr s. type s. mult left heat right heat ht str no.
15351701 1000 0.0 0.0 0.0245 1
*
*htstr
*mod2.5*15351801 0 0.0 0.0 0.0 1
15351801 0.10.10.0.0.0.0.1.1
*
*htstr
*mod2.5*15351901 0 0.0 0.0 0.0 1
15351901 0.10.10.0.0.0.0.1.1
*
*-----*
* ht str 5401 - upper core average channel fuel plates
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl.incr
15401000 5 11 1 1 0.0 0 0 0
*
*htstr mesh locn mesh fmt
15401100 0 1
*
*htstr intervals rt.coord
15401101 2 1.059e-5
15401102 2 2.5700e-4
15401103 6 6.3800e-4
*
*htstr compxn no. interval
15401201 4 2
15401202 2 4
15401203 5 10
*
*htstr source interval
15401301 0. 2
15401302 0.0025414 4
15401303 0.40085 10
*
15401401 400.11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15401501 540010000 10000 1 0 5.05 5
15401501 540010000 10000 102 0 5.05 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15401601 0 0 0 0 5.05 5
*
*htstr s. type s. mult left heat right heat ht str no.
15401701 1000 9.4681501d-02 1.5542655d-03 0.000000d+00 1
15401702 1000 9.0058054d-02 1.4783355d-03 0.000000d+00 2
15401703 1000 8.1646150d-02 1.3402808d-03 0.000000d+00 3
15401704 1000 7.1904678d-02 1.1803675d-03 0.000000d+00 4
15401705 1000 6.1812793d-02 1.0147018d-03 0.000000d+00 5
*
*htstr
*mod2.5*15401801 0 0.0 0.0 0.0 5
15401801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15401901 0 0.0 0.0 0.0 5
15401901 0.10.10.0.0.0.0.1.5
*
*-----*
* ht str 5402 - upper core average channel inner side plate
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl.incr
15402000 5 4 2 1 0.224 0 0 0

```



```

15454100      0      1
*
*htstr      intervals      rt. coord
15454101      2      1.055e-5
15454102      2      2.5700e-4
15454103      6      6.3800e-4
*
*htstr      compxn no.      interval
15454201      4      2
15454202      2      4
15454203      5      10
*
*htstr      source      interval
15454301      0.      2
15454302      0.0025414      4
15454303      0.40085      10
*
15454401 400. 11
*
*htstr      left vol      incr b.cond      sa code      area/factor      ht str no.
*mod2.5*15454501 545010000 10000 1 0 0.0000888 5
15454501 545010000 10000 102 0 0.0000888 5
*
*htstr      right vol      incr b.cond      sa code      area/factor      ht str no.
15455601 0 0 0 0 0.0000888 5
*
*htstr      s. type      s. mult      left heat      right heat      ht str no.
15455701 1000 2.6782525d-06 0.0000000d+00 0.0000000d+00 1
15455702 1000 2.5012045d-06 0.0000000d+00 0.0000000d+00 2
15455703 1000 2.2774803d-06 0.0000000d+00 0.0000000d+00 3
15455704 1000 2.0376608d-06 0.0000000d+00 0.0000000d+00 4
15455705 1000 1.4582312d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15455801 0 0 0 0 0.0 5
15455801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15455901 0 0 0 0 0.0 5
15455901 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr      mesh locn      mesh fnt
15461100      0      1
*
*htstr      intervals      rt. coord
15461101      2      1.055e-5
15461102      2      2.5700e-4
15461103      6      6.3800e-4
*
*htstr      compxn no.      interval
15461201      4      2
15461202      2      4
15461203      5      10
*
*htstr      source      interval
15461301      0.      2
15461302      0.0025414      4
15461303      0.40085      10
*
15461401 400. 11
*
*htstr      left vol      incr b.cond      sa code      area/factor      ht str no.
*mod2.5*15461501 546010000 10000 1 0 0.00888 5
15461501 546010000 10000 102 0 0.00888 5
*
*htstr      right vol      incr b.cond      sa code      area/factor      ht str no.
15461601 0 0 0 0 0.00888 5
*
*htstr      s. type      s. mult      left heat      right heat      ht str no.
15461701 1000 2.2265565d-04 3.650541d-06 0.0000000d+00 1
15461702 1000 2.2210656d-04 3.6460404d-06 0.0000000d+00 2
15461703 1000 2.0522207d-04 3.3688692d-06 0.0000000d+00 3
15461704 1000 1.8504305d-04 3.0376158d-06 0.0000000d+00 4
15461705 1000 1.5854949d-04 2.6027050d-06 0.0000000d+00 5
*
*htstr

```

```

15454100      0      1
*
*htstr      intervals      rt. coord
15454101      2      1.055e-5
15454102      2      2.5700e-4
15454103      6      6.3800e-4
*
*htstr      compxn no.      interval
15454201      4      2
15454202      2      4
15454203      5      10
*
*htstr      source      interval
15454301      0.      2
15454302      0.0025414      4
15454303      0.40085      10
*
15454401 400. 11
*
*htstr      left vol      incr b.cond      sa code      area/factor      ht str no.
*mod2.5*15454501 545010000 10000 1 0 0.0000888 5
15454501 545010000 10000 102 0 0.0000888 5
*
*htstr      right vol      incr b.cond      sa code      area/factor      ht str no.
15454601 0 0 0 0 0.0000888 5
*
*htstr      s. type      s. mult      left heat      right heat      ht str no.
15454701 1000 3.3410527d-06 0.0000000d+00 0.0000000d+00 1
15454702 1000 3.2394535d-06 0.0000000d+00 0.0000000d+00 2
15454703 1000 3.0206243d-06 0.0000000d+00 0.0000000d+00 3
15454704 1000 2.7451340d-06 0.0000000d+00 0.0000000d+00 4
15454705 1000 2.4579207d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15454801 0 0 0 0 0.0 5
15454801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15454901 0 0 0 0 0.0 5
15454901 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr      mesh locn      mesh fnt
15455100      0      1
*
*htstr      intervals      rt. coord
15455101      2      1.055e-5
15455102      2      2.5700e-4
15455103      6      6.3800e-4
*
*htstr      compxn no.      interval
15455201      4      2
15455202      2      4
15455203      5      10
*
*htstr      source      interval
15455301      0.      2
15455302      0.0025414      4
15455303      0.40085      10
*

```

```

* ht str 5455 - upper core hot stripe - 95% probability - fe
*
*htstr      ht str m ptes geom init l.coord refl b.vol axl. incr
15455000 5 11 1 1 0. 0. 0 0 0
*
*htstr      mesh locn      mesh fnt
15455100      0      1
*
*htstr      intervals      rt. coord
15455101      2      1.055e-5
15455102      2      2.5700e-4
15455103      6      6.3800e-4
*
*htstr      compxn no.      interval
15455201      4      2
15455202      2      4
15455203      5      10
*
*htstr      source      interval
15455301      0.      2
15455302      0.0025414      4
15455303      0.40085      10
*

```

```

*mod2.5*15461801 0 0 0 0.0 0.0 0.5
15461801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
15464301 0.
15464302 0.0025414
15464303 0.40085
10
*
15464401 400. 11
*
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15464501 546010000 10000 1 0 0.0000888 5
15464501 546010000 10000 102 0 0.0000888
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15464601 0 0 0 0 0.0000888
*
*htstr s. type s. mult left heat right heat ht str no.
15464701 1000 4.084364d-06 0.000000d+00 0.000000d+00 1
15464702 1000 3.9601635d-06 0.000000d+00 0.000000d+00 2
15464703 1000 3.692649d-06 0.000000d+00 0.000000d+00 3
15464704 1000 3.358683d-06 0.000000d+00 0.000000d+00 4
15464705 1000 3.0047561d-06 0.000000d+00 0.000000d+00 5
*
*htstr
*mod2.5*15464801 0 0 0 0.0 0.0 0.5
15464801 0. 10. 10. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15464901 0 0 0 0.0 0.0 0.5
15464901 0. 10. 10. 0. 0. 0. 1. 5
*
*
* ht str 5465 - upper core hot stripe - 99.9% probability - fe
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15465000 5 11 1 1 0. 0 0 0
*
*htstr mesh locn mesh fmt
15465100 0 1
*
*htstr intervals rt. coord
15465101 2 1.055e-5
15465102 2 2.5700e-4
15465103 6 6.3800e-4
*
*htstr compxn no. interval
15465201 4 2
15465202 2 4
15465203 5 10
*
*htstr source interval
15465301 0.
15465302 0.0025414
15465303 0.40085
10
*
15465401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15465501 546010000 10000 1 0 0.0000888 5
15465501 546010000 10000 102 0 0.0000888
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15465601 0 0 0 0 0.0000888
*
*htstr s. type s. mult left heat right heat ht str no.
15465701 1000 3.2672629d-06 0.000000d+00 0.000000d+00 1

```

```

15465702 1000 3.0512779d-06 0.0000000d+00 0.0000000d+00 2
15465703 1000 2.778315d-06 0.0000000d+00 0.0000000d+00 3
15465704 1000 2.4857901d-06 0.0000000d+00 0.0000000d+00 4
15465705 1000 1.7789304d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15465801 0 0.0 0.0 0.0 0.5
15465801 0.10.10.0.0.0.0.1.1.5
*
*htstr
*mod2.5*15465901 0 0.0 0.0 0.0 0.5
15465901 0.10.10.0.0.0.0.1.1.5
*
*-----*
* ht str 5501 - outer cbpt in uc and lc regions
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15501000 10 4 2 1 0.291 0 0 0 0
*
*htstr mesh locn mesh fmt
15501100 0 1
*
*htstr intervals rt. coord
15501101 3 0.301
*
*htstr compxn no. interval
15501201 2 3
*
*htstr source interval
15501301 3
15501401 400.4
*
*mod2.5*15502801 0 0.0 0.0 0.0 0.5
15502801 0.10.10.0.0.0.0.1.1.5
*
*htstr
*mod2.5*15502901 0 0.0 0.0 0.0 0.5
15502901 0.10.10.0.0.0.0.1.1.5
*
*-----*
* ht str 5503 - inner cbpt in upper core region
*-----*
*htstr ht str m pts geom .init l.coord refl b.vol axl. incr
15503000 5 4 2 1 0.281 0 0 0 0
*
*htstr mesh locn mesh fmt
15503100 0 1
*
*htstr intervals rt. coord
15503101 3 0.288
*
*htstr compxn no. interval
15503201 2 3
*
*htstr source interval
15503301 3
15503401 400.4
*
*mod2.5*15503501 0 0.0 0.0 0.0 0.5
15503501 0.10.10.0.0.0.0.1.1.5
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15503501 540010000 10000 1 1 0.0836 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15503601 550160000 10000 1 1 0.0836 5
*
*htstr s. type s. mult left heat right heat ht str no.
15503701 10735 0.211 0. 0. 1
15503702 10734 0.211 0. 0. 2
15503703 10733 0.211 0. 0. 3
15503704 10732 0.211 0. 0. 4
15503705 10731 0.211 0. 0. 5
*
15465702 1000 3.0512779d-06 0.0000000d+00 0.0000000d+00 2
15465703 1000 2.778315d-06 0.0000000d+00 0.0000000d+00 3
15465704 1000 2.4857901d-06 0.0000000d+00 0.0000000d+00 4
15465705 1000 1.7789304d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15465801 0 0.0 0.0 0.0 0.5
15465801 0.10.10.0.0.0.0.1.1.5
*
*htstr
*mod2.5*15465901 0 0.0 0.0 0.0 0.5
15465901 0.10.10.0.0.0.0.1.1.5
*
*-----*
* ht str 5501 - outer cbpt in uc and lc regions
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15501000 10 4 2 1 0.291 0 0 0 0
*
*htstr mesh locn mesh fmt
15501100 0 1
*
*htstr intervals rt. coord
15501101 3 0.301
*
*htstr compxn no. interval
15501201 2 3
*
*htstr source interval
15501301 3
15501401 400.4
*
*mod2.5*15502801 0 0.0 0.0 0.0 0.5
15502801 0.10.10.0.0.0.0.1.1.5
*
*htstr
*mod2.5*15502901 0 0.0 0.0 0.0 0.5
15502901 0.10.10.0.0.0.0.1.1.5
*
*-----*
* ht str 5503 - inner cbpt in upper core region
*-----*
*htstr ht str m pts geom .init l.coord refl b.vol axl. incr
15503000 5 4 2 1 0.281 0 0 0 0
*
*htstr mesh locn mesh fmt
15503100 0 1
*
*htstr intervals rt. coord
15503101 3 0.288
*
*htstr compxn no. interval
15503201 2 3
*
*htstr source interval
15503301 3
15503401 400.4
*
*mod2.5*15503501 0 0.0 0.0 0.0 0.5
15503501 0.10.10.0.0.0.0.1.1.5
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15503501 540010000 10000 1 1 0.0836 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15503601 550160000 10000 1 1 0.0836 5
*
*htstr s. type s. mult left heat right heat ht str no.
15503701 10735 0.211 0. 0. 1
15503702 10734 0.211 0. 0. 2
15503703 10733 0.211 0. 0. 3
15503704 10732 0.211 0. 0. 4
15503705 10731 0.211 0. 0. 5
*
15465702 1000 3.0512779d-06 0.0000000d+00 0.0000000d+00 2
15465703 1000 2.778315d-06 0.0000000d+00 0.0000000d+00 3
15465704 1000 2.4857901d-06 0.0000000d+00 0.0000000d+00 4
15465705 1000 1.7789304d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15465801 0 0.0 0.0 0.0 0.5
15465801 0.10.10.0.0.0.0.1.1.5
*
*htstr
*mod2.5*15465901 0 0.0 0.0 0.0 0.5
15465901 0.10.10.0.0.0.0.1.1.5
*
*-----*
* ht str 5502 - inner cbpt in lower core region
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15502000 5 4 2 1 0.281 0 0 0 0
*

```

```

*
*htstr 15552501 555010000 10000 1 1 0.1543 5
*mod2.5*15503801 0 0.0 0.0 0.0 5
15503801 0.10.10.0.0.0.0.1.5
*
*htstr 15552601 550210000 10000 1 1 0.1543 10
*mod2.5*15503901 0 0.0 0.0 0.0 5
15503901 0.10.10.0.0.0.0.1.5
*
*-----*
* ht str 5551 - lower/upper core sprtn shroud in core outlet region *
*-----*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15551000 2 4 2 1 0.224 0 0 0
*
*htstr mesh locn mesh fmt
15551100 0 1
*
*htstr intervals rt. coord
15551101 3 0.231
*
*htstr compxn no. interval
15551201 2 3
*
*htstr source interval
15551301 0 3
15551401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15551501 525010000 10000 1 1 0.7715 2
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15551601 555010000 2000000 1 1 0.7715 2
*
*htstr s. type s. mult left heat right heat ht str no.
15551701 0 0 0 0 0
*
*mod2.5*15551801 0 0.0 0.0 0.0 2
15551801 0.10.10.0.0.0.0.1.2
*
*htstr
*mod2.5*15551901 0 0.0 0.0 0.0 2
15551901 0.10.10.0.0.0.0.1.2
*
*-----*
* ht str 5552 - cbpt in core outlet region *
*-----*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15552000 10 4 2 1 0.281 0 0 0
*
*htstr mesh locn mesh fmt
15552100 0 1
*
*htstr intervals rt. coord
15552101 3 0.286
*
*htstr compxn no. interval
15552201 2 3
*
*htstr source interval
15552301 0 3
15552401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.

```

```

15552501 555010000 10000 1 1 0.1543 5
15552502 557010000 10000 1 1 0.1543 10
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15552601 550210000 10000 1 1 0.1543 10
*
*htstr s. type s. mult left heat right heat ht str no.
15552701 0 0 0 0 0
*
*htstr
*mod2.5*15552801 0 0.0 0.0 0.0 10
15552801 0.10.10.0.0.0.0.1.10
*
*htstr
*mod2.5*15552901 0 0.0 0.0 0.0 10
15552901 0.10.10.0.0.0.0.1.10
*
*-----*
* ht str 5553 - inner/lower core sprtn shroud in core outlet region *
*-----*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15553000 2 4 2 1 0.162 0 0 0
*
*htstr mesh locn mesh fmt
15553100 0 1
*
*htstr intervals rt. coord
15553101 3 0.169
*
*htstr compxn no. interval
15553201 2 3
*
*htstr source interval
15553301 0 3
15553401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15553501 580010000 50000 1 1 0.7715 2
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15553601 525010000 50000 1 1 0.7715 2
*
*htstr s. type s. mult left heat right heat ht str no.
15553701 0 0 0 0 0
*
*htstr
*mod2.5*15553801 0 0.0 0.0 0.0 2
15553801 0.10.10.0.0.0.0.1.2
*
*htstr
*mod2.5*15553901 0 0.0 0.0 0.0 2
15553901 0.10.10.0.0.0.0.1.2
*
*-----*
* ht str no. 5611 control rod aluminum (8-35 deg sectors)
*-----*
*htstr ht str m pts geom init 1.coord refl b.vol axl. incr
15611000 11 4 2 1 0.022 0 0 0
*
*htstr mesh locn mesh fmt
15611100 0 1
*
*htstr intervals rt. coord
15611101 3 0.0285

```

```

*
*htstr compxn no. interval
15611201 2 3
*
*htstr source interval
15611301 1. 3
15611401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15611501 561010000 10000 1 1 0.0676 5
15611502 561060000 0 1 1 0.0333 6
15611503 561070000 10000 1 1 0.0676 11
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15621601 562010000 10000 1 1 0.0676 5
15621602 562060000 0 1 1 0.0333 6
15621603 562070000 10000 1 1 0.0676 11
*
*htstr s. type s. mult left heat right heat ht str no.
15621701 10642 0.166 0. 0. 1
15621702 10642 0.205 0. 0. 2
15621703 10642 0.211 0. 0. 3
15621704 10642 0.210 0. 0. 4
15621705 10642 0.208 0. 0. 5
15621706 0 0 0 0 6
15621707 0 0 0 0 7
15621708 0 0 0 0 8
15621709 0 0 0 0 9
15621710 0 0 0 0 10
15621711 0 0 0 0 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15621801 0 10. 10. 0. 0. 0. 1. 11
15621801 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15621901 0 10. 10. 0. 0. 0. 1. 11
15621901 0. 10. 10. 0. 0. 0. 1. 11
*
$-----$
$ ht str no. 5631 control rod hafnium structure (8-35 degree sectors)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15631000 11 4 2 1 0.03125 0 0 0
*
*htstr mesh locn mesh fnt
15631100 0 1
*
*htstr intervals rt. coord
15631101 3 0.0355
*
*htstr compxn no. interval
15631201 3 3
*
*htstr source interval
15631301 1. 3
15631401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15631501 563010000 10000 1 1 0.23660 5
15631502 563060000 0 1 1 0.11667 6
15631503 563070000 10000 1 1 0.23660 11
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15631601 563010000 10000 1 1 0.23660 5
15631602 563060000 0 1 1 0.11667 6
15631603 563070000 10000 1 1 0.23660 11
*
*htstr s. type s. mult left heat right heat ht str no.
15631701 10643 0.166 0. 0. 1
15631702 10643 0.205 0. 0. 2
15631703 10643 0.211 0. 0. 3

```

```

*
*htstr compxn no. interval
15611201 2 3
*
*htstr source interval
15611301 1. 3
15611401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15611501 561010000 10000 1 1 0.23660 5
15611502 561060000 0 1 1 0.11667 6
15611503 561070000 10000 1 1 0.23660 11
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15621601 562010000 10000 1 1 0.23660 5
15621602 562060000 0 1 1 0.11667 6
15621603 562070000 10000 1 1 0.23660 11
*
*htstr s. type s. mult left heat right heat ht str no.
15621701 10641 0.166 0. 0. 1
15621702 10641 0.205 0. 0. 2
15621703 10641 0.211 0. 0. 3
15621704 10641 0.210 0. 0. 4
15621705 10641 0.208 0. 0. 5
15621706 0 0 0 0 6
15621707 0 0 0 0 7
15621708 0 0 0 0 8
15621709 0 0 0 0 9
15621710 0 0 0 0 10
15621711 0 0 0 0 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15611801 0 10. 10. 0. 0. 0. 1. 11
15611801 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15611901 0 10. 10. 0. 0. 0. 1. 11
15611901 0. 10. 10. 0. 0. 0. 1. 11
*
$-----$
$ ht str no. 5621 control rod hafnium/aluminum (8-10 degree sectors)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15621000 11 10 2 1 0.022 0 0 0
*
*htstr mesh locn mesh fnt
15621100 0 1
*
*htstr intervals rt. coord
15621101 3 0.0285
15621102 2 0.03125
15621103 1 0.0315
15621104 3 0.0355
*
*htstr compxn no. interval
15621201 2 5
15621202 6 6
15621203 3 9
*
*htstr source interval
15621301 0.2 5
15621302 0. 6
15621303 0.8 9
*
15621401 400. 10

```

```

15631704 10643 0.210 0. 0. 0. 4
15631705 10643 0.208 0. 0. 0. 5
15631706 0 0 0 0. 6
15631707 0 0 0 0. 7
15631708 0 0 0 0. 8
15631709 0 0 0 0. 9
15631710 0 0 0 0. 10
15631711 0 0 0 0. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15631801 0 0. 0. 0. 0. 1. 11
15631801 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15631901 0 0. 0. 0. 0. 1. 11
15631901 0. 10. 10. 0. 0. 0. 1. 11
*
$-----$
$ ht str no. 5612 structure for gamma heating of inner flow $
$-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15612000 11 2 1 1 0. 0 0 0
*
*htstr mesh locn mesh fmt
15612100 0 1
*
*htstr intervals rt. coord
15612101 1 0.001
*
*htstr compxn no. interval
15612201 2 1
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15612301 0 0. 0. 0. 0. 1. 11
15612301 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15612401 0 0. 0. 0. 0. 1. 11
15612401 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15612501 561010000 10000 1 0 0.01 11
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15612601 0 0 0 0 0.01 11
*
*htstr s. type s. mult left heat right heat ht str no.
15612701 10613 0. .166 0. 0. 1
15612702 10613 0. .205 0. 0. 2
15612703 10613 0. .211 0. 0. 3
15612704 10613 0. .210 0. 0. 4
15612705 10613 0. .208 0. 0. 5
15612706 0 0. 0. 0. 0. 6
15612707 10640 0. .166 0. 0. 7
15612708 10640 0. .205 0. 0. 8
15612709 10640 0. .211 0. 0. 9
15612710 10640 0. .210 0. 0. 10
15612711 10640 0. .208 0. 0. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15612801 0 0. 0. 0. 0. 1. 11
15612801 0. 10. 10. 0. 0. 0. 1. 11
*
$-----$
$ ht str no. 5622 structure for gamma heating of flow around rod $
$-----$
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15622000 11 2 1 1 0. 0 0 0
*
*htstr mesh locn mesh fmt
15622100 0 1
*
*htstr intervals rt. coord
15622101 1 0.001
*
*htstr compxn no. interval
15622201 2 1
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15622301 0 0. 0. 0. 0. 1. 11
15622301 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15622401 0 0. 0. 0. 0. 1. 11
15622401 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15622501 562010000 10000 1 0 0.01 11
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15622601 0 0 0 0 0.01 11
*
*htstr s. type s. mult left heat right heat ht str no.
15622701 10700 0. 1. 0. 1
15622702 10699 0. 1. 0. 2
15622703 10698 0. 1. 0. 3
15622704 10697 0. 1. 0. 4
15622705 10696 0. 1. 0. 5
15622706 0 0. 1. 0. 6
15622707 10675 0. 1. 0. 7
15622708 10674 0. 1. 0. 8
15622709 10673 0. 1. 0. 9
15622710 10672 0. 1. 0. 10
15622711 10671 0. 1. 0. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15622801 0 0. 0. 0. 0. 1. 11
15622801 0. 10. 10. 0. 0. 0. 1. 11
*
*htstr chf flag hyd diam equiv diam ch. len ht str no.
*mod2.5*15622901 0 0. 0. 0. 0. 1. 11
15622901 0. 10. 10. 0. 0. 0. 1. 11
*
* ht str 5651 - core outlet pipe wall *
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15651000 5 4 2 1 0.28019 0 0 0
*
*htstr mesh locn mesh fmt
15651100 0 1
*
*htstr intervals rt. coord
15651101 3 0.3048
*
*htstr compxn no. interval
15651201 1 3
*
*htstr source interval
15651301 0. 3
15651401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15651501 565010000 10000 1 0.1836 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15651601 0 0 0 1 0.1836 5

```



```

*
*htstr
*mod2.5*15703801 0 0.0 0.0 0.0 5
15703801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15703901 0 0.0 0.0 0.0 5
15703901 0.10.10.0.0.0.0.1.5
*
*-----*
* ht str 5751 - inner core hot channel fuel plates (95%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15751000 5 11 1 1 0.0 0 0 0 0
*
*htstr mesh locn mesh fmt
15751100 0 1
*
*htstr intervals rt. coord
15751101 2 1.059e-5
15751102 2 2.5700e-4
15751103 6 6.3800e-4
*
*htstr compxn no. interval
15751201 4 2
15751202 2 4
15751203 5 10
*
*htstr source interval
15751301 0 2
15751302 0.00087199 4
15751303 0.13754 10
*
15751401 400.11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15751501 575010000 10000 1 0 0.01260 5
15751501 575010000 10000 102 0 0.01260 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15751601 0 0 0 0.01260 5
*
*htstr s. type s. mult left heat right heat ht str no.
15751701 1000 2.7803161d-04 1.1306634d-05 0.0000000d+00 1
15751702 1000 2.2967829d-04 9.3402627d-06 0.0000000d+00 2
15751703 1000 2.0421953d-04 8.3049385d-06 0.0000000d+00 3
15751704 1000 1.7509764d-04 7.1206468d-06 0.0000000d+00 4
15751705 1000 1.4469366d-04 5.8842165d-06 0.0000000d+00 5
*
*htstr
*mod2.5*15751801 0 0.0 0.0 0.0 5
15751801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15751901 0 0.0 0.0 0.0 5
15751901 0.10.10.0.0.0.0.1.5
*
*-----*
* ht str 5752 - inner core hot channel inner side plate - (95%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15752000 5 4 2 1 0.095 0 0 0 0
15752000 5 4 2 1 0.095 0 0 0 0
*
*htstr mesh locn mesh fmt
15752100 0 1

```

```

*
*htstr intervals rt. coord
15752101 3 0.102
*
*htstr compxn no. interval
15752201 2 3
*
*htstr source interval
15752301 1. 3
15752401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15752501 562010000 10000 1 1 0.0001659 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15752601 575010000 10000 1 1 0.0001659 5
*
*htstr s. type s. mult left heat right heat ht str no.
15752701 1000 1.5272018d-06 6.5904982d-06 0.0000000d+00 1
15752702 1000 1.2616015d-06 5.4443246d-06 0.0000000d+00 2
15752703 1000 1.1217589d-06 4.8408468d-06 0.0000000d+00 3
15752704 1000 9.6179509d-07 4.1505377d-06 0.0000000d+00 4
15752705 1000 7.9478883d-07 3.4298377d-06 0.0000000d+00 5
*
*htstr
*mod2.5*15752801 0 0.0 0.0 0.0 5
15752801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15752901 0 0.0 0.0 0.0 5
15752901 0.10.10.0.0.0.0.1.5
*
*-----*
* ht str 5753 - inner core hot channel outer side plate (95%)
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15753000 5 4 2 1 0.162 0 0 0 0
*
*htstr mesh locn mesh fmt
15753100 0 1
*
*htstr intervals rt. coord
15753101 3 0.169
*
*htstr compxn no. interval
15753201 2 3
*
*htstr source interval
15753301 1. 3
15753401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15753501 575010000 10000 1 1 0.0001659 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15753601 525010000 10000 1 1 0.0001659 5
*
*htstr s. type s. mult left heat right heat ht str no.
15753701 1000 1.0727195d-06 0.0000000d+00 7.8199183d-06 1
15753702 1000 8.8615956d-07 0.0000000d+00 6.4599325d-06 2
15753703 1000 7.8793294d-07 0.0000000d+00 5.7438794d-06 3
15753704 1000 6.7557300d-07 0.0000000d+00 4.9247970d-06 4
15753705 1000 5.5846639d-07 0.0000000d+00 4.0696545d-06 5
*
*htstr

```

```

*mod2.5*15753801 0 0.0 0.0 0.0 0.0 5
15753801 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15753901 0 0.0 0.0 0.0 0.0 5
15753901 0. 10. 10. 0. 0. 0. 0. 1. 5
*
* ht str 5754 - lower core hot stripe - 95% probability - chf
*-----*
*htstr ht str 5754 m pts geom init l.coord refl b.vol axl. incr
15754000 5 11 1 1 0. 0 0 0 0
*
*htstr mesh locn mesh fmt
15754100 0 1
*
*htstr intervals rt. coord
15754101 2 1.055e-5
15754102 2 2.5700e-4
15754103 6 6.3800e-4
*
*htstr compxn no. interval
15754201 4 2
15754202 2 4
15754203 5 10
*
*htstr source interval
15754301 0. 2
15754302 0.00087199 4
15754303 0.13754 10
*
15754401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15755501 575010000 10000 102 0 0.0001260 5
15755501 575010000 10000 102 0 0.0001260 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15755601 0 0 0 0 0.0001260 5
*
*htstr s.type s.mult left heat right heat ht str
15755701 1000 3.0689720d-06 0.0000000d+00 0.0000000d+00 1
15755702 1000 2.5726843d-06 0.0000000d+00 0.0000000d+00 2
15755703 1000 2.2900451d-06 0.0000000d+00 0.0000000d+00 3
15755704 1000 1.9317387d-06 0.0000000d+00 0.0000000d+00 4
15755705 1000 1.5422753d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15755801 0 0.0 0.0 0.0 0.0 5
15755801 0. 10. 10. 0. 0. 0. 0. 1. 5
*
*htstr
*mod2.5*15755901 0 0.0 0.0 0.0 0.0 5
15755901 0. 10. 10. 0. 0. 0. 0. 1. 5
*
* ht str 5761 - inner core hot channel fuel plates (99.9% probability)*
*-----*
*htstr ht str 5761 m pts geom init l.coord refl b.vol axl. incr
15761000 5 11 1 1 0. 0 0 0 0
*
*htstr mesh locn mesh fmt
15761100 0 1
*
*htstr intervals rt. coord
15761101 2 1.055e-5
15761102 2 2.5700e-4
15761103 6 6.3800e-4
*
*htstr compxn no. interval
15761201 4 2
15761202 2 4
15761203 5 10
*
*htstr source interval
15761301 0. 2
15761302 0.00087199 4
15761303 0.13754 10
*
15761401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.

```

```

*mod2.5*15761501 576010000 10000 1 0 0.01260 5
15761501 576010000 10000 102 0 0.01260 5
*htstr right vol incr b.cond sa code area/factor ht str no.
15761601 0 0 0 0 0.01260 5
*
*htstr s.type s.mult left heat right heat ht str
15761701 1000 2.8812773d-04 1.1717210d-05 0.0000000d+00 1
15761702 1000 2.3801856d-04 9.6794342d-06 0.0000000d+00 2
15761703 1000 2.1163322d-04 8.6065145d-06 0.0000000d+00 3
15761704 1000 1.8145594d-04 7.3792178d-06 0.0000000d+00 4
15761705 1000 1.4994790d-04 6.0978892d-06 0.0000000d+00 5
*htstr
*mod2.5*15761801 0 0.0 0.0 0.0 5
15761801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15761901 0 0.0 0.0 0.0 5
15761901 0.10.10.0.0.0.0.1.5
*
* ht str 5762 - inner core hot channel inner side plate (99.9%)
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15762000 5 4 2 1 0.095 0 0 0
*
*htstr mesh locn mesh fmt
15762100 0 1
*
*htstr intervals rt. coord
15762101 3 0.102
*
*htstr compxn no. interval
15762201 2 3
*
*htstr source interval
15762301 1. 3
15762401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15762501 562010000 10000 1 1 0.0001659 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15762601 576010000 10000 1 1 0.0001659 5
*
*htstr s.type s.mult left heat right heat ht str no.
15762701 1000 1.5826589d-06 6.8298180d-06 0.0000000d+00 1
15762702 1000 1.3074139d-06 5.6420235d-06 0.0000000d+00 2
15762703 1000 1.1624932d-06 5.0166318d-06 0.0000000d+00 3
15762704 1000 9.9672062d-07 4.3012556d-06 0.0000000d+00 4
15762705 1000 8.2364988d-07 3.5543848d-06 0.0000000d+00 5
*
*htstr
*mod2.5*15762801 0 0.0 0.0 0.0 5
15762801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15762901 0 0.0 0.0 0.0 5
15762901 0.10.10.0.0.0.0.1.5
*
* ht str 5763 - inner core hot channel outer side plate (99.9%)
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15763000 5 4 2 1 0.162 0 0 0

```

```

*
*htstr mesh locn mesh fmt
15763100 0 1
*
*htstr intervals rt. coord
15763101 3 0.169
*
*htstr compxn no. interval
15763201 2 3
*
*htstr source interval
15763301 1. 3
15763401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
15763501 576010000 10000 1 1 0.0001659 5
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15763601 525010000 10000 1 1 0.0001659 5
*
*htstr s.type s.mult left heat right heat ht str no.
15763701 1000 1.1116730d-06 0.0000000d+00 8.1038819d-06 1
15763702 1000 9.1833854d-07 0.0000000d+00 6.6945111d-06 2
15763703 1000 8.1654503d-07 0.0000000d+00 5.9524560d-06 3
15763704 1000 7.0010498d-07 0.0000000d+00 5.1036305d-06 4
15763705 1000 5.7853863d-07 0.0000000d+00 4.2174352d-06 5
*
*htstr
*mod2.5*15763801 0 0.0 0.0 0.0 5
15763801 0.10.10.0.0.0.0.1.5
*
*htstr
*mod2.5*15763901 0 0.0 0.0 0.0 5
15763901 0.10.10.0.0.0.0.1.5
*
* ht str 5764 - inner core hot stripe - 99.9% probability - chf
*-----*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15764000 5 11 1 1 0. 0 0 0
*
*htstr mesh locn mesh fmt
15764100 0 1
*
*htstr intervals rt. coord
15764101 2 1.055e-5
15764102 2 2.5700e-4
15764103 6 6.3800e-4
*
*htstr compxn no. interval
15764201 4 2
15764202 2 4
15764203 5 10
*
*htstr source interval
15764301 0. 2
15764302 0.00087199 4
15764303 0.13754 10
*
*htstr
15764401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15764501 576010000 10000 1 0 0.0001260 5
15764501 576010000 10000 102 0 0.0001260 5

```

```

*htstr right vol incr b.cond sa code area/factor ht str no.
15764601 0 0 0 0 0.0001260 5
*
*htstr s.type s.mult left heat right heat ht str
15764701 1000 5.1860445d-06 0.0000000d+00 0.0000000d+00 1
15764702 1000 4.4654851d-06 0.0000000d+00 0.0000000d+00 2
15764703 1000 3.8011161d-06 0.0000000d+00 0.0000000d+00 3
15764704 1000 3.3648141d-06 0.0000000d+00 0.0000000d+00 4
15764705 1000 2.8359632d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15764801 0 0 0 0 0.0 5
15764801 0 10 10 0 0 0 0 1. 5
*
*htstr
*mod2.5*15764901 0 0 0 0 0.0 5
15764901 0 10 10 0 0 0 0 1. 5
*
*-----*
* ht str 5765 - inner core hot stripe - 99.9% probability - fe *
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
15765000 5 11 1 1 0. 0 0 0 0
*
*htstr mesh locn mesh fmt
15765100 0 1
*
*htstr intervals rt. coord
15765101 2 1.055e-5
15765102 2 2.5700e-4
15765103 6 6.3800e-4
*
*htstr compxn no. interval
15765201 4 2
15765202 2 4
15765203 5 10
*
*htstr source interval
15765301 0. 2
15765302 0.00087199 4
15765303 0.13754 10
*
15765401 400. 11
*
*htstr left vol incr b.cond sa code area/factor ht str no.
*mod2.5*15765501 576010000 10000 1 0 0.0001260 5
15765501 576010000 10000 102 0 0.0001260
*
*htstr right vol incr b.cond sa code area/factor ht str no.
15765601 0 0 0 0 0.0001260 5
*
*htstr s.type s.mult left heat right heat ht str
15765701 1000 3.7439107d-06 0.0000000d+00 0.0000000d+00 1
15765702 1000 3.1384777d-06 0.0000000d+00 0.0000000d+00 2
15765703 1000 2.7936795d-06 0.0000000d+00 0.0000000d+00 3
15765704 1000 2.3565732d-06 0.0000000d+00 0.0000000d+00 4
15765705 1000 1.8814576d-06 0.0000000d+00 0.0000000d+00 5
*
*htstr
*mod2.5*15765801 0 0 0 0 0.0 5
15765801 0 10 10 0 0 0 0 1. 5
*
*htstr
*mod2.5*15765901 0 0 0 0 0.0 5
15765901 0 10 10 0 0 0 0 1. 5

```

```

*-----*
* ht str no. 6401 hotpipe $
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
16401000 6 4 2 1 0.28019 0 0 0
*
*htstr mesh locn mesh fmt
16401100 0 1
*
*htstr intervals rt. coord
16401101 3 0.3048
*
*htstr compxn no. interval
16401201 1 3
*
*htstr source interval
16401301 0. 3
16401401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
16401501 640010000 10000 1 1 0.6267 3
16401502 641010000 10000 1 1 2.33667 6
*
*htstr right vol incr b.cond sa code area/factor ht str no.
16401601 -501 0 4521 1 0.6267 3
16401602 -501 0 4581 1 2.33667 6
*
*htstr s.type s.mult left heat right heat ht str no.
16401701 0 0 0 0 0 6
*
*htstr
*mod2.5*16401801 0 0 0 0 0.0 6
16401801 0 10 10 0 0 0 0 1. 6
*
*htstr
*mod2.5*16401901 0 0 0 0 0.0 6
16401901 0 10 10 0 0 0 0 1. 6
*
*-----*
* ht str no. 6451 hotpipe $
*
*htstr ht str m pts geom init l.coord refl b.vol axl. incr
16451000 1 4 2 1 0.28019 0 0 0
*
*htstr mesh locn mesh fmt
16451100 0 1
*
*htstr intervals rt. coord
16451101 3 0.3048
*
*htstr compxn no. interval
16451201 1 3
*
*htstr source interval
16451301 0. 3
16451401 400. 4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
16451501 645010000 0 1 1 8.23 1
*
*htstr right vol incr b.cond sa code area/factor ht str no.
16451601 -501 0 4521 1 8.23 1
*
*htstr s.type s.mult left heat right heat ht str no.

```

```

16451701      0      0      0      0      0      0      1
*
*htstr
*mod2.5*16451801 0 0 0 0 0 0 0 1
16451801 0 10 10 0 0 0 0 1 1
*mod2.5*16451901 0 0 0 0 0 0 0 1
16451901 0 10 10 0 0 0 0 1 1
*
*-----
*      ht str no. 6501      hothead
*-----
*htstr ht str mpts geom init l.coord refl b.vol axl. incr
16501000 4 4 2 1      0.28019 0 0 0 0
*
*htstr mesh locn mesh fmt
16501100 0 0 1
*
*htstr intervals rt. coord
16501101 3 0.3048
*
*htstr compxn no. interval
16501201 1 3
*
*htstr source interval
16501301 0 3
16501401 400.4
*
*htstr left vol incr b.cond sa code area/factor ht str no.
16501501 650010000 0 1 1 1.68 1
16501502 650110000 0 1 1 3.51 2
16501503 650290000 0 1 1 1.22 3
16501504 650390000 0 1 1 1.83 4
*
*htstr right vol incr b.cond sa code area/factor ht str no.
16501601 -501 0 4521 1 1.68 1
16501602 -501 0 4521 1 3.51 2
16501603 -501 0 4521 1 1.22 3
16501604 -501 0 4521 1 1.83 4
*
*htstr s. type s. mult left heat right heat ht str no.
16501701 0 0 0 0 0 4
*
*
*htstr
*mod2.5*16501801 0 0 0 0 0 0 0 4
16501801 0 10 10 0 0 0 0 1 4
*mod2.5*16501901 0 0 0 0 0 0 0 4
16501901 0 10 10 0 0 0 0 1 4
*
*-----
*      general data tables
*-----
*
* saturation table (pressure as a fcn. of temperature)
20203500 reac-t
20203503 40. 6.549e3
20203505 50. 11.121e3
20203506 60. 18.200e3
20203507 70. 28.80e3
20203508 80. 44.23e3
20203509 90. 66.07e3
20203510 100. 96.25e3
20203511 110. 137.06e3
*
20203512 120. 191.4e3
20203513 130. 261.5e3
20203514 140. 351.7e3
20203515 150. 465.3e3
20203516 160. 606.7e3
20203517 170. 780.3e3
20203518 180. 991.2e3
20203519 190. 1244.5e3
20203520 200. 1546.0e3
*
* primary coolant pump post-cavitation head degradation factor
20203900 reac-t
20203901 0.0 0.0
20203902 0.7 0.0
20203903 0.8 0.95
20203904 1.0 1.0
*
* main circulation pump homologous curve: hvn
20204100 reac-t
20204101 0. -0.35
20204102 0.425 0.
20204103 0.567 0.142
20204104 0.637 0.239
20204105 0.728 0.391
20204106 0.850 0.644
20204107 1. 1.
*
* main circulation pump homologous curve: hvn inverse
20204200 reac-t
20204201 -0.35 0.
20204202 0. 0.425
20204203 0.142 0.567
20204204 0.239 0.637
20204205 0.391 0.728
20204206 0.644 0.850
20204207 1. 1.
*
* main circulation pump speed vs. frictional torque
* tf = 150 + 10*n**2
20204300 reac-t
20204301 .000 150. .100 150.1 .200 150.4 .300 150.9
20204302 .400 151.6 .500 152.5 .600 153.6 .700 154.9
20204303 .800 156.4 .900 158.1 1.0 160.
*
* main circulation pump
* relative speed vs. pony motor torque (n-m)
* the hfr data have been normalized keeping the ratio between the
* pony motor locked-rotor torque and the main motor rated torque constant.
20204400 reac-t
20204401 0.0000 2408.
20204402 0.0731 1035.4
20204403 0.1134 613.1
20204404 0.1537 382.1
20204405 0.2142 203.9
20204406 0.2681 126.8
20204407 0.4032 0.0
20204408 1.0000 0.0
*
*-----
*      table no. 135 - mcp coastdown
*-----

```

20213500 react-t 635									
20213501	-1.	1.							
20213502	0.	1.							
20213503	0.001	0.9995							
20213504	0.005	0.9975							
20213505	0.1	0.9529							
20213506	0.2	0.9100							
20213507	0.5	0.8021							
20213508	1.	0.6704							
20213509	2.	0.5064							
20213510	3.	0.4091							
20213511	6.	0.2644							
20213512	9.	0.2010							
20213513	10.	0.1874							
20213514	15.	0.1457							
20213515	20.	0.1256							
20213516	50.	0.1012							
20213517	100.	0.1000							
20213518	1.e6	0.1000							
20223500 react-t 635									
20223501	-1.	1.							
20223502	0.	1.							
20223503	0.001	0.9995							
20223504	0.005	0.9975							
20223505	0.1	0.9529							
20223506	0.2	0.9100							
20223507	0.5	0.8021							
20223508	1.	0.6704							
20223509	2.	0.5064							
20223510	3.	0.4091							
20223511	6.	0.2644							
20223512	9.	0.2010							
20223513	10.	0.1874							
20223514	15.	0.1457							
20223515	20.	0.1256							
20223516	50.	0.1012							
20223517	100.	0.1000							
20223518	1.e6	0.1000							
20233500 react-t 635									
20233501	-1.	1.							
20233502	0.	1.							
20233503	0.001	0.9995							
20233504	0.005	0.9975							
20233505	0.1	0.9529							
20233506	0.2	0.9100							
20233507	0.5	0.8021							
20233508	1.	0.6704							
20233509	2.	0.5064							
20233510	3.	0.4091							
20233511	6.	0.2644							
20233512	9.	0.2010							
20233513	10.	0.1874							
20233514	15.	0.1457							
20233515	20.	0.1256							
20233516	50.	0.1012							
20233517	100.	0.1000							
20233518	1.e6	0.1000							
table no. 500 - core power									

* table no. 591 - htc from outside of 43.75-in. horizontal ehx shell
 * assumes pool temperature of 311.15 k
 * -----\$

20259100 htc-temp	330.	856.	340.	1033.
20259101 320.	622.	856.	340.	1033.
20259102 350.	1175.	1289.	370.	1411.
20259103 380.	1566.	1700.	400.	1815.
20259104 410.	1912.	1992.	430.	2110.
20259105 440.	2226.	2329.	460.	2419.

* -----\$
 * table no. 599 - htc from outside of 83-in. horizontal hx shell
 * assumes pool temperature of 311.15 k
 * -----\$

20259900 htc-temp	330.	849.	340.	1025.
20259901 320.	615.	849. <td>340. <td>1025.</td> </td>	340. <td>1025.</td>	1025.
20259902 350.	1167.	1280.	370.	1402.
20259903 380.	1556.	1689.	400.	1804.
20259904 410.	1901.	1980.	430.	2098.
20259905 440.	2214.	2316.	460.	2407.

* -----\$
 \$ table 606 - normalized fission power as a function of
 \$ time after scram
 * -----\$

table no. 606 - norm fis power		
table	table type	trip no. factor1 factor2
20260600	react-t	510 1.0 1.0

* time power
 20260601 -1.

0.	1.000000
0.0010000	1.000000
0.0020000	1.000000
0.0030000	1.000000
0.0040000	1.000000
0.0050000	1.000000
0.0060000	1.000000
0.0070000	1.000000
0.0080000	1.000000
0.0090000	1.000000
0.0100000	1.000000
0.0110000	1.000000
0.0120000	1.000000
0.0130000	1.000000
0.0140000	1.000000
0.0150000	1.000000
0.0160000	1.000000
0.0170000	1.000000
0.0180000	1.000000
0.0190000	1.000000
0.0200000	1.000000
0.0300000	1.000000
0.0400000	0.9952940
0.0500000	0.9706620
0.0600000	0.9135980
0.0700000	0.8185900
0.0800000	0.6913340
0.0900000	0.5482860
0.1000000	0.4104350
0.1100000	0.2948530
0.1200000	0.2085720

0.1300000	0.1502310
0.1400000	0.1155010
0.1500000	0.0962423
0.1600000	0.0845212
0.1700000	0.0766344
0.1800000	0.0715573
0.1900000	0.0673201
0.2000000	0.0634865
0.3000000	0.0389523
0.4000000	0.0206108
0.5000000	0.0200444
0.6000000	0.0195264
0.7000000	0.0190503
0.8000000	0.0187457
0.9000000	0.0181940
1.0000000	0.0178052
1.1000000	0.0174368
1.2000000	0.0170881
1.3000000	0.0167569
1.4000000	0.0164414
1.5000000	0.0161401
1.6000000	0.0158517
1.7000000	0.0155752
1.8000000	0.0153096
1.9000000	0.0150541
2.0000000	0.0148080
3.0000000	0.0127552
4.0000000	0.0112157
5.0000000	0.0100163
6.0000000	0.0090598
7.0000000	0.0082837
8.0000000	0.0076467
9.0000000	0.0071162
10.000000	0.0066687
11.000000	0.0062861
12.000000	0.0059539
13.000000	0.0056637
14.000000	0.0054083
15.000000	0.0051792
16.000000	0.0049729
17.000000	0.0047840
18.000000	0.0046092
19.000000	0.0044484
20.000000	0.0042995
30.000000	0.0032245
40.000000	0.0025527
50.000000	0.0020821
60.000000	0.0017350
70.000000	0.0014720
80.000000	0.0012695
90.000000	0.0011122
100.00000	9.890e-04
110.00000	8.918e-04
120.00000	8.146e-04
130.00000	7.529e-04
140.00000	7.031e-04
150.00000	6.628e-04
160.00000	6.299e-04
170.00000	6.028e-04
180.00000	5.804e-04
190.00000	5.618e-04
200.00000	5.463e-04

-----\$
 \$ table 607 - fission product decay power as a function of
 \$ time after scram
 \$ -----\$

table no. 607 - norm fpd power					
* table	type	trip	factor1	factor2	
20260700	react-t	510	1.0	17.378	
* table	time	power			
20260701	-1.	0.0575440			
+	0.	0.0575440			
+	0.0010000	0.0575440			
+	0.0020000	0.0575440			
+	0.0030000	0.0575440			
+	0.0040000	0.0575440			
+	0.0050000	0.0575440			
+	0.0060000	0.0575440			
+	0.0070000	0.0575440			
+	0.0080000	0.0575440			
+	0.0090000	0.0575440			
+	0.0100000	0.0575440			
+	0.0110000	0.0575440			
+	0.0120000	0.0575440			
+	0.0130000	0.0575440			
+	0.0140000	0.0575440			
+	0.0150000	0.0575440			
+	0.0160000	0.0575440			
+	0.0170000	0.0575440			
+	0.0180000	0.0575440			
+	0.0190000	0.0575440			
+	0.0200000	0.0575440			
+	0.0300000	0.0575440			
+	0.0400000	0.0575440			
+	0.0500000	0.0575440			
+	0.0600000	0.0575440			
+	0.0700000	0.0575440			
+	0.0800000	0.0575440			
+	0.0900000	0.0575440			
+	0.1000000	0.0575440			
+	0.1100000	0.0575440			
+	0.1200000	0.0575440			
+	0.1300000	0.0575440			
+	0.1400000	0.0575440			
+	0.1500000	0.0575440			
+	0.1600000	0.0575440			
+	0.1700000	0.0575440			
+	0.1800000	0.0575440			
+	0.1900000	0.0575440			
+	0.2000000	0.0575440			
+	0.3000000	0.0575440			
+	0.4000000	0.0575440			
+	0.5000000	0.0575440			
+	0.6000000	0.0575440			
+	0.7000000	0.0575440			
+	0.8000000	0.0575440			
+	0.9000000	0.0575440			
+	1.0000000	0.0575440			
+	1.1000000	0.0575440			
+	1.2000000	0.0571496			
+	1.3000000	0.0567496			
+	1.4000000	0.0563844			
+	1.5000000	0.0560485			
+	1.6000000	0.0557379			
+	1.7000000	0.0554489			
+	1.8000000	0.0551790			
+	1.9000000	0.0549257			
+	2.0000000	0.0546874			

*	3.0000000	0.0528604			
+	4.0000000	0.0516186			
+	5.0000000	0.0506824			
+	6.0000000	0.0499335			
+	7.0000000	0.0493110			
+	8.0000000	0.0487792			
+	9.0000000	0.0483157			
+	10.000000	0.0479055			
+	11.000000	0.0471744			
+	12.000000	0.0464751			
+	13.000000	0.0458414			
+	14.000000	0.0452628			
+	15.000000	0.0447310			
+	16.000000	0.0442395			
+	17.000000	0.0437828			
+	18.000000	0.0433568			
+	19.000000	0.0429577			
+	20.000000	0.0425827			
+	30.000000	0.0397339			
+	40.000000	0.0378315			
+	50.000000	0.0364198			
+	60.000000	0.0353061			
+	70.000000	0.0343914			
+	80.000000	0.0336184			
+	90.000000	0.0329510			
+	100.00000	0.0323654			
+	110.00000	0.0315756			
+	120.00000	0.0308686			
+	130.00000	0.0302323			
+	140.00000	0.0296548			
+	150.00000	0.0291272			
+	160.00000	0.0286422			
+	170.00000	0.0281940			
+	180.00000	0.0277778			
+	190.00000	0.0273898			
+	200.00000	0.0270268			
\$	\$-----				
\$	\$ table 608 - al-28 decay power as a function of				
\$	\$ time after scram				
*	\$-----				
*	table no. 608 - al decay power				
*table	type	trip	factor1	factor2	*
20260800	react-t	510	1.0	1.0	
*	\$-----				
*table	time	power			
20260801	-1.	1.0			
+	0.	1.0			
+	0.0010000	0.9999948			
+	0.0100000	0.9999487			
+	0.1000000	0.9994866			
+	1.0000000	0.9948787			
+	2.0000000	0.9897835			
+	3.0000000	0.9847148			
+	4.0000000	0.9796718			
+	5.0000000	0.9746546			
+	6.0000000	0.9696631			
+	7.0000000	0.9646972			
+	8.0000000	0.9597568			
+	9.0000000	0.9548416			
+	10.000000	0.9499516			
+	11.000000	0.9450866			
+	12.000000	0.9402466			
+	13.000000	0.9354314			
+	14.000000	0.9306407			

\$-----\$
 \$ table 608 - al-28 decay power as a function of
 \$ time after scram
 \$-----\$

-----\$
 table no. 608 - al decay power
 -----\$

```

20295610 0.04 1.8727
20295611 0.045 1.9752
20295612 0.0491 2.0292
20295613 0.06 2.1360
20295614 1.0 11.3480
*-----*
* table 970 - control rod reactivity as function of normalized rod
* position (biased to zero at initial position)
*-----*
* table table type trip no. factor 1 factor 2
*-----*
20297000 react-t
*-----*
* table
*-----*
20297001 time reactivity
20297002 0. 3.93
20297003 0.1218 3.50
20297004 0.2195 2.33
20297005 0.2790 0.
20297006 0.4391 -6.27
20297007 0.6098 -18.18
20297008 0.7805 -28.89
20297009 1. -32.78
*-----*
* control variable input
*-----*
*-----*
* control mcp speed to reach new steady-state
*-----*
20507700 tr-tu tripunit 1.00000d+00 1. 1
20507701 -528
20507800 piflow constant 2.00000d+01
20507900 ferror sum 1.00000d+00 2.01796-5 1
20507901 0. 1.,cntrlvar,78 -1.,veifj,507010200
20508000 fterr mult 1.00000d+00 2.01796-5 0
20508001 cntrlvar,77 cntrlvar,79
20508100 flo-pi prop-int 1.00000d+00 171.419 0
20508101 0.20 2.0 cntrlvar 80
20508200 flo-d diffrend 1.00000d-06 -1.407062-10 0
20508201 cntrlvar,80
20508300 mcp-vel sum 1.00000d+00 171.419 1
20508301 0. 1.,cntrlvar,81 1.,cntrlvar,82
*-----*
* specified speed coastdown for mcps
*-----*
*-----*
20519500 mcplsp function 171.419 171.419 0 3 .00 171.419
20519501 time 0 135
*-----*
* these control variables are for purely cosmetic purposes (i.e. the
* solution is not dependend upon) to monitor the limits in the fuel.
*-----*
* cost flow excursion predictions (w/m^2)
* - lower fuel hot channel - 95% uncertainty
20520000 sgrtveif power 1.00000d+00 4.36474 0
20520001 veif 515010000 0.5
20520100 sattemp sum 1.0 490.326 1
20520101 0. 0.5,sattemp,515010000 0.5,sattemp,515020000
20520200 subcool sum 1.00000d+00 158.4946 0
20520201 0. 1.,cntrlvar,201 -1.,tempf,515010000

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```

15.000000 0.9258747
16.000000 0.9211331
17.000000 0.9164157
18.000000 0.9117225
19.000000 0.9070533
20.000000 0.9024081
30.000000 0.8572440
40.000000 0.8143403
50.000000 0.7735839
60.000000 0.7348672
70.000000 0.6980883
80.000000 0.6631501
90.000000 0.6299605
100.00000 0.5984320
110.00000 0.5684815
120.00000 0.5400299
130.00000 0.5130022
140.00000 0.4873273
150.00000 0.4629373
160.00000 0.4397681
170.00000 0.4177584
180.00000 0.3968502
190.00000 0.3769885
200.00000 0.3581209
*-----*
* table no. 820 - sb p2r speed
*-----*
* table table type trip no. factor 1 factor 2
*-----*
20282000 react-t 550 1. 1.
*-----*
* table
*-----*
20282001 time reactivity
20282002 -1. 0.
20282003 0. 0.
20282004 5. 214.7884
20282005 1.e6 214.7884
*-----*
* table no. 855 - idvalve
*-----*
* table table type trip no. factor 1 factor 2
*-----*
20285500 react-t 550 1. 1.
*-----*
* table
*-----*
20285501 time reactivity
20285502 -1. 1.
20285503 0. 1.
20285504 1. 0.
20285505 1.e6 1.e6
*-----*
* table 956 - scram rod reactivity as function of time after trip
*-----*
* table table type trip no. factor 1 factor 2
*-----*
20295600 react-t 510 1. 1.
*-----*
* table
*-----*
20295601 time reactivity
20295602 -1. 0.
20295603 0. 0.
20295604 0.005 0.2931
20295605 0.01 0.5802
20295606 0.015 0.8555
20295607 0.02 1.1133
20295608 0.025 1.3485
20295609 0.03 1.5561
20295610 0.035 1.7321

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20523401 0. 1.,cntrlvar,233 -1.,tempf,516040000
20523500 costaf mult 7.812500d+04 5405876. 0
20523500 sqrtvelf power 1.000000d+00 4.37892 0
20523501 cntrlvar,232 cntrlvar,234
20523600 sqrtvelf power 1.000000d+00 4.43498 0
20523601 velf 515020000 0.5
20523700 sattlep sum 1.0 487.03 1
20523701 0. 0.5,sattlep,515020000 0.5,sattlep,515030000
20523800 subcoolf sum 1.000000d+00 142.3255 0
20523801 0. 1.,cntrlvar,205 -1.,tempf,515020000
20523900 costaf mult 7.812500d+04 4.869+7 0
20523901 cntrlvar,204 cntrlvar,206
20523900 sqrtvelf power 1.000000d+00 4.39487 0
20523901 velf 515030000 0.5
20523901 cntrlvar,236 cntrlvar,238
*
* - upper fuel hot channel - 95% uncertainty
20524000 sqrtvelf power 1.000000d+00 4.35178 0
20524001 velf 545010000 0.5
20524100 sattlep sum 1.0 490.171 1
20524101 0. 0.5,sattlep,545010000 0.5,sattlep,545020000
20524200 subcoolf sum 1.000000d+00 158.302 0
20524201 0. 1.,cntrlvar,241 -1.,tempf,545010000
20524300 costaf mult 7.812500d+04 53819940. 0
20524301 cntrlvar,240 cntrlvar,242
20524400 sqrtvelf power 1.000000d+00 4.36561 0
20524401 velf 545020000 0.5
20524500 sattlep sum 1.0 486.891 1
20524501 0. 0.5,sattlep,545020000 0.5,sattlep,545030000
20524600 subcoolf sum 1.000000d+00 142.364 0
20524601 0. 1.,cntrlvar,245 -1.,tempf,545020000
20524700 costaf mult 7.812500d+04 48555096. 0
20524701 cntrlvar,244 cntrlvar,246
20524800 sqrtvelf power 1.000000d+00 4.3811 0
20524801 velf 545030000 0.5
20524900 sattlep sum 1.0 483.518 1
20524901 0. 0.5,sattlep,545030000 0.5,sattlep,545040000
20525000 subcoolf sum 1.000000d+00 127.2553 0
20525001 0. 1.,cntrlvar,249 -1.,tempf,545030000
20525100 costaf mult 7.812500d+04 43556100. 0
20525101 cntrlvar,248 cntrlvar,250
20525200 sqrtvelf power 1.000000d+00 4.39708 0
20525201 velf 545040000 0.5
20525300 sattlep sum 1.0 480.022 1
20525301 0. 0.5,sattlep,545040000 0.5,sattlep,545050000
20525400 subcoolf sum 1.000000d+00 113.1481 0
20525401 0. 1.,cntrlvar,253 -1.,tempf,545040000
20525500 costaf mult 7.812500d+04 38868864. 0
20525501 cntrlvar,252 cntrlvar,254
20525600 sqrtvelf power 1.000000d+00 4.41255 0
20525601 velf 545050000 0.5
20525700 sattlep sum 1.0 476.456 1
20525701 0. 1.5,sattlep,545050000 -0.5,sattlep,545040000
20525800 subcoolf sum 1.000000d+00 100.4831 0
20525801 0. 1.,cntrlvar,257 -1.,tempf,545050000
20525900 costaf mult 7.812500d+04 34639572. 0
20525901 cntrlvar,256 cntrlvar,258
*
* - upper fuel hot channel - 99.9% uncertainty
20526000 sqrtvelf power 1.000000d+00 4.35487 0
20526001 velf 546010000 0.5
20526100 sattlep sum 1.0 490.154 1
20526101 0. 0.5,sattlep,546010000 0.5,sattlep,546020000
20526200 subcoolf sum 1.000000d+00 157.7802 0
20526201 0. 1.,cntrlvar,261 -1.,tempf,546010000
20526300 costaf mult 7.812500d+04 53680664. 0
20526301 cntrlvar,260 cntrlvar,262
20526400 sqrtvelf power 1.000000d+00 4.36935 0
20526401 velf 546020000 0.5

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20520300 costaf mult 7.812500d+04 5405876. 0
20520301 cntrlvar,200 cntrlvar,202
20520400 sqrtvelf power 1.000000d+00 4.37892 0
20520401 velf 515020000 0.5
20520500 sattlep sum 1.0 487.03 1
20520501 0. 0.5,sattlep,515020000 0.5,sattlep,515030000
20520600 subcoolf sum 1.000000d+00 142.3255 0
20520601 0. 1.,cntrlvar,205 -1.,tempf,515020000
20520700 costaf mult 7.812500d+04 4.869+7 0
20520701 cntrlvar,204 cntrlvar,206
20520800 sqrtvelf power 1.000000d+00 4.39487 0
20520801 velf 515030000 0.5
20520900 sattlep sum 1.0 483.64 1
20520901 0. 0.5,sattlep,515030000 0.5,sattlep,515040000
20521000 subcoolf sum 1.000000d+00 126.8238 0
20521001 0. 1.,cntrlvar,209 -1.,tempf,515030000
20521100 costaf mult 7.812500d+04 43544880. 0
20521101 cntrlvar,208 cntrlvar,210
20521200 sqrtvelf power 1.000000d+00 4.41171 0
20521201 velf 515040000 0.5
20521300 sattlep sum 1.0 480.126 1
20521301 0. 0.5,sattlep,515040000 0.5,sattlep,515050000
20521400 subcoolf sum 1.000000d+00 112.086 0
20521401 0. 1.,cntrlvar,213 -1.,tempf,515040000
20521500 costaf mult 7.812500d+04 38632132. 0
20521501 cntrlvar,212 cntrlvar,214
20521600 sqrtvelf power 1.000000d+00 4.42843 0
20521601 velf 515050000 0.5
20521700 sattlep sum 1.0 476.543 1
20521701 0. 1.5,sattlep,515050000 -0.5,sattlep,515040000
20521800 subcoolf sum 1.000000d+00 98.6883 0
20521801 0. 1.,cntrlvar,217 -1.,tempf,515050000
20521900 costaf mult 7.812500d+04 34143260. 0
20521901 cntrlvar,216 cntrlvar,218
*
* - lower fuel hot channel - 99.9% uncertainty
20522000 sqrtvelf power 1.000000d+00 4.367895 0
20522001 velf 516010000 0.5
20522100 sattlep sum 1.0 490.309 1
20522101 0. 0.5,sattlep,516010000 0.5,sattlep,516020000
20522200 subcoolf sum 1.000000d+00 157.955 0
20522201 0. 1.,cntrlvar,221 -1.,tempf,516010000
20522300 costaf mult 7.812500d+04 53900860. 0
20522301 cntrlvar,220 cntrlvar,222
20522400 sqrtvelf power 1.000000d+00 4.38275 0
20522401 velf 516020000 0.5
20522500 sattlep sum 1.0 487.01 1
20522501 0. 0.5,sattlep,516020000 0.5,sattlep,516030000
20522600 subcoolf sum 1.000000d+00 141.2668 0
20522601 0. 1.,cntrlvar,225 -1.,tempf,516020000
20522700 costaf mult 7.812500d+04 48370108. 0
20522701 cntrlvar,224 cntrlvar,226
20522800 sqrtvelf power 1.000000d+00 4.39954 0
20522801 velf 516030000 0.5
20522900 sattlep sum 1.0 483.617 1
20522901 0. 0.5,sattlep,516030000 0.5,sattlep,516040000
20523000 subcoolf sum 1.000000d+00 125.2745 0
20523001 0. 1.,cntrlvar,229 -1.,tempf,516030000
20523100 costaf mult 7.812500d+04 43058564. 0
20523101 cntrlvar,228 cntrlvar,230
20523200 sqrtvelf power 1.000000d+00 4.4173 0
20523201 velf 516040000 0.5
20523300 sattlep sum 1.0 480.101 1
20523301 0. 0.5,sattlep,516040000 0.5,sattlep,516050000
20523400 subcoolf sum 1.000000d+00 110.0802 0

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20526500 sattemp sum 1.0 486.872 1
20526501 0. 0.5, sattemp, 546020000 0.5, sattemp, 546030000
20526600 subcool sum 1.000000d+00 141.1347 0
20526601 0. 1., cntrlvar, 265 -1., tempf, 546020000
20526700 costaf mult 7.812500d+04 48245388. 0
20526701 cntrlvar, 264 cntrlvar, 266
20526800 sqrtvelf power 1.000000d+00 4.38564 0
20526801 velf 546030000 0.5
20526900 sattemp sum 1.0 483.496 1
20526901 0. 0.5, sattemp, 546030000 0.5, sattemp, 546040000
20527000 subcool sum 1.000000d+00 125.7548 0
20527001 0. 1., cntrlvar, 269 -1., tempf, 546030000
20527100 costaf mult 7.812500d+04 43087096. 0
20527101 cntrlvar, 268 cntrlvar, 270
20527200 sqrtvelf power 1.000000d+00 4.40249 0
20527201 velf 546040000 0.5
20527300 sattemp sum 1.0 479.997 1
20527301 0. 0.5, sattemp, 546040000 0.5, sattemp, 546050000
20527400 subcool sum 1.000000d+00 111.2214 0
20527401 0. 1., cntrlvar, 273 -1., tempf, 546040000
20527500 costaf mult 7.812500d+04 38253956. 0
20527501 cntrlvar, 272 cntrlvar, 274
20527600 sqrtvelf power 1.000000d+00 4.41882 0
20527601 velf 546050000 0.5
20527700 sattemp sum 1.0 476.429 1
20527701 0. 1.5, sattemp, 546050000 -0.5, sattemp, 546040000
20527800 subcool sum 1.000000d+00 98.1924 0
20527801 0. 1., cntrlvar, 277 -1., tempf, 546050000
20527900 costaf mult 7.812500d+04 3.3898+7 0
20527901 cntrlvar, 276 cntrlvar, 278
*
* - inner fuel hot channel - 95% uncertainty
20528000 sqrtvelf power 1.000000d+00 4.35853 0
20528001 velf 575010000 0.5
20528100 sattemp sum 1.0 490.196 1
20528101 0. 0.5, sattemp, 575010000 0.5, sattemp, 575020000
20528200 subcool sum 1.000000d+00 158.9817 0
20528201 0. 1., cntrlvar, 281 -1., tempf, 575010000
20528300 costaf mult 7.812500d+04 54134860. 0
20528301 cntrlvar, 280 cntrlvar, 282
20528400 sqrtvelf power 1.000000d+00 4.37024 0
20528401 velf 575020000 0.5
20528500 sattemp sum 1.0 486.902 1
20528501 0. 0.5, sattemp, 575020000 0.5, sattemp, 575030000
20528600 subcool sum 1.000000d+00 145.781 0
20528601 0. 1., cntrlvar, 285 -1., tempf, 575020000
20528700 costaf mult 7.812500d+04 49773260. 0
20528701 cntrlvar, 284 cntrlvar, 286
20528800 sqrtvelf power 1.000000d+00 4.38173 0
20528801 velf 575030000 0.5
20528900 sattemp sum 1.0 483.504 1
20528901 0. 0.5, sattemp, 575030000 0.5, sattemp, 575040000
20529000 subcool sum 1.000000d+00 133.557 0
20529001 0. 1., cntrlvar, 289 -1., tempf, 575030000
20529100 costaf mult 7.812500d+04 45719612. 0
20529101 cntrlvar, 288 cntrlvar, 290
20529200 sqrtvelf power 1.000000d+00 4.392825 0
20529201 velf 575040000 0.5
20529300 sattemp sum 1.0 479.971 1
20529301 0. 0.5, sattemp, 575040000 0.5, sattemp, 575050000
20529400 subcool sum 1.000000d+00 122.4368 0
20529401 0. 1., cntrlvar, 293 -1., tempf, 575040000
20529500 costaf mult 7.812500d+04 4.2019+7 0
20529501 cntrlvar, 292 cntrlvar, 294
20529600 sqrtvelf power 1.000000d+00 4.40293 0
20529601 velf 575050000 0.5
20529700 sattemp sum 1.0 476.364 1
20529701 0. 1.5, sattemp, 575050000 -0.5, sattemp, 575040000
20529800 subcool sum 1.000000d+00 112.5494 0
20529801 0. 1., cntrlvar, 297 -1., tempf, 575050000
20529900 costaf mult 7.812500d+04 38714600. 0
20529901 cntrlvar, 296 cntrlvar, 298
*
* - inner fuel hot channel - 99.9% uncertainty
20530000 sqrtvelf power 1.000000d+00 4.36145 0
20530001 velf 576010000 0.5
20530100 sattemp sum 1.0 490.18 1
20530101 0. 0.5, sattemp, 576010000 0.5, sattemp, 576020000
20530200 subcool sum 1.000000d+00 158.4936 0
20530201 0. 1., cntrlvar, 301 -1., tempf, 576010000
20530300 costaf mult 7.812500d+04 54004828. 0
20530301 cntrlvar, 300 cntrlvar, 302
20530400 sqrtvelf power 1.000000d+00 4.3737 0
20530401 velf 576020000 0.5
20530500 sattemp sum 1.0 486.883 1
20530501 0. 0.5, sattemp, 576020000 0.5, sattemp, 576030000
20530600 subcool sum 1.000000d+00 144.8957 0
20530601 0. 1., cntrlvar, 305 -1., tempf, 576020000
20530700 costaf mult 7.812500d+04 49510160. 0
20530701 cntrlvar, 304 cntrlvar, 306
20530800 sqrtvelf power 1.000000d+00 4.38577 0
20530801 velf 576030000 0.5
20530900 sattemp sum 1.0 483.483 1
20530901 0. 0.5, sattemp, 576030000 0.5, sattemp, 576040000
20531000 subcool sum 1.000000d+00 132.3187 0
20531001 0. 1., cntrlvar, 309 -1., tempf, 576030000
20531100 costaf mult 7.812500d+04 45337396. 0
20531101 cntrlvar, 308 cntrlvar, 310
20531200 sqrtvelf power 1.000000d+00 4.39744 0
20531201 velf 576040000 0.5
20531300 sattemp sum 1.0 479.949 1
20531301 0. 0.5, sattemp, 576040000 0.5, sattemp, 576050000
20531400 subcool sum 1.000000d+00 120.8957 0
20531401 0. 1., cntrlvar, 313 -1., tempf, 576040000
20531500 costaf mult 7.812500d+04 41533756. 0
20531501 cntrlvar, 312 cntrlvar, 314
20531600 sqrtvelf power 1.000000d+00 4.40809 0
20531601 velf 576050000 0.5
20531700 sattemp sum 1.0 476.341 1
20531701 0. 1.5, sattemp, 576050000 -0.5, sattemp, 576040000
20531800 subcool sum 1.000000d+00 110.7572 0
20531801 0. 1., cntrlvar, 317 -1., tempf, 576050000
20531900 costaf mult 7.812500d+04 38142804. 0
20531901 cntrlvar, 316 cntrlvar, 318
*
* - pellet numbers for hot channels
* assume hydraulic diameters of 0.002236 for lc and 0.002299 for uc
* lc 95% probability
20532000 dh-g-cp mult 0.002236 195377.4 1
20532001 velf, 515010000 rhoof, 515010000 subpf, 515010000
20532100 pelc95-1 div 1.0 313842. 1
20532101 thconf, 515010000 cntrlvar, 320
20532200 dh-g-cp mult 0.002236 194558.7 1
20532201 velf, 515020000 rhoof, 515020000 subpf, 515020000
20532300 pelc95-2 div 1.0 309300.4 1
20532301 thconf, 515020000 cntrlvar, 322
20532400 dh-g-cp mult 0.002236 193873.2 1
20532401 velf, 515030000 rhoof, 515030000 subpf, 515030000
20532500 pelc95-3 div 1.0 306184. 1
20532501 thconf, 515030000 cntrlvar, 324

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20532600 dh-g-cp mult 0.002236 193365.4 1
20532601 velf,515040000 rhof,515040000 csbupf,515040000
20532700 pelc95-4 div 1.0 304305.4 1
20532701 thconf,515040000 cntrlvar,326
20532800 dh-g-cp mult 0.002236 193101.1
20532801 velf,515050000 rhof,515050000 csbupf,515050000
20532900 pelc95-5 div 1.0 303539.1
20532901 thconf,515050000 cntrlvar,328
* lc 99.9% probability
20533000 dh-g-cp mult 0.002236 195579.7 1
20533001 velf,516010000 rhof,516010000 csbupf,516010000
20533100 pelc99-1 div 1.0 314012.3 1
20533101 thconf,516010000 cntrlvar,330
20533200 dh-g-cp mult 0.002236 194723.2 1
20533201 velf,516020000 rhof,516020000 csbupf,516020000
20533300 pelc99-2 div 1.0 309350.6 1
20533301 thconf,516020000 cntrlvar,332
20533400 dh-g-cp mult 0.002236 194014.6 1
20533401 velf,516030000 rhof,516030000 csbupf,516030000
20533500 pelc99-3 div 1.0 306216.7 1
20533501 thconf,516030000 cntrlvar,334
20533600 dh-g-cp mult 0.002236 193501.1
20533601 velf,516040000 rhof,516040000 csbupf,516040000
20533700 pelc99-4 div 1.0 304404.1
20533701 thconf,516040000 cntrlvar,336
20533800 dh-g-cp mult 0.002236 193256.3 1
20533801 velf,516050000 rhof,516050000 csbupf,516050000
20533900 pelc99-5 div 1.0 303778.1
20533901 thconf,516050000 cntrlvar,338
* uc 99.9% probability
20534000 dh-g-cp mult 0.0022299 193684.1
20534001 velf,545010000 rhof,545010000 csbupf,545010000
20534100 pelc95-1 div 1.0 311110.5 1
20534101 thconf,545010000 cntrlvar,340
20534200 dh-g-cp mult 0.0022299 192880.1
20534201 velf,545020000 rhof,545020000 csbupf,545020000
20534300 pelc95-2 div 1.0 306668.1
20534301 thconf,545020000 cntrlvar,342
20534400 dh-g-cp mult 0.0022299 192230.5 1
20534401 velf,545030000 rhof,545030000 csbupf,545030000
20534500 pelc95-3 div 1.0 303662.1
20534501 thconf,545030000 cntrlvar,344
20534600 dh-g-cp mult 0.0022299 191766.1
20534601 velf,545040000 rhof,545040000 csbupf,545040000
20534700 pelc95-4 div 1.0 301865.6 1
20534701 thconf,545040000 cntrlvar,346
20534800 dh-g-cp mult 0.0022299 191519.5 1
20534801 velf,545050000 rhof,545050000 csbupf,545050000
20534900 pelc95-5 div 1.0 301078.6 1
20534901 thconf,545050000 cntrlvar,348
* uc 99.9% probability
20535000 dh-g-cp mult 0.0022299 193881.7 1
20535001 velf,546010000 rhof,546010000 csbupf,546010000
20535100 pelc99-1 div 1.0 311280.3 1
20535101 thconf,546010000 cntrlvar,350
20535200 dh-g-cp mult 0.0022299 193041.1
20535201 velf,546020000 rhof,546020000 csbupf,546020000
20535300 pelc99-2 div 1.0 306719.1
20535301 thconf,546020000 cntrlvar,352
20535400 dh-g-cp mult 0.0022299 192370.5 1
20535401 velf,546030000 rhof,546030000 csbupf,546030000
20535500 pelc99-3 div 1.0 303694.6 1
20535501 thconf,546030000 cntrlvar,354
20535600 dh-g-cp mult 0.0022299 191902.1
20535601 velf,546040000 rhof,546040000 csbupf,546040000
20535700 pelc99-4 div 1.0 301958.1
20535701 thconf,546040000 cntrlvar,356
20535800 dh-g-cp mult 0.0022299 191673.5 1
20535801 velf,546050000 rhof,546050000 csbupf,546050000
20535900 pelc99-5 div 1.0 304292.3 1
20535901 thconf,546050000 cntrlvar,358
* lc 95% probability
20536000 dh-g-cp mult 0.0022299 194384.6 1
20536001 velf,575010000 rhof,575010000 csbupf,575010000
20536100 pelc95-1 div 1.0 312431.1
20536101 thconf,575010000 cntrlvar,360
20536200 dh-g-cp mult 0.0022299 193856.5 1
20536201 velf,575020000 rhof,575020000 csbupf,575020000
20536300 pelc95-2 div 1.0 308965.1
20536301 thconf,575020000 cntrlvar,362
20536400 dh-g-cp mult 0.0022299 193382.1
20536401 velf,575030000 rhof,575030000 csbupf,575030000
20536500 pelc95-3 div 1.0 306441.1
20536501 thconf,575030000 cntrlvar,364
20536600 dh-g-cp mult 0.0022299 193038.7 1
20536601 velf,575040000 rhof,575040000 csbupf,575040000
20536700 pelc95-4 div 1.0 304775.1
20536701 thconf,575040000 cntrlvar,366
20536800 dh-g-cp mult 0.0022299 192816.4 1
20536801 velf,575050000 rhof,575050000 csbupf,575050000
20536900 pelc95-5 div 1.0 303759.3 1
20536901 thconf,575050000 cntrlvar,368
* uc 99.9% probability
20537000 dh-g-cp mult 0.0022299 194573.2 1
20537001 velf,576010000 rhof,576010000 csbupf,576010000
20537100 pelc99-1 div 1.0 312593.1
20537101 thconf,576010000 cntrlvar,370
20537200 dh-g-cp mult 0.0022299 194020.2 1
20537201 velf,576020000 rhof,576020000 csbupf,576020000
20537300 pelc99-2 div 1.0 309029.1
20537301 thconf,576020000 cntrlvar,372
20537400 dh-g-cp mult 0.0022299 193528.8 1
20537401 velf,576030000 rhof,576030000 csbupf,576030000
20537500 pelc99-3 div 1.0 306469.1
20537501 thconf,576030000 cntrlvar,374
20537600 dh-g-cp mult 0.0022299 193175.8 1
20537601 velf,576040000 rhof,576040000 csbupf,576040000
20537700 pelc99-4 div 1.0 304809.1
20537701 thconf,576040000 cntrlvar,376
20537800 dh-g-cp mult 0.0022299 192954.5 1
20537801 velf,576050000 rhof,576050000 csbupf,576050000
20537900 pelc99-5 div 1.0 303831.1
20537901 thconf,576050000 cntrlvar,378
*
* prandtl numbers for hot channels
* lc 95%
20544400 visc-cp mult 1.0 2.367397 1
20544401 velf,515010000 csbupf,515010000
20544500 prand511 div 1.0 3.80284 1
20544501 thconf,515010000 cntrlvar,444
20544600 visc-cp mult 1.0 1.948485 1
20544601 velf,515020000 csbupf,515020000
20544700 prand512 div 1.0 3.09761 1
20544701 thconf,515020000 cntrlvar,446
20544800 visc-cp mult 1.0 1.656296 1
20544801 velf,515030000 csbupf,515030000
20544900 prand513 div 1.0 2.61579 1
20544901 thconf,515030000 cntrlvar,448
20545000 visc-cp mult 1.0 1.446564 1
20545001 velf,515040000 csbupf,515040000

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20545100 prand514 div 1.0 2.276504 1
20545101 thconf,515040000 cntrlvar,450
20545200 visc-cp mult 1.0 1.298663 1
20545201 visc-cp mult 1.0 1.298663 1
20545300 prand515 div 1.0 2.041393 1
20545301 thconf,515050000 cntrlvar,452
* lc 99.9%
20545400 visc-cp mult 1.0 2.347557 1
20545401 visc,516010000 csbpf,516010000
20545500 prand911 div 1.0 3.76911 1
20545501 thconf,516010000 cntrlvar,454
20545600 visc-cp mult 1.0 1.920113 1
20545601 visc,516020000 csbpf,516020000
20545700 prand912 div 1.0 3.050423 1
20545701 thconf,516020000 cntrlvar,456
20545800 visc-cp mult 1.0 1.624742 1
20545801 visc,516030000 csbpf,516030000
20545900 prand913 div 1.0 2.56436 1
20545901 thconf,516030000 cntrlvar,458
20546000 visc-cp mult 1.0 1.414302 1
20546001 visc,516040000 csbpf,516040000
20546100 prand914 div 1.0 2.2249 1
20546101 thconf,516040000 cntrlvar,460
20546200 visc-cp mult 1.0 1.266842 1
20546201 visc,516050000 csbpf,516050000
20546300 prand915 div 1.0 1.99134 1
20546301 thconf,516050000 cntrlvar,462
* uc 99.9%
20546400 visc-cp mult 1.0 2.36598 1
20546401 visc,545010000 csbpf,545010000
20546500 prand514 div 1.0 3.800424 1
20546501 thconf,545010000 cntrlvar,464
20546600 visc-cp mult 1.0 1.95339 1
20546601 visc,545020000 csbpf,545020000
20546700 prand512 div 1.0 3.105777 1
20546701 thconf,545020000 cntrlvar,466
20546800 visc-cp mult 1.0 1.66799 1
20546801 visc,545030000 csbpf,545030000
20546900 prand513 div 1.0 2.634884 1
20546901 thconf,545030000 cntrlvar,468
20547000 visc-cp mult 1.0 1.466167 1
20547001 visc,545040000 csbpf,545040000
20547100 prand514 div 1.0 2.307944 1
20547101 thconf,545040000 cntrlvar,470
20547200 visc-cp mult 1.0 1.324867 1
20547201 visc,545050000 csbpf,545050000
20547300 prand515 div 1.0 2.08276 1
20547301 thconf,545050000 cntrlvar,472
* uc 99.9%
20547400 visc-cp mult 1.0 2.34682 1
20547401 visc,546010000 csbpf,546010000
20547500 prand911 div 1.0 3.767856 1
20547501 thconf,546010000 cntrlvar,474
20547600 visc-cp mult 1.0 1.925685 1
20547601 visc,546020000 csbpf,546020000
20547700 prand912 div 1.0 3.059683 1
20547701 thconf,546020000 cntrlvar,476
20547800 visc-cp mult 1.0 1.637054 1
20547801 visc,546030000 csbpf,546030000
20547900 prand913 div 1.0 2.58441 1
20547901 thconf,546030000 cntrlvar,478
20548000 visc-cp mult 1.0 1.434436 1
20548001 visc,546040000 csbpf,546040000
20548100 prand914 div 1.0 2.257084 1
20548101 thconf,546040000 cntrlvar,480

20548200 visc-cp mult 1.0 1.293455 1
20548201 visc,546050000 csbpf,546050000
20548300 prand915 div 1.0 2.03186 1
20548301 thconf,546050000 cntrlvar,482
* lc 95%
20548400 visc-cp mult 1.0 2.39121 1
20548401 visc,575010000 csbpf,575010000
20548500 prand511 div 1.0 3.843354 1
20548501 thconf,575010000 cntrlvar,484
20548600 visc-cp mult 1.0 2.051986 1
20548601 visc,575020000 csbpf,575020000
20548700 prand512 div 1.0 3.27042 1
20548701 thconf,575020000 cntrlvar,486
20548800 visc-cp mult 1.0 1.812146 1
20548801 visc,575030000 csbpf,575030000
20548900 prand513 div 1.0 2.8716 1
20548901 thconf,575030000 cntrlvar,488
20549000 visc-cp mult 1.0 1.641434 1
20549001 visc,575040000 csbpf,575040000
20549100 prand514 div 1.0 2.591544 1
20549101 thconf,575040000 cntrlvar,490
20549200 visc-cp mult 1.0 1.51994 1
20549201 visc,575050000 csbpf,575050000
20549300 prand515 div 1.0 2.394487 1
20549301 thconf,575050000 cntrlvar,492
* lc 99.9%
20549400 visc-cp mult 1.0 2.37297 1
20549401 visc,576010000 csbpf,576010000
20549500 prand911 div 1.0 3.81232 1
20549501 thconf,576010000 cntrlvar,494
20549600 visc-cp mult 1.0 2.02613 1
20549601 visc,576020000 csbpf,576020000
20549700 prand912 div 1.0 3.22715 1
20549701 thconf,576020000 cntrlvar,496
20549800 visc-cp mult 1.0 1.78275 1
20549801 visc,576030000 csbpf,576030000
20549900 prand913 div 1.0 2.823134 1
20549901 thconf,576030000 cntrlvar,498
20550000 visc-cp mult 1.0 1.610505 1
20550001 visc,576040000 csbpf,576040000
20550100 prand914 div 1.0 2.54119 1
20550101 thconf,576040000 cntrlvar,500
20550200 visc-cp mult 1.0 1.488473 1
20550201 visc,576050000 csbpf,576050000
20550300 prand915 div 1.0 2.34379 1
20550301 thconf,576050000 cntrlvar,502
*
* -----$
* control pr speed to reach new steady-state (487-491)
* these control variables should only be active when
* a new steady pressurizing flow rate is being sought
* -----$
20558700 prvel constant 1.629971 3.465 0
20558800 flerror sum 1.000004+00 -5.43169-5 1
20558901 0. 1.,cntrlvar,587 -1.,vel,f,825000000
20558900 flo-pi prop-int 1.0 246.00 0
20558901 8.0 80. cntrlvar 588
20559000 flo-d diffrend 1.000004-06 8.07164-11 0
20559001 cntrlvar,588
20559100 prvel sum 1.0 246.00 1
20559101 0. 1.,cntrlvar,589 1.,cntrlvar,590
*
* -----$

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* control system to control primary coolant system temperature by
* adjusting the secondary flow
*-----$
*ctrlvar name type factor init f c min max
20559200 terror sum 1.00000d+00 -9.77584-5 1
20559201 318.75 -1. tempf 500010000
*
*20559300 p1cntrl prop-int -1.00000d+00 1681.036 0
*20559301 30. 3.0 cntrlvar 592
*20559300 secflow constant 1681.036
*
20559400 se-off tripunit 1.0000d+00 0. 0 3 .00 1.0000d+00
20559401 540
*
20559500 deltat sum 1.00000d+00 180.704 0 1 0.
20559501 -10. 1.,time,0
*
20559600 factor mult 0.1 0. 0 3 0.0 0.9677
20559601 cntrlvar,594 cntrlvar,595
*
20559700 se-dec sum 1.0 1. 0
20559701 1. -1.,cntrlvar,596
*
20559800 setlo1 mult 1.00000d+00 1681.036 0
20559801 cntrlvar,593 cntrlvar,597
*
*-----$
* $ the 600 to 700 series inputs the transient powers into the control
$ rods and the surrounding d2o.
*-----$
*flag for scram 0.0-no 1.0-yes
*ctrlvar name type factor init f c min
20560000 "scram" tripunit 1.0 0. 1 0
*
*ctrlvar trip no.
20560001 510
$complement flag for no scram 0.0-yes 1.0-no
*ctrlvar name type factor init f c min
20560100 "noscam" tripunit 1.0 1. 1 0
*
*ctrlvar trip no.
20560101 -510
*
* get current power into system
*ctrlvar name type factor init f c min
20560200 "pwcnt1" sum 1.0 3.44+8 1 0
*
*ctrlvar a0 coeff variable name parameter no.
20560201 0.0 1.0 rktpow 0
*-----$
$ multiply current power by no-scram
$ should have no value after scram
*ctrlvar name type factor init f c min
20560300 "pwr01" mult 1.0 3.44+8 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20560301 cntrlvar 601 cntrlvar 602
*-----$
$ multiply current, saved power by scram
$ should have no value before scram
*ctrlvar name type factor init f c min
20560400 "pwr02" mult 1.0 0. 1 0

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*ctrlvar variable name parameter no. variable name parameter no.
20560401 cntrlvar 600 cntrlvar 605
$-----$
$ add scram-weighted powers together. before scram, should be true,
$ kinetic power; after scram should be the last saved power before
$ scram
*ctrlvar name type factor init f c min
20560500 "savpow" sum 1.0 3.44+8 1 0
*
*ctrlvar a0 coeff variable name parameter no.
20560501 0.0 1.0 cntrlvar 603
20560502 1.0 cntrlvar 604
*
$ multiplies the no-scram flag by saved power and by the factor which
$ represents the total power by fission neutrons, fission gammas,
$ fission product gammas, and al-28 gamma & beta decay. factor
$ includes axial peaking. local heating will follow power until
$ scram, at which point it should go to zero because this heat
$ source is moved to another volume.
$-----$
$ the next 15 controls multiple normalized power from a tabular
$ function of time by a scalar. table 606 is the fission power
$ table; table 607 is the fission decay power table; table 608 is
$ al-28 decay table.
$ titles fspwxx refer to fission gammas and neutrons. the factor
$ is the sum of those sources on level xx in the zr/al/hf composite
$ multiplied by a level factor and divided by 3.5e8 watts.
$ titles fstdkxx refer to fission decay gammas. the factor
$ is the sum of those sources on level xx in the zr/al/hf composite
$ multiplied by a level factor and divided by 3.5e8 watts.
$ titles aldkxx refer to aluminum beta and gamma decay. the factor
$ is the sum of those sources on level xx in the zr/al/hf composite
$ multiplied by a level factor and divided by 3.5e8 watts.
$ radial distribution is applied via the heat structure cards.
$ summation and by the last saved power before scram. the local
$ decay powers are thus scaled by the power at scram and weighted
$ by the scram flag (before scram = no value, after scram = value)
$ as above, these 15 cards multiply the appropriate scalars by the
$ corresponding tables, in this case for the power in the d2o in the
$ central rod hole.
$-----$
$ the sums are multiplied the th saved power at scram and the scram
$ flag. as above there is no value before scram.
$-----$
*ctrlvar name type factor init f c min max
20561100 "aliss" mult 4.9028e-04 168656.3 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20561101 cntrlvar 601 cntrlvar 605
$-----$
*ctrlvar name type factor init f c min max
20561200 "hfiss" mult 2.3105e-03 794812. 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20561201 cntrlvar 601 cntrlvar 605
$-----$
*ctrlvar name type factor init f c min max
20561300 "d2oiss" mult 2.1391e-04 73585. 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20561301 cntrlvar 601 cntrlvar 605
$-----$
*ctrlvar name type factor init f c min max

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20561400 "alcomp" mult 2.1689e-4 74610.2 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20561401 cntrlvar 601 cntrlvar 605
$-----$
*ctrlvar name type factor init f c min max
20561500 "hfcamp" mult 6.6004e-4 227053.8 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20561501 cntrlvar 601 cntrlvar 605
$-----$
*ctrlvar name type factor init f c min max
20561600 "alhass" sum 1.0 301664. 1 0
*
*ctrlvar a0 coeff variable name parameter no.
20561601 0.0 1.0 cntrlvar 614
20561602 1.0 cntrlvar 615
$-----$
*ctrlvar name type factor init f c min max
20562100 "alfsp" function 4.8823e-4 4.8823-4 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20562101 time 0 606
$-----$
*ctrlvar name type factor init f c min max
20562200 "alfad" function 3.4996e-5 3.4996-5 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20562201 time 0 607
$-----$
*ctrlvar name type factor init f c min max
20562300 "alal" function 1.0733e-5 1.0733-5 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20562301 time 0 608
$-----$
*ctrlvar name type factor init f c min max
20562400 "altot1" sum 1.0 5.33959-4 1 0
*
*ctrlvar a0 coeff variable name parameter no.
20562401 0.0 1.0 cntrlvar 621
20562402 1.0 cntrlvar 622
20562403 1.0 cntrlvar 623
$-----$
*ctrlvar name type factor init f c min max
20562500 "altot2" mult 1.0 0.
*
*ctrlvar variable name parameter no. variable name parameter no.
20562501 cntrlvar 600 cntrlvar 605
20562502 cntrlvar 624
$-----$
*ctrlvar name type factor init f c min max
20562600 "hffsp" function 1.8708e-3 .0018708 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20562601 time 0 606
$-----$
*ctrlvar name type factor init f c min max
20562700 "hffad" function 3.9623e-4 3.9623-4 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20562701 time 0 607
$-----$
*ctrlvar name type factor init f c min max
20562800 "hfa1" function 4.3444e-5 4.3444-5 1 0
$-----$

*
*ctrlvar srch arg. name srch arg. no. table no.
20562801 time 0 608
$-----$
*ctrlvar name type factor init f c min max
20562900 "hftot1" sum 1.0 .002310474 1 0
*
*ctrlvar a0 coeff variable name parameter no.
20562901 0.0 1.0 cntrlvar 626
20562902 1.0 cntrlvar 627
20562903 1.0 cntrlvar 628
$-----$
*ctrlvar name type factor init f c min max
20563000 "hftot2" mult 1.0 0. 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20563001 cntrlvar 600 cntrlvar 605
20563002 cntrlvar 629
$-----$
*ctrlvar name type factor init f c min max
20563100 "sumfsp" function 7.5041e-4 7.5041-4 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20563101 time 0 606
$-----$
*ctrlvar name type factor init f c min max
20563200 "sumfsd" function 1.2868e-4 1.2868-4 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20563201 time 0 607
$-----$
*ctrlvar name type factor init f c min max
20563300 "sumal" function 1.7159e-5 1.7159-5 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20563301 time 0 608
$-----$
*ctrlvar name type factor init f c min max
20563400 "sumtot1" sum 1.0 8.96249-4 1 0
*
*ctrlvar a0 coeff variable name parameter no.
20563401 0.0 1.0 cntrlvar 631
20563402 1.0 cntrlvar 632
20563403 1.0 cntrlvar 633
$-----$
*ctrlvar name type factor init f c min max
20563500 "sumtot2" mult 1.0 0. 1 0
*
*ctrlvar variable name parameter no. variable name parameter no.
20563501 cntrlvar 600 cntrlvar 605
20563502 cntrlvar 634
$-----$
*ctrlvar name type factor init f c min max
20563600 "d2ofsp" function 2.1238e-4 2.1238-4 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20563601 time 0 606
$-----$
*ctrlvar name type factor init f c min max
20563700 "d2ofsd" function 7.6092e-6 7.6092-6 1 0
*
*ctrlvar srch arg. name srch arg. no. table no.
20563701 time 0 607
$-----$
*ctrlvar name type factor init f c min max

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20563800 "d2oal" function 1.5251e-6 1.5251-6 1 0
*ctivar srch arg. name srch arg. no. table no.
*ctivar time 0 608
$-----$
*ctivar name type factor init f c min max
20563900 "d2otot1" sum 1.0 2.215143-4 1 0
*
*ctivar a0 coeff variable name parameter no.
20563901 0.0 1.0 cntrivar 636
20563902 1.0 1.0 cntrivar 637
20563903 1.0 1.0 cntrivar 638
$-----$
*ctivar name type factor init f c min max
20564000 "d2otot2" mult 1.0 0. 1 0
*
*ctivar variable name parameter no. variable name parameter no.
20564001 cntrivar 600 cntrivar 605
20564002 cntrivar 639
$-----$
*ctivar name type factor init f c min max
20564100 "alhfs" sum 1. 168656.3 0 0
*
*ctivar a0 coeff variable name parameter no.
20564101 0. 1. cntrivar 625
20564102 1. 1. cntrivar 611
$-----$
*ctivar name type factor init f c min max
20564200 "alhfs" sum 1. 301664. 0 0
*
*ctivar a0 coeff variable name parameter no.
20564201 0. 1. cntrivar 635
20564202 1. 1. cntrivar 616
$-----$
*ctivar name type factor init f c min max
20564300 "hhs" sum 1. 794812. 0 0
*
*ctivar a0 coeff variable name parameter no.
20564301 0. 1. cntrivar 630
20564302 1. 1. cntrivar 612
* these are the outer d2o cards. they parallel the above cards
*ctivar name type factor init f c min max
20567100 "wohs1" mult 1.2489e-3 429622. 1
*
*ctivar variable name parameter no. variable name parameter no.
20567101 cntrivar 601 cntrivar 605
$-----$
*ctivar name type factor init f c min max
20567200 "wohs2" mult 1.2610e-3 433784. 1 0
*
*ctivar variable name parameter no. variable name parameter no.
20567201 cntrivar 601 cntrivar 605
$-----$
*ctivar name type factor init f c min max
20567300 "wohs3" mult 1.2670e-3 435848. 1 0
*
*ctivar variable name parameter no. variable name parameter no.
20567301 cntrivar 601 cntrivar 605
$-----$
*ctivar name type factor init f c min max
20567400 "wohs4" mult 1.2310e-3 423464. 1 0
*
*ctivar variable name parameter no. variable name parameter no.
20567401 cntrivar 601 cntrivar 605
$-----$

```

```

*ctivar name type factor init f c min max
20567500 "wohs5" mult 9.9681e-4 342902.6 1 0
*
*ctivar variable name parameter no. variable name parameter no.
20567501 cntrivar 601 cntrivar 605
$-----$
*ctivar name type factor init f c min max
20567600 "fspwo1" function 9.6471e-4 9.6471-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20567601 time 0 606
$-----$
*ctivar name type factor init f c min max
20567700 "fsdkwo1" function 2.6619e-4 2.6619-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20567701 time 0 607
$-----$
*ctivar name type factor init f c min max
20567800 "aldhwo1" function 1.8902e-5 1.8902-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20567801 time 0 608
$-----$
*ctivar name type factor init f c min max
20567900 "fspwo2" function 9.7398e-4 9.7398-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20567901 time 0 606
$-----$
*ctivar name type factor init f c min max
20568000 "fsdkwo2" function 2.6875e-4 2.6875-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568001 time 0 607
$-----$
*ctivar name type factor init f c min max
20568100 "aldhwo2" function 1.8232e-5 1.8232-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568101 time 0 608
$-----$
*ctivar name type factor init f c min max
20568200 "fspwo3" function 9.7866e-4 9.7866-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568201 time 0 606
$-----$
*ctivar name type factor init f c min max
20568300 "fsdkwo3" function 2.7003e-4 2.7003-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568301 time 0 607
$-----$
*ctivar name type factor init f c min max
20568400 "aldhwo3" function 1.8319e-5 1.8319-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568401 time 0 608
$-----$
*ctivar name type factor init f c min max
20568500 "fspwo4" function 9.5081e-4 9.5081-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568501 time 0 606

```

```

$-----$
*ctivar name type factor init f c min max
20568600 "fsdkwo4" function 2.6235e-4 2.6235e-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568601 time 0 607
$-----$
*ctivar name type factor init f c min max
20568700 "aldkwo4" function 1.7798e-5 1.7798e-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568701 time 0 608
$-----$
*ctivar name type factor init f c min max
20568800 "fspwwo5" function 7.6993e-4 7.6993e-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568801 time 0 606
$-----$
*ctivar name type factor init f c min max
20568900 "fsdkwo5" function 2.1244e-4 2.1244e-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20568901 time 0 607
$-----$
*ctivar name type factor init f c min max
20569000 "aldkwo5" function 1.4412e-5 1.4412e-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20569001 time 0 608
$-----$
*ctivar name type factor init f c min max
20569100 "wosum01" sum 1.0 .001249802 1 0
*
*ctivar a0 coeff variable name parameter no.
20569101 0.0 1.0 cntlvar 676
20569102 1.0 cntlvar 677
20569103 1.0 cntlvar 678
$-----$
*ctivar name type factor init f c min max
20569200 "wosum02" sum 1.0 .001260962 1 0
*
*ctivar a0 coeff variable name parameter no.
20569201 0.0 1.0 cntlvar 679
20569202 1.0 cntlvar 680
20569203 1.0 cntlvar 681
$-----$
*ctivar name type factor init f c min max
20569300 "wosum03" sum 1.0 .001230958 1 0
*
*ctivar a0 coeff variable name parameter no.
20569301 0.0 1.0 cntlvar 682
20569302 1.0 cntlvar 683
20569303 1.0 cntlvar 684
$-----$
*ctivar name type factor init f c min max
20569400 "wosum04" sum 1.0 .001230958 1 0
*
*ctivar a0 coeff variable name parameter no.
20569401 0.0 1.0 cntlvar 685
20569402 1.0 cntlvar 686
20569403 1.0 cntlvar 687
$-----$
*ctivar name type factor init f c min max
20569500 "wosum05" sum 1.0 9.96782e-4 1 0
$-----$
*
*ctivar variable name parameter no.
20569501 cntlvar 688
20569502 cntlvar 689
20569503 cntlvar 690
$-----$
*ctivar name type factor init f c min max
20569600 "powwo1" mult 1.0 0. 1 0
*
*ctivar variable name parameter no.
20569601 cntlvar 600
20569602 cntlvar 691
$-----$
*ctivar name type factor init f c min max
20569700 "powwo2" mult 1.0 0. 1 0
*
*ctivar variable name parameter no.
20569701 cntlvar 600
20569702 cntlvar 692
$-----$
*ctivar name type factor init f c min max
20569800 "powwo3" mult 1.0 0. 1 0
*
*ctivar variable name parameter no.
20569801 cntlvar 600
20569802 cntlvar 693
$-----$
*ctivar name type factor init f c min max
20569900 "powwo4" mult 1.0 0. 1 0
*
*ctivar variable name parameter no.
20569901 cntlvar 600
20569902 cntlvar 694
$-----$
*ctivar name type factor init f c min max
20570000 "powwo5" mult 1.0 0. 1 0
*
*ctivar variable name parameter no.
20570001 cntlvar 600
20570002 cntlvar 695
$-----$
*ctivar name type factor init f c min max
20570100 "cpbtt1" mult 5.3967e-4 185646.5 1 0
*
*ctivar variable name parameter no.
20570101 cntlvar 601
20570102 cntlvar 605
$-----$
*ctivar name type factor init f c min max
20570200 "cpbtt2" mult 5.4486e-4 187432. 1 0
*
*ctivar variable name parameter no.
20570201 cntlvar 601
20570202 cntlvar 605
$-----$
*ctivar name type factor init f c min max
20570300 "cpbtt3" mult 5.4745e-4 188322.8 1 0
*
*ctivar variable name parameter no.
20570301 cntlvar 601
20570302 cntlvar 605
$-----$
*ctivar name type factor init f c min max
20570400 "cpbtt4" mult 5.3189e-4 182970. 1 0
*
*ctivar variable name parameter no.
20570401 cntlvar 601
20570402 cntlvar 605
$-----$

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$-----$
*ctivar name type factor init f c min max
20570500 "cpbt5" mult 4.3070e-4 148160.8 1 0
*
*ctivar variable name parameter no. variable name parameter no.
20570501 cntlvar 601 cntlvar 605
$-----$
*ctivar name type factor init f c min max
20570600 "fspwpt1" function 3.1372e-4 3.1372-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20570601 time 0 606
$-----$
*ctivar name type factor init f c min max
20570700 "fsdkt1" function 7.5233e-5 7.5233-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20570701 time 0 607
$-----$
*ctivar name type factor init f c min max
20570800 "aldkpt1" function 7.5233e-5 7.5233-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20570801 time 0 608
$-----$
*ctivar name type factor init f c min max
20570900 "fspwpt2" function 3.1676e-4 3.1676-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20570901 time 0 606
$-----$
*ctivar name type factor init f c min max
20571000 "fsdkt2" function 1.5219e-4 1.5219-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571001 time 0 607
$-----$
*ctivar name type factor init f c min max
20571100 "aldkpt2" function 7.5956e-5 7.5956-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571101 time 0 608
$-----$
*ctivar name type factor init f c min max
20571200 "fspwpt3" function 3.1826e-4 3.1826-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571201 time 0 606
$-----$
*ctivar name type factor init f c min max
20571300 "fsdkt3" function 1.5291e-4 1.5291-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571301 time 0 607
$-----$
*ctivar name type factor init f c min max
20571400 "aldkpt3" function 7.6318e-5 7.6318-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571401 time 0 608
$-----$
*ctivar name type factor init f c min max
20571500 "fspwpt4" function 3.0921e-4 3.0921-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571501 time 0 606

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$-----$
*ctivar name type factor init f c min max
20571600 "fsdkt4" function 1.4856e-4 1.4856-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571601 time 0 607
$-----$
*ctivar name type factor init f c min max
20571700 "aldkpt4" function 7.4148e-5 7.4148-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571701 time 0 608
$-----$
*ctivar name type factor init f c min max
20571800 "fspwpt5" function 2.5038e-4 2.5038-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571801 time 0 606
$-----$
*ctivar name type factor init f c min max
20571900 "fsdkt5" function 1.2030e-4 1.203-4 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20571901 time 0 607
$-----$
*ctivar name type factor init f c min max
20572000 "aldkpt5" function 6.0042e-5 6.0042-5 1 0
*
*ctivar srch arg. name srch arg. no. table no.
20572001 time 0 608
$-----$
*ctivar name type factor init f c min max
20572100 "ptaum1" sum 1.0 4.6418e-4 1 0
*
*ctivar variable name parameter no.
20572101 0.0 1.0 cntlvar 706
20572102 1.0 1.0 cntlvar 707
20572103 1.0 1.0 cntlvar 708
$-----$
*ctivar name type factor init f c min max
20572200 "ptaum2" sum 1.0 5.4490e-4 1 0
*
*ctivar variable name parameter no.
20572201 0.0 1.0 cntlvar 709
20572202 1.0 1.0 cntlvar 710
20572203 1.0 1.0 cntlvar 711
$-----$
*ctivar name type factor init f c min max
20572300 "ptaum3" sum 1.0 5.4748e-4 1 0
*
*ctivar variable name parameter no.
20572301 0.0 1.0 cntlvar 712
20572302 1.0 1.0 cntlvar 713
20572303 1.0 1.0 cntlvar 714
$-----$
*ctivar name type factor init f c min max
20572400 "ptaum4" sum 1.0 5.3191e-4 1 0
*
*ctivar variable name parameter no.
20572401 0.0 1.0 cntlvar 715
20572402 1.0 1.0 cntlvar 716
20572403 1.0 1.0 cntlvar 717
$-----$
*ctivar name type factor init f c min max
20572500 "ptaum5" sum 1.0 4.3072e-4 1 0

```

*ctlvar	a0	coeff	variable name	parameter no.
20572501	0.0	1.0	cntrlvar	718
20572502		1.0	cntrlvar	719
20572503		1.0	cntrlvar	720

*ctlvar	name	type	init	f c min max
20572600	"ptpow1"	mult	1.0	0. 1.0

*ctlvar	variable name	parameter no.		
20572601	cntrlvar	600		605
20572602	cntrlvar	721		

*ctlvar	name	type	init	f c min max
20572700	"ptpow2"	mult	1.0	0. 1.0

*ctlvar	variable name	parameter no.		
20572701	cntrlvar	600		605
20572702	cntrlvar	722		

*ctlvar	name	type	init	f c min max
20572800	"ptpow3"	mult	1.0	0. 1.0

*ctlvar	variable name	parameter no.		
20572801	cntrlvar	600		605
20572802	cntrlvar	723		

*ctlvar	name	type	init	f c min max
20572900	"ptpow4"	mult	1.0	0. 1.0

*ctlvar	variable name	parameter no.		
20572901	cntrlvar	600		605
20572902	cntrlvar	724		

*ctlvar	name	type	init	f c min max
20573000	"ptpow5"	mult	1.0	0. 1.0

*ctlvar	variable name	parameter no.		
20573001	cntrlvar	600		605
20573002	cntrlvar	725		

*ctlvar	name	type	init	f c min max
20573100	"pti"	sum	1.0	185646.5 1.0

*ctlvar	a0	coeff	variable name	parameter no.
20573101	0.0	1.0	cntrlvar	701
20573102		1.0	cntrlvar	726

*ctlvar	name	type	init	f c min max
20573200	"pt2"	sum	1.0	187432. 1.0

*ctlvar	a0	coeff	variable name	parameter no.
20573201	0.0	1.0	cntrlvar	702
20573202		1.0	cntrlvar	727

*ctlvar	name	type	init	f c min max
20573300	"pt3"	sum	1.0	188322.8 1.0

*ctlvar	a0	coeff	variable name	parameter no.
20573301	0.0	1.0	cntrlvar	703
20573302		1.0	cntrlvar	728

*ctlvar	name	type	init	f c min max
20573400	"pt4"	sum	1.0	182970. 1.0

*ctlvar	a0	coeff	variable name	parameter no.
20573401	0.0	1.0	cntrlvar	704
20573402		1.0	cntrlvar	729

*ctlvar	name	type	init	f c min max
20573500	"pt5"	sum	1.0	148160.8 1.0

*ctlvar	a0	coeff	variable name	parameter no.
20573501	0.0	1.0	cntrlvar	705
20573502		1.0	cntrlvar	730

*ctlvar	name	type	init	f c min max
20574100	"cpbt6"	mult	5.3373e-4	183603. 1.0

*ctlvar	variable name	parameter no.		
20574101	cntrlvar	601		605

*ctlvar	name	type	init	f c min max
20574200	"cpbt7"	mult	5.4248e-4	186613. 1.0

*ctlvar	variable name	parameter no.		
20574201	cntrlvar	601		605

*ctlvar	name	type	init	f c min max
20574300	"cpbt8"	mult	5.7164e-4	196644. 1.0

*ctlvar	variable name	parameter no.		
20574301	cntrlvar	601		605

*ctlvar	name	type	init	f c min max
20574400	"cpbt9"	mult	6.2123e-4	213703. 1.0

*ctlvar	variable name	parameter no.		
20574401	cntrlvar	601		605

*ctlvar	name	type	init	f c min max
20574500	"cpbt0"	mult	6.4748e-4	222733. 1.0

*ctlvar	variable name	parameter no.		
20574501	cntrlvar	601		605

*ctlvar	name	type	init	f c min max
20574600	"fcpwt6"	function	2.9139e-4	2.9139-4 1.0

*ctlvar	srch arg. name	srch arg. no.		table no.
20574601	time	0		606

*ctlvar	name	type	init	f c min max
20574700	"fcdkpt6"	function	1.1863e-4	1.1863-4 1.0

*ctlvar	srch arg. name	srch arg. no.		table no.
20574701	time	0		607

*ctlvar	name	type	init	f c min max
20574800	"aldkpt6"	function	1.2370e-4	1.237-4 1.0

*ctlvar	srch arg. name	srch arg. no.		table no.
20574801	time	0		608

*ctlvar	name	type	init	f c min max
20574900	"fcpwt6"	function	2.9617e-4	2.9617-4 1.0

*ctlvar	srch arg. name	srch arg. no.		table no.
20574901	time	0		606

```

*ctlvar name type factor init f c min max
20575000 "fcdkpt7" function 1.2058e-4 1.2058-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575001 time 0 607
$-----$
*ctlvar name type factor init f c min max
20575100 "aldkpt8" function 1.2573e-4 1.2573-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575101 time 0 608
$-----$
*ctlvar name type factor init f c min max
20575200 "fspwpt8" function 3.1210e-4 3.121-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575201 time 0 606
$-----$
*ctlvar name type factor init f c min max
20575300 "fcdkpt8" function 1.2706e-4 1.2706-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575301 time 0 607
$-----$
*ctlvar name type factor init f c min max
20575400 "aldkpt8" function 1.3249e-4 1.3249-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575401 time 0 608
$-----$
*ctlvar name type factor init f c min max
20575500 "fspwpt9" function 3.3917e-4 3.3917-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575501 time 0 606
$-----$
*ctlvar name type factor init f c min max
20575600 "fcdkpt9" function 1.3808e-4 1.3808-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575601 time 0 607
$-----$
*ctlvar name type factor init f c min max
20575700 "aldkpt9" function 1.4398e-4 1.4398-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575701 time 0 608
$-----$
*ctlvar name type factor init f c min max
20575800 "fspwpt0" function 3.5350e-4 3.535-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575801 time 0 606
$-----$
*ctlvar name type factor init f c min max
20575900 "fcdkpt0" function 1.4392e-4 1.4392-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20575901 time 0 607
$-----$
*ctlvar name type factor init f c min max
20576000 "aldkpt0" function 1.5006e-4 1.5006-4 1 0
*
*ctlvar srch arg. name srch arg. no. table no.
20576001 time 0 608
$-----$
$-----$
*ctlvar name type factor init f c min max
20576100 "ptsum6" sum 1.0 5.3372-4 1 0
*
*ctlvar a0 coeff variable name parameter no.
20576101 0.0 1.0 cntrlvar 746
20576102 1.0 1.0 cntrlvar 747
20576103 1.0 1.0 cntrlvar 748
$-----$
*ctlvar name type factor init f c min max
20576200 "ptsum7" sum 1.0 5.4248-4 1 0
*
*ctlvar a0 coeff variable name parameter no.
20576201 0.0 1.0 cntrlvar 749
20576202 1.0 1.0 cntrlvar 750
20576203 1.0 1.0 cntrlvar 751
$-----$
*ctlvar name type factor init f c min max
20576300 "ptsum8" sum 1.0 5.7165-4 1 0
*
*ctlvar a0 coeff variable name parameter no.
20576301 0.0 1.0 cntrlvar 752
20576302 1.0 1.0 cntrlvar 753
20576303 1.0 1.0 cntrlvar 754
$-----$
*ctlvar name type factor init f c min max
20576400 "ptsum9" sum 1.0 6.2123-4 1 0
*
*ctlvar a0 coeff variable name parameter no.
20576401 0.0 1.0 cntrlvar 755
20576402 1.0 1.0 cntrlvar 756
20576403 1.0 1.0 cntrlvar 757
$-----$
*ctlvar name type factor init f c min max
20576500 "ptsum0" sum 1.0 6.4748-4 1 0
*
*ctlvar a0 coeff variable name parameter no.
20576501 0.0 1.0 cntrlvar 758
20576502 1.0 1.0 cntrlvar 759
20576503 1.0 1.0 cntrlvar 760
$-----$
*ctlvar name type factor init f c min max
20576600 "ptpow6" mult 1.0 0. 1 0
*
*ctlvar variable name parameter no. variable name parameter no.
20576601 cntrlvar 600 cntrlvar 605
20576602 cntrlvar 761
$-----$
*ctlvar name type factor init f c min max
20576700 "ptpow7" mult 1.0 0. 1 0
*
*ctlvar variable name parameter no. variable name parameter no.
20576701 cntrlvar 600 cntrlvar 605
20576702 cntrlvar 762
$-----$
*ctlvar name type factor init f c min max
20576800 "ptpow8" mult 1.0 0. 1 0
*
*ctlvar variable name parameter no. variable name parameter no.
20576801 cntrlvar 600 cntrlvar 605
20576802 cntrlvar 763
$-----$
*ctlvar name type factor init f c min max
20576900 "ptpow9" mult 1.0 0. 1 0
*

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*ctlvar variable name parameter no. variable name parameter no.
20576901 cntlvar 600 505
20576902 cntlvar 764
$-----$
*ctlvar name type factor init f c min max
20577000 "prpow0" mult 1.0 0. 1 0
*
*ctlvar variable name parameter no. variable name parameter no.
20577001 cntlvar 600 505
20577002 cntlvar 765
$-----$
*ctlvar name type factor init f c min max
20577100 "pt6" sum 1.0 183603. 1 0
*
*ctlvar a0 coeff variable name parameter no.
20577101 0.0 1.0 cntlvar 741
20577102 1.0 cntlvar 766
$-----$
*ctlvar name type factor init f c min max
20577200 "pt7" sum 1.0 186613. 1 0
*
*ctlvar a0 coeff variable name parameter no.
20577201 0.0 1.0 cntlvar 742
20577202 1.0 cntlvar 767
$-----$
*ctlvar name type factor init f c min max
20577300 "pt8" sum 1.0 196644. 1 0
*
*ctlvar a0 coeff variable name parameter no.
20577301 0.0 1.0 cntlvar 743
20577302 1.0 cntlvar 768
$-----$
*ctlvar name type factor init f c min max
20577400 "pt9" sum 1.0 213703. 1 0
*
*ctlvar a0 coeff variable name parameter no.
20577401 0.0 1.0 cntlvar 744
20577402 1.0 cntlvar 769
$-----$
*ctlvar name type factor init f c min max
20577500 "pt0" sum 1.0 222733. 1 0
*
*ctlvar a0 coeff variable name parameter no.
20577501 0.0 1.0 cntlvar 745
20577502 1.0 cntlvar 770
$-----$
* logic to trip pressurizer pumps when make-up tank empties
*
$-----$
*ctlvar name type factor init f c min max
20580100 Binary tripunit 1.0000d+00 0. 0 3 .00 1.0000d+00
*
*ctlvar trip no.
20580101 550
$-----$
*ctlvar name type factor init f c min max
20580200 flow sum 1.0000d+00 14.60408 0
*
*ctlvar a0 coeff variable name parameter no.
20580201 0. 1. mflowj 850010000
*
*ctlvar name type factor init f c min max
20580300 flow mult 1.0000d+00 0. 0
*
*ctlvar variable name parameter no. variable name parameter no.
20580301 cntlvar 801 802
$-----$
*ctlvar name type factor init f c min max
20580400 intflow integral 1.0000d+00 0. 0
*
*ctlvar integrand name integrand no.
20580401 cntlvar 803
$-----$
*ctlvar name type factor init f c min max
20580500 binary tripunit 1.0000d+00 0. 0 3 .00 1.0000d+00
*
*ctlvar trip no.
20580501 551
$-----$
*ctlvar name type factor init f c min max
20580600 dntrpm mult -1.0000d+00 0. 0 3 -1.00 1.0000d+00
*
*ctlvar var. name parameter no. var. name parameter no.
20580601 cntlvar 943 cntlvar 805
$-----$
*ctlvar name type factor init f c min max
20580700 nrpm sum 1.0000d+00 1. 0 3 .00 1.0000d+00
*
*ctlvar a0 coeff variable name parameter no.
20580701 0. 1. cntlvar 807
20580702 1. cntlvar 806
$-----$
*ctlvar name type factor init f c min max
20581500 mprzrp sum 245.9957 245.9957 0 3 .00 245.9957
*
*ctlvar a0 coeff variable name parameter no.
20581501 0. 1. cntlvar 807
$-----$
* logic to ramp standby pressurizer pump on
*
*ctlvar name type factor init f c min max
20581600 sbprzrp function 1.0000d+00 0. 0 3 .00 245.9957
*
*ctlvar srch arg. name srch arg. no. table no.
20581601 time 0 820
$-----$
*ctlvar name type factor init f c min max
20581700 sbprzrp mult 1.0000d+00 0. 0 3 .00 245.9957
*
*ctlvar variable name parameter no. variable name parameter no.
20581701 cntlvar 816 cntlvar 807
$-----$
* pressure drop from cell center to junction
*
* delta p = 1/2 * ajun/avol * (delta xlvol * fwalfvol + velfjun
*
$-----$
*ctlvar name type factor init f c min max
20582100 dp-505 mult 0.0433402 477.05 1
*
*ctlvar variable name parameter no. variable name parameter no.
20582101 fwalf 505090000 velfj 507010200
*
*ctlvar name type factor init f c min max
20582200 dp-520 mult 0.0123587 128.9298 1

```

```

*ctlvar variable name parameter no. variable name parameter no.
20582201 fwalp 520010000 veljf 522010100
*
*ctlvar name type factor init f c min max
20582300 dp-535 mult 0.010047 122.4094 1
*
*ctlvar variable name parameter no. variable name parameter no.
20582301 fwalp 535010000 veljf 537010200
*
*ctlvar name type factor init f c min max
20582400 dp-555 mult 0.038294 443.271 1
*
*ctlvar variable name parameter no. variable name parameter no.
20582401 fwalp 555010000 veljf 556010100
*
*ctlvar name type factor init f c min max
20582500 dp-572 mult 0.0286696 281.5674 1
*
*ctlvar variable name parameter no. variable name parameter no.
20582501 fwalp 572010000 veljf 569010200
*
*ctlvar name type factor init f c min max
20582600 dp-580 mult 0.0517239 490.6165 1
*
*ctlvar variable name parameter no. variable name parameter no.
20582601 fwalp 580010000 veljf 581010100
*
*-----$
* delta p in average fuel channels including entrance and exit losses
*
*-----$
*
*ctlvar name type factor init f c min max
20582700 lcexitp sum 1.0 1806924. 0
*
*ctlvar a0 coeff variable name parameter no.
20582701 0.0 1.0 p 520010000
20582702 1.0 cntrlvar 822
*
*ctlvar name type factor init f c min max
20582800 lcdeltap sum 1.0 712214. 0
*
*ctlvar a0 coeff variable name parameter no.
20582801 0.0 1.0 p 505090000
20582802 -1.0 cntrlvar 821
20582803 -1.0 cntrlvar 827
*
*ctlvar name type factor init f c min max
20582900 ucexitp sum 1.0 1801998. 0
*
*ctlvar a0 coeff variable name parameter no.
20582901 0.0 1.0 p 555010000
20582902 1.0 cntrlvar 824
*
*ctlvar name type factor init f c min max
20583000 ucdeltap sum 1.0 707110. 0
*
*ctlvar a0 coeff variable name parameter no.
20583001 0.0 1.0 p 535010000
20583002 -1.0 cntrlvar 823
20583003 -1.0 cntrlvar 829
*
*ctlvar name type factor init f c min max
20583100 icexitp sum 1.0 1799004. 0

```

```

*
*ctlvar a0 coeff variable name parameter no.
20583101 0.0 1.0 p 580010000
20583102 1.0 cntrlvar 826
*
*ctlvar name type factor init f c min max
20583200 lcdeltap sum 1.0 712954. 0
*
*ctlvar a0 coeff variable name parameter no.
20583201 0.0 1.0 p 572010000
20583202 -1.0 cntrlvar 825
20583203 -1.0 cntrlvar 831
*
*-----$
* first order lag applied to sensor location pressure
*
*-----$
*
*ctlvar name type factor init f c min max
20583900 lagpres lag 1.000000d+00 1651716. 0
*
*ctlvar tau-1 variable name parameter no.
20583901 0.03 p 645150000
*
*-----$
* control system to control primary coolant system pressure by
* adjusting the letdown flow area using:
*
* d-k*(p-ps)
* dx/dt=(d-x)/tau
*
* where:
* k = proportional constant = 5/mpa
* tau = time constant = 1 s
* p = measured sensor pressure
* ps = setpoint pressure = 3.2 mpa
* d = demand (cv 840)
* x = valve position
* = -1 for fully closed,
* = 1 for fully open,
* = 0 at normal position
*
* note: letdown valve orifice area = 0.000283 m^2
* (calibrated for half-open valve at x=0)
*
20584000 perror sum 5. -.0153826 1 0
20584001 -1.810 1.e-6 cntrlvar 827
*
* sf = a0, multiplier on cv860 = 1/a0
20584200 dadt sum .5 1.652712-5 1 0
20584201 1.0 -2. cntrlvar 860
20584202 1. cntrlvar 840
*
20584400 dt sum 1. .004 1 0
20584401 0. 1. time 0
20584402 -1. cntrlvar 845
*
20584500 oldtime sum 1. 190.704 1 0
20584501 0. 1. time 0
*
20584700 da mult 1. 6.61085-8 1 0
20584701 cntrlvar 842 cntrlvar 844
*
20586000 ldvarea sum 1. .492292 0 3 0. 1.
20586001 0. 1. cntrlvar 860

```



```

*****
*ctivar name type factor init f c min max
20590500 cdenrx sum 7.50000d-02 .00620261 1
*
*ctivar a0 coeff variable name parameter no.
20590501 0. 0.0922978 cntlvar 904
*****
*ctivar name type factor init f c min max
20590800 c510dtn sum 7.69000d-02 27.02664 1
*
*ctivar a0 coeff variable name parameter no.
20590801 0. 1. htvat 5101001
20590802 -0.5 htvat 5102001
20590803 -0.5 htvat 5103001
20590804 1. htvat 5101002
20590805 -0.5 htvat 5102002
20590806 -0.5 htvat 5103002
20590807 1. htvat 5101003
20590808 -0.5 htvat 5102003
20590809 -0.5 htvat 5103003
20590810 1. htvat 5101004
20590811 -0.5 htvat 5102004
20590812 -0.5 htvat 5103004
20590813 1. htvat 5101005
20590814 -0.5 htvat 5102005
20590815 -0.5 htvat 5103005
*****
*ctivar name type factor init f c min max
20590900 c515dtn sum 3.22000d-04 .1468073 1
*
*ctivar a0 coeff variable name parameter no.
20590901 0. 1. htvat 5151001
20590902 -0.5 htvat 5152001
20590903 -0.5 htvat 5153001
20590904 1. htvat 5151002
20590905 -0.5 htvat 5152002
20590906 -0.5 htvat 5153002
20590907 1. htvat 5151003
20590908 -0.5 htvat 5152003
20590909 -0.5 htvat 5153003
20590910 1. htvat 5151004
20590911 -0.5 htvat 5152004
20590912 -0.5 htvat 5153004
20590913 1. htvat 5151005
20590914 -0.5 htvat 5152005
20590915 -0.5 htvat 5153005
*****
*ctivar name type factor init f c min max
20591000 c540dtn sum 1.22000d-01 236.4414 1
*
*ctivar a0 coeff variable name parameter no.
20591001 0. 1. htvat 5401001
20591002 -0.1 htvat 5402001
20591003 1. htvat 5401002
20591004 -0.1 htvat 5402002
20591005 1. htvat 5401003
20591006 -0.1 htvat 5402003
20591007 1. htvat 5401004
20591008 -0.1 htvat 5402004
20591009 1. htvat 5401005
20591010 -0.1 htvat 5402005
20591011 1. htvat 5401006
20591012 -0.1 htvat 5402006
20591013 1. htvat 5401007
20591014 -0.1 htvat 5402007
*****
*ctivar name type factor init f c min max
20591100 c545dtn sum 2.92000d-04 .619647 1
*
*ctivar a0 coeff variable name parameter no.
20591101 0. 1. htvat 5451001
20591102 -0.1 htvat 5452001
20591103 1. htvat 5451002
20591104 -0.1 htvat 5452002
20591105 1. htvat 5451003
20591106 -0.1 htvat 5452003
20591107 1. htvat 5451004
20591108 -0.1 htvat 5452004
20591109 1. htvat 5451005
20591110 -0.1 htvat 5452005
20591111 1. htvat 5451006
20591112 -0.1 htvat 5452006
20591113 1. htvat 5451007
20591114 -0.1 htvat 5452007
*****
*ctivar name type factor init f c min max
20591200 dcfsp sum 1.00000d+00 -14.74075 1
*
*ctivar a0 coeff variable name parameter no.
20591201 -89.1343 0.7600 cntlvar 908
20591202 0.7600 cntlvar 909
20591203 0.2267 cntlvar 910
20591204 0.2267 cntlvar 911
*****
*ctivar name type factor init f c min max
20591300 expanrx sum -6.19000d-04 .00912452 1
*
*ctivar a0 coeff variable name parameter no.
20591301 0. 1. cntlvar 912
*****
*ctivar name type factor init f c min max
20591700 drho sum 1.00000d+00 1.021442 1
*
*ctivar a0 coeff variable name parameter no.
20591701 -1085.22 0.14586 rho 500010000
20591702 0.07207 rho 505010000
20591703 0.12983 rho 530010000
20591704 0.01712 rho 530020000
20591705 0.01712 rho 530030000
20591706 0.01453 rho 530040000
20591707 0.01453 rho 530050000
20591708 0.01453 rho 530060000
20591709 0.18451 rho 555010000
20591710 0.01550 rho 525010000
20591711 0.12177 rho 525020000
20591712 0.25263 rho 565010000
*****
*ctivar name type factor init f c min max
20591800 axmodrx sum 3.33000d-02 .0031343 1
*
*ctivar a0 coeff variable name parameter no.
20591801 0. 0.0921472 cntlvar 917
*****
*ctivar name type factor init f c min max
20592200 drho sum 1.00000d+00 1.071552 1
*
*ctivar a0 coeff variable name parameter no.
20592201 -1088.98 0.34802 rho 520010000
20592202 0.65198 rho 535010000
*****
*ctivar name type factor init f c min max
20592300 midplrx sum 3.33000d-02 .00327671 1
*
*ctivar a0 coeff variable name parameter no.
20592301 0. 0.0918291 cntlvar 922
*****
*ctivar name type factor init f c min max
20592700 "prelim" sum 1. 500.483 1 0
*

```



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20596102      1.      cntrlvar      960
*****
*ctivar name type factor init f c min max
20596500 deltasos mult 1.00000d+00 1.229861-12 0
*
*ctivar variable name parameter no. variable name parameter no.
20596501 cntrlvar 961 cntrlvar 943
*****
*ctivar name type factor init f c min max
20596700 newpos sum 1.0000d+00 .2805935 0 3 .00 1.0000d+00
*
*ctivar a0 coeff variable name parameter no.
20596701 0. 1. cntrlvar 968
20596702 1. cntrlvar 965
*****
*ctivar name type factor init f c min max
20596800 oldpos sum 1.0000d+00 .2805935 0 3 .00 1.0000d+00
*
*ctivar a0 coeff variable name parameter no.
20596801 0. 1. cntrlvar 967
*****
*ctivar name type factor init f c min max
20597000 rodrea function 1.0000d+00 -.0624074 1 3 -32.78 3.9300d+00
*
*ctivar srch arg. name srch arg. no. table no.
20597001 cntrlvar 967 970
*****
*ctivar name type factor init f c min max
20597200 totalrx sum 1.00000d+00 -6.16065-4 1
*
*ctivar a0 coeff variable name parameter no.
20597201 0. 1. cntrlvar 905
20597202 1. cntrlvar 913
20597203 1. cntrlvar 918
20597204 1. cntrlvar 923
20597205 1. cntrlvar 929
20597206 1. cntrlvar 934
20597207 1. cntrlvar 970
*20597200 totalrx constant 0.
*
*****
* point kinetics
*****
*
*kinetix kinetics type feedback type
30000000 point separabl
*
* beta = 0.0074, lambda = 0.0005 s
*
*kinetix fp type ttl power react. delay fr. fp yld u239 y1
30000001 gamma 3.44e8 0. 14.8 1.0 1.0
*
*kinetix fp type mev/fsn
30000002 ans9-1 200.
*
* total reactivity input from cntrlvar 972
30000011 10972
*
* irradiation history - power, duration
30000401 3.44e8 17. day
*
*dummy reactivity coefficients entered to satisfy input requirements
30000501 1098. 0.

```

```

30000601 322. 0.
30000701 510010000 0 0.5 0.
30000702 510020000 0 0.5 0.
30000801 5101001 0 0.5 0.
30000802 5101002 0 0.5 0.
*
* * end of case

```

```

c This program modifies the ans RELAPS input
c fuel heat structure source terms
c
c For Three-element core, a third, inner fuel element has been added.
c The upper fuel element now refers to the outermost element, and
c the lower fuel element refers to the middle element.
c
c implicit double precision (a-h,p-z)
c character'80 arec
c
c Variable Definition
c c Average power density in upper core average fuel ht str
c avpdia - average power density in lower core average fuel ht str
c avpdia - average power density in inner core average fuel ht str
c avpdia - average power density in upper core hot fuel ht str
c avpdih - average power density in lower core hot fuel ht str
c avpdih - average power density in inner core hot fuel ht str
c avpdus - avg pwr density in upper core hot stripe ht str (CHF,FE)
c avpdls - avg pwr density in lower core hot stripe ht str (CHF,FE)
c avpdls - avg pwr density in inner core hot stripe ht str (CHF,FE)
c pducac - power density, upper core, average channel
c pduchc - power density, upper core, hot stripe (CHF,FE)
c pduchs - power density, upper core, average channel
c pdicac - power density, lower core, hot stripe (CHF,FE)
c pduchc - power density, lower core, hot stripe (CHF,FE)
c pduchs - power density, inner core, average channel
c pduchc - power density, inner core, hot stripe (CHF,FE)
c pduchs - power density, inner core, hot stripe (CHF,FE)
c pf9shc - peaking factor, 95% uncertainty, hot channel
c pf9shs - peaking factor, 95% uncertainty, hot stripe (CHF,FE)
c pf99hc - peaking factor, 99.9% uncertainty, hot channel
c pf99hs - peaking factor, 99.9% uncertainty, hot stripe (CHF,FE)
c
c .....1.....2.....3.....4.....5.....6.....7
real mavgl, mavgu, mavgi, ml99, ml95, mu99, mu95, ml95, ml99
dimension avpdus(2),avpdls(2),avpdls(2)
dimension pducac(5),pduchc(5),pduchs(5,2)
dimension pducac(5),pduchc(5),pdlchs(5,2)
dimension pducac(5),pdlchs(5),pdlchs(5,2)
dimension pducac(5),pdlchs(5),pf99hc(5),pf99hs(5,2)
open(unit=21,file='inda',status='old',form='formatted')
open(unit=23,file='pd.dat',status='old',form='formatted')
open(unit=24,file='pf.dat',status='old',form='formatted')
open(unit=22,file='INDTA',status='unknown',form='formatted')
pi = 4*datan(1.d0)
c
c calculate total core coolant volumes (cubic millimeters)
c
radol = 224.
radil = 169.
radou = 281.
radiu = 231.
radioi = 162.
radii = 102.
hetlen = 418.
vi = pi*(radol*radol-radil*radil)*hetlen/2.
vu = pi*(radou*radou-radilu*radilu)*hetlen/2.
vi = pi*(radioi*radioi-radili*radili)*hetlen/2.
c volumes for annular regions
viann = pi*(radol*radol-radil*radil)*(2.582+3.0)
vuanu = pi*(radou*radou-radilu*radilu)*(2.582+3.0)
viann = pi*(radioi*radioi-radili*radili)*(2.582+3.0)
c
vtot = vi+vu+vi
c
c read in power densities and peaking factors
c
c power densities
c
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
do 5 i=1,5
5 read(23,9992)iz,pducac(iz),pduchc(iz),pduchs(iz,1),pduchs(iz,2)
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
do 6 i=1,5
6 read(23,9992)iz,pdicac(iz),pdichc(iz),pdichs(iz,1),pdichs(iz,2)
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
read(23,9998)arec
do 7 i=1,5
7 read(23,9992)iz,pdicac(iz),pdichc(iz),pdichs(iz,1),pdichs(iz,2)
c
c peaking factors
c
read(24,9998)arec
read(24,9998)arec
read(24,9998)arec
read(24,9998)arec
read(24,9998)arec
do 9 i=1,5
9 read(24,9992)iz,pf95hc(iz),pf95hs(iz,1),pf95hs(iz,2)
read(24,9998)arec
read(24,9998)arec
read(24,9998)arec
read(24,9998)arec
do 16 i=1,5
16 read(24,9992)iz,pf99hc(iz),pf99hs(iz,1),pf99hs(iz,2)
c
c calculate average power densities
c
avpdia = (pducac(1)+pducac(2)+pducac(3)+pducac(4) + pducac(5))/5.
avpdia = (pdicac(1)+pdicac(2)+pdicac(3)+pdicac(4) + pdicac(5))/5.
avpdia = (pdicac(1)+pdicac(2)+pdicac(3)+pdicac(4) + pdicac(5))/5.
avpdih = (pduchc(1)+pduchc(2)+pduchc(3)+pduchc(4) + pduchc(5))/5.
avpdih = (pdichc(1)+pdichc(2)+pdichc(3)+pdichc(4) + pdichc(5))/5.
avpdus(1) = (pduchs(1,1)+pduchs(2,1)+pduchs(3,1)+pduchs(4,1)+pduchs(5,1))/5.

```

```

      avpdu(2) = (pduchs(1,2)*pduchs(2,2)+pduchs(3,2)
      + pduchs(4,2)+pduchs(5,2))/5.
      avpdl(1) = (pdichs(1,1)*pdichs(2,1)+pdichs(3,1)
      + pdichs(4,1)+pdichs(5,1))/5.
      avpdl(2) = (pdichs(1,2)+pdichs(2,2)+pdichs(3,2)
      + pdichs(4,2)+pdichs(5,2))/5.
      avpdl(1) = (pdichs(1,1)+pdichs(2,1)+pdichs(3,1)
      + pdichs(4,1)+pdichs(5,1))/5.
      avpdl(2) = (pdichs(1,2)+pdichs(2,2)+pdichs(3,2)
      + pdichs(4,2)+pdichs(5,2))/5.
      -----c
c
c calculate the power fractions
c
c hot channels
      mi99 = avpdih/avpdia*pf99hc(1)/252.
      mi95 = avpdih/avpdia*pf95hc(1)/252.
      mi99 = avpdih/avpdia*pf99hc(1)/418.
      mi95 = avpdih/avpdia*pf95hc(1)/418.
      mi99 = avpdih/avpdia*pf99hc(1)/571.
      mi95 = avpdih/avpdia*pf95hc(1)/571.
c average channels
      mavgi = 1. - mi99 - mi95
      mavgl = 1. - mi99 - mi95
      mavgu = 1. - mu99 - mu95
      -----c
c
c zero summations
c
      sum = 0.
      sumif = 0.
      sumlf = 0.
      sumuf = 0.
      sumoth = 0.
      sumcli = 0.
      sumc11 = 0.
      sumclu = 0.
      sumclo = 0.
      sumisp = 0.
      sumlsp = 0.
      sumusp = 0.
      sumcpc = 0.
      -----c
c
c Read input data to modify heat structure sources
c
      10 read(21,9998,end=999)arec
c IF THIS IS A HEAT STRUCTURE CARD
      if(arec(1:1).eq.'1'.and.arec(8:8).ne.'1'.and.
      .arec(6:6).eq.'7') then
        iptr = 9
        iw1 = iread(iptr,arec)
        if(iw1.ne.0) then
          w2 = dread(iptr,arec)
          w3 = dread(iptr,arec)
          w4 = dread(iptr,arec)
          iw5 = iread(iptr,arec)
        endif
c IF THE SOURCE TERM IS 1000 (POINT KINETICS)
        if(iw1.eq.1000) then
          read(arec(8:8),'(i1)')n
c
c Leading factors on fuel w2 source terms are calculated from
c tot core pwr frctn x fuel meat and clad pwr frctn / 5 cells
c
      avpdu(2) = (pduchs(1,2)+pduchs(2,2)+pduchs(3,2)
      + pduchs(4,2)+pduchs(5,2))/5.
      avpdl(1) = (pdichs(1,1)+pdichs(2,1)+pdichs(3,1)
      + pdichs(4,1)+pdichs(5,1))/5.
      avpdl(2) = (pdichs(1,2)+pdichs(2,2)+pdichs(3,2)
      + pdichs(4,2)+pdichs(5,2))/5.
      -----c
c
c leading factors on fuel w3 source terms are calculated from
c tot core coolant pwr frctn / 5 cells x
c single core volume / total volume of all cores
c
      avpdu(2) = (pduchs(1,2)+pduchs(2,2)+pduchs(3,2)
      + pduchs(4,2)+pduchs(5,2))/5.
      avpdl(1) = (pdichs(1,1)+pdichs(2,1)+pdichs(3,1)
      + pdichs(4,1)+pdichs(5,1))/5.
      avpdl(2) = (pdichs(1,2)+pdichs(2,2)+pdichs(3,2)
      + pdichs(4,2)+pdichs(5,2))/5.
      -----c
c
c LOWER FUEL LOWER FUEL LOWER FUEL LOWER FUEL LOWER FUEL
c
c Lower fuel heat structures
c
c LOWER FUEL LOWER FUEL LOWER FUEL LOWER FUEL LOWER FUEL
c
c LOWER FUEL LOWER FUEL LOWER FUEL LOWER FUEL LOWER FUEL
c
c IF THIS HEAT STRUCTURE IS IN THE LOWER FUEL
      if(arec(3:3).eq.'1') then
        c average fuel heat structure
        if(arec(2:5).eq.'5101') then
          w2 = (0.405*0.90757/5.)*mavgl*pdicac(n)/avpdia
          w3 = 0.00777/5.*v1/(vannl+v1)*mavgl*pdicac(n)/avpdia
          w4 = 0.0
          sumlf = sumlf+w2
          sumc11 = sumc11+w3+w4
        else if(arec(2:5).eq.'5102') then
          w2 = 2.2155d-4*mavgl*pdicac(n)/avpdia
          w3 = 5.6000d-4*mavgl*pdicac(n)/avpdia
          w4 = 0.0
          sumlsp = sumlsp+w2
          sumc11 = sumc11+w3+w4
        else if(arec(2:5).eq.'5103') then
          w2 = 3.0445d-4*mavgl*pdicac(n)/avpdia
          w3 = 0.0
          w4 = 6.5800d-4*mavgl*pdicac(n)/avpdia
          sumlsp = sumlsp+w2
          sumc11 = sumc11+w3+w4
        else if(arec(2:5).eq.'5151') then
          w2 = (0.405*0.90757/5.)*ml95*pdichc(n)/avpdih
          w3 = 0.00777/5.*v1/(vannl+v1)*ml95*pdichc(n)/avpdih
          w4 = 0.0
          sumlf = sumlf+w2
          sumc11 = sumc11+w3+w4
        else if(arec(2:5).eq.'5152') then
          w2 = 2.2155d-4*ml95*pdichc(n)/avpdih
          w3 = 5.6000d-4*ml95*pdichc(n)/avpdih
          w4 = 0.0
          sumlsp = sumlsp+w2
          sumc11 = sumc11+w3+w4
        else if(arec(2:5).eq.'5153') then
          w2 = 3.0445d-4*ml95*pdichc(n)/avpdih
          w3 = 0.0
          w4 = 6.5800d-4*ml95*pdichc(n)/avpdih
          sumlsp = sumlsp+w2
          sumc11 = sumc11+w3+w4
        else if(arec(2:5).eq.'5154') then
          a1 = ml95/5.*0.405*0.90757/100.
          a2 = (pdichs(1,1)*pf95hs(1,1)+
          pdichs(2,1)*pf95hs(2,1)+
          pdichs(3,1)*pf95hs(3,1)+
          pdichs(4,1)*pf95hs(4,1)+
          pdichs(5,1)*pf95hs(5,1))/5.
          a3 = (pdichc(1)*pf95hc(1)+
          pdichc(2)*pf95hc(2)+
          pdichc(3)*pf95hc(3)+
          pdichc(4)*pf95hc(4)+
          pdichc(5)*pf95hc(5))/5.
        endif
      endif

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      pdlchc(3)*pf9shc(3)+
      pdlchc(4)*pf9shc(4)+
      pdlchc(5)*pf9shc(5))/5.
      w2 = pdlchs(n,1)/avpdlis(1)*a1*a2/a3
      w3 = 0.
      w4 = 0.
      sumlf = sumlf+w2
      sumcll = sumcll+w3+w4
      c FE hot stripe heat structure
      else if (arec(2:5).eq.'5155') then
        a1 = ml99/5+.0405*0.90757/100.
        a2 = (pdlchs(1,2)*pf9shs(1,2)+
        pdlchs(2,2)*pf9shs(2,2)+
        pdlchs(3,2)*pf9shs(3,2)+
        pdlchs(4,2)*pf9shs(4,2)+
        pdlchs(5,2)*pf9shs(5,2))/5.
        a3 = (pdlchc(1)*pf9shc(1)+
        pdlchc(2)*pf9shc(2)+
        pdlchc(3)*pf9shc(3)+
        pdlchc(4)*pf9shc(4)+
        pdlchc(5)*pf9shc(5))/5.
        w2 = pdlchs(n,2)/avpdlis(2)*a1*a2/a3
        w3 = 0.
        w4 = 0.
        sumlf = sumlf+w2
        sumcll = sumcll+w3+w4
      endif
    c
    write(arec(9:80),9988) iw1,w2,w3,w4,iw5
    do 12 ii=1,80
      if(arec(ii:ii).eq.'D') arec(ii:ii)='d'
      if(arec(ii:ii).eq.'E') arec(ii:ii)='e'
    12
    *
    c UPPER FUEL UPPER FUEL UPPER FUEL UPPER FUEL UPPER FUEL UPPER FUEL
    c
    c
    c      Upper fuel heat structures
    c
    c
    c
    c UPPER FUEL UPPER FUEL UPPER FUEL UPPER FUEL UPPER FUEL UPPER FUEL
    *
    c IF THIS HEAT STRUCTURE IS IN THE UPPER FUEL
      else if (arec(3:3).eq.'4') then
        c average fuel heat structure
        if (arec(2:5).eq.'5401') then
          w2 = (0.443*0.90757/5.)*mavgu*pducac(n)/avpdua
          w3 = 0.00660/5.*vu/(vannu+vu)*mavgu*pducac(n)/avpdua
          w4 = 0.0
          sumlf = sumlf+w2
          sumclu = sumclu+w3+w4
        c inner side plate heat structure
        else if (arec(2:5).eq.'5402') then
          w2 = 2.2926d-4*mavgu*pducac(n)/avpdua
          w3 = 7.7600d-4*mavgu*pducac(n)/avpdua
          w4 = 0.0
          sumlf = sumlf+w2
          sumclu = sumclu+w3+w4
        c outer side plate heat structure
        else if (arec(2:5).eq.'5403') then
          w2 = 2.8674d-4*mavgu*pducac(n)/avpdua
          w3 = 0.0
          w4 = 8.0160d-6*mavgu*pducac(n)/avpdua
          sumlf = sumlf+w2
          sumclu = sumclu+w3+w4
        c 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95%
        c hot channel fuel plate
        else if (arec(2:5).eq.'5451') then
          w2 = (0.443*0.90757/5.)*m95*pducac(n)/avpduh
          w3 = 0.00660/5.*vu/(vannu+vu)*m95*pducac(n)/avpduh
          w4 = 0.0
          sumlf = sumlf+w2
          sumclu = sumclu+w3+w4
        c hot channel inner side plate heat structure
        else if (arec(2:5).eq.'5452') then

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w2 = 2.2926d-4*mu95*pduehc(n)/avpduh
w3 = 7.7600d-4*mu95*pduehc(n)/avpduh
w4 = 0.0
sumusp = sumusp+w2
sumclu = sumclu+w3+w4
c hot channel outer side plate heat structure
else if (arec(2:5).eq.'5453') then
w2 = 2.8674d-4*mu95*pduehc(n)/avpduh
w3 = 0.0
w4 = 8.0160d-6*mu95*pduehc(n)/avpduh
sumusp = sumusp+w2
sumclu = sumclu+w3+w4
c CHF hot stripe heat structure
else if (arec(2:5).eq.'5464') then
a1 = mu95/5.*0.443*0.90757/100.
a2 = (pduehc(1,1)*pf95hs(1,1)+
pduehc(2,1)*pf95hs(2,1)+
pduehc(3,1)*pf95hs(3,1)+
pduehc(4,1)*pf95hs(4,1)+
pduehc(5,1)*pf95hs(5,1))/5.
a3 = (pduehc(1)*pf95hc(1)+
pduehc(2)*pf95hc(2)+
pduehc(3)*pf95hc(3)+
pduehc(4)*pf95hc(4)+
pduehc(5)*pf95hc(5))/5.
w2 = pduehc(n,1)/avpduh(1)*a1*a2/a3
w3 = 0.
w4 = 0.
sumuf = sumuf+w2
sumclu = sumclu+w3+w4
c FE hot stripe heat structure
else if (arec(2:5).eq.'5465') then
a1 = mu95/5.*0.443*0.90757/100.
a2 = (pduehc(1,2)*pf95hs(1,2)+
pduehc(2,2)*pf95hs(2,2)+
pduehc(3,2)*pf95hs(3,2)+
pduehc(4,2)*pf95hs(4,2)+
pduehc(5,2)*pf95hs(5,2))/5.
a3 = (pduehc(1)*pf95hc(1)+
pduehc(2)*pf95hc(2)+
pduehc(3)*pf95hc(3)+
pduehc(4)*pf95hc(4)+
pduehc(5)*pf95hc(5))/5.
w2 = pduehc(n,2)/avpduh(2)*a1*a2/a3
w3 = 0.
w4 = 0.
sumuf = sumuf+w2
sumclu = sumclu+w3+w4
endif

c
write(arec(9:80),9988)iw1,w2,w3,w4,iw5
do 22 ii=1,80
if (arec(ii:ii).eq.'D') arec(ii:ii)='d'
if (arec(ii:ii).eq.'G') arec(ii:ii)='e'
22
c INNER FUEL INNER FUEL INNER FUEL INNER FUEL INNER FUEL INNER FUEL
c
c Inner fuel heat structures
c
c INNER FUEL INNER FUEL INNER FUEL INNER FUEL INNER FUEL INNER FUEL
c
c IF THIS HEAT STRUCTURE IS IN THE INNER FUEL
else if (arec(3:3).eq.'7') then
c average fuel heat structure
if (arec(2:5).eq.'5701') then
w2 = (0.152*0.90757/5.)*navgi*pdicac(n)/avpdia
w3 = 0.00561/5.*vi/(vanni+vi)*navgi*pdicac(n)/avpdia
w4 = 0.0
sumuf = sumuf+w2
sumcli = sumcli+w3+w4
c inner side plate heat structure
else if (arec(2:5).eq.'5702') then

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w2 = 2.2926d-4*mu95*pduehc(n)/avpduh
w3 = 7.7600d-4*mu95*pduehc(n)/avpduh
w4 = 0.0
sumusp = sumusp+w2
sumclu = sumclu+w3+w4
c hot channel outer side plate heat structure
else if (arec(2:5).eq.'5453') then
w2 = 2.8674d-4*mu95*pduehc(n)/avpduh
w3 = 0.0
w4 = 8.0160d-6*mu95*pduehc(n)/avpduh
sumusp = sumusp+w2
sumclu = sumclu+w3+w4
c CHF hot stripe heat structure
else if (arec(2:5).eq.'5454') then
a1 = mu95/5.*0.443*0.90757/100.
a2 = (pduehc(1,1)*pf95hs(1,1)+
pduehc(2,1)*pf95hs(2,1)+
pduehc(3,1)*pf95hs(3,1)+
pduehc(4,1)*pf95hs(4,1)+
pduehc(5,1)*pf95hs(5,1))/5.
a3 = (pduehc(1)*pf95hc(1)+
pduehc(2)*pf95hc(2)+
pduehc(3)*pf95hc(3)+
pduehc(4)*pf95hc(4)+
pduehc(5)*pf95hc(5))/5.
w2 = pduehc(n,1)/avpduh(1)*a1*a2/a3
w3 = 0.
w4 = 0.
sumuf = sumuf+w2
sumclu = sumclu+w3+w4
c FE hot stripe heat structure
else if (arec(2:5).eq.'5455') then
a1 = mu95/5.*0.443*0.90757/100.
a2 = (pduehc(1,2)*pf95hs(1,2)+
pduehc(2,2)*pf95hs(2,2)+
pduehc(3,2)*pf95hs(3,2)+
pduehc(4,2)*pf95hs(4,2)+
pduehc(5,2)*pf95hs(5,2))/5.
a3 = (pduehc(1)*pf95hc(1)+
pduehc(2)*pf95hc(2)+
pduehc(3)*pf95hc(3)+
pduehc(4)*pf95hc(4)+
pduehc(5)*pf95hc(5))/5.
w2 = pduehc(n,2)/avpduh(2)*a1*a2/a3
w3 = 0.
w4 = 0.
sumuf = sumuf+w2
sumclu = sumclu+w3+w4
endif

c 99.9% 99.9% 99.9% 99.9% 99.9% 99.9% 99.9% 99.9% 99.9% 99.9%
c hot channel fuel plate
else if (arec(2:5).eq.'5461') then
w2 = (0.443*0.90757/5.)*mu99*pduehc(n)/avpduh
w3 = 0.00660/5.*vu/(vannu+vu)*mu99*pduehc(n)/avpduh
w4 = 0.0
sumuf = sumuf+w2
sumclu = sumclu+w3+w4
c hot channel inner side plate heat structure
else if (arec(2:5).eq.'5462') then
w2 = 2.2926d-4*mu99*pduehc(n)/avpduh
w3 = 7.7600d-4*mu99*pduehc(n)/avpduh
w4 = 0.0
sumusp = sumusp+w2
sumclu = sumclu+w3+w4
c hot channel outer side plate heat structure
else if (arec(2:5).eq.'5463') then

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w2 = 1.5155d-4*navgi*pdicac(n)/avpdia
w3 = 6.540d-4*navgi*pdicac(n)/avpdia
w4 = 0.0
sumisp = sumif*w2
sumcli = sumcli+w3+w4
c outer side plate heat structure
else if (arec(2:5).eq.'5703') then
w2 = 1.0645d-4*navgi*pdicac(n)/avpdia
w3 = 0.0
w4 = 7.7600d-4*navgi*pdicac(n)/avpdia
sumisp = sumif*w2
sumcli = sumcli+w3+w4
c 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95% 95%
c hot channel fuel plate
else if (arec(2:5).eq.'5751') then
w2 = (0.152+0.90757/5.)*mi95*pdicac(n)/avpdih
w3 = 0.00561/5.*vi/(vanni+vi)*mi95*pdicac(n)/avpdih
w4 = 0.0
sumisp = sumif*w2
sumcli = sumcli+w3+w4
c hot channel inner side plate heat structure
else if (arec(2:5).eq.'5752') then
w2 = 1.5155d-4*mi95*pdicac(n)/avpdih
w3 = 6.540d-4*mi95*pdicac(n)/avpdih
w4 = 0.0
sumisp = sumif*w2
sumcli = sumcli+w3+w4
c hot channel inner side plate heat structure
else if (arec(2:5).eq.'5753') then
w2 = 1.5155d-4*mi95*pdicac(n)/avpdih
w3 = 6.540d-4*mi95*pdicac(n)/avpdih
w4 = 0.0
sumisp = sumif*w2
sumcli = sumcli+w3+w4
c CHF hot stripe heat structure
else if (arec(2:5).eq.'5754') then
a1 = mi95/5.*0.152+0.90757/100.
a2 = (pdicac(1,1)*pf95hs(1,1)+
pdicac(2,1)*pf95hs(2,1)+
pdicac(3,1)*pf95hs(3,1)+
pdicac(4,1)*pf95hs(4,1)+
pdicac(5,1)*pf95hs(5,1))/5.
a3 = (pdicac(1)*pf95hc(1)+
pdicac(2)*pf95hc(2)+
pdicac(3)*pf95hc(3)+
pdicac(4)*pf95hc(4)+
pdicac(5)*pf95hc(5))/5.
w2 = pdicac(n,1)/avpdih(1)*a1+a2/a3
w3 = 0.
w4 = 0.
sumif = sumif*w2
sumcli = sumcli+w3+w4
c FE hot stripe heat structure
else if (arec(2:5).eq.'5755') then
a1 = mi95/5.*0.152+0.90757/100.
a2 = (pdicac(1,2)*pf95hs(1,2)+
pdicac(2,2)*pf95hs(2,2)+
pdicac(3,2)*pf95hs(3,2)+
pdicac(4,2)*pf95hs(4,2)+
pdicac(5,2)*pf95hs(5,2))/5.
a3 = (pdicac(1)*pf95hc(1)+
pdicac(2)*pf95hc(2)+
pdicac(3)*pf95hc(3)+
pdicac(4)*pf95hc(4)+
pdicac(5)*pf95hc(5))/5.
w2 = pdicac(n,2)/avpdih(2)*a1+a2/a3
w3 = 0.
w4 = 0.
sumif = sumif*w2
sumcli = sumcli+w3+w4
endif

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32      write(arec(9:80),9988)iw1,w2,w3,w4,iw5
      do 32 ii=1,80
      if(arec(ii:ii).eq.'D')arec(ii:ii)='d'
      if(arec(ii:ii).eq.'E')arec(ii:ii)='e'
      else
      sumoth = sumoth+w2
      sumclo = sumclo+w3+w4
      endif
      c ENDIF THE SOURCE TERM IS 1000
      999 continue
      write(6,9987)arec(2:5),iw1,w2,w3,w4,iw5
      else if(iw1.eq.10775) then
      sum75 = sum75 + w2*222733./3.44d8
      sumcp = sumcp + (w3 + w4)*222733./3.44d8
      else if(iw1.eq.10774) then
      sum74 = sum74 + w2*213703./3.44d8
      sumcp = sumcp + (w3 + w4)*213703./3.44d8
      else if(iw1.eq.10773) then
      sum73 = sum73 + w2*196644./3.44d8
      sumcp = sumcp + (w3 + w4)*196644./3.44d8
      else if(iw1.eq.10772) then
      sum72 = sum72 + w2*186613./3.44d8
      sumcp = sumcp + (w3 + w4)*186613./3.44d8
      else if(iw1.eq.10771) then
      sum71 = sum71 + w2*183603./3.44d8
      sumcp = sumcp + (w3 + w4)*183603./3.44d8
      else if(iw1.eq.10735) then
      sum735 = sum735 + w2*148160./3.44d8
      sumcp = sumcp + (w3 + w4)*148160./3.44d8
      else if(iw1.eq.10734) then
      sum734 = sum734 + w2*182970./3.44d8
      sumcp = sumcp + (w3 + w4)*182970./3.44d8
      else if(iw1.eq.10733) then
      sum733 = sum733 + w2*188323./3.44d8
      sumcp = sumcp + (w3 + w4)*188323./3.44d8
      else if(iw1.eq.10732) then
      sum732 = sum732 + w2*187432./3.44d8
      sumcp = sumcp + (w3 + w4)*187432./3.44d8
      else if(iw1.eq.10731) then
      sum731 = sum731 + w2*185646.5/3.44d8
      sumcp = sumcp + (w3 + w4)*185646.5/3.44d8
      else if(iw1.eq.10641) then
      sum641 = sum641 + w2*168656.3/3.44d8
      sumcp = sumcp + (w3 + w4)*168656.3/3.44d8
      else if(iw1.eq.10642) then
      sum642 = sum642 + w2*301664./3.44d8
      sumcp = sumcp + (w3 + w4)*301664./3.44d8
      else if(iw1.eq.10643) then
      sum643 = sum643 + w2*794812./3.44d8
      sumcp = sumcp + (w3 + w4)*794812./3.44d8
      else if(iw1.eq.10613) then
      sum613 = sum613 + w2*73585./3.44d8
      sumcp = sumcp + (w3 + w4)*73585./3.44d8
      else if(iw1.eq.10671) then
      sum671 = sum671 + w2*429622./3.44d8
      sumcp = sumcp + (w3 + w4)*429622./3.44d8
      else if(iw1.eq.10672) then
      sum672 = sum672 + w2*433784./3.44d8
      sumcp = sumcp + (w3 + w4)*433784./3.44d8
      else if(iw1.eq.10673) then
      sum673 = sum673 + w2*435848./3.44d8
      sumcp = sumcp + (w3 + w4)*435848./3.44d8
      else if(iw1.eq.10674) then
      sum674 = sum674 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10675) then
      sum675 = sum675 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10676) then
      sum676 = sum676 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10677) then
      sum677 = sum677 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10678) then
      sum678 = sum678 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10679) then
      sum679 = sum679 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10680) then
      sum680 = sum680 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10681) then
      sum681 = sum681 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10682) then
      sum682 = sum682 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10683) then
      sum683 = sum683 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10684) then
      sum684 = sum684 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10685) then
      sum685 = sum685 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10686) then
      sum686 = sum686 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10687) then
      sum687 = sum687 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10688) then
      sum688 = sum688 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10689) then
      sum689 = sum689 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10690) then
      sum690 = sum690 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10691) then
      sum691 = sum691 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10692) then
      sum692 = sum692 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10693) then
      sum693 = sum693 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10694) then
      sum694 = sum694 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10695) then
      sum695 = sum695 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10696) then
      sum696 = sum696 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10697) then
      sum697 = sum697 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10698) then
      sum698 = sum698 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10699) then
      sum699 = sum699 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10700) then
      sum700 = sum700 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10701) then
      sum701 = sum701 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10702) then
      sum702 = sum702 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10703) then
      sum703 = sum703 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10704) then
      sum704 = sum704 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10705) then
      sum705 = sum705 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10706) then
      sum706 = sum706 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10707) then
      sum707 = sum707 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10708) then
      sum708 = sum708 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10709) then
      sum709 = sum709 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10710) then
      sum710 = sum710 + w2*423464./3.44d8
      sumcp = sumcp + (w3 + w4)*423464./3.44d8
      else if(iw1.eq.10711) then
      sum711 = sum711 + w2*423464./3.44d8
     
```

```

c Function to read alphanumeric data
c
function read(iptr,arec,length)
c Finds the first alphanumeric on the record after the iptr character
c
character*10 aread
character*80 arec
character*5 format
format = '( ' )'
do 10 i=iptr+1,80
  if(arec(i:i).ne.' ') then
    i1 = i
    go to 15
  endif
10 continue
return
15 do 20 i=i1+1,80
  if(arec(i:i).eq.' ') then
    length = i-i1
    iptr = i
    go to 25
  endif
20 continue
25 continue
if(length.lt.10) then
  write(format(3:4),'(a1,i1)' 'a',length
else
  write(format(2:4),'(a1,i2)' 'a',length
endif
read(arec(i1:i1+length-1),format)aread
return
end

idec1 = 0
idec2 = 0
do 10 i=iptr+1,80
  if(arec(i:i).ne.' ') then
    i1 = i
    go to 15
  endif
10 continue
dread = 0.d0
return
15 do 20 i=i1+1,80
  if(arec(i:i).eq.' ') then
    length = i-i1
    iptr = i
    go to 25
  endif
20 continue
25 do 30 i=i1,i1+length
  if(arec(i:i).eq.' ') then
    idec1 = i+1
  else if(arec(i:i).eq.'d' .or. arec(i:i).eq.'e' .or. i.eq.i1+length
    & .or. arec(i:i).eq.'+' .or. arec(i:i).eq.'-' ) then
    idec2 = i-1
  endif
30 continue
if(idec2.eq.0) then
  dread = 0.
  return
endif
ndec = idec2-idec1+1
write(format(2:7),'(a1,i2,a1,i2)' 'd',length,'.',ndec
read(arec(i1:i1+length-1),format)dread
return
end

c Function to read integer data
c
function read(iptr,arec)
c Finds the first integer on the record after the iptr character
c
character*80 arec
character*4 format
data format /'( ' )'/
do 10 i=iptr+1,80
  if(arec(i:i).ne.' ') then
    i1 = i
    go to 15
  endif
10 continue
15 do 20 i=i1+1,80
  if(arec(i:i).eq.' ') then
    length = i-i1
    iptr = i
    go to 25
  endif
20 continue
25 continue
write(format(2:3),'(a1,i1)' 'i',length
read(arec(i1:i1+length-1),format)iread
return
end

```


APPENDIX C: RELAP5/TEC PLOT TRANSLATOR AND POST PROCESSOR (rlptec6.f)

```

c
c This program reads a RELAP5 generated strip file and creates a
c TEC PLOT-readable ASCII data file.
c
c Written by M. W. Wendel (615-574-2825)
c
c .....1.....2.....3.....4.....5.....6.....7.....
c implicit double precision (a-h,o-z)
c dimension calc(600,10000),calci(600,10000)
c dimension costar(30),chfavr(15),chfr(30),szmodr(30),suphtr(30),
c   vel(30),szr(30)
c   real lbr(20),lbrmin
c   common /pool/ pool(4,138)
c   dimension qwhxp(10000),qehxp(10000),qhl(10000),qhlc(10000),
c     qcl(10000)
c   character*8 names(600),adummy
c   character*5 techam(600)
c   character*10 numa(600),filnam
c   character*40 title
c   real all, al2, al3
c dimension peaking factors corresponding to three standard deviation levels
c dimension pfsz95(3),pfsz99(3),pftw95(3),pftw99(3),pfi95(3),
c   pfi99(3)
c
c Peaking factors for Costa, Saha-Zuber, and Twall-Tsat
c For Costa, a standard deviation of 10% was assumed.
c For Saha-Zuber and Twall-Tsat, three standard deviations are used:
c
c           Saha-Zuber      Twall-Tsat
c Pe > 70,000 and velocity > 8 m/s      16%      3.3% (3)
c Pe > 70,000 and velocity < 8 m/s      30% (1)      3.3%
c Pe < 70,000 and velocity < 8 m/s      75% (2)      3.3%
c
c (1) not applied for 99.9% probability due to very large peaking factor.
c (2) not applied for either probability due to very large peaking factor.
c (3) not applied for 95% probability.
c
c For 95% probability level in the Costa correlation
c data pfco95 /1.305/
c data pfco99 /1.592/
c
c Saha Zuber peaking factors (used only for Pe > 70,000)
c 95% probability
c data pfsz95 /1.52,2.08,1.46/
c 99.9% probability
c data pfsz99 /2.30,1.46,1.46/
c
c Twall-Tsat peaking factors
c 95% probability
c data pftw95 /1.15,1.15,1.16/
c 99.9% probability
c data pftw99 /1.25,1.25,1.25/
c
c Incipient boiling peaking factors (same as for chf)
c 95% probability
c data pfi95 /1.30,1.30,1.30/
c 99.9% probability
c data pfi99 /1.59,1.59,1.59/
c
c Critical Heat Flux peaking factors
c 95% probability
c data pf95a /1.631/
c data pf95b /1.554/
c 99.9% probability

```

```

data pf99a /1.995/
data pf99b /1.899/
data dh /0.0025/
conversion=conversion-conversion-conversion-conversion-conver
c
c Conversion factors from SI to British
c
c Pressure
c data cpress /1.0/
c Mass
c data cmass /1.0/
c Internal energy
c data cu /1.0/
c Temperature
c data ctemp1,ctemp2 /1.0,1.0/
c Heat flux
c data chtfhx /1.0/
c Pump velocity
c data cpmv /1.0/
c Power
c data cpower /1.0/
c Density
c data cdens /1.0/
c Velocity
c data cvel /1.0/
c Interfacial area heat transfer coeff. density
c data chi /1.0/
conversion=conversion-conversion-conversion-conversion-conver
c
open(unit=21,file='strip.dat',status='old',form='formatted')
open(unit=22,file='tec.dat',status='unknown',form='formatted')
open(unit=23,file='chf4.dat',status='unknown')
open(unit=24,file='chf5.dat',status='unknown')
open(unit=28,file='twall.dat',status='unknown')
open(unit=29,file='ibdat',status='unknown')
open(unit=26,file='axial.dat',status='unknown')
open(unit=27,file='axial.dat',status='unknown')
open(unit=17,file='debug',status='unknown',form='formatted')
write(28,9100)
9100 format('time,qlim,hflx,sbcool,hlim')
write(29,9101)
9101 format('time,qib,hflx,twall,hb')
pi = 4.*atan(1.0)
write(6,985)
read(6,979) title
if(title(1:1).eq.'-') then
  copf95 = pfco95
  copf99 = pfco99
  do 3 m=1,3
    pfsz95(m) = 1.0
    pfsz99(m) = 1.0
    pfi95(m) = 1.0
    pfi99(m) = 1.0
    pftw95(m) = 1.0
    pftw99(m) = 1.0
  3 continue
else
  copf95 = 1.0
  copf99 = 1.0
endif
5 continue
zero = 0.d0
ithin = 1
nn = 0

```

```

c
c Read list of variables from strip file
c
  read(21,990)adummy
  read(21,990)adummy
  read(21,999) nt
  nt=nt-1
  nt= nt
  nt= nt/8
  last = min(nt,7)
  read(21,998) (names(i),i=1,last)
  if(nl.gt.0) then
    do 10 j=1,nl
      last = min(nt,7+j*8)
      ifirst = 8*j
      read(21,988) (names(i),i=ifirst,last)
10 continue
  endif
  read(21,991) (nums(i)(2:10),i=1,nt)
c
c Read time-dependent data for requested variables
c
  do 20 i=1,10000
    n1 = 1
    n2 = 4
    read(21,982,ends=30) (calc(j,i),j=n1,n2)
    n1 = 5
    do 25 i1=1,2000
      if(n2.ge.nt) go to 21
      n2 = n1+4
      read(21,986,ends=30) (calc(j,i),j=n1,n2)
      n1 = n1+5
25 continue
21 if(mod(i,100).eq.0)write(6,984)i
20 continue
30 i1=i-1
  write(6,994)i1ist
c
c Scan the data, change some names, define pointers
c
  do 40 n=1,nt
    conv1 = 1.
    conv2 = 0.
    if(names(n).eq.'p') then
      tecnam(n) = 'p'
      tecnam(n)(3:5) = nums(n)(2:4)
      conv1 = cpres
    else if(names(n).eq.'hig') then
      tecnam(n) = 'hi'
      tecnam(n)(3:5) = nums(n)(2:4)
      conv1 = 1.0
    conv2 = 0.
    else if(names(n).eq.'flore') then
      tecnam(n) = 'fr'
      tecnam(n)(3:5) = nums(n)(2:4)
      conv1 = 1.0
    conv2 = 0.
    else if(names(n).eq.'tempf') then
      if(nums(n)(2:6).eq.'51501') ltempf = n-1
      tecnam(n) = 'tf'
      tecnam(n)(3:5) = nums(n)(2:4)
      conv1 = ctemp1
      conv2 = ctemp2
    else if(names(n).eq.'htemp') then
      nmbx = nmbx+1
      conv1 = 433.9405

```

```

if (nums(n) (2:10).eq.'550100204') lh=n-1
if (nums(n) (2:10).eq.'515500501') lhnstr=n-1
tecnam(n) = 't'
tecnam(n)(2:5) = nums(n) (2:5)
conv1 = ctemp1
conv2 = ctemp2
else if (names(n).eq.'hthtc') then
tecnam(n) = 'h'
tecnam(n)(3:5) = nums(n) (2:5)
conv1 = 1.0
conv2 = 0.0
else if (names(n).eq.'htmode') then
tecnam(n) = 'hm'
tecnam(n)(3:5) = nums(n) (3:5)
conv1 = 1.0
conv2 = 0.0
else if (names(n).eq.'hthtc') then
tecnam(n) = 'hm'
tecnam(n)(3:5) = nums(n) (3:5)
conv1 = 1.0
conv2 = 0.0
else if (names(n).eq.'htvat') then
tecnam(n) = 'ha'
tecnam(n)(3:5) = nums(n) (3:5)
conv1 = ctemp1
conv2 = ctemp2
else if (names(n).eq.'temp') then
tecnam(n) = 'tg'
tecnam(n)(3:5) = nums(n) (2:4)
conv1 = ctemp1
conv2 = ctemp2
else if (names(n).eq.'sattemp') then
tecnam(n) = 'st'
tecnam(n)(3:5) = nums(n) (2:4)
conv1 = ctemp1
conv2 = ctemp2
if (nums(n) (2:6).eq.'51501') least = n-1
else if (names(n).eq.'mflow') then
tecnam(n) = 'mf'
tecnam(n)(3:5) = nums(n) (2:4)
conv1 = cmass
conv2 = ctemp2
else if (names(n).eq.'emass') then
tecnam(n) = 'emass'
tecnam(n)(3:5) = nums(n) (2:4)
conv1 = cmass
conv2 = ctemp2
else if (names(n).eq.'tnass') then
tecnam(n) = 'tnass'
tecnam(n)(3:5) = nums(n) (2:4)
conv1 = cmass
conv2 = ctemp2
else if (names(n).eq.'htchf') then
if (nums(n) (2:8).eq.'5101001') lchfav=n-1
if (nums(n) (2:8).eq.'5154001') lchfht=n-1
tecnam(n) = 'c'
tecnam(n)(2:5) = nums(n) (2:5)
conv1 = chtflx
conv2 = ctemp2
else if (names(n).eq.'htnr') then
if (nums(n) (2:8).eq.'5101001') lfixav=n-1
if (nums(n) (2:8).eq.'5155001') lfixht=n-1
if (nums(n) (2:8).eq.'5154001') lfixfn=n-1
if (nums(n) (2:8).eq.'1081001') lpool=n-1
if (nums(n) (2:8).eq.'1083001') lmbx=n-1
if (nums(n) (2:5).eq.'1083'.or(nums(n) (2:5).eq.'2083'.
or nums(n) (2:5).eq.'3083')) then
nmbx = nmbx+1
conv1 = 433.9405

```

```

tecnam(n) = 'Q'
tecnam(n)(2:5) = nums(n)(2:5)
else if(nums(n)(2:5).eq.'1081'.or.npool.ne.0) then
  npool=npool+1
  rad = pool(2,npool)
  xfac = pool(3,npool)
  geo = pool(4,npool)
  if(geo.gt.1) then
    conv1 = xfac*2*pi*rad*chtflix
  endif
  if(geo.lt.1.5) conv1 = xfac*chtflix
  tecnam(n) = 'Q'
  tecnam(n)(2:5) = nums(n)(2:5)
else
  tecnam(n) = 'Q'
  tecnam(n)(2:5) = nums(n)(2:5)
  conv1 = chtflix
endif
else if(names(n).eq.'Costa fl') then
  tecnam(n) = 'Co'
  tecnam(n)(3:5) = nums(n)(3:5)
  conv1 = chtflix
else if(names(n).eq.'rhofj') then
  tecnam(n) = 'rj'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'vapgen') then
  tecnam(n) = 'vg'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'rhog') then
  tecnam(n) = 'rg'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'rhof') then
  tecnam(n) = 'rf'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'rhogj') then
  tecnam(n) = 'rj'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'thconf') then
  tecnam(n) = 'k'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = 1.0
if(nums(n)(2:6).eq.'51501') lk = n-1
else if(names(n).eq.'viscf') then
  tecnam(n) = 'nu'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = 1.0
if(nums(n)(2:6).eq.'51501') lvis = n-1
else if(names(n).eq.'rho') then
  tecnam(n) = 'r'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'gamaw') then
  tecnam(n) = 'ga'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cdens
else if(names(n).eq.'hif') then
  tecnam(n) = 'hf'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = chi
else if(names(n).eq.'hig') then
  tecnam(n) = 'hg'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = chi
else if(names(n).eq.'pmphead') then
  tecnam(n) = 'ph'
  tecnam(n)(3:5) = nums(n)(8:10)
  conv1 = cpres
else if(names(n).eq.'pmpvel') then
  tecnam(n) = 'pv'
  tecnam(n)(3:5) = nums(n)(8:10)
  conv1 = cpmvp
else if(names(n).eq.'uf') then
  tecnam(n) = 'uf'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cu
else if(names(n).eq.'ug') then
  tecnam(n) = 'ug'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cu
else if(names(n).eq.'ufj') then
  tecnam(n) = 'ufj'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cu
else if(names(n).eq.'ugj') then
  tecnam(n) = 'ugj'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cu
else if(names(n).eq.'q') then
  tecnam(n) = 'q'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cpower
else if(names(n).eq.'qwg') then
  tecnam(n) = 'qw'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cpower
else if(names(n).eq.'veifj') then
  tecnam(n) = 'vj'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
else if(names(n).eq.'velgj') then
  tecnam(n) = 'vj'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
else if(names(n).eq.'veif') then
  tecnam(n) = 'vf'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
if(nums(n)(2:10).eq.'515010000') lvel = n-1
else if(names(n).eq.'veif') then
  tecnam(n) = 'vf'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
else if(names(n).eq.'velg') then
  tecnam(n) = 'vg'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
else if(names(n).eq.'sounde') then
  tecnam(n) = 'so'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
else if(names(n).eq.'voidg') then
  tecnam(n) = 'vd'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
else if(names(n).eq.'voidf') then
  tecnam(n) = 'vf'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = cvel
if(nums(n)(2:6).eq.'15601') lp = n-1
  tecnam(n) = 'vl'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = chi
else if(names(n).eq.'quals') then
  tecnam(n) = 'qs'
  tecnam(n)(3:5) = nums(n)(2:4)
  conv1 = chi

```



```

write(22,997) 'm05-1'
write(22,997) 'z05-1'
write(22,997) 'f05-1'
write(22,997) 't05-2'
write(22,997) 'i05-2'
write(22,997) 'c05-2'
write(22,997) 'm05-2'
write(22,997) 'z05-2'
write(22,997) 'f05-2'
write(22,997) 't05-3'
write(22,997) 'i05-3'
write(22,997) 'c05-3'
write(22,997) 'm05-3'
write(22,997) 'z05-3'
write(22,997) 'f05-3'
write(22,997) 't05-4'
write(22,997) 'i05-4'
write(22,997) 'c05-4'
write(22,997) 'm05-4'
write(22,997) 'z05-4'
write(22,997) 'f05-4'
write(22,997) 't05-5'
write(22,997) 'i05-5'
write(22,997) 'c05-5'
write(22,997) 'm05-5'
write(22,997) 'z05-5'
write(22,997) 'f05-5'
write(22,997) 't09-1'
write(22,997) 'i09-1'
write(22,997) 'c09-1'
write(22,997) 'm09-1'
write(22,997) 'z09-1'
write(22,997) 'f09-1'
write(22,997) 't09-2'
write(22,997) 'i09-2'
write(22,997) 'c09-2'
write(22,997) 'm09-2'
write(22,997) 'z09-2'
write(22,997) 'f09-2'
write(22,997) 't09-3'
write(22,997) 'i09-3'
write(22,997) 'c09-3'
write(22,997) 'm09-3'
write(22,997) 'z09-3'
write(22,997) 'f09-3'
write(22,997) 't09-4'
write(22,997) 'i09-4'
write(22,997) 'c09-4'
write(22,997) 'm09-4'
write(22,997) 'z09-4'
write(22,997) 'f09-4'
write(22,997) 't09-5'
write(22,997) 'i09-5'
write(22,997) 'c09-5'
write(22,997) 'm09-5'
write(22,997) 'z09-5'
write(22,997) 'f09-5'
* inner core
write(22,997) 't15-1'
write(22,997) 'i15-1'
write(22,997) 'c15-1'
write(22,997) 'm15-1'
write(22,997) 'z15-1'
write(22,997) 'f15-1'
write(22,997) 't15-2'

```

```

write(22,997) 'i15-2'
write(22,997) 'c15-2'
write(22,997) 'm15-2'
write(22,997) 'z15-2'
write(22,997) 'f15-2'
write(22,997) 't15-3'
write(22,997) 'i15-3'
write(22,997) 'c15-3'
write(22,997) 'm15-3'
write(22,997) 'z15-3'
write(22,997) 'f15-3'
write(22,997) 't15-4'
write(22,997) 'i15-4'
write(22,997) 'c15-4'
write(22,997) 'm15-4'
write(22,997) 'z15-4'
write(22,997) 'f15-4'
write(22,997) 't15-5'
write(22,997) 'i15-5'
write(22,997) 'c15-5'
write(22,997) 'm15-5'
write(22,997) 'z15-5'
write(22,997) 'f15-5'
write(22,997) 't19-1'
write(22,997) 'i19-1'
write(22,997) 'c19-1'
write(22,997) 'm19-1'
write(22,997) 'z19-1'
write(22,997) 'f19-1'
write(22,997) 't19-2'
write(22,997) 'i19-2'
write(22,997) 'c19-2'
write(22,997) 'm19-2'
write(22,997) 'z19-2'
write(22,997) 'f19-2'
write(22,997) 't19-3'
write(22,997) 'i19-3'
write(22,997) 'c19-3'
write(22,997) 'm19-3'
write(22,997) 'z19-3'
write(22,997) 'f19-3'
write(22,997) 't19-4'
write(22,997) 'i19-4'
write(22,997) 'c19-4'
write(22,997) 'm19-4'
write(22,997) 'z19-4'
write(22,997) 'f19-4'
write(22,997) 't19-5'
write(22,997) 'i19-5'
write(22,997) 'c19-5'
write(22,997) 'm19-5'
write(22,997) 'z19-5'
write(22,997) 'f19-5'
c critical heat flux ratio limits at average channels
write(22,997) 'fav11'
write(22,997) 'fav12'
write(22,997) 'fav13'
write(22,997) 'fav14'
write(22,997) 'fav15'
write(22,997) 'fav01'
write(22,997) 'fav02'
write(22,997) 'fav03'
write(22,997) 'fav04'
write(22,997) 'fav05'
write(22,997) 'fav11'

```

```

write(22,997) 'fav12'
write(22,997) 'fav13'
write(22,997) 'fav14'
write(22,997) 'fav15'
write(22,997) 'comin'
write(22,997) 's2min'
write(22,997) 'cfmin'
write(22,997) 'shmin'
write(22,997) 'fimin'
write(22,997) 'shmax'
if (lpool.gt.0) then
  write(22,997) 'qpool'
  write(22,997) 'qmbx'
  write(22,997) 'qmbxp'
  write(22,997) 'qebxp'
  write(22,997) 'qhl1'
  write(22,997) 'qhlc'
  write(22,997) 'qcl'
endif
write(23,997) 'CHFL4'
write(24,997) 'CHFL5'

c sum heat transfer components from piping to pool
c
c qpool = total heat from piping and heat exchanger shells to pool
c qmbx = heat removal from main heat exchanger primary to secondary system
c qmbxp = heat removal from main heat exchanger shell to pool
c qebxp = heat removal from emergency heat exchanger shell to pool
c qhl1 = heat removal from all four hot leg loop piping to pool
c qhlc = heat removal from common hot leg to pool
c qcl = total heat removal from all four cold legs to pool
c      (including CFRG inlet volumes)
c
do 143 i=1,11st
  qmbxp(i) = 0.
  qebxp(i) = 0.
  qhl1(i) = 0.
  qhlc(i) = 0.
  qcl(i) = 0.
  do 144 ih=1,11
    qmbxp(i) = qmbxp(i) + calcl(lpool+ih,i)
  144 continue
  do 145 ih=12,19
    qebxp(i) = qebxp(i) + calcl(lpool+ih,i)
  145 continue
  do 146 ih=20,30
    qmbxp(i) = qmbxp(i) + calcl(lpool+ih,i)
  146 continue
  do 147 ih=31,38
    qebxp(i) = qebxp(i) + calcl(lpool+ih,i)
  147 continue
  do 148 ih=39,49
    qmbxp(i) = qmbxp(i) + calcl(lpool+ih,i)
  148 continue
  do 149 ih=50,57
    qebxp(i) = qebxp(i) + calcl(lpool+ih,i)
  149 continue
  do 150 ih=58,63
    qhl1(i) = qhl1(i) + calcl(lpool+ih,i)
  150 continue
  do 151 ih=64,78
    qcl(i) = qcl(i) + calcl(lpool+ih,i)
  151 continue
  do 160 ih=79,84
    qhl1(i) = qhl1(i) + calcl(lpool+ih,i)
  160 continue
  do 161 ih=85,97
    qcl(i) = qcl(i) + calcl(lpool+ih,i)
  161 continue
  do 170 ih=98,101
    qhl1(i) = qhl1(i) + calcl(lpool+ih,i)
  170 continue
  do 171 ih=102,114
    qcl(i) = qcl(i) + calcl(lpool+ih,i)
  171 continue
  do 172 ih=116,126
    qhl1(i) = qhl1(i) + calcl(lpool+115,i)
  172 continue
  do 173 ih=127,138
    qhlc(i) = qhlc(i) + calcl(lpool+ih,i)
  173 continue
  143 continue
c
  ii = 0
  write(22,995)
  do 45 i=1,11st
    ii = ii+1
    ll = lp
    comin = 1.d6
    szmin = 1.d6
    shmax = -900.
    shmin = 1.d6
    chfmin = 1.d6
    do 39 m=1,30
      val(m) = calcl(lvel+m,i)
    39 continue
c
c translate time variable backwards by 10 s (start transient at time=0)
c
  calcl(1,i) = calcl(1,i)-10.
  if(calcl(1,i).lt.0.d0) go to 45
  if(calcl(1,i).eq.0.d0) calcl(1,i)=1.d-6
  all = calcl(11+1,i)*4.09+(calcl(11+2,i)+calcl(11+3,i)+
    calcl(11+4,i)+calcl(11+5,i))*0.12-4.88*(1.-calcl(11+6,i))
  ll = lp+6
  all2 = calcl(11+1,i)*4.09+(calcl(11+2,i)+calcl(11+3,i)+
    calcl(11+4,i)+calcl(11+5,i))*0.12-4.88*(1.-calcl(11+6,i))
  ll = lp+12
  all3 = calcl(11+1,i)*4.09+(calcl(11+2,i)+calcl(11+3,i)+
    calcl(11+4,i)+calcl(11+5,i))*0.12-4.88*(1.-calcl(11+6,i))
c
  accf1 = calcl(2,i)+calcl(3,i)+calcl(4,i)
  qpool = 0.
  qmbx = 0.
  do 43 ih= 1,30
    qmbx = qmbx+calcl(lmbx+ih,i)
  43 continue
  do 44 ih= 1,npool
    qpool = qpool+calcl(lpool+ih,i)
  44 continue
c
c .....1.....2.....3.....4.....5.....6.....7..
c Costa ratios
c lower core 95%
do 46 m = 1,5
  costar(m) = max(0.00001d0,copf95+calcl(lco+m,i)/

```

```

c
c Determine peaked heat flux
c
      if (pe.ge.70000.) then
        qlim = 0.0065*re*pr*ckb/dh*sbcool*fact
        if (vel(m).gt.8.) then
          if (mod(m-1,10).le.4) then
            pf = pfsz95(1)
            hflx = pf*calci(lflxht+m,i)/pfco95
          else
            pf = pfsz99(1)
            hflx = pf*calci(lflxht+m,i)/pfco99
          endif
        else
          if (mod(m-1,10).le.4) then
            pf = pfsz95(2)
            hflx = pf*calci(lflxht+m,i)/pfco95
          else
            pf = pfsz99(2)
            hflx = pf*calci(lflxht+m,i)/pfco99
          endif
        endif
      else
        qlim = 455.*ckb/dh*sbcool*fact
        if (mod(m-1,10).le.4) then
          pf = pfsz95(3)
          hflx = pf*calci(lflxht+m,i)/pfco95
        else
          pf = pfsz99(3)
          hflx = pf*calci(lflxht+m,i)/pfco99
        endif
      endif
    endif
  else
    szmodr(m) = max(0.00001d0,qlim/hflx)
    szr(m) = max(0.00001d0,qlim/hflx/fact)
    if (szmodr(m).lt.szmin.and.szmodr(m).gt.0.0001d0) then
      szmin = szmodr(m)
    endif
    if (szmodr(m).lt.1.0) iszwrn = iszwrn+1
  endif
56 continue
c
c .....1.....2.....3.....4.....5.....6.....7..
c CHF ratios
c
c Average Fuel
  do 70 m = 1,15
    chfavr(m) = max(0.00001d0,calci(lchfav+m,i)/calci(lflxav+m,i))
    if (chfavr(m).lt.chfmin.and.chfavr(m).gt.0.00001d0) then
      chfmin = chfavr(m)
    endif
    if (chfavr(m).gt.100.) ichwrn = ichwrn+1
  70 continue
c Hot Fuel
  do 75 m = 1,30
    fp = 1.
    c divide out the peaking factor from CHF hot stripe flux if requested
    if (title(1:1).eq.'-') then
      if (mod(m-1,10).le.4) then
        if (mod(m,10).eq.1.or.mod(m,10).eq.5) then
          fp = 1./pf995a
        else
          fp = 1./pf995b
        endif
      else
        fp = 1.
      endif
    endif
  75 m = 1,30
  fp = 1.
c
c Calculate Modified and Unmodified Saha-Zuber thermal limit ratio
  do 56 m=1,30
    pe = abs(calci(lpe+m,i))
    pr = calci(lpr+m,i)
    ckb = calci(lk+m,i)
    re = pe/pr
    sbcool = calci(lsc+m,i)
    dh = 0.002236
    if (m.gt.10) dh = 0.002239
    if (m.gt.20) dh = 0.002249
    fact = 0.55 + 11.21/sbcool
  56 m=1,30
  51 continue
c
c .....1.....2.....3.....4.....5.....6.....7..
c

```

```

if(mod(m,10).eq.1.or.mod(m,10).eq.5) then
  fp = 1./pf999a
else
  fp = 1./pf999b
endif
endif
endif
c.....1.....2.....3.....4.....5.....6.....7..
chfr(m) = max(0.00001d0,calci(1fht+m,i)/
  (calci(1fht+m,i)*fp))
if(chfr(m).lt.chfrmin.and.chfr(m).gt.0.00001d0) then
  chfrmin = chfr(m)
endif
if(chfr(m).gt.100.) ichwrn = ichwrn+1
75 continue
c
c Calculate Pecukhov heat flux based on Tbulk and Tsat
c at hot channel exit locations only
do 76 m=1,30
  pe = abs(calci(lpe+m,i))
  pr = calci(lpr+m,i)
  re = pe/pr
  tsat = calci(lsat+m,i)
  sbcool = calci(lsc+m,i)
  const = 1.0875 - 0.1125*(1.143/87.35)
  dh = 0.002498
  vissat = d2ovis(tsat)
  visrat = calci(lvis+m,i)/vissat
  if(m.gt.2) then
    * THIS APPEARS TO BE AN ERROR!, m.gt.10 is write I think ... MMW 8-3-95
    const = 1.0875 - 0.1125*(1.143/70.29)
    dh = 0.002494
  endif
  fd = const/(1.82*log10(re)-1.64)**2
  hturb = fd/8.*calci(lk+m,i)/dh*pe*vissat**0.11/
    ((1+3.4*fd)+(11.7+1.8/pr**0.3333)*(fd/8.))**0.5*
    (pr**0.5667-1.)
  hlam = 7.63*calci(lk+m,i)/dh
  if(hlam.gt.hturb) then
    write(6,962)calci(1,i),m,re
    hlam = hlam
  else
    hlam = hturb
  endif
  qlim = hlam*sbcool
c
c Determine peaked heat flux
c
if(pe.ge.70000.) then
  if(vel(m).gt.8.) then
    if(mod(m-1,10).le.4) then
      pf = pftw95(1)
      hflx = pf*calci(1fht+m,i)/pfco95
    else
      pf = pftw99(1)
      hflx = pf*calci(1fht+m,i)/pfco99
    endif
  else
    if(mod(m-1,10).le.4) then
      pf = pftw95(2)
      hflx = pf*calci(1fht+m,i)/pfco95
    else
      pf = pftw99(2)
      hflx = pf*calci(1fht+m,i)/pfco99
    endif
  endif
endif
endif
c
if(mod(m-1,10).le.4) then
  pf = pftw95(1)
  hflx = pf*calci(1fht+m,i)/pfco95
else
  pf = pftw99(1)
  hflx = pf*calci(1fht+m,i)/pfco99
endif
ibr(m) = max(0.00001d0,qib/hflx)
if(ibr(m).lt.ibrmin.and.ibr(m).gt.0.0001d0) then
  ibrmin = ibr(m)
  xibrmin = float(m)
endif
if(m.eq.10) write(29,9102) calci(1,i),qib,hflx,twalib,hib
9102 format(5(1X,e15.7))
77 continue
c

```


APPENDIX D: RELAP5 STRIP INPUT FILE (strprfd6in)

```

= strip file for ans model
100 strip fmtout
103 0
104 noaction
*-----
1001 mflowj 157000000 * Accumulator 1
1002 mflowj 257000000 * Accumulator 2
1003 mflowj 357000000 * Accumulator 3
1004 mflowj 148000000 * BHX Chimney Flow
1005 mflowj 169000000 * Break Flow - Core Inlet (TD
only)
1006 mflowj 124010000 * pump mass flow - loop 1
1007 mflowj 224010000 * pump mass flow - loop 2
1008 mflowj 324010000 * pump mass flow - loop 3
1009 mflowj 567010400 * Total Core Flow
1010 mflowj 865010000 * Letdown Flow Rate
1011 mflowj 850010000 * Pressurizing Flow Rate
1012 mflowj 132000000 * Secondary
1013 rktpow 0
1014 rkfpow 0
1015 rkgapow 0
1016 rkcreac 0
* Pressures
1017 cntrlvar 827 * lower core exit pressure
1018 cntrlvar 828 * lower core pressure drop
1019 cntrlvar 829 * upper core exit pressure
1020 cntrlvar 830 * upper core pressure drop
1021 cntrlvar 831 * inner core pressure drop
1022 cntrlvar 832 * inner core pressure drop
1023 p 490010000
1024 p 500010000
1025 p 505010000
1026 p 520010000
1027 p 535010000
1028 p 555010000
1029 p 515010000
1030 p 515020000
1031 p 515030000
1032 p 515040000
1033 p 515050000
1034 p 122260000 * pump suction pressure
1035 p 126010000 * pump suction pressure

1036 p 156010000
1037 p 104010000
1038 p 106010000
1039 p 650030000
1040 sattemp 650030000
1041 pmpvel 124
1042 pmpvel 224
1043 pmpvel 324
1044 pmpvel 815
1045 pmpvel 830
1055 tempf 490010000
1056 tempf 565010000
1057 tempf 645150000
1058 tempf 106010000
1059 tempf 650030000
1060 tempf 515050000
1061 tempf 516050000
1062 cntrlvar 218 * LC 95% hot channel exit subcooling
1063 cntrlvar 238 * LC 99.9% hot channel exit
subcooling
1066 velfj 507010300 * inner core 95% inlet velocity
1067 velfj 522010200 * inner core 95% exit velocity
1068 velfj 507010200 * inner average inlet velocity
1069 velfj 510040000
1070 velfj 515040000
1071 velfj 516040000
1072 velfj 540040000
1073 velfj 545040000
1074 velfj 546040000
1075 velfj 570040000
1076 velfj 575040000
1077 velfj 576040000
1085 voidg 515010000
1086 voidg 515020000
1087 voidg 515030000
1088 voidg 515040000
1089 voidg 515050000
1090 voidg 516010000
1091 voidg 516020000
1092 voidg 516030000
1093 voidg 516040000
1094 voidg 516050000
1095 voidg 545010000

```


1270	htchf 540100500		1318	cntrlvar 211
1271	htchf 570100100	* IC average channel fuel	1319	cntrlvar 215
1272	htchf 570100200		1320	cntrlvar 219
1273	htchf 570100300		1321	cntrlvar 223
1274	htchf 570100400		1322	cntrlvar 227
1275	htchf 570100500		1323	cntrlvar 231
1276	htchf 515400100	* LC CHF 95% hot stripe	1324	cntrlvar 235
1277	htchf 515400200		1325	cntrlvar 239
1278	htchf 515400300		1326	cntrlvar 243
1279	htchf 515400400		1327	cntrlvar 247
1280	htchf 515400500		1328	cntrlvar 251
1281	htchf 516400100	* LC CHF 99.9% hot stripe	1329	cntrlvar 255
1282	htchf 516400200		1330	cntrlvar 259
1283	htchf 516400300		1331	cntrlvar 263
1284	htchf 516400400		1332	cntrlvar 267
1285	htchf 516400500		1333	cntrlvar 271
1286	htchf 545400100	* UC CHF 95% hot stripe	1334	cntrlvar 275
1287	htchf 545400200		1335	cntrlvar 279
1288	htchf 545400300		1336	cntrlvar 283
1289	htchf 545400400		1337	cntrlvar 287
1290	htchf 545400500		1338	cntrlvar 291
1291	htchf 546400100	* UC CHF 99.9% hot stripe	1339	cntrlvar 295
1292	htchf 546400200		1340	cntrlvar 299
1293	htchf 546400300		1341	cntrlvar 303
1294	htchf 546400400		1342	cntrlvar 307
1295	htchf 546400500		1343	cntrlvar 311
1296	htchf 575400100	* IC CHF 95% hot stripe	1344	cntrlvar 315
1297	htchf 575400200		1345	cntrlvar 319
1298	htchf 575400300		1346	cputime 0
1299	htchf 575400400			* viscosities in hot channels
1300	htchf 575400500		1371	viscf 515010000
1301	htchf 576400100	* IC CHF 99.9% hot stripe	1372	viscf 515020000
1302	htchf 576400200		1373	viscf 515030000
1303	htchf 576400300		1374	viscf 515040000
1304	htchf 576400400		1375	viscf 515050000
1305	htchf 576400500		1376	viscf 516010000
1306	cputime 0		1377	viscf 516020000
1308	hthtc 515500500		1378	viscf 516030000
1309	hthtc 545500500		1379	viscf 516040000
1310	hthtc 575500500		1380	viscf 516050000
	* Costa heat flux limits		1381	viscf 545010000
1316	cntrlvar 203	* LC 95% hot stripe	1382	viscf 545020000
1317	cntrlvar 207		1383	viscf 545030000

1384	viscf 545040000	1426	thconf 576010000
1385	viscf 545050000	1427	thconf 576020000
1386	viscf 546010000	1428	thconf 576030000
1387	viscf 546020000	1429	thconf 576040000
1388	viscf 546030000	1430	thconf 576050000
1389	viscf 546040000	* velocities in hot channels	
1390	viscf 546050000	1431	velf 515010000
1391	viscf 575010000	1432	velf 515020000
1392	viscf 575020000	1433	velf 515030000
1393	viscf 575030000	1434	velf 515040000
1394	viscf 575040000	1435	velf 515050000
1395	viscf 575050000	1436	velf 516010000
1396	viscf 576010000	1437	velf 516020000
1397	viscf 576020000	1438	velf 516030000
1398	viscf 576030000	1439	velf 516040000
1399	viscf 576040000	1440	velf 516050000
1400	viscf 576050000	1441	velf 545010000
* thermal conductivities in hot channels			
1401	thconf 515010000	1442	velf 545020000
1402	thconf 515020000	1443	velf 545030000
1403	thconf 515030000	1444	velf 545040000
1404	thconf 515040000	1445	velf 545050000
1405	thconf 515050000	1446	velf 546010000
1406	thconf 516010000	1447	velf 546020000
1407	thconf 516020000	1448	velf 546030000
1408	thconf 516030000	1449	velf 546040000
1409	thconf 516040000	1450	velf 546050000
1410	thconf 516050000	1451	velf 575010000
1411	thconf 545010000	1452	velf 575020000
1412	thconf 545020000	1453	velf 575030000
1413	thconf 545030000	1454	velf 575040000
1414	thconf 545040000	1455	velf 575050000
1415	thconf 545050000	1456	velf 576010000
1416	thconf 546010000	1457	velf 576020000
1417	thconf 546020000	1458	velf 576030000
1418	thconf 546030000	1459	velf 576040000
1419	thconf 546040000	1460	velf 576050000
1420	thconf 546050000	* Subcooling	
1421	thconf 575010000	1461	cntrlvar 202
1422	thconf 575020000	1462	cntrlvar 206
1423	thconf 575030000	1463	cntrlvar 210
1424	thconf 575040000	1464	cntrlvar 214
1425	thconf 575050000	1465	cntrlvar 218
		1466	cntrlvar 222

1467	cntrlvar 226	1514	cntrlvar 481
1468	cntrlvar 230	1515	cntrlvar 483
1469	cntrlvar 234	1516	cntrlvar 485 * inner core 95% hot channel
1470	cntrlvar 238	1517	cntrlvar 487
1471	cntrlvar 242	1518	cntrlvar 489
1472	cntrlvar 246	1519	cntrlvar 491
1473	cntrlvar 250	1520	cntrlvar 493
1474	cntrlvar 254	1521	cntrlvar 495 * inner core 99.9% hot channel
1475	cntrlvar 258	1522	cntrlvar 497
1476	cntrlvar 262	1523	cntrlvar 499
1477	cntrlvar 266	1524	cntrlvar 501
1478	cntrlvar 270	1525	cntrlvar 503
1479	cntrlvar 274		* Peclet numbers
1480	cntrlvar 278	1526	cntrlvar 321 * lower core 95% hot channel
1481	cntrlvar 282	1527	cntrlvar 323
1482	cntrlvar 286	1528	cntrlvar 325
1483	cntrlvar 290	1529	cntrlvar 327
1484	cntrlvar 294	1530	cntrlvar 329
1485	cntrlvar 298	1531	cntrlvar 331 * lower core 99.9% hot channel
1486	cntrlvar 302	1532	cntrlvar 333
1487	cntrlvar 306	1533	cntrlvar 335
1488	cntrlvar 310	1534	cntrlvar 337
1489	cntrlvar 314	1535	cntrlvar 339
1490	cntrlvar 318	1536	cntrlvar 341 * upper core 95% hot channel
	* prandtl numbers	1537	cntrlvar 343
1496	cntrlvar 445 * lower core 95% hot channel	1538	cntrlvar 345
1497	cntrlvar 447	1539	cntrlvar 347
1498	cntrlvar 449	1540	cntrlvar 349
1499	cntrlvar 451	1541	cntrlvar 351 * upper core 99.9% hot channel
1500	cntrlvar 453	1542	cntrlvar 353
1501	cntrlvar 455 * lower core 99.9% hot channel	1543	cntrlvar 355
1502	cntrlvar 457	1544	cntrlvar 357
1503	cntrlvar 459	1545	cntrlvar 359
1504	cntrlvar 461	1546	cntrlvar 361 * inner core 95% hot channel
1505	cntrlvar 463	1547	cntrlvar 363
1506	cntrlvar 465 * upper core 95% hot channel	1548	cntrlvar 365
1507	cntrlvar 467	1549	cntrlvar 367
1508	cntrlvar 469	1550	cntrlvar 369
1509	cntrlvar 471	1551	cntrlvar 371 * inner core 99.9% hot channel
1510	cntrlvar 473	1552	cntrlvar 373
1511	cntrlvar 475 * upper core 99.9% hot channel	1553	cntrlvar 375
1512	cntrlvar 477	1554	cntrlvar 377
1513	cntrlvar 479	1555	cntrlvar 379

* saturation temperatures in hot channels

1561 sattemp 515010000
 1562 sattemp 515020000
 1563 sattemp 515030000
 1564 sattemp 515040000
 1565 sattemp 515050000
 1566 sattemp 516010000
 1567 sattemp 516020000
 1568 sattemp 516030000
 1569 sattemp 516040000
 1570 sattemp 516050000
 1571 sattemp 545010000
 1572 sattemp 545020000
 1573 sattemp 545030000
 1574 sattemp 545040000
 1575 sattemp 545050000
 1576 sattemp 546010000
 1577 sattemp 546020000
 1578 sattemp 546030000
 1579 sattemp 546040000
 1580 sattemp 546050000
 1581 sattemp 575010000
 1582 sattemp 575020000
 1583 sattemp 575030000
 1584 sattemp 575040000
 1585 sattemp 575050000
 1586 sattemp 576010000
 1587 sattemp 576020000
 1588 sattemp 576030000
 1589 sattemp 576040000
 1590 sattemp 576050000
 * Fuel surface temperatures
 1596 httemp 515500101
 1597 httemp 515500201
 1598 httemp 515500301
 1599 httemp 515500401
 1600 httemp 515500501
 1601 httemp 516500101
 1602 httemp 516500201
 1603 httemp 516500301
 1604 httemp 516500401
 1605 httemp 516500501
 1606 httemp 545500101

1607 httemp 545500201
 1608 httemp 545500301
 1609 httemp 545500401
 1610 httemp 545500501
 1611 httemp 546500101
 1612 httemp 546500201
 1613 httemp 546500301
 1614 httemp 546500401
 1615 httemp 546500501
 1616 httemp 575500101
 1617 httemp 575500201
 1618 httemp 575500301
 1619 httemp 575500401
 1620 httemp 575500501
 1621 httemp 576500101
 1622 httemp 576500201
 1623 httemp 576500301
 1624 httemp 576500401
 1625 httemp 576500501
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