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International Agreement Report

Assessment of RELAP5/MOD2 Cycle 36.04 with LOFT Large Break LOCE L2-3

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NOTICE

ICAP

ASSESSMENT OF RELAP5/MOD2 Cycle 36.04

USING LOFT LARGE BREAK LOCE L2-3

Abstract

The LOFT LOCE L2-3 was simulated using the RELAP5/MOD2 Cycle 36.04 code to assess its capability to predict the thermal-hydraulic phenomena in LBLOCA of the PWR. The reactor vessel was simulated with two core channels and split downcomer modelling for a base case calculation using the frozen code. From the results of the base case calculation, deficiencies of the critical flow model and the CHF correlation at high flow rate were identified, and the severeness of the rewetting criteria were also found. Additional calculation using an updated version of RELAP5/MOD2 Cycle 36.04 including modifications of the rewet criteria shows a substantial improvement in the core thermal response.

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Executive Summary

This report documents the assessment calculations using the RELAP5/MOD2 Cycle 36.04 to predict thermal-hydraulic response of Loss of Fluid Test (LOFT) system during the Loss of Coolant Experiment (LOCE) L2-3. LOCE L2-3 simulated a 200 % offset shear at the discharge of the Primary Coolant Pump (PCP) in the four loop commercial PWR.

To simulate LOFT system specific to L2-3 experiment, the reactor core was modelled with two separate flow channels and the reactor vessel downcomer was described by two equally-split channels. Three heat structures were used to describe the LOFT fuel assemblies.

The results of the base case calculation using the frozen code of the RELAP5/MOD2 were compared with the experimental data in terms of loop flows, secondary side pressure, Emergency Core Cooling System (ECCS) performance, reactor vessel behavior and fuel rod thermal response. As result of comparisons, the overall hydraulic behavior was well-predicted, while fuel rod thermal response was poorly predicted.

Major reasons of the discrepancies in the prediction were identified as the code deficiencies in the thermal-hydraulic models : (1) underprediction of cold leg break flow due to the deficiency of critical flow model, (2) poor prediction of the core early heatup during blowdown due to the deficiency of CHF correlation at high flow rate, and (3) poor prediction of rewetting phenomena due to the severeness of the rewet criteria in the frozen code.

To reidentify the deficiencies found in the base case calculation and to determine the effectiveness of the rewet criteria change in the frozen code, a sensitivity calculation was performed using an updated code with the PSI modification. The result of the sensitivity calculation shows that the rewet phenomena was well-predicted by the PSI-modified criteria.

1. Introduction

RELAP5/MOD2[1], a frozen version by US Nuclear Regulatory Commission (USNRC), has been assessed through the International Code Assessment and Application Program (ICAP) for its capability and deficiencies in the prediction of the postulated Large Break Loss of Coolant Accident (LBLOCA) in Pressurized Water Reactor (PWR).

This report is one of the Korean ICAP contributions to support code assessment, code deficiency identification and code improvement. In this study the RELAP5/MOD2 Cycle 36.04 was assessed for the Experiment L2-3 conducted in the Loss of Fluid Test (LOFT) at Idaho National Engineering Laboratory (INEL) [2].

The Experiment L2-3, as one of the Integral Effect Test (IET), was a Large Break Loss of Coolant Experiment (LBLOCE), which represented the postulated LBLOCA in the typical Westinghouse type PWR with four loop. During LOCE L2-3, two Primary Coolant Pumps (PCP) in LOFT system were set to operate without coastdown, this PCP running was found to have significant effect on the reactor core thermal response, i.e, the early core quenching in blowdown phase. This blowdown quenching phenomena was called as 'rewet' which was due to a quick return to the nulcleate boiling heat transfer regime from the post dryout regime and was one of the important assessment items in the previous LBLOCA calculations [3, 4].

The objectives of this study are to predict the major hydraulic behavior and thermal response of the LOFT system during the LOCE L2-3 and to identify deficiencies of the frozen RELAP5/MOD2 Cycle 36.04 code in simulating thermal-hydraulic phenomena specific to LBLOCA by comparing the calculation results with the experiment data. From the findings obtained by ICAP activities [5], it was known that the major deficiencies of RELAP5/MOD2 were summarized as the Critical Heat Flux (CHF) correlations, the critical flow model and the interfacial drag correlations. This study, therefore, is focused to confirm whether the deficiencies as stated above are still found in the Experiment L2-3 simulation. And to investigate the sensitivity of the rewet criteria in the RELAP5/MOD2, an updated version from Cycle 36.04 using the modified rewet criteria by Aksan [6], at Paul Scherer Institute (PSI), Swiss was tested in this study.

The descriptions for LOFT facility and L2-3 experiment are presented in chapter 2, the RELAP5 input modelling in chapter 3 and the results of a base case calculation and their discussions in chapter 4. In chapter 5, a result of sensitivity calculation is described and the conclusions obtained from the present study are summarized in chapter 6.

2. Facility and Test Description

2.1 Facility Description

The LOFT facility is an experimental 50 MWt PWR designed to simulate LOCA's and anticipated transients and to provide data on the thermal-hydraulic pheromena occuring throughout the system [7]. It is a scaled representation of a commercial PWR of Westinghouse type having 4 loops with a volume ratio of 1/60. The LOFT system consists of five major systems : reactor system, primary coolant sysytem, blowdown suppression system, emergency core cooling system and secondary coolant system, and also includes instrumentations. The length of the core and reactor vessel is 1.68 and 7 m, respectively. The overall configuration is shown in Fig.1.

2.2 Test Description

Experiment L2-3 was performed as part of LOFT program Power Ascension Series (L2), which was designed to investigate the response of LOFT nuclear core to the blowdown, refill and reflood transient during LOCE.

Experiment L2-3 represents a postulate 200 % double ended offset shear of the pump discharge piping in the cold leg of commercial PWR. The specific objectives of L2-3 test were to determine the corewide and spatial variation of fuel rod cladding thermal response, to identify thermal-hydraulic phenomena and their effect on the core of LOFT and to determine the ECCS performance and core reflood characteristics. During L2-3 experiment, primary coolant pumps were set to continue to operate, which results in a early quenching during blowdown, called rewet. The phenomena of rewet is currently known as early return to nucleate boiling in the core, which has been a common interesting point of code assessment [3, 4].

Prior to Experiment L2-3, LOFT facility was set to be a primary system pressure of 15.06 MPa, primary system cold leg and hot leg temperature of 560.7 K and 592.9 K repectively, and a loop mass flow rate of 199.7 kg/sec. Initial reactor power level was 36.7 MW with a maximum linear heat generation rate (LHGR) of 39.4 kW/m. Table 1 presents a summary of initial conditions of Experiment L2-3.

The experiment was initiated by opening the Quick Opening Blowdown Valves (QOBV) both in hot leg and cold leg. Reactor was scrammed at 0.103 sec after initiation of the experiment by operator signal. Identifiable phenomena in the experiment are listed in Table 2. Injection from accumulator began at 17 sec, approximately when primary system pressure moved down to 4.18 MPa. High Pressure Safety Injection (HPSI) system and Low Pressure Safety Injection (LPSI) system started to inject at 14 sec and 29 sec and LOFT core volume was finally reflooded at approximately 55 sec.

2.3 Measurement Uncertainty

Uncertainties of the experimental data and computed variables were fully discussed in reference [2] for L2-3 test. Uncertainties on the measured values and computed values used for comparisons with calculation in this report are presented in Table 3.

3. Code and Modelling Description

RELAP5/MOD2 Cycle 36.04, frozen version of the code by USNRC, was used in the present calculation with modifications of some indexing schemes. An update procedure is listed in Appendix A, which is exactly the same as that in L2-5 assesment report [8]. Since any RELAP5 input specific to L2-3 experiment was not obtained from INEL, a reference input was developed by the authors based on the input used in the previous L2-5 experiment assessment [8].

3.1 Input Modelling

All components except a reactor core and a reactor vessel downcomer of LOFT for L2-3 experiment were geometrically modelled as the same as those for L2-5 case [8] i.e, equal volumes, junctions and heat structures. A nodalization diagram used in the present calculation is shown in Fig.2. Total number of hydrodynamic volumes, junctions and heat structures are 128, 149 and 27.

The reactor core was modelled by two flow channels; a hot channel and an average channel representing the central fuel assembly (numbered by 5 in the reference [7]) and the other peripheral fuel assemblies, respectively. Each flow channel was divided by six volumes with equal lengths. Two flow channels were linked by six crossflow junctions to allow crossflow in the core with a specified junction loss coefficient of 4.69 for all crossflow junctions. These junction loss coefficients were selected as the same as those in the Best Estimate Prediction for L2-5 experiment [9].

The reactor vessel downcomer was modelled by two split flow channels : an intact side downcomer and a broken side downcomer. Each downcomer has five volumes including a volume representing an upper annulus part above the cold leg nozzles. To describe an azimuthal flow across the downcomer, four crossflow junctions were used to link four volumes between the intact-side downcomer and the broken-side one with exception of the volumes representing the cold leg nozzles. Loss coefficients at the downcomer crossflow junctions were tuned to match the measured loop flow behavior, accroding to the reference [9]. The values used in the present calculation ranges from 18.0 to 98.0 with their junction elevations.

Originally LOFT fuel rods had two types of axial power profile : a high power shape for central fuel assembly and a low power shape for peripheral fuel assemblies. Both of them have almost identical shapes but have different magnitudes in LHGR. During L2-3 input preparation, however it is found that an actual summation of rod power integrated over the full length of rod did not match and was lower than the experimental total power level, 36.7 MW. In the present study, three heat structure component were used to model the LOFT fuel rods: 204 hot rods in the central fuel assembly, 572 average rods and 574 intermediate rods in the peripheral fuel assemblies repectively. And the axial power shapes can be determined by the experimental LHGR distributions [2] for the hot rods and average rods. For the intermediate fuel rods heat structure, a mean LHGR distribution of hot and average rods can be used. This modelling scheme of fuel rods can match a given total power. The profiles of LHGR's were shown in Fig.3 and Table 4 presents a summary of reactor vessel modelling.

3.2 Initial Conditions and Boundary conditions

To provide all initial conditions of the whole system prior to transient, a steady state run was carried out with seven steady state controllers : two primary coolant pump speed controllers, a pressurizer heater power controller a pressurizer spray valve area controller, a letdown and charging valve area controller, a main steam control valve (MSCV) area controller and a feedwater flow rate controller. A steady input deck was provided in Appendix B.

The result obtained from the steady state run was compared with the measured initial conditions in Table 1. The RELAP5 calculated results generally agree with the experimental conditions.

Boundary conditions required to simulate the L2-3 experiment are almost the same as those in L2-5 experiment except PCP running. The PCP speed during the the transient was assumed to be constant, which was a simple approximation of the real PCP running behavior showing oscillations around a fixed speed during the transient [2].

Based on the experiment data [2], the reactor power history and containment pressure were described as time dependent tables. Performance curves for HPSI and LPSI flow rate as function of cold leg pressure were provided in the input. Feedwater flow rate was reduced to be zero in 2.5 seconds after LOCE initiation using a time-dependent junction as the same as the L2-5 experiment. And the steam generator secondary side air-cooled condenser was modelled as a time-dependent volume with a constant pressure of 2.069 MPa during the transient. All informations of the boundary conditions were provided in the steady and transient input deck. The transient input deck was listed in Appendix C.

4. Base Case Calculation

The L2-3 LOCE was calculated up to 100 sec using all initial conditions obtained from steady state run. Some additional components such as pressurizer spray, letdown and charging systems used for the steady state calculation are deleted in transient input deck.

The sequence of events during transient calculation are presented in Table 2 as compared with L2-3 experiment chronology. In this chapter, the predicted important thermal-hydraulic parameter such as system pressure, loop mass flow rates and cladding temperatures are compared with the measured data.

4.1 Loop Behavior

Fig.4 shows a comparison of the calculated mass flow rate with the measured one at the broken loop cold leg up to 40 sec. An overall behavior of break flow was well predicted by RELAP5/MOD2 except the underprediction during a short period from 3 sec to 9 sec. This period corresponded to the transition phase from the subcooled break flow to the two-phase break flow. The subcooled break flow was completed at about 3 sec both in calculation and in experiment as shown in Table 2. After that time the break flow was well simulated by the RELAP5 calculation. The underprediction of break flow during the phase transition period can be considered as a deficiency of the RELAP5/MOD2 critical flow model. This led the reactor vessel to contain more coolant inventory than the experiment, which amounts to 400 kg approximately. This overestimated coolant inventory may suppress the core heatup discussed in later chapter.

Fig.5 presents a comparison of mass flow rate in the broken loop hot leg. As expected, the magnitude of break flow was less than that in the cold leg due to higher flow resistance in the hot leg. The calculated break flow in hot leg was well-agreed with the experimental result.

Mass flow rate in the intact loop cold leg was shown in Fig.6. The predicted mass flow rate was almost similar to the measured one. However, the calculation did not show several jumps which can be found in the experimental behavior with high frequencies after 20 sec. It was regarded as the effect of void oscillation phenomena induced by the highly subcooled ECC injection water during the reflood phase.

Fig.7 indicates a comparison of the net flow into the core, i.e intact loop cold leg flow minus broken loop cold leg flow. The intact loop cold leg mass flow, driven by the operating pumps, exceeded the broken loop flow from 3 sec to 6 seconds causing an increase in positive core flow, which had reversed after saturation in the lower plenum at about 7 sec. The calculation result was in good agreement with the experimental data.

In general, the predicted loop behaviors agreed well with the experiment data within the range allowed by the instrument uncertainty except the underprediction of cold leg break flow during the transition period.

4.2 Secondary Side Behavior and ECCS Performance

Fig.8 shows a comparison of the steam dome pressure of the steam generator secondary side. The experimental data used in this comparison was not fully qualified one but accurate for initial condition only. The predicted pressure was fairly well-agreed to the measured one up to 40 sec. Difference after 40 sec was considered to have little effect on the primary side behavior since the transient was fast enough to neglect the heat transfer from the secondary side.

Fig.9 presents a comparison of acculumator injection flow rate and Fig.10

a comparison of accumulator liquid level. The calculated injection flow rate was larger before 42 sec and then lower than the experiment, while the accumlator liquid level was well agreed to the experiment. The overprediction of mass flow rate during 20 to 40 sec can be due to a underprediction of the primary system cold leg pressure discussed in later chapter. The overpredicted injection mass amounts to 180 kg approximately. The experiment shows that the injection continued until 60 sec, while the calculation shows that the injection was completed at 42 sec. From the fact that the measured liquid level was almost stationary at 42 sec as shown in Fig.10, it can be stated that the jump and oscillation in the injection mass flow rate is not a real situation but a measurement error.

Figs. 11 and 12 show comparisons of mass flow rates through a HPSI line and LPSI line. During the early period of injection, some overpredictions were found in both injection flow rates, whose total amount was about 65 kg. This overprediction was also due to the primary system pressure. However, the overall injection behaviors were comparatively close to the experiment.

4.3 Vessel Phenomena

Fig.13 shows a comparison of primary system pressure at the upper plenum. The predicted behavior agreed with experiment data very well. A little earlier depressurization was found in calculation than that in the experiment before 10 sec , which was resulted partly from an underprediction of cold leg break flow (Fig.4). The calculation also presented a little lower pressure after 20 sec than the experiment. It resulted in the early high ECC injection behavior as stated in the previous chapter and yielded a underestimation of the liquid coolant temperature in the lower plenum as shown in Fig. 14, which was a saturation temperature at the corresponded pressure.

Fig.15 shows the collapsed liquid levels in the two downcomer channels and in the two core channels of reactor vessel. Since no experiment data for these items were availble, the predicted levels are plotted only.

The liquid level behaviors in core were found to be almost identical in both average channel and hot channel. From these level behaviors, it is shown that the LOFT core was almost empty in 5 sec and then filled with liquid up to 2.36 m in 8 sec by the positive net flow into the core as explained in the previous chapter. This substantial liquid filling up for a short period yielded a corewide rewet, and the rewet was completed in 8 sec. A core re-empty was predicted at 14 sec, a lower plenum was fully refilled by ECC water injection at 35 sec, and a core-reflood was completed at 43 sec, approximately. The end of reflood was predicted to be quite earlier than the measured time as shown in Table [illegible]. This earlier end of reflood, i.e, earlier core quenching, than the experiment was due to the overestimated coolant inventory, which was mainly caused by underprediction of cold leg break flow.

The liquid level in the broken side downcomer were predicted to be different from that in the intact side one due to the split nodalization of vessel downcomer. In the early blowdown period up to 3 sec, the broken side liquid level dropped more rapidly than the intact side one due to less flow resistance. Both levels ceased to drop and increased a little slightly at the time of the transition from subcooled break flow to two-phase break flow. The increase of level is caused that the break flow was reduced significantly at the transition time, while the incoming flow was still maintained by the operation of the intact loop pumps. During core rewetting period, downcomer liquid levels decreased again. The slope of the broken side liquid level was slower than that in intact side one, which was due to upward water flow from the lower plenum to the broken side downcomer. At the time of accumulator injection, 16 sec, both levels moved up again with some time delay in the broken side.

4.4 Fuel Thermal Response

Figs. 16, 17, 18, 19, 20 and 21 present comparisons of cladding temperatures of hot fuel rods at 5, 16.5, 27.5, 39, 49.5 and 60 inch elevations from the bottom of core, repectively. From these comparisons, the following features were found,

1) For a lower part (5 in and 16.5 in), the predicted DNB(departures from nucleate boiling) times were later than the measured values during blowdown phase. And the calculated cladding temperatures during blowdown heatup period were appreciably lower and core rewet was completed earlier than the measured data.
2) The predicted thermal response during reflood heatup period were also later in timing and smaller in heatup amounts than the experimental data. Consequently, core quenching times were predicted as substantially earlier than the experiment.
3) For a middle part(27.5 in and 39 in), the prediction shows earlier DNB's, higher heat up's and earlier core quenchings than the experiment, and the absences of blowdown rewets. The peak cladding temperature (PCT) was predicted as 950 K at 27.5 inch elevation in blowdown phase, whch was higher than the experiment, 891 K at 24 inch elevations.
4) For a higher part (49.5 in and 60 in), core was not heated up both in blowdown and reflood phases.

To find out some reasons of such thermal responses that deviated from the experimental behaviors, the calculated fuel surface heat transfer coefficients were presented as shown in Fig.22 for a volume 2 (16.5 in) and a volume 3 (27. 5 in). For a volume 3, heat transfer coefficient rapidly dropped as soon as the experiment was initiated (transition from the saturated nucleate boiling to the film boiling) and the film boiling heat transfer mode was sustained until 20 sec, while for a volume 2, the saturated nucleate boiling remained for 4 or 5 sec, and then changed to the film boiling during a short period (rewet).

Fig.23 shows liquid fractions at volume 2 and volume 3. Both volumes had experienced an almost similar transient in liquid fraction for the first 2 sec, as shown in this figure, however a DNB was not predicted in volume 2 as shown in Fig.17. As a result of poor prediction of DNB, flow regimes at these two volumes were different during the same period as shown in Fig.24. Therefore, it can be stated that the deficiency of CHF correlation in the frozen RELAP5/MOD2 was also found in the LOCE L2-3 simulation in the condition of high flow rate (the predicted mass flux into the core was about 1000 kg/m2 sec).

The increasing behavior of liquid fraction at volume 3 was almost the same as that in volume 2 during 5 to 8 sec except some time delay, however no re-wetting was found at the volume 3. This indicates the severeness of rewet criteria in the frozen RELAP5/MOD2 Cycle 36.04.

Some features found in reflood heat up calculation can be regarded as an over prediction of coolant inventory as mentioned in the previous chapter. Total amount of coolant inventory overestimated by the present calculation was 545 kg, approximately. This amount was not so small when compared to the primary coolant system inventory 5646.8 kg at the steady state condition. This added inventory can be considered to suppress the core heat up during reflood period.

5. Sensitivity Study

From the findings in the base case calculation, the severeness of the rewet criteria in the frozen code was one of the most noticeable problems in the point of the fuel cladding thermal response. In this study, to investigate the sensitivity of rewet criteria, an updated code with PSI modification from the RELAP5/MOD2 Cycle 36.04 was used in the re-calculation with the same input as in the base case calculation. The PSI modification [6] includes three major changes : interfacial friction formula, rewet criteria and heat transfer correlations in reflood phase. A whole list of the updates was presented in the Appendix D. Especially in the rewet, three independent criteria was checked as follows :

1) (Tw + Tsat) < 1250 K
2) Equilibrium quality less than 0.99
3) Mass flux less than -100 kg/sec m2

Figures 25, 26, 27 and 28 show comparisons of the calculated cladding temperatures by the frozen Cycle 36.04 with those by PSI updated version at 16.5, 27.5, 39 and 49.5 inch elevation, respectively. The predicted thermal responses at 5 and 60 inch elevation were not plotted since almost the same result was obtained as base calculation. Even at 16.5 inch location (Fig.25), a similar thermal response to the base case calculation was obtained except a little higher heat up in blowdown phase. And both calculation still show differences from the experimental cladding temperature.

At the middle elevations, 27.5 inches in Fig.26 and 39 inches in Fig.27, the sensitivity calculation shows the blowdown rewet evidently, which were not predicted in the base case calculation. As the result calculated by the PSI-updated version, the core heatups were a little higher than the base case calculation result. It was due to some modifications of heat transfer coefficients in the subcooled or saturated transition film boiling regime included in the PSI updates [6].

At 49 inch elevation, the sensitivity calculation result shows a appreciable blowdown heatup and a rewet, which was not found in the base case one. The onset of CHF at this elevation was currently understood as a deficiency of Biasi's CHF correlation in the RELAP5/MOD2. A comparison of void fraction at the 5th volume in hot channel was presented in Fig. 29. In spite that the void fraction predicted by the PSI version was lower than that calculated by cycle 36.04 version until 1.5 sec approximately, as shown in Fig.29, a heatup was found in the calculation by the PSI version.

From these comparisons, it is concluded that the deficiency of the Biasi's CHF correlation was re-identified at high flow rate and that the modification of rewet criteria using PSI updates can predict the rewet phenomena during blowdown phase properly

6. Run Statistics

The main frame computer used in the present calculations was CDC 170-875 Series at KAERI, with NOS Version 2.6.1.

Fig.30 presents the plot of the required CPU time for the transient time in the base case calculation. And the time step size are also plotted in Fig.31. The user-specified maximum time step was 0.05 sec up to 20 second in real time and then reduced to 0.01 sec up to 100 second as recommended in reference[1]. The run statistics is summarized in Table 5 from the major edit and the grind time can be calculated as follows.

Computer time, CPU = 1795.36 - 3.121 = 1792.239 (sec)

Number of time step, DT = 9635 - 76 = 9559

Number of volume, C = 128

Transient real time, RT = 100 (sec)

Grind time = CPU x1000/ (C * DT) = 1.4647 CPU m sec/vol/step

7. Conclusions

RELAP5/MOD2 Cycle 36.04 code was assessed using LOFT L2-3 LBLOCE data. A base case calculation was carried out using the original version of the code. And one sensitivity calculation was conducted with an updated version by the PSI modification. The calculated thermal-hydraulic behaviors were compared with the experimental data to identify code capability. As a result of the present calculations, the following conclusions are obtained :

1) Using LOFT LOCE L2-3, a base case calculation and a sensitivity calculation were successfully executed from the point of view of specific objectives and requirements of ICAP assessment activity.
2) The loop flow behaviors were faily well predicted by the frozen RELAP5/MOD2 Cycle 36.04 code. The secondary side behavior and ECCS performance were also well simulated by the base case calculation. Hydraulic behavior such as liquid levels in downcomer and core in the reactor vessel were resonably predicted. The thermal response of fuel rods was calculated, and the calculated PCT was 950 K, a little higher than the measured PCT of 891 K.
3) From the base case calculation using the frozen RELAP5/MOD2, the cold leg break flow was underpredicted due to the deficiency of the critical flow model in the transition phase from subcooled flow to two-phase flow. This led a overprediction of coolant inventory. The early core heatup during the blowdown phase was not well-predicted due to a deficiency of CHF correlation at high flow rate of the frozen code. The rewet phenomena was also poorly predicted due to the severeness of the criteria.
4) As a result of the sensitivity calculation using the updated rewet criteria by PSI, blowdown quenching behavior was relatively well-predicted.

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Table 1 Summary of comparison of the initial conditions between the measured and the calculated in base case

Parameter	Measured	Calculated
• Primary Coolant System		
Mass flow rate* , kg/s	199.0	199.01
Hot leg pressure* , MPa	15.06	15.07
Cold leg temperature* ,K	560.7	560.39
Hot leg temperature , K	592.9	592.75
• Reactor Vessel		
Power level , MW	36.0	36.0
Maximum linear heat generation rate(MLHGR), kW/m	39.4	39.8
• Pressurizer		
Liquid temperature , K	615.3	613.8
Pressure , MPa	15.06	15.066
Liquid level* , m	1.19	1.1723
Water volume, m3	0.67	0.627
• Steam Generator sec.side		
Saturation temperature , K	482.1	487.88
Pressure , MPa	6.18	6.1
Mass flow rate , kg/s	19.5	19.129
Level* , m	3.11	3.11

Note * : Setpoint in steady state controllers

Table 2 Summary of comparison of the sequence of events between the measured and the calculated in base case

Event	Measured,sec	Calculated,sec
Experiment initiated	0.	0.
End of subcooled blowdown	0.05	**
Reactor scrammed *	0.103	0.103
First indication of DNB	0.96	0.4
End of subcooled break flow (cold leg)	3.0	3.05
Maximum cladding temperature attained	4.95	5.0
Earliest corewide rewet	8.0	7.8
HPSI initiated *	14.0	14.0
Pressureizer emptied	14.0	14.0
Accumulator injection initiated	16.0	15.66
LPSI initiated *	29.0	29.0
Lower plenum refilled	35.0	35.0
Saturated blowdown ended	40.0	**
Accummulator liquid flow ended	45.0	42.0
Core volume reflooded	55.0	43.0

Note * : specified by input , ** : not predicted

Table 3. Uncertainties of Measurements

item	type	range	uncertainty
Primary system pressure	M	0.1 - 20.8 MPa	0.22 MPa
Secondary system pressure	M	0.1 - 8.4 MPa	0.11 MPa
Coolant Temperature	M	311 - 977.4 K	5.1 K
Accumulator liquid level	M	0.0 - 3 m	0.02 m
Accumulator flow rate	M	0.0 - 126.2 l/s	3.5 l/s
HPSI flow rate	M	0.0 - 1.9 l/s	0.02 l/s
LPSI flow rate	M	0.0 - 25.2 l/s	Not available
Mass flow rate at			
broken loop cold leg	C		63.7 kg/s
broken loop hot leg	C		23.7 kg/s
Cladding Temperature	M	422 - 1533 K	6.5 K
Primary Coolant Pump Speed	C	0.0 - 4500 RPM	8.2 RPM
Reactor Power	M	0.0 - 100 %	3.0 %

Note. M : Measured data,
C : Computed varibles from the measured data

Table 4. Summary of the important items in nodalization

items	Description
Core	
Number of flow channel	2
Channel area ratio (hot/total)	13.7 %
Number of volume per channel	6
Number of crossflow junction between channels	6
Loss coefficients at crossflow jucntions	4.2
Number of heat structure component (hot:average)	1:2
Power ratio (hot/total)	20.5 %
Number of volume per heat structure	6
Gap conductance model	used
Reflood option	Pressure *
Number of mesh point in heat structure	10
Number of maximum fine mesh	8
Number of volume in core bypass component	3
Core Bypass flow ratio	5 %
Downcomer	
Number of flow channel	2
Area ratio (intact side channel/broken side channel)	1/1
Number of volume per flow channel	5
Number of crossflow junctions for downcomer bypass	5
Loss coefficients at crossflow junction	18.0 - 98.0 **

Note * : Pressure at core top less than 0.1 MPa
** : Loss coefficients varies with elevation

Table 5 . Run statistics data in base case

Transient time (sec)	CPU time (sec)	Attempted ADV	Repeated ADV	Last DT	Courant DT
0	3.121	0	0	0.05	0
10	122.678	669	12	0.0125	0.01546
20	265.146	1469	12	0.0125	0.01202
25	352.17	1969	12	0.01	0.00958
30	446.903	2469	12	0.01	0.01097
35	542.424	2969	12	0.01	0.00916
40	645.349	3497	12	0.01	0.02857
45	750.017	4020	21	0.01	0.01576
50	845.089	4520	21	0.01	0.02828
55	940.003	5020	21	0.01	0.02852
60	1035.32	5520	21	0.01	0.03126
65	1130.72	6028	25	0.01	0.02552
70	1223.29	6528	25	0.01	0.03884
75	1316.72	7028	25	0.01	0.0450
80	1410.51	7528	25	0.01	0.01604
85	1504.71	8050	35	0.01	0.03274
90	1594.56	8550	35	0.01	0.04819
95	1693.06	9083	50	0.01	0.05249
100	1795.36	9635	76	0.01	0.04379

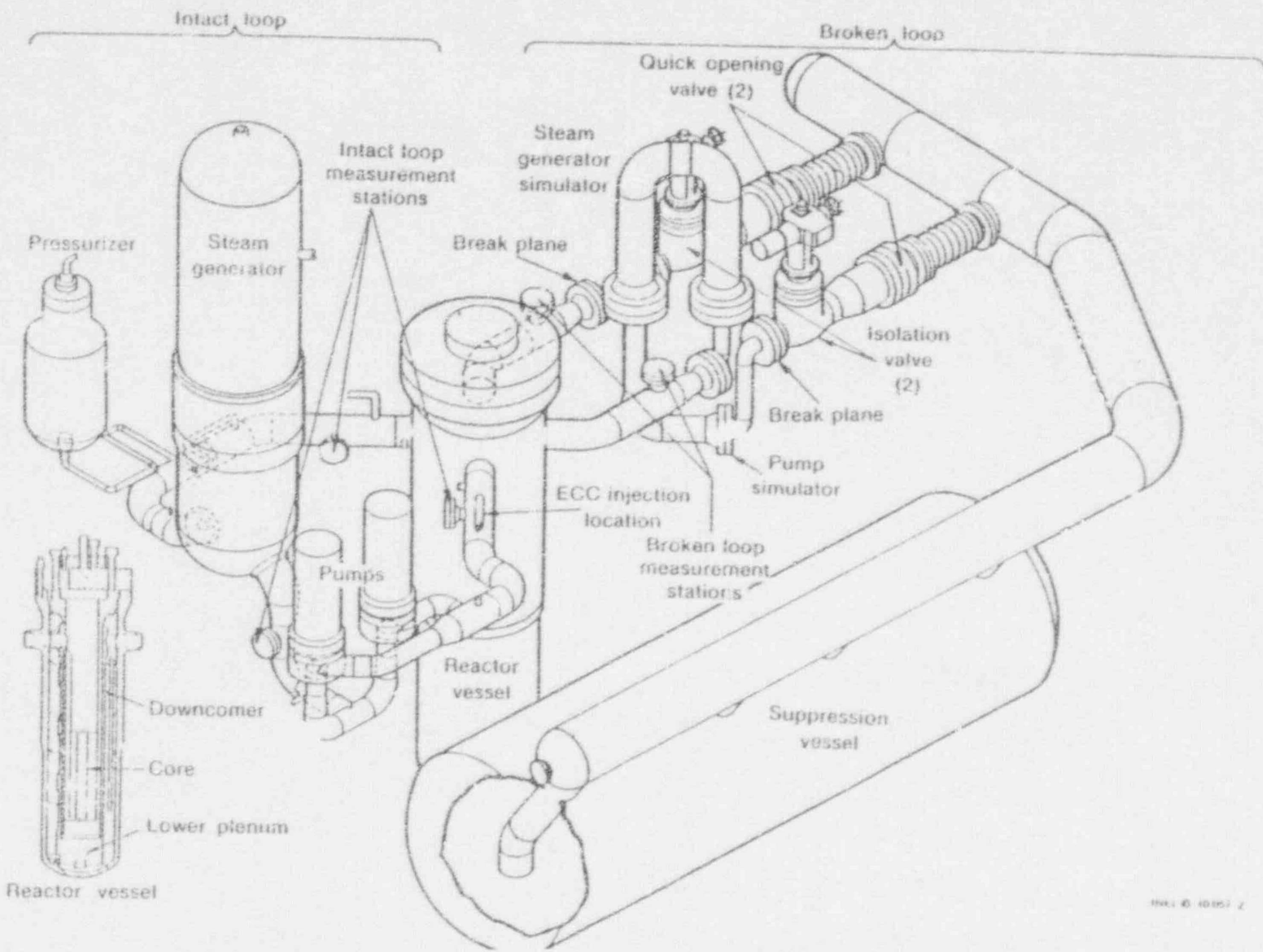


Fig.1 Axonometric configuration of LOFT L2-3 test

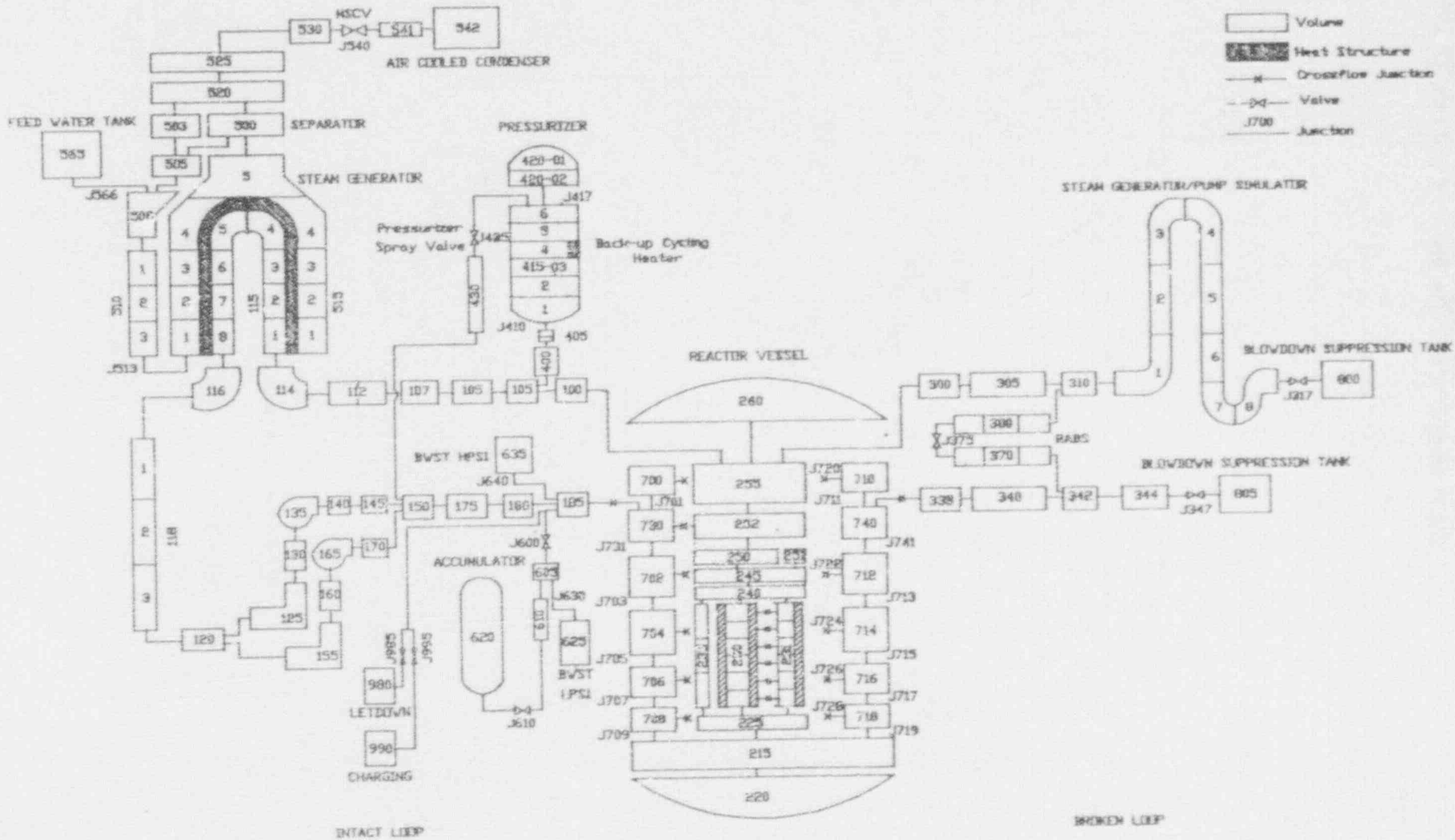


Fig.2 Nodalization diagram for base case calculation of LOFT L2-3 test

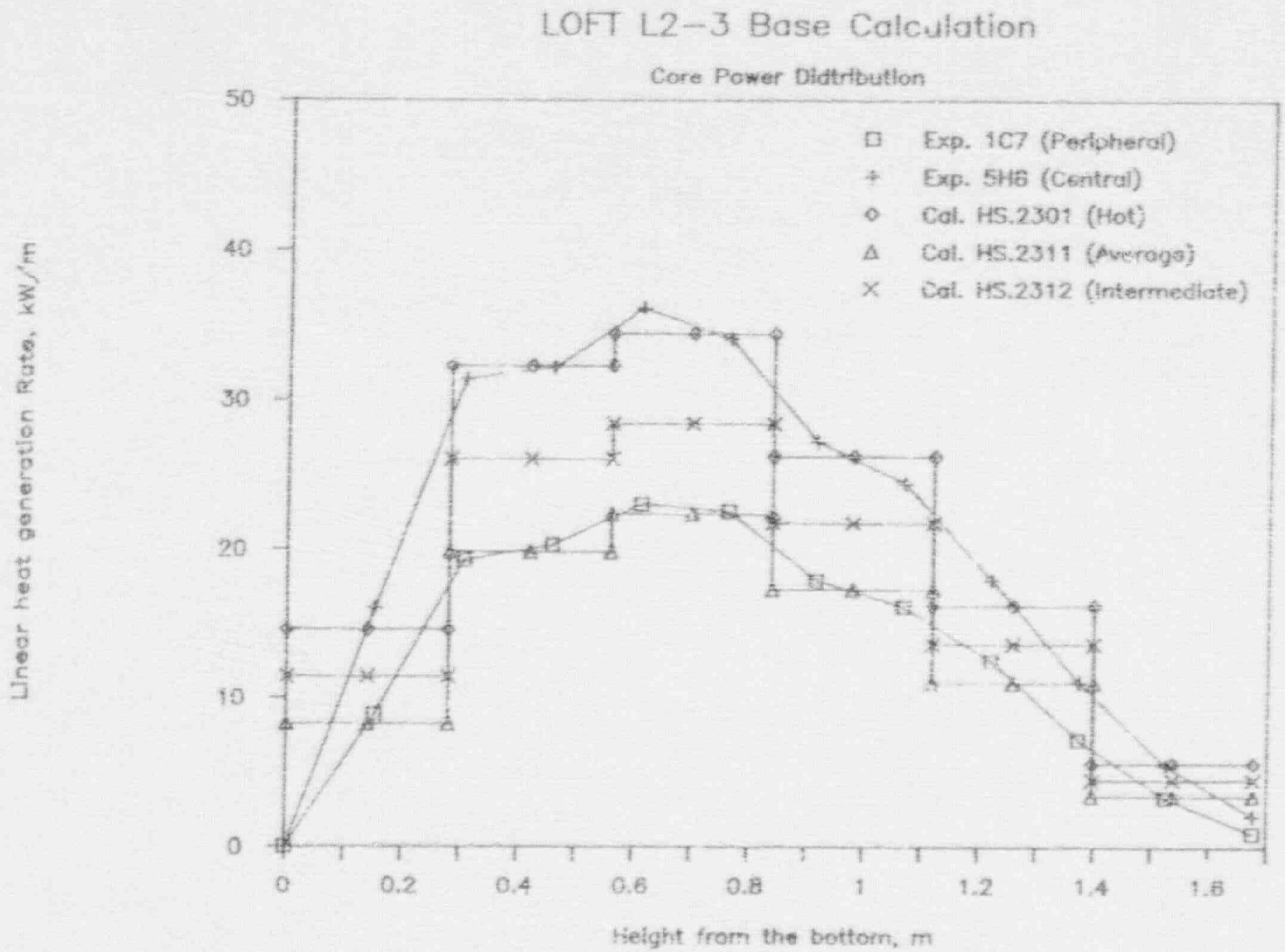


Fig.3 Axial power distribution in base case calculation of L2-3 test

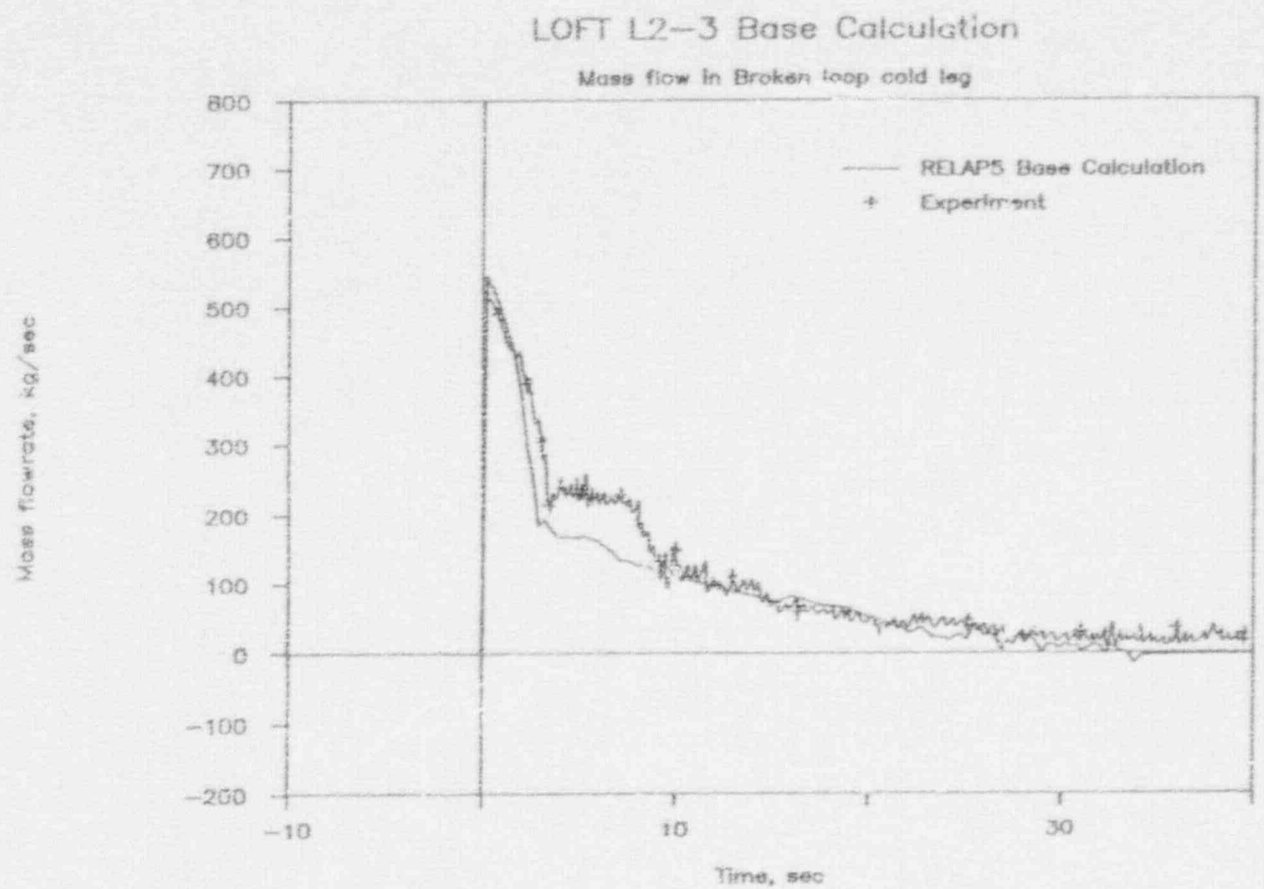


Fig.4 Comparison of mass flow rate at broken loop cold leg between the base case calculation and the experiment

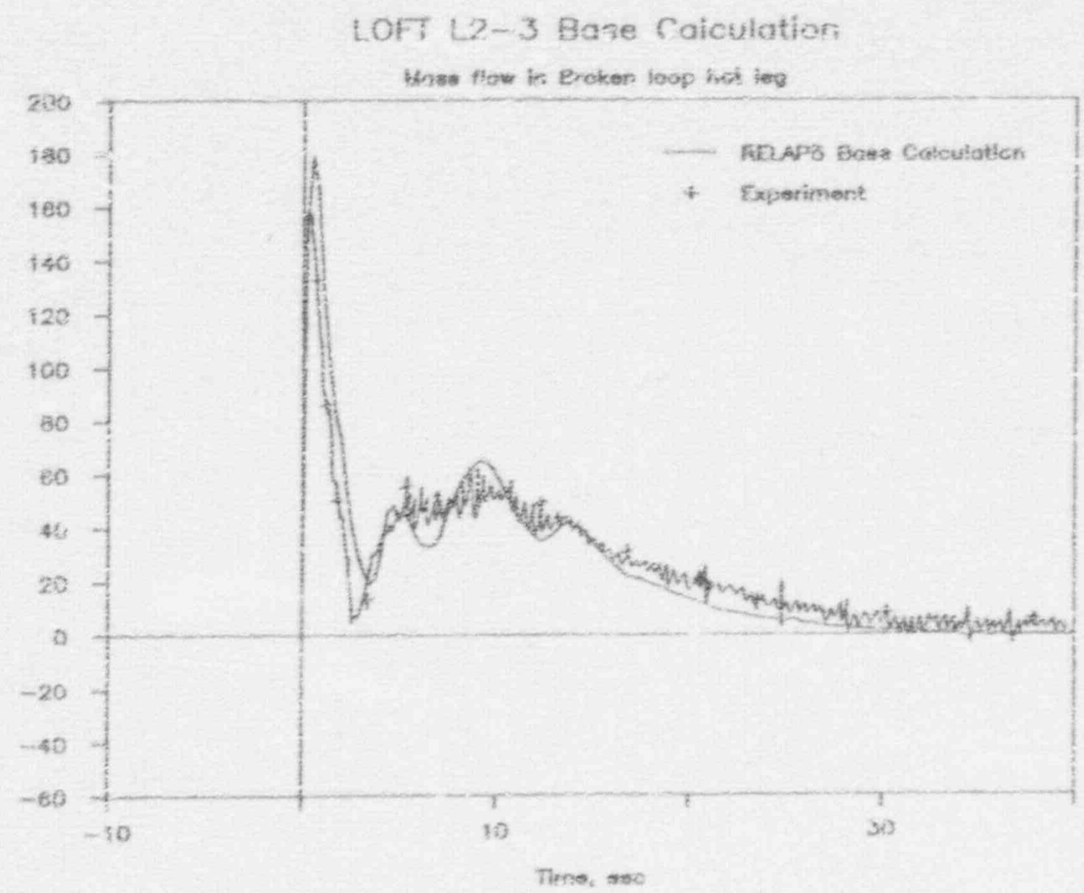


Fig.5 Comparison of mass flow rate at broken loop hot leg between the base case calculation and the experiment

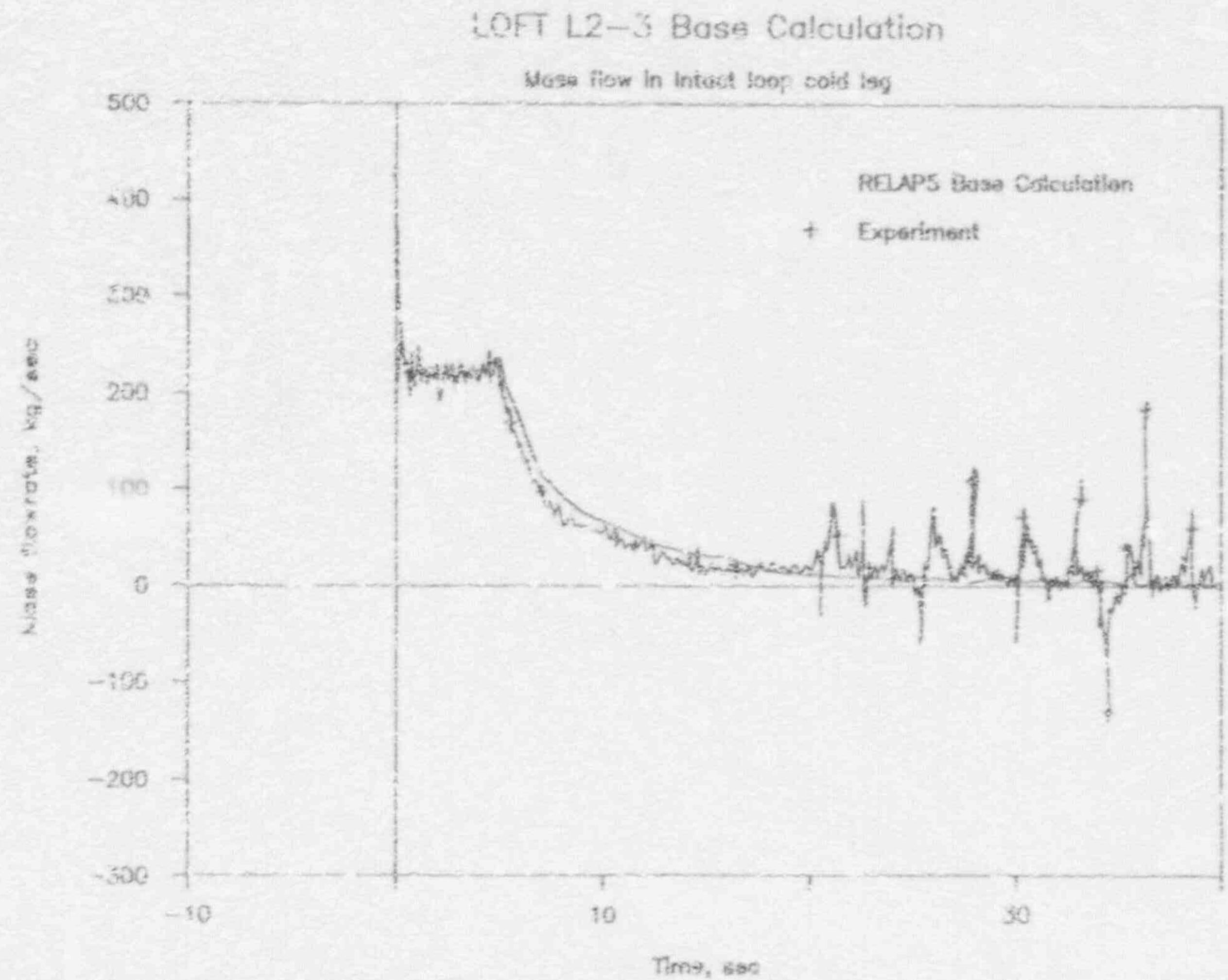


Fig.6 Comparison of mass flow rate at intact loop cold leg between the base case calculation and the experiment

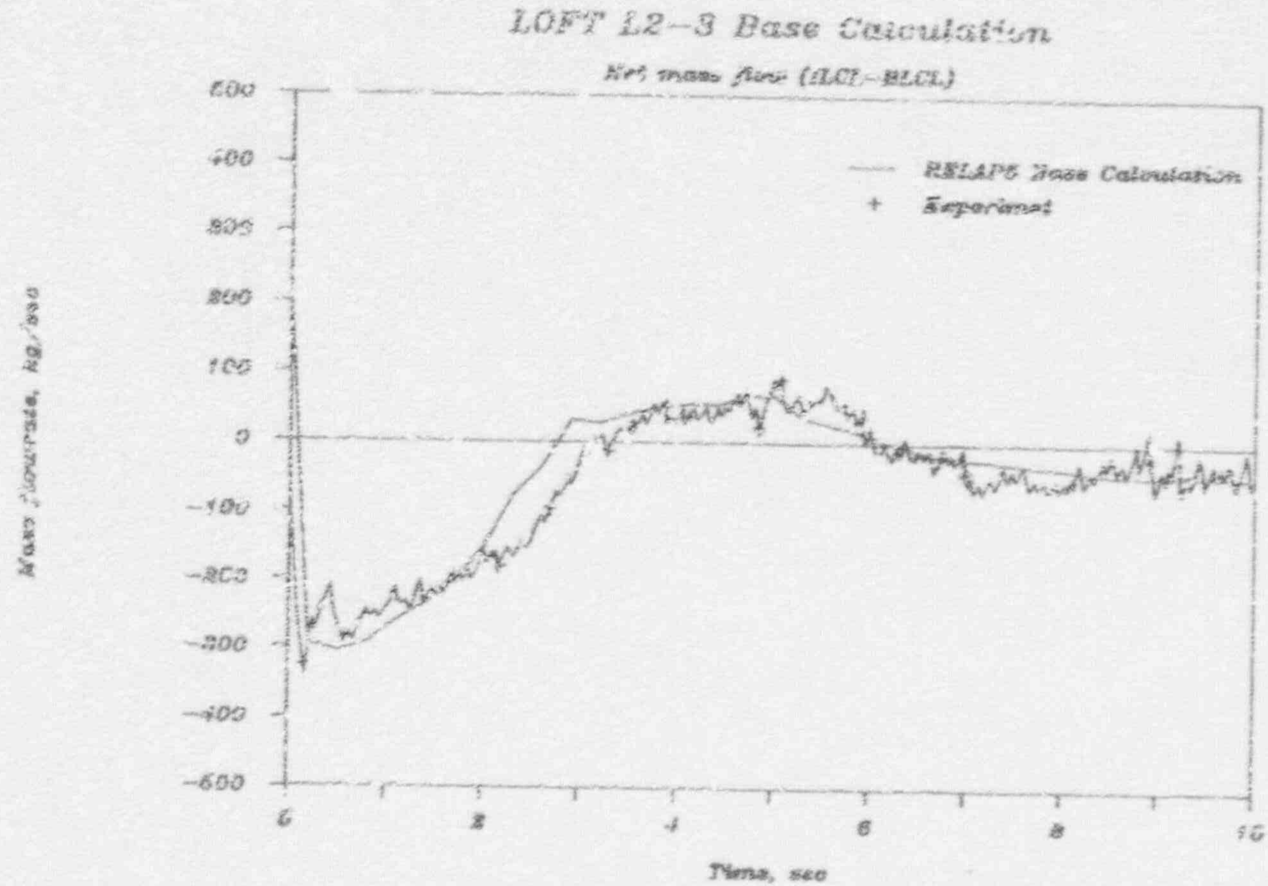


Fig.7 Comparison of net mass flow rate into the core between the base case calculation and the experiment

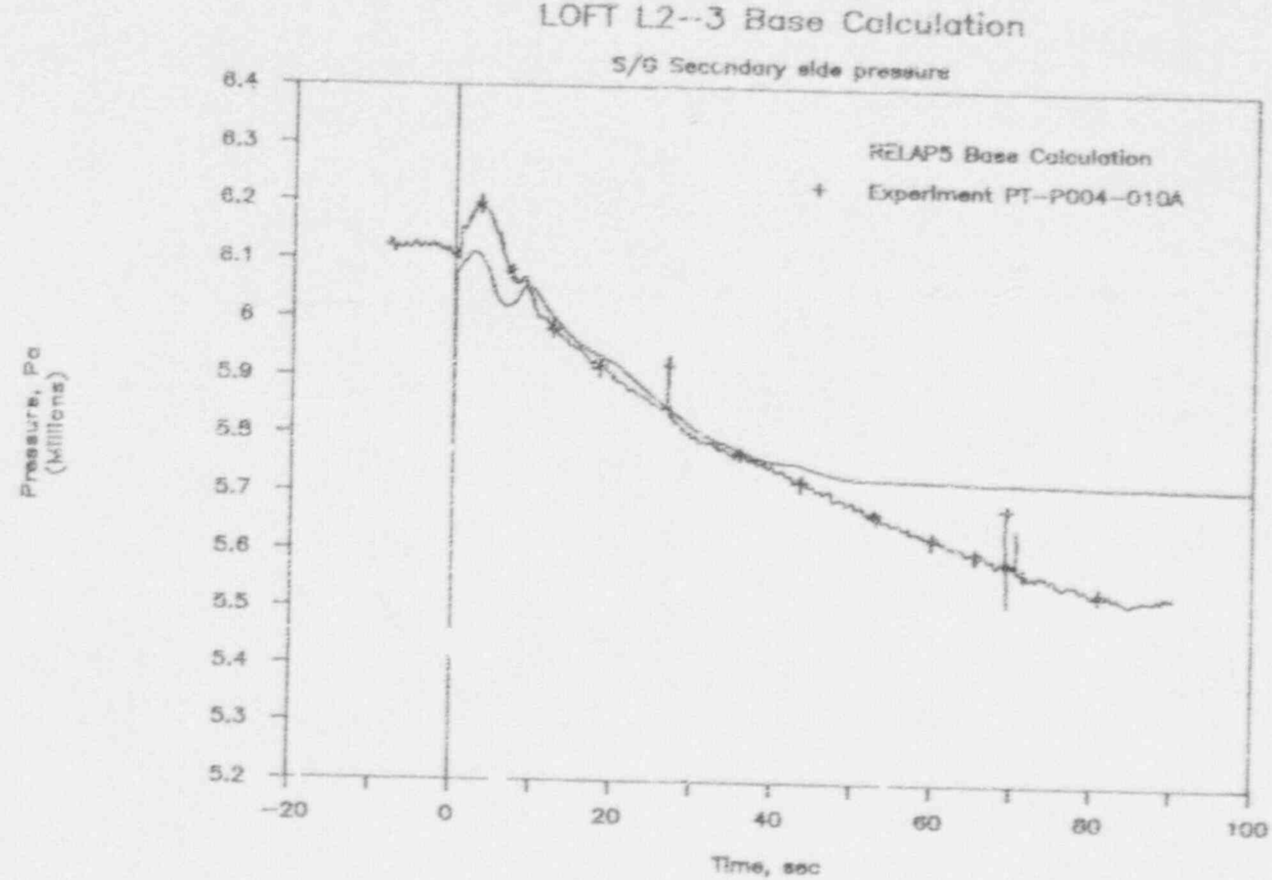
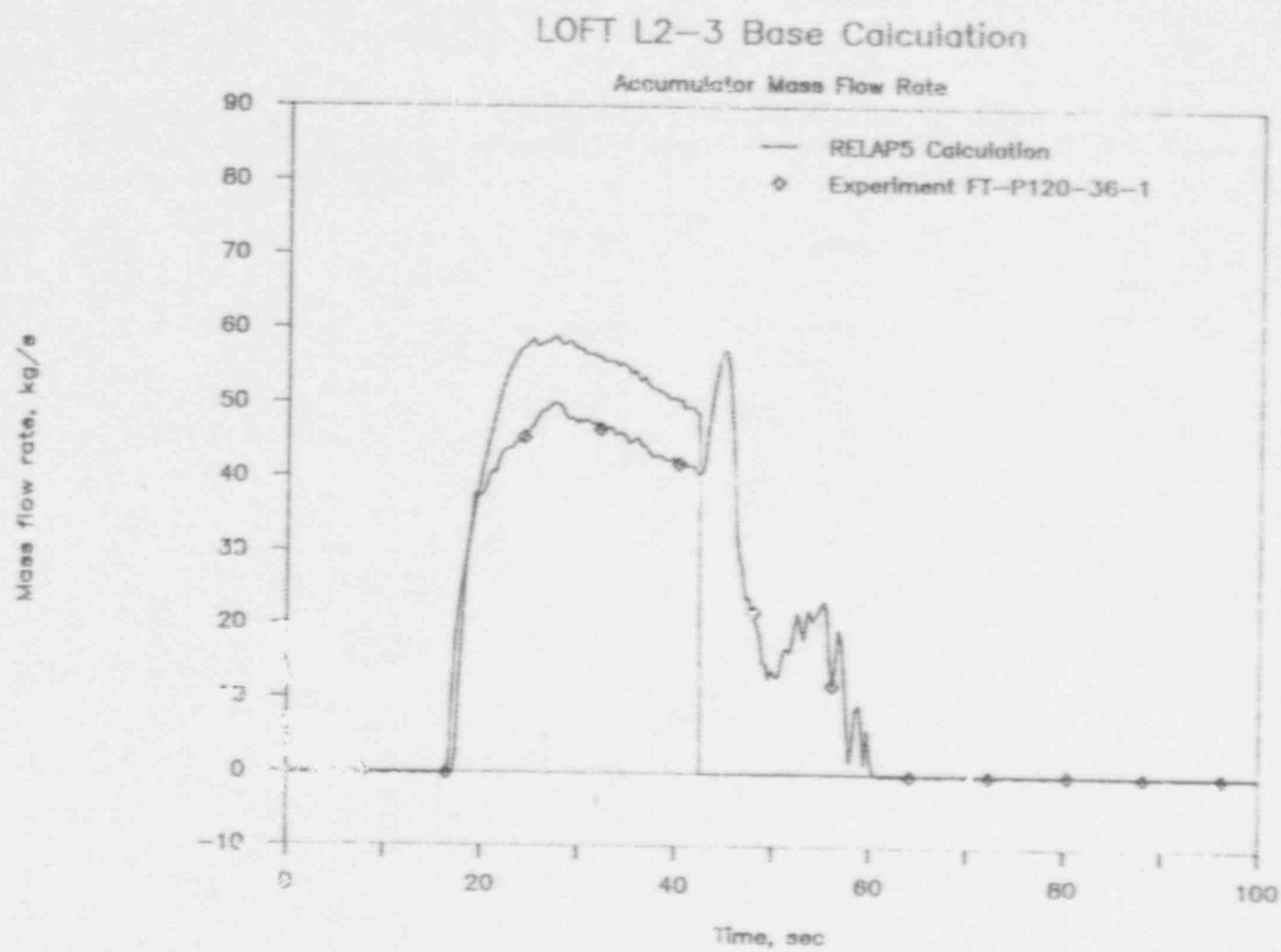


Fig.8 Comparison of steam dome pressure at S/G secondary side between the base case calculation and the experiment



F. .9 Comparison of accumulator injection flow rate between the base case calculation and the experiment

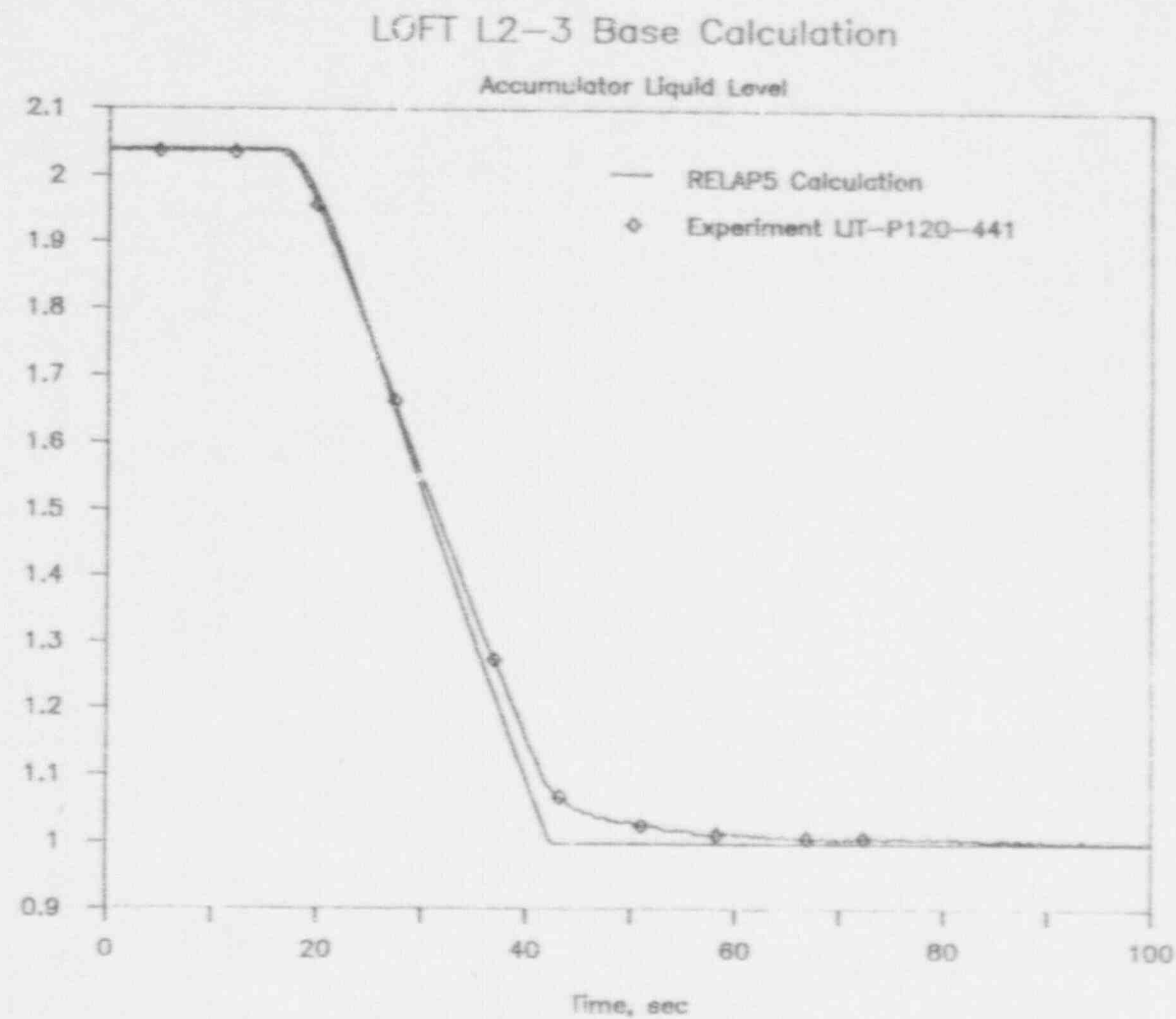


Fig.10 Comparison of accumulator liquid level between the base case calculation and the experiment

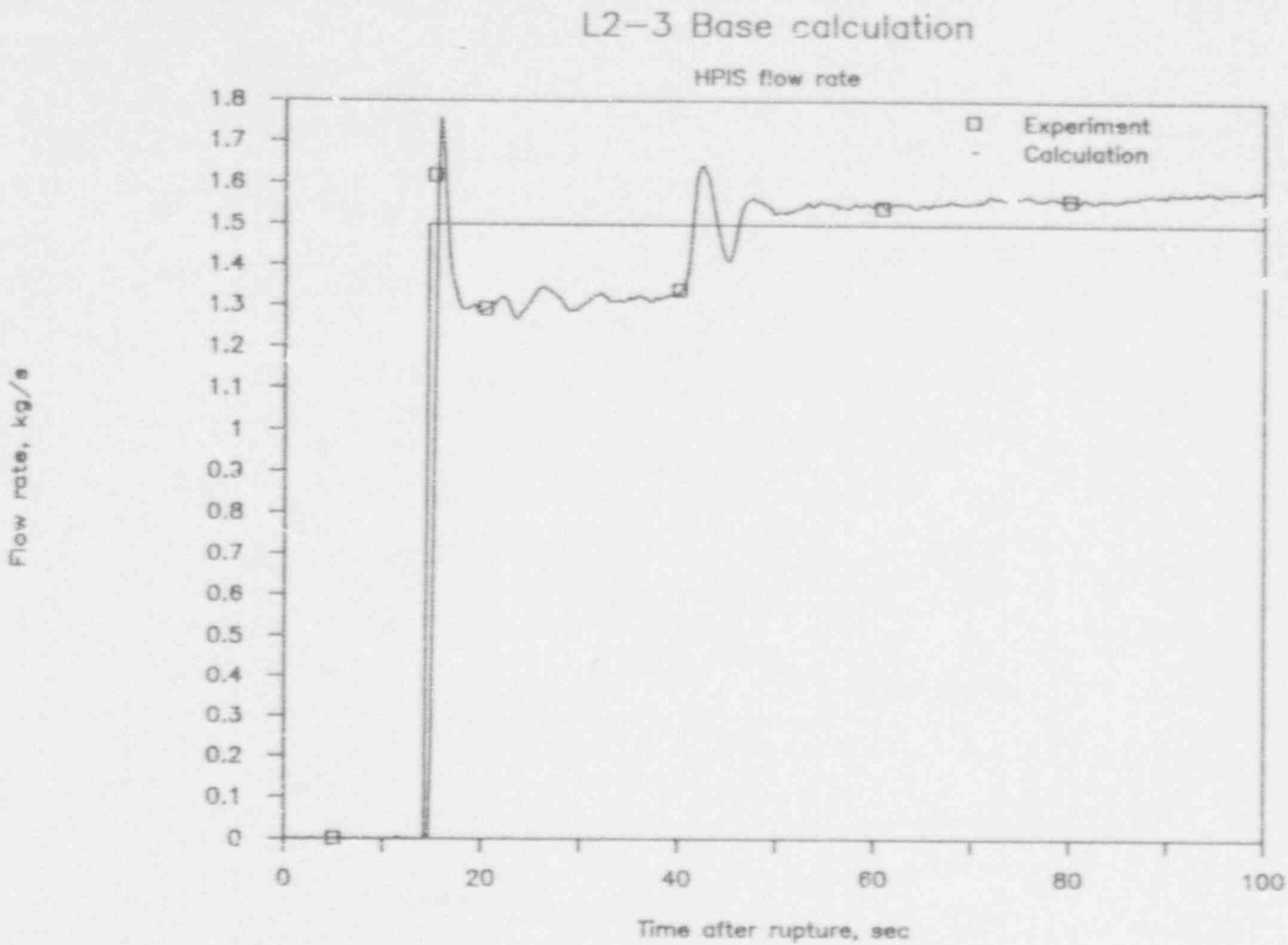


Fig.11 Comparison of HPSI flow rate
between the base case calculation and the experiment

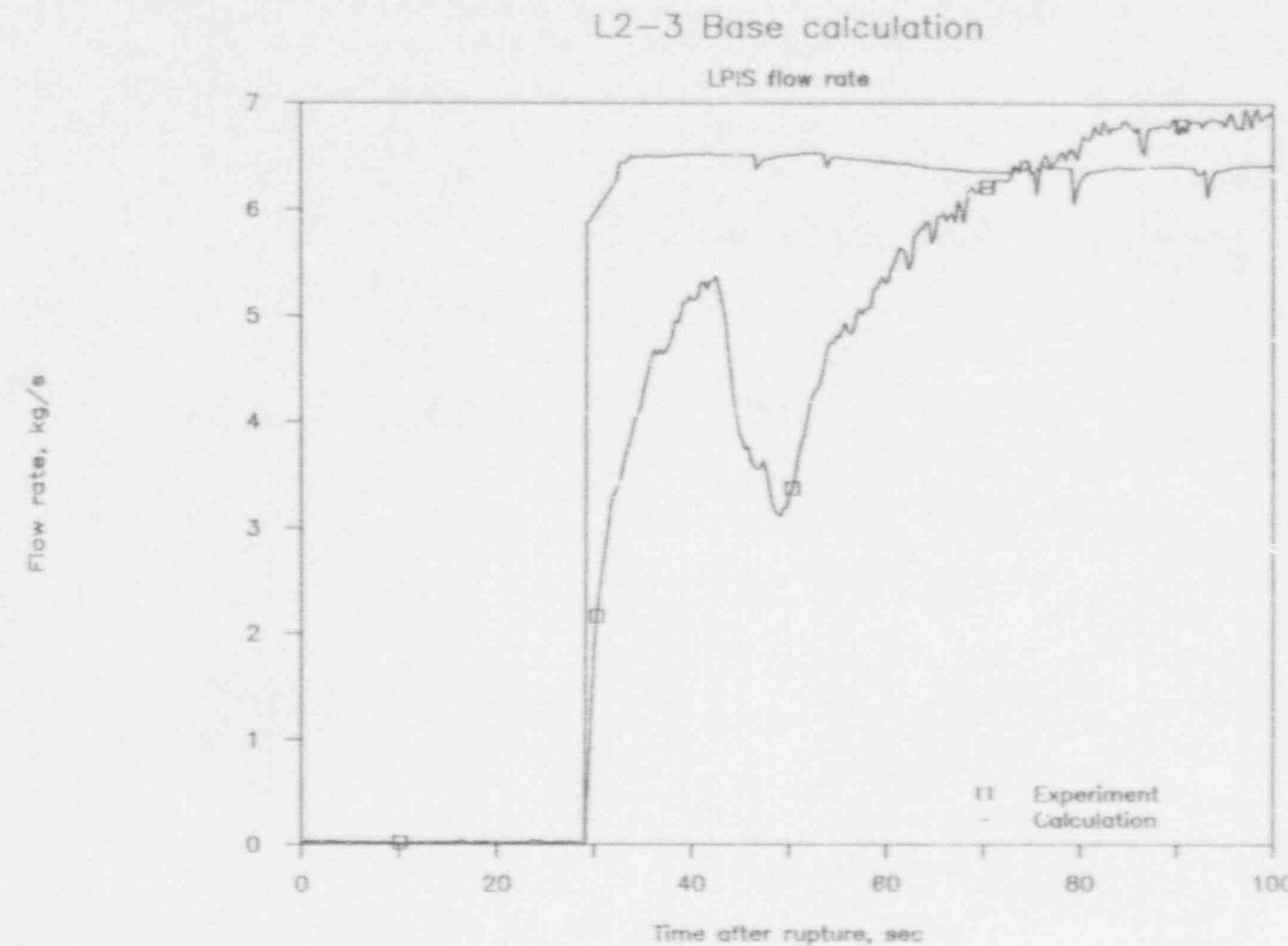


Fig.12 Comparison of LPSI flow rate between the base case calculation and the experiment

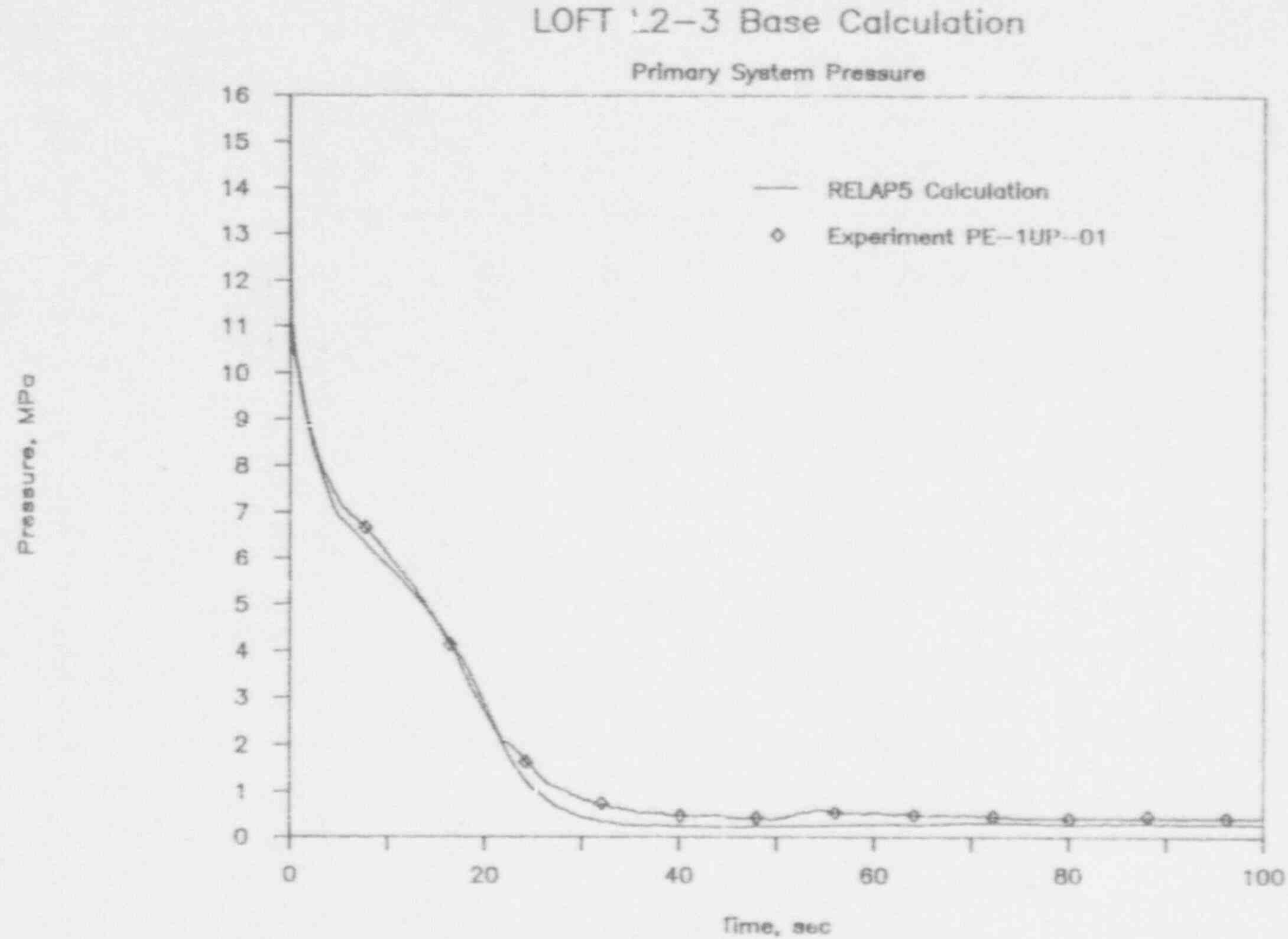


Fig.13 Comparison of primary system pressure between the base case calculation and the experiment

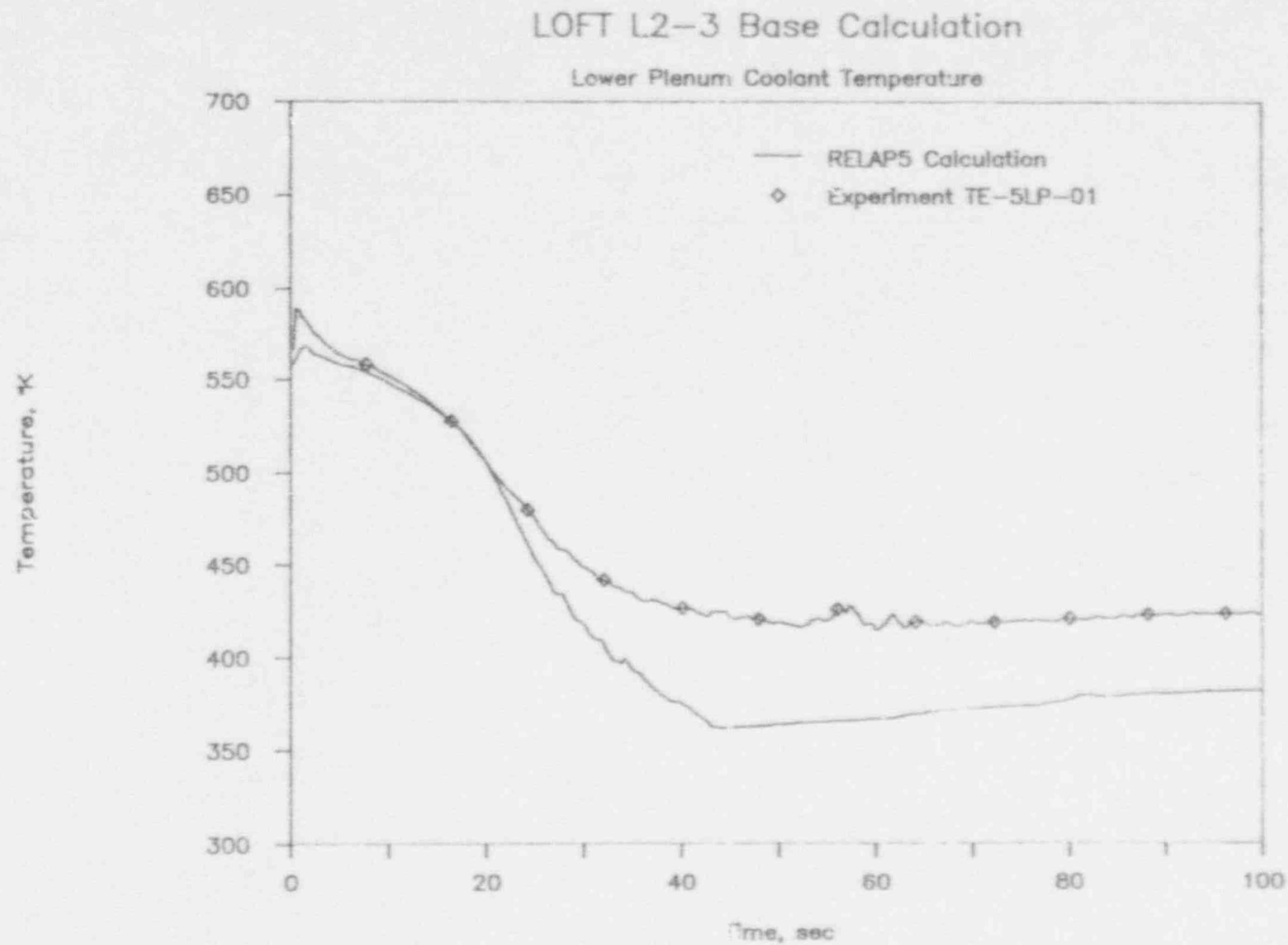


Fig.14 Comparison of coolant temperature in lower plenum between the base case calculation and the experiment

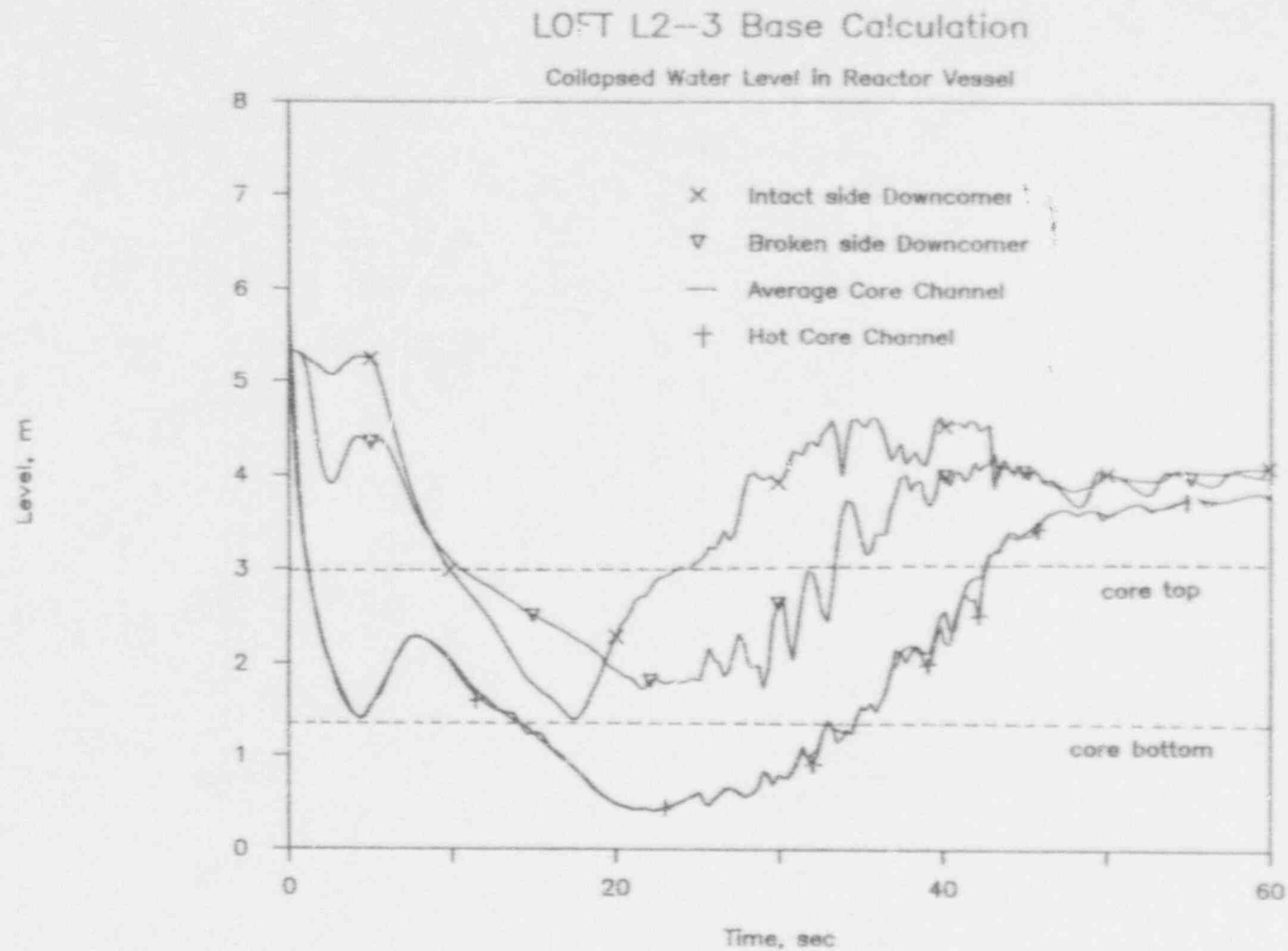


Fig.15 Collapsed liquid levels calculated in the base case calculation for the broken side downcomer, intact side downcomer, hot core channel and average core channel of the reactor vessel

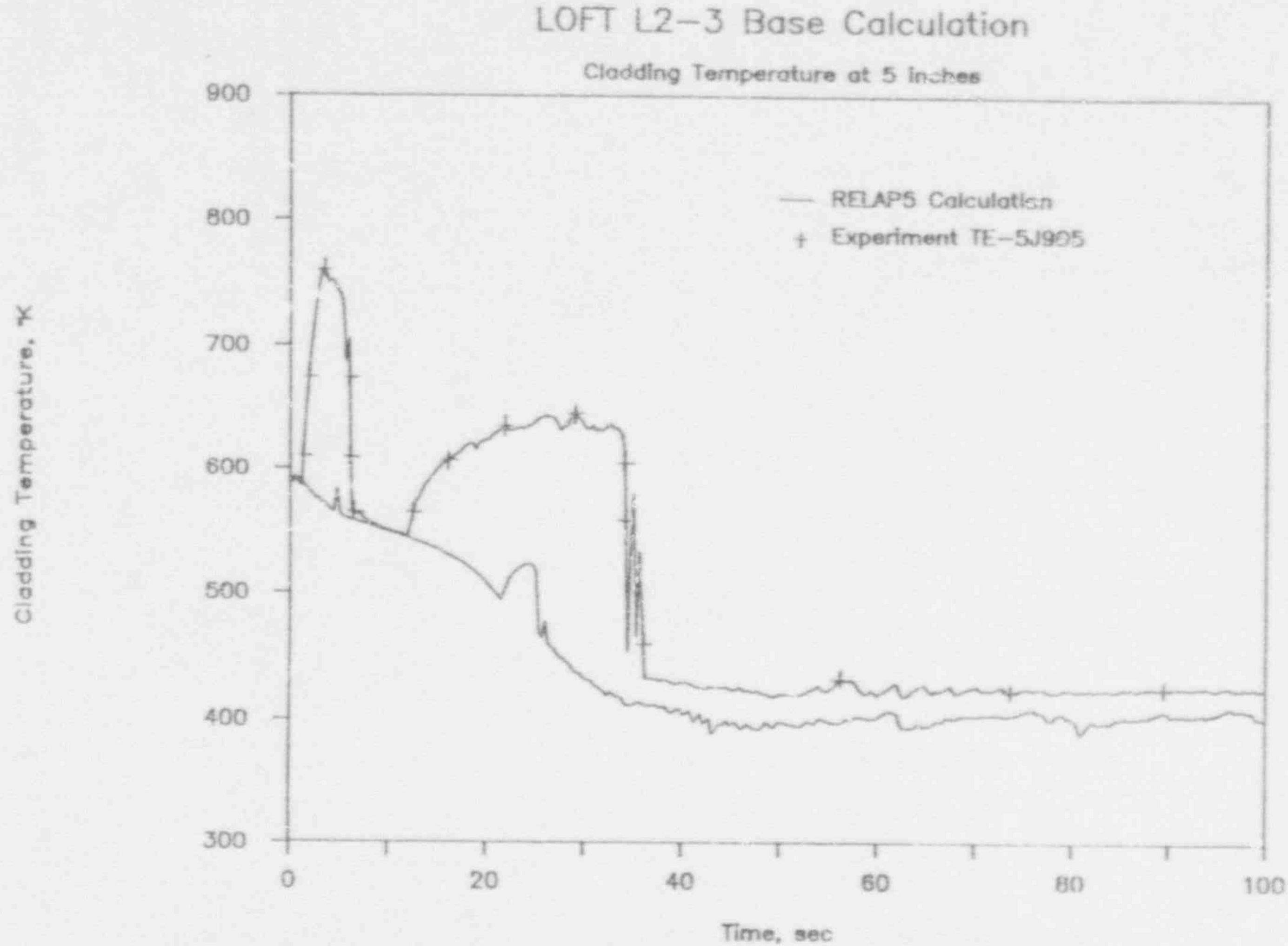


Fig.16 Comparison of cladding temperature at 5 inches of hot fuel between the base case calculation and the experiment

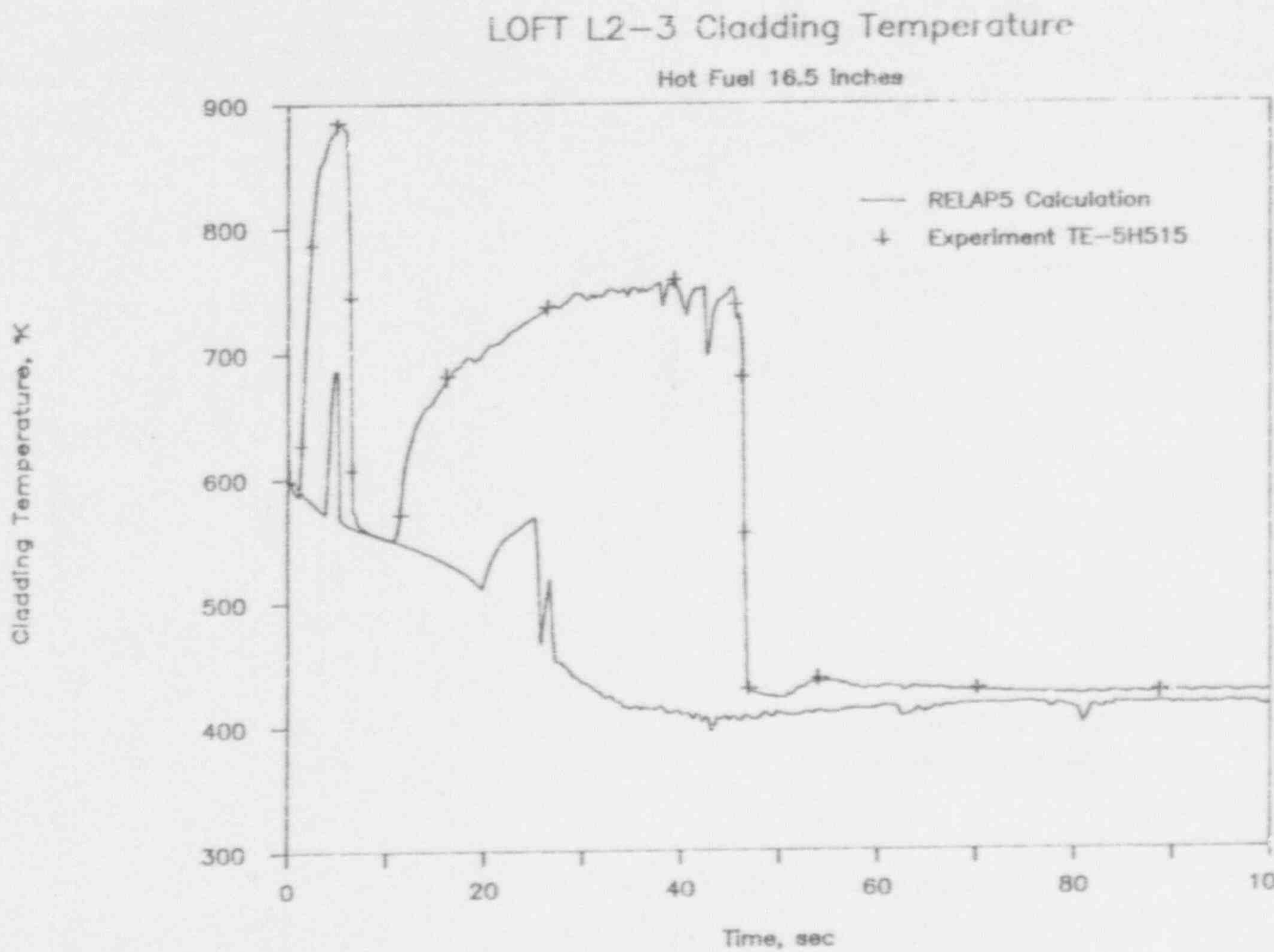


Fig.17 Comparison of cladding temperature at 16.5 inches of hot fuel between the base case calculation and the experiment

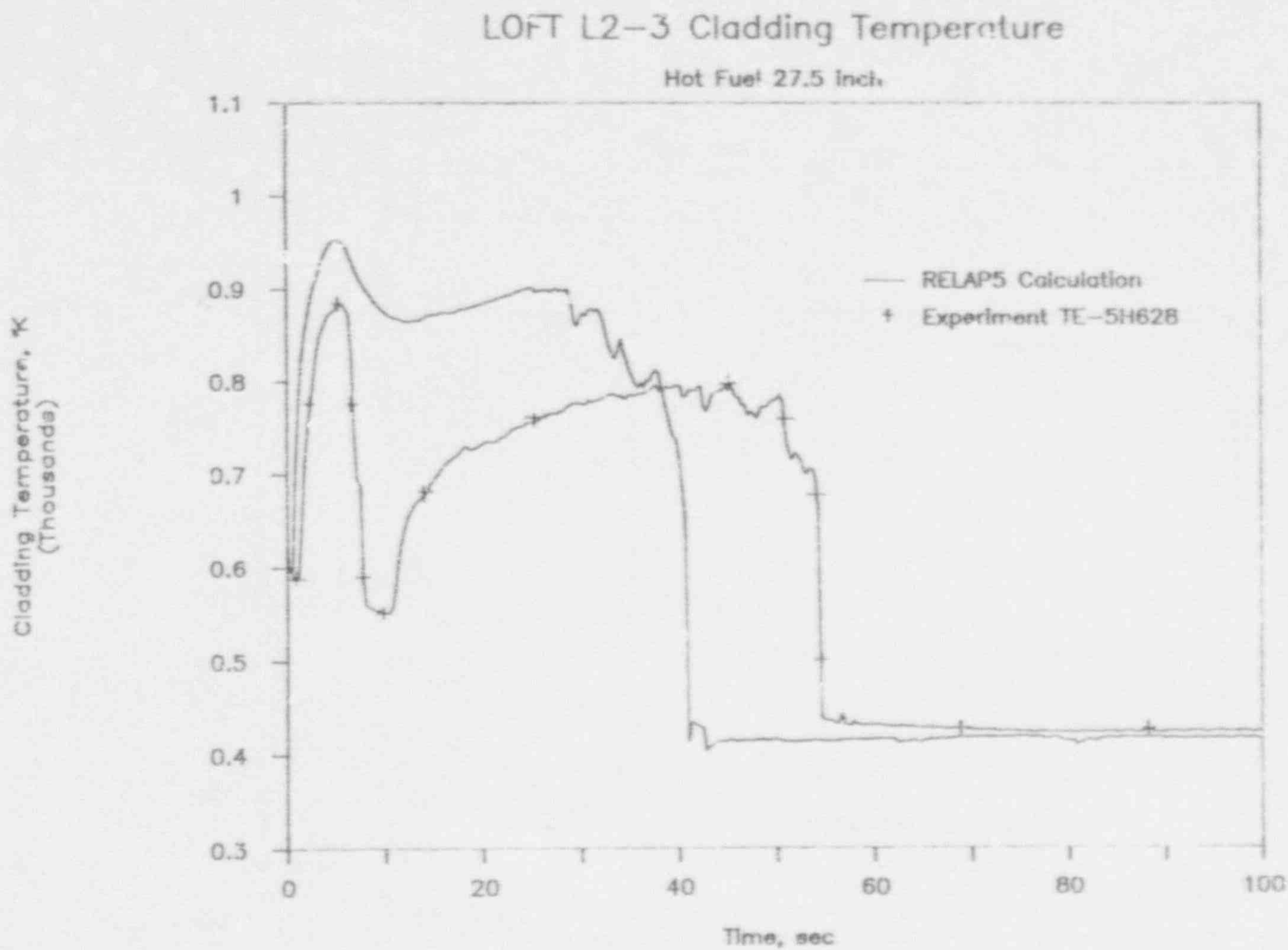


Fig.18 Comparison of cladding temperature at 27.5 inches of hot fuel between the base case calculation and the experiment

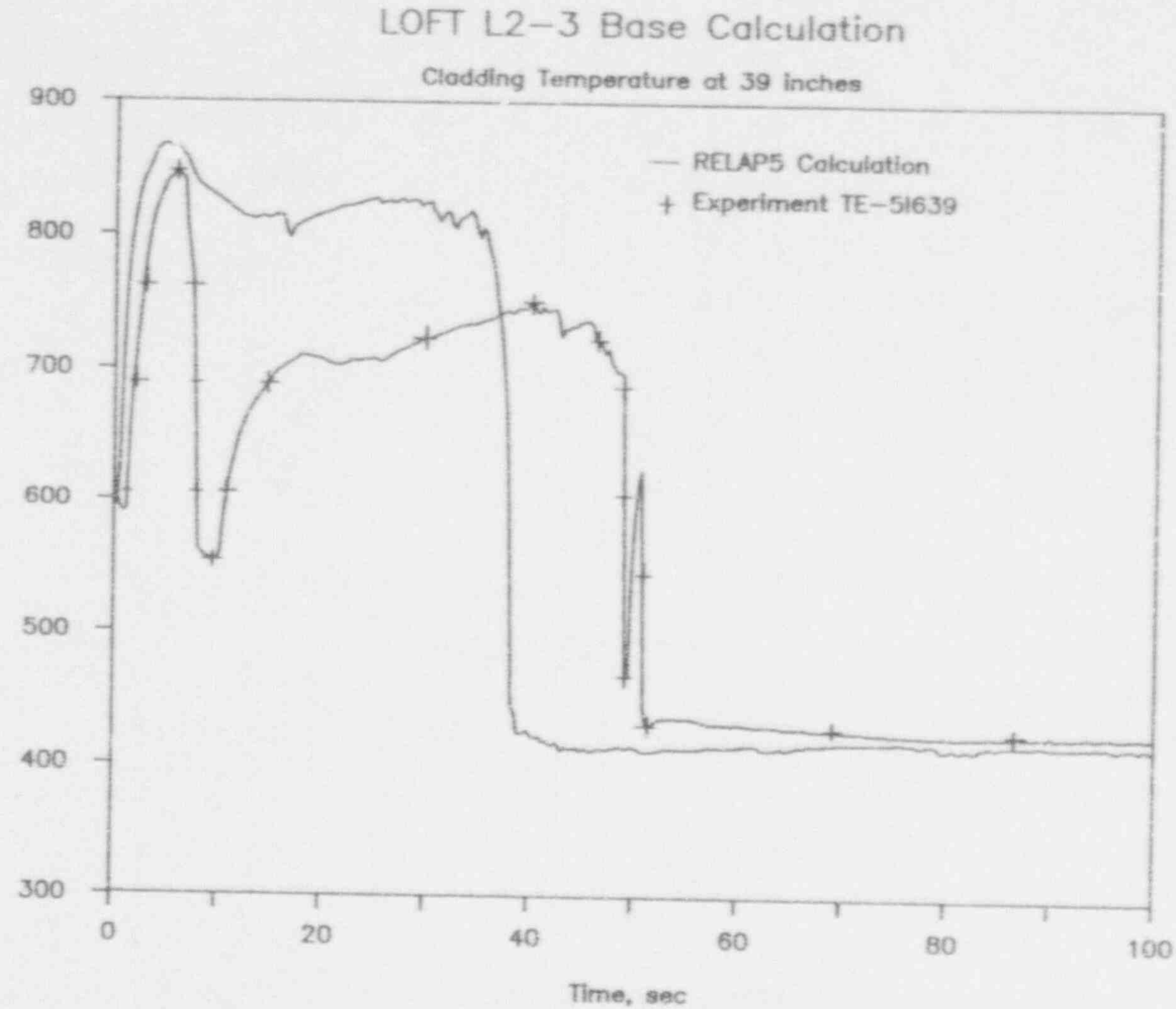


Fig.19 Comparison of cladding temperature at 39 inches of hot fuel between the base case calculation and the experiment

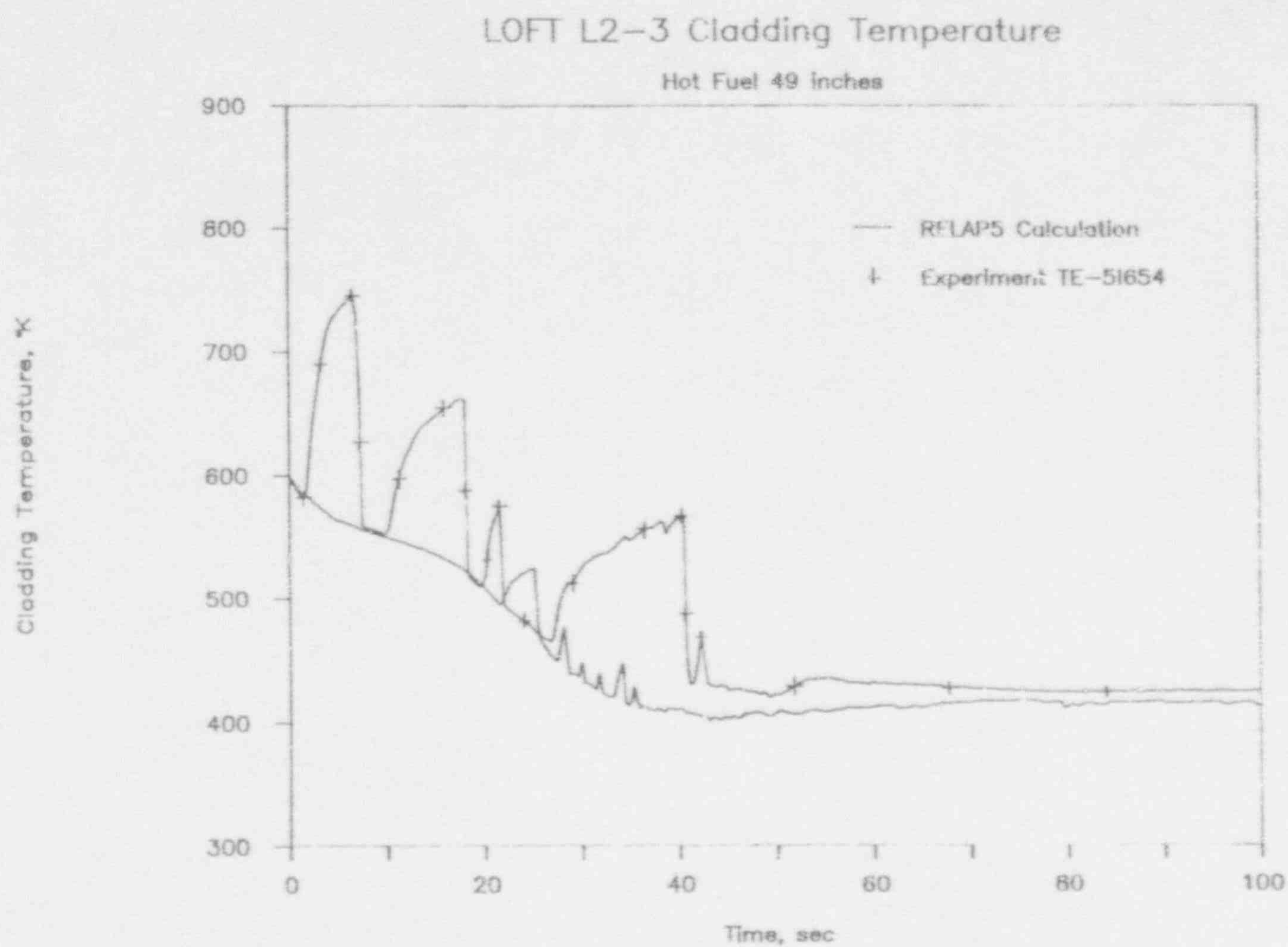


Fig.20 Comparison of cladding temperature at 49.5 inches of hot fuel between the base case calculation and the experiment

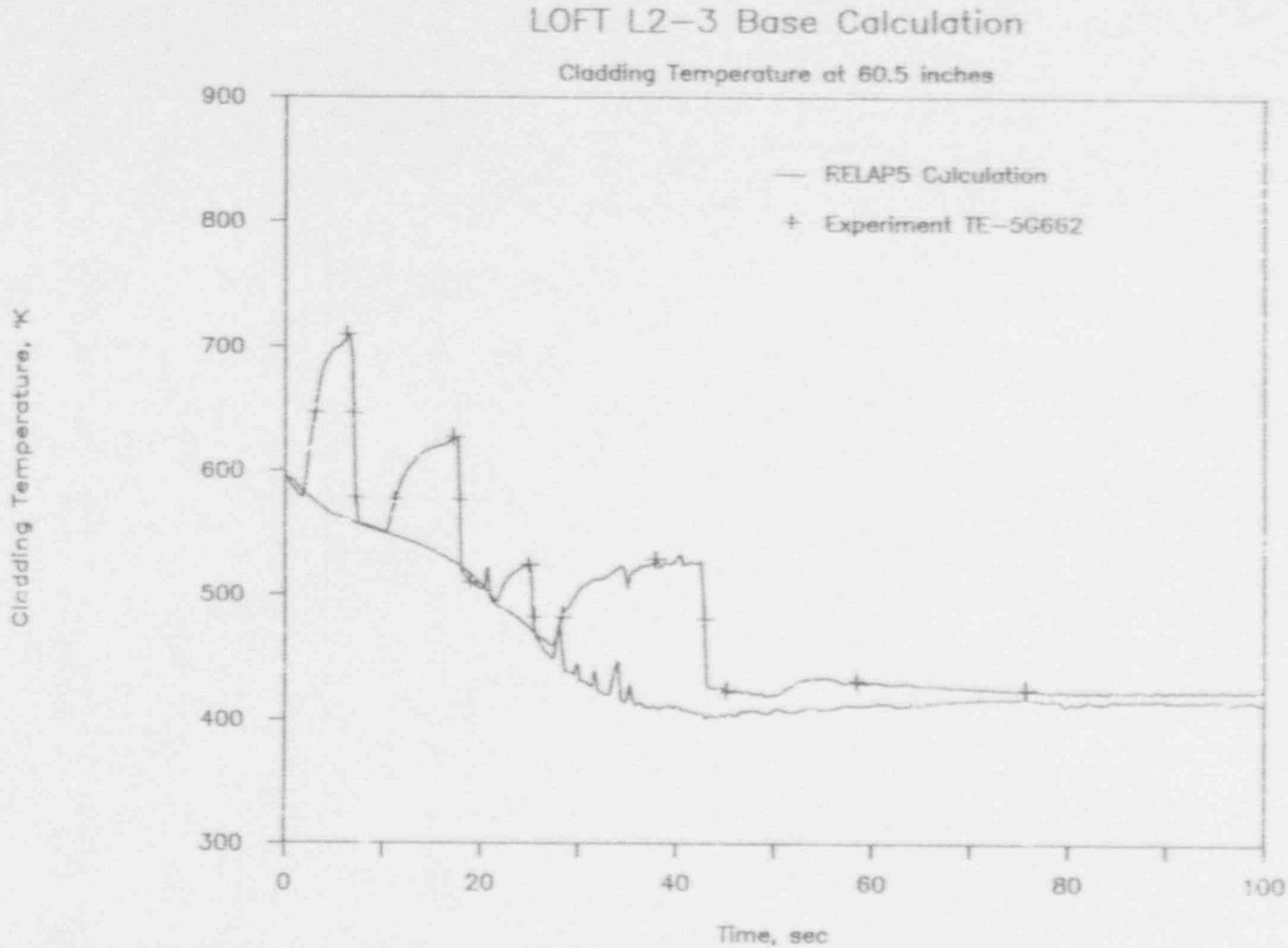


Fig.21 Comparison of cladding temperature at 60 inches of hot fuel between the base case calculation and the experiment

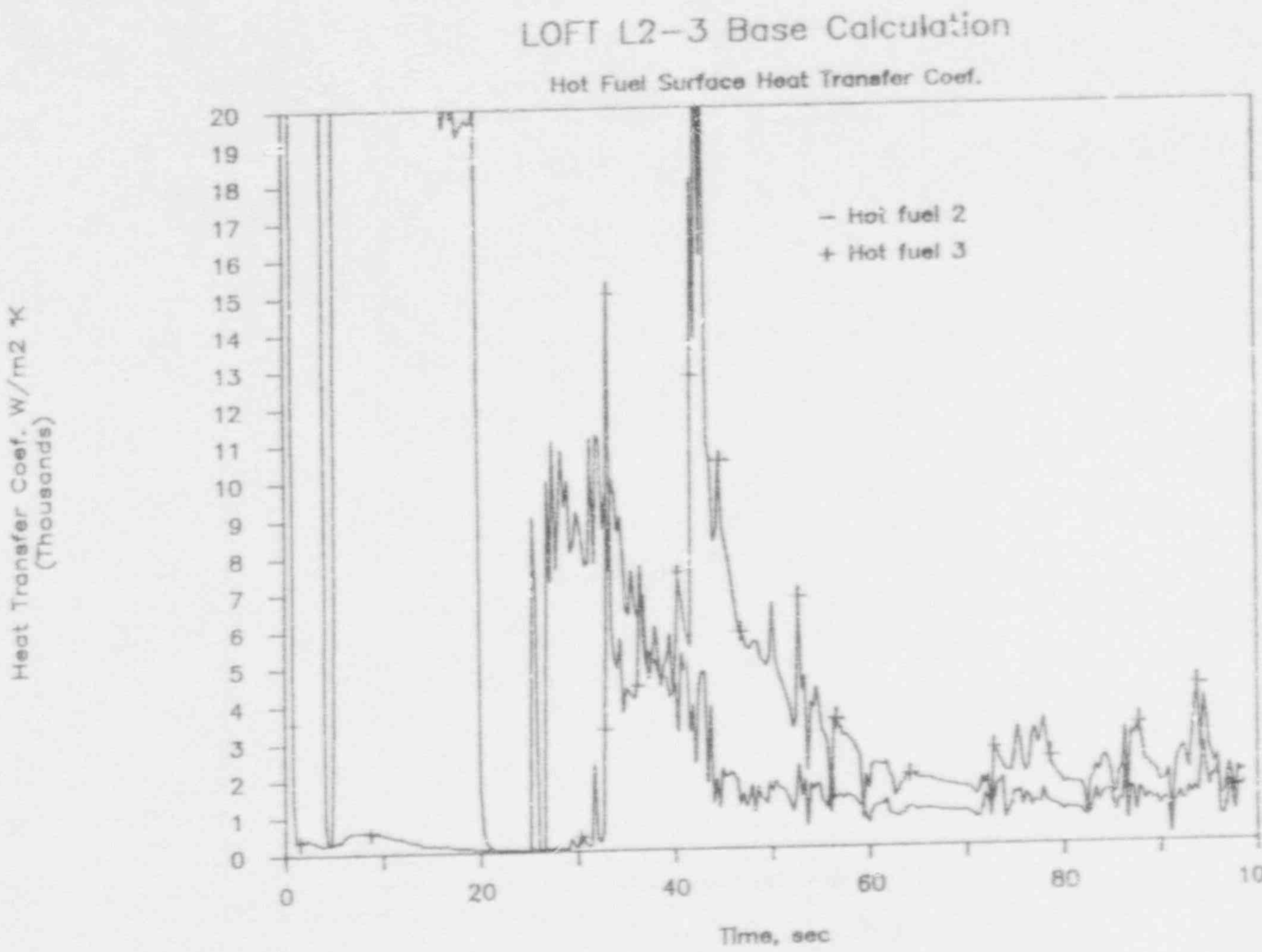


Fig.22 Wall heat transfer coefficients calculated in the base case calculation at volume 2 and 3 of hot fuel

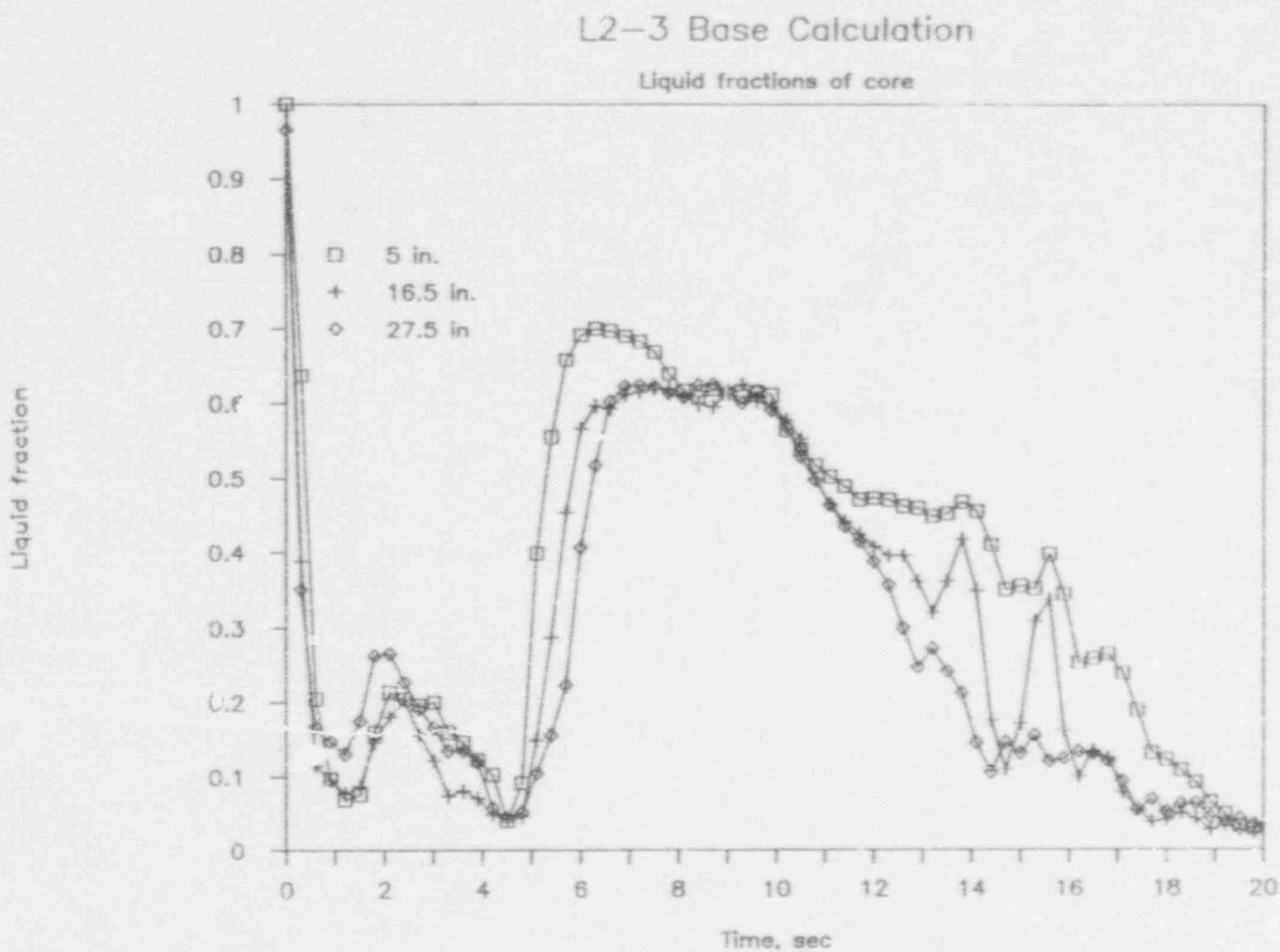


Fig.23 Liquid fractions calculated in the base case calculation at volume 2 and 3 of hot fuel

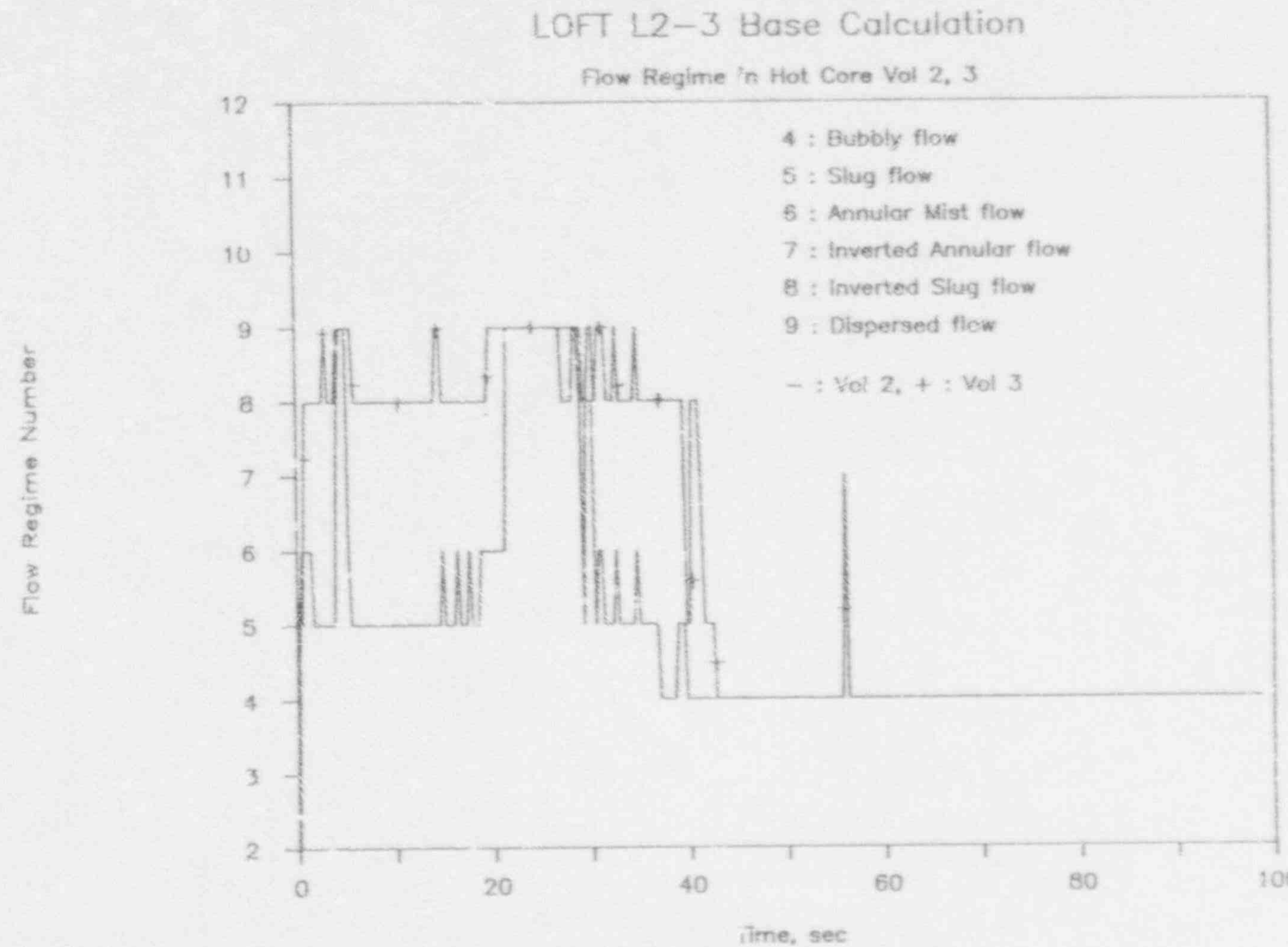


Fig.24 Flow regimes predicted in the base case calculation at volume 2 and 3 of hot core channel

LOFT L2-3 Cladding Temperature

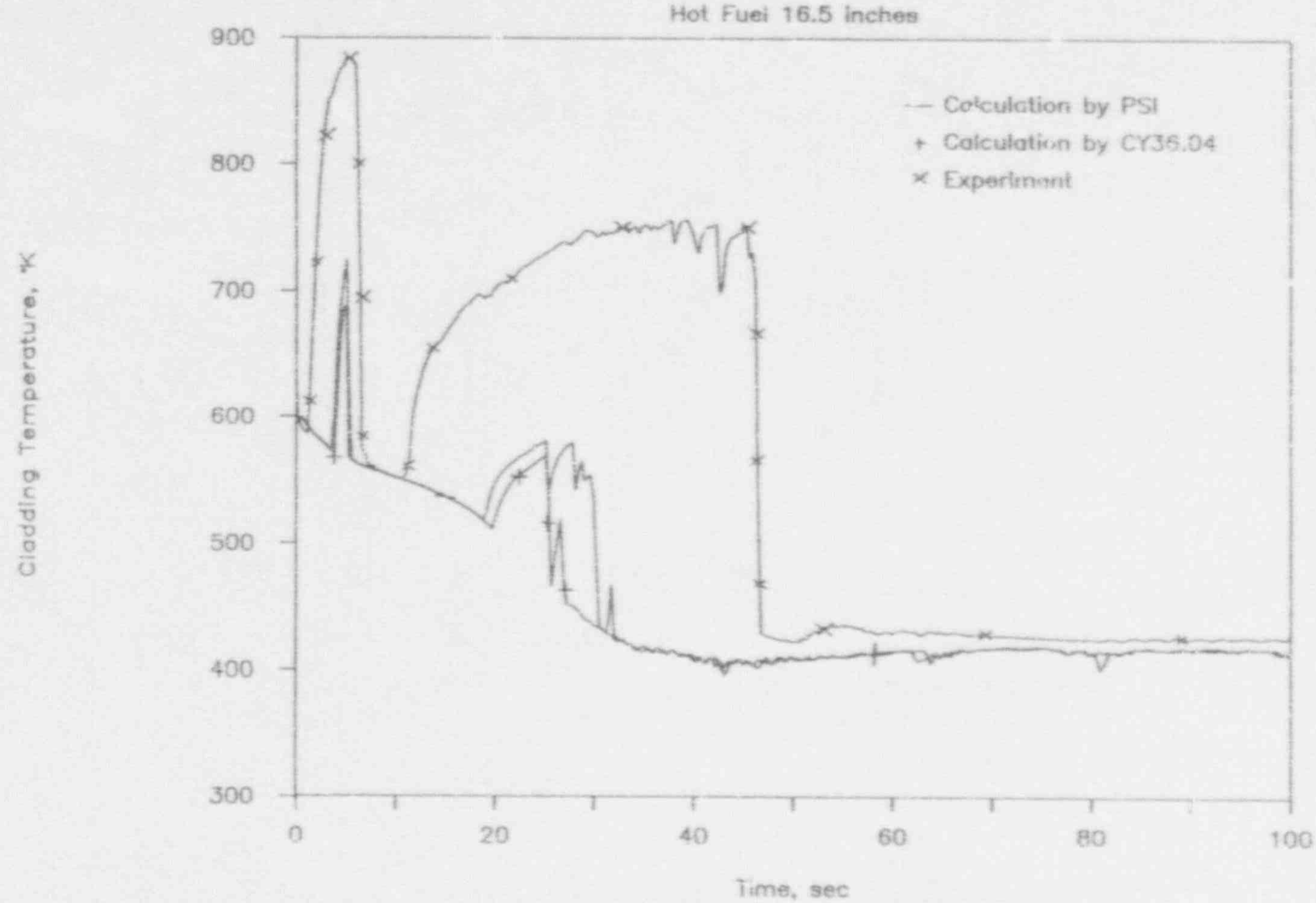


Fig.25 Comparison of cladding temperature at 16.5 inches of hot fuel between the base case calculation and the sensitivity calculation

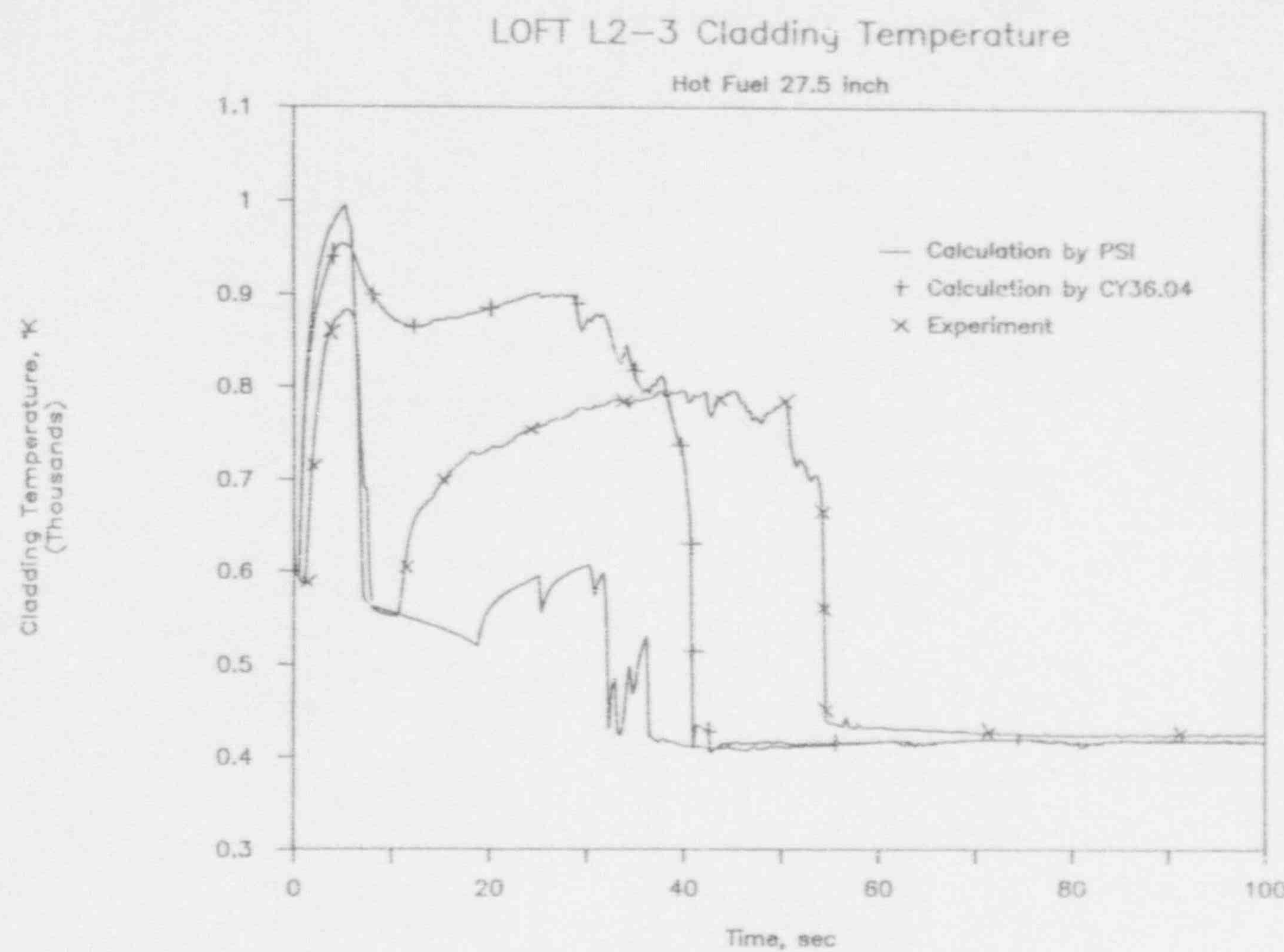


Fig.26 Comparison of cladding temperature at 27.5 inches of hot fuel between the base case calculation and the sensitivity calculation

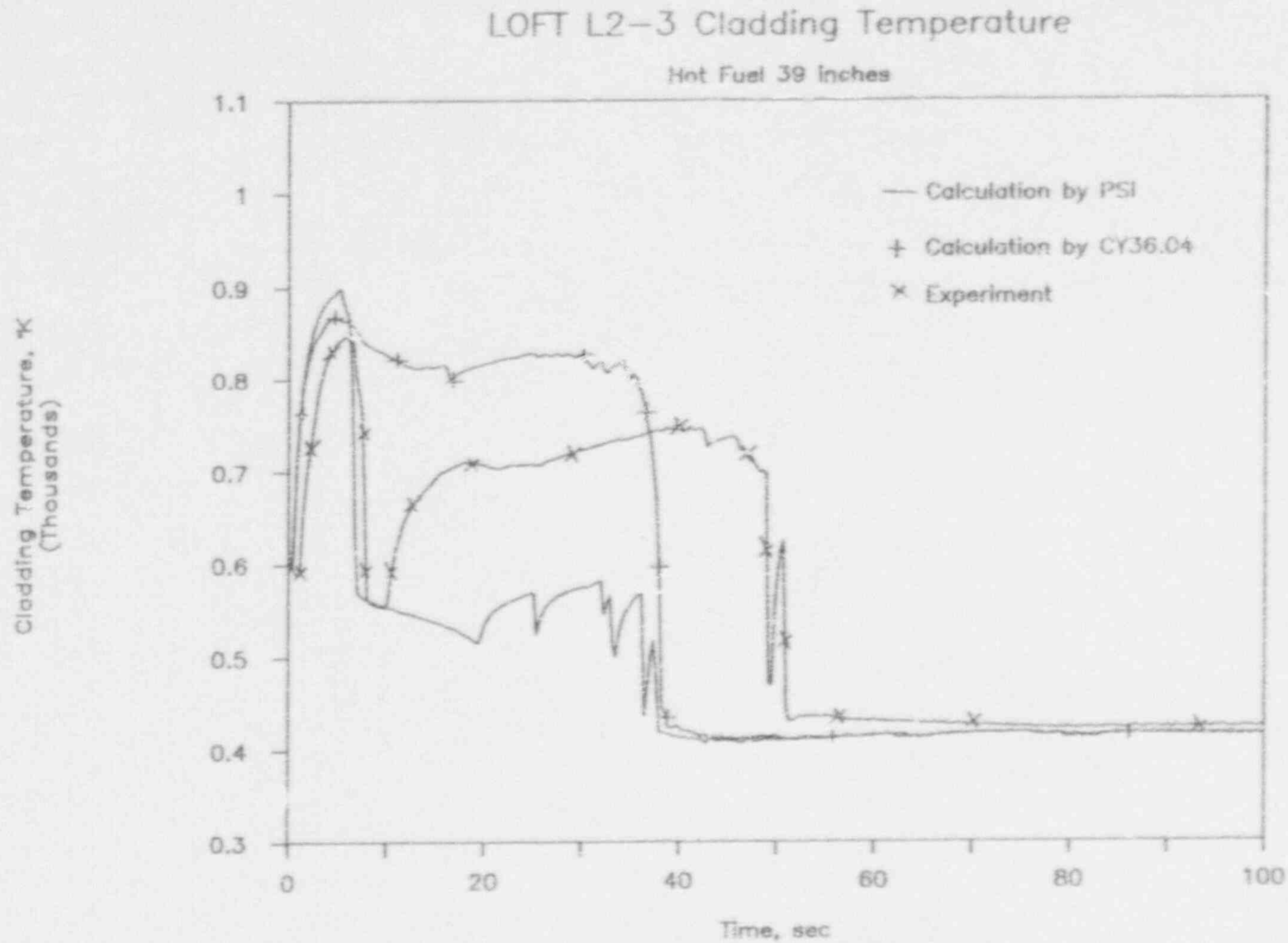


Fig.27 Comparison of cladding temperature at 39 inches of hot fuel between the base case calculation and the sensitivity calculation

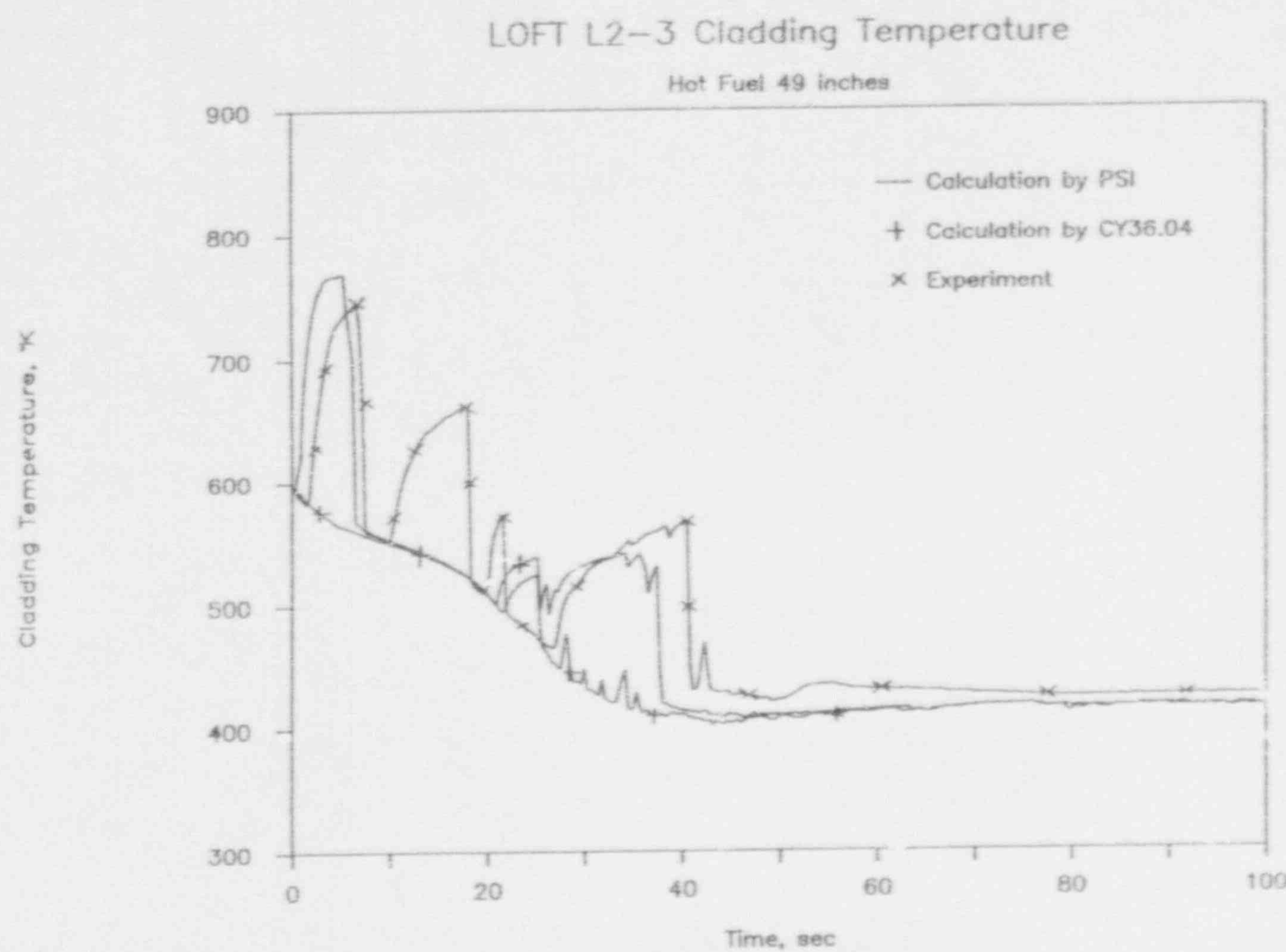


Fig.28 Comparison of cladding temperature at 49.5 inches of hot fuel between the base case calculation and the sensitivity calculation

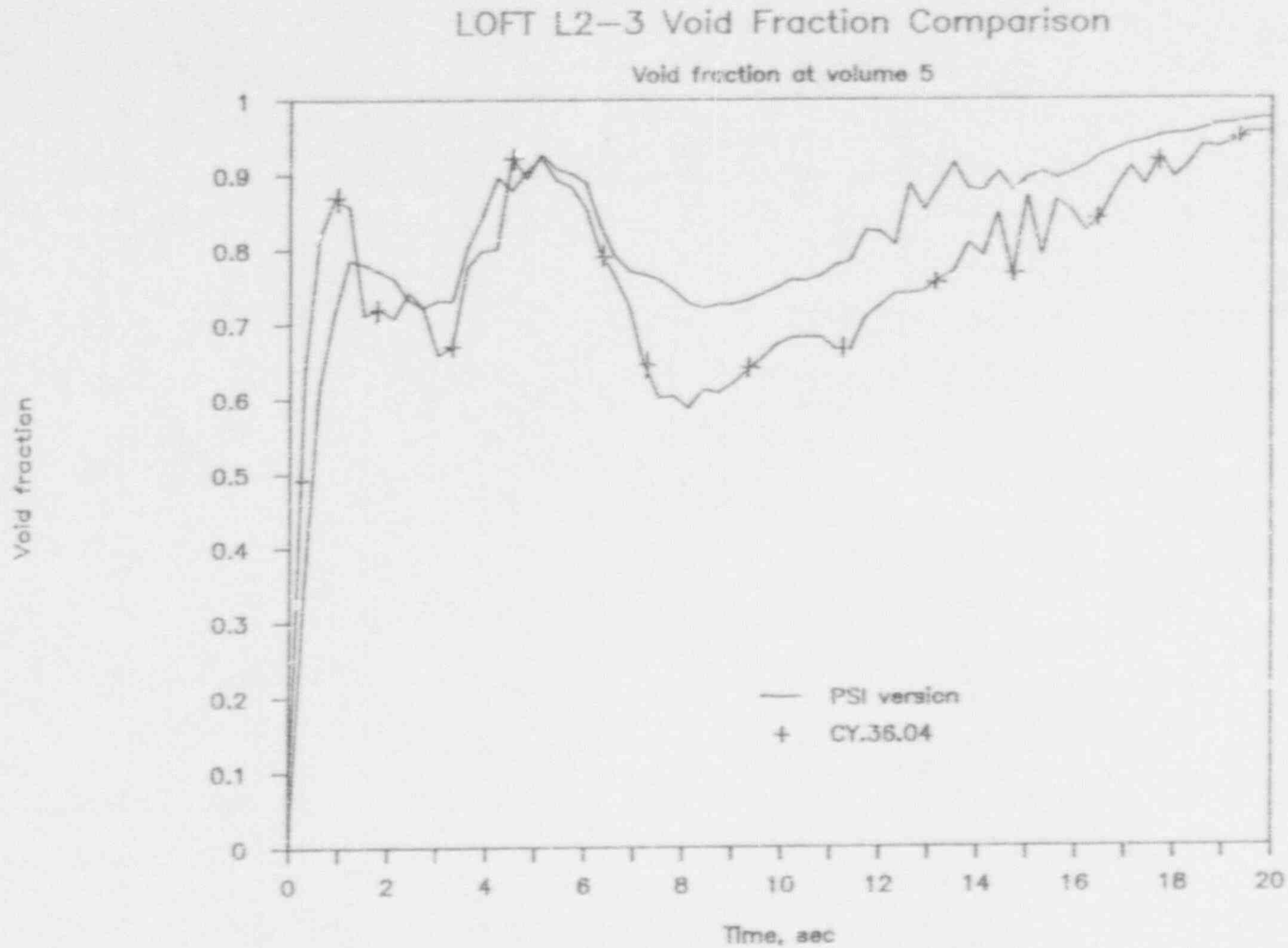


Fig.29 Comparison of void fraction at volume 5 of hot core channel between the base case calculation and the sensitivity calculation

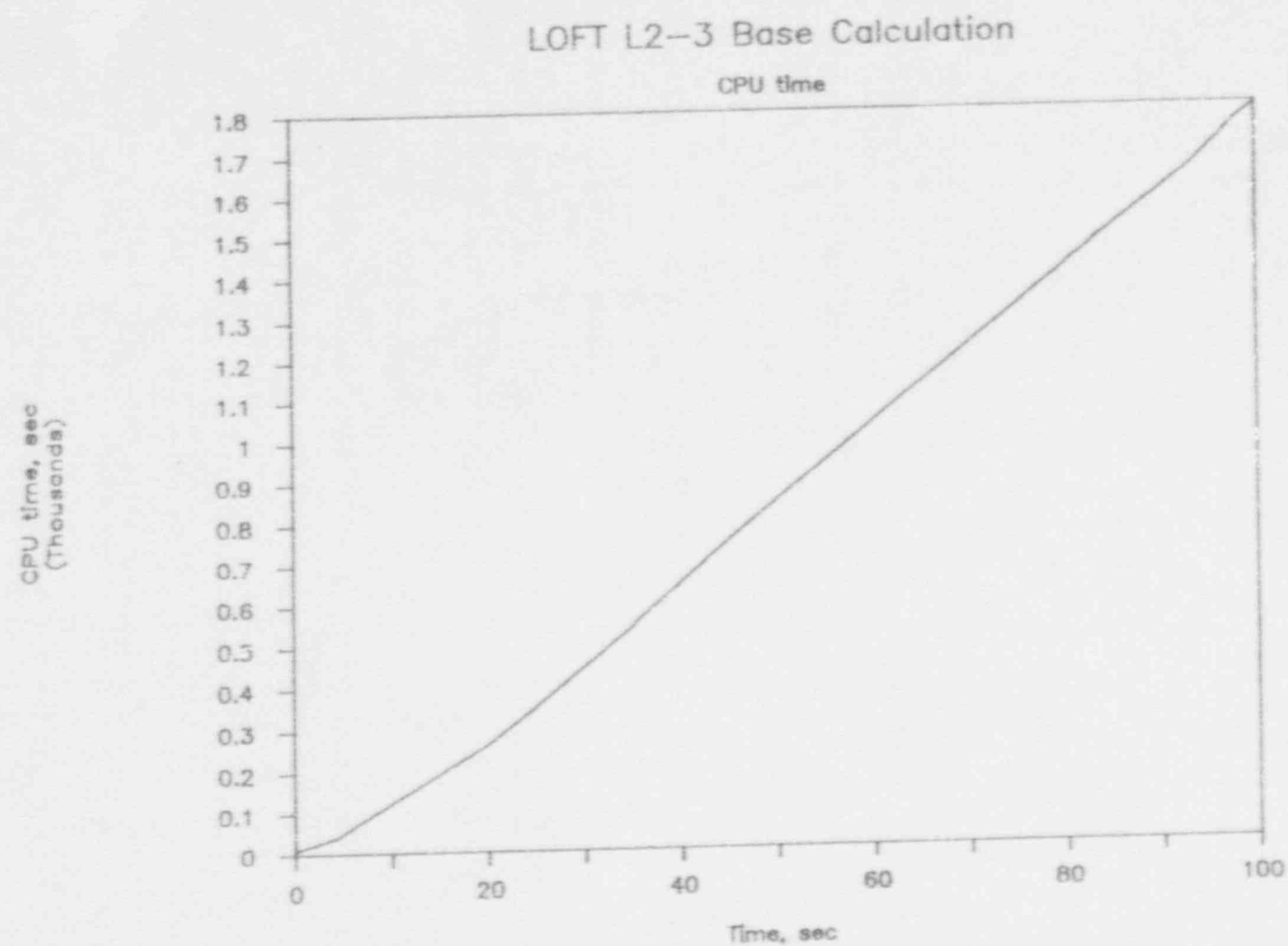


Fig.30 The required CPU time versus the advanced time in the base case calculation

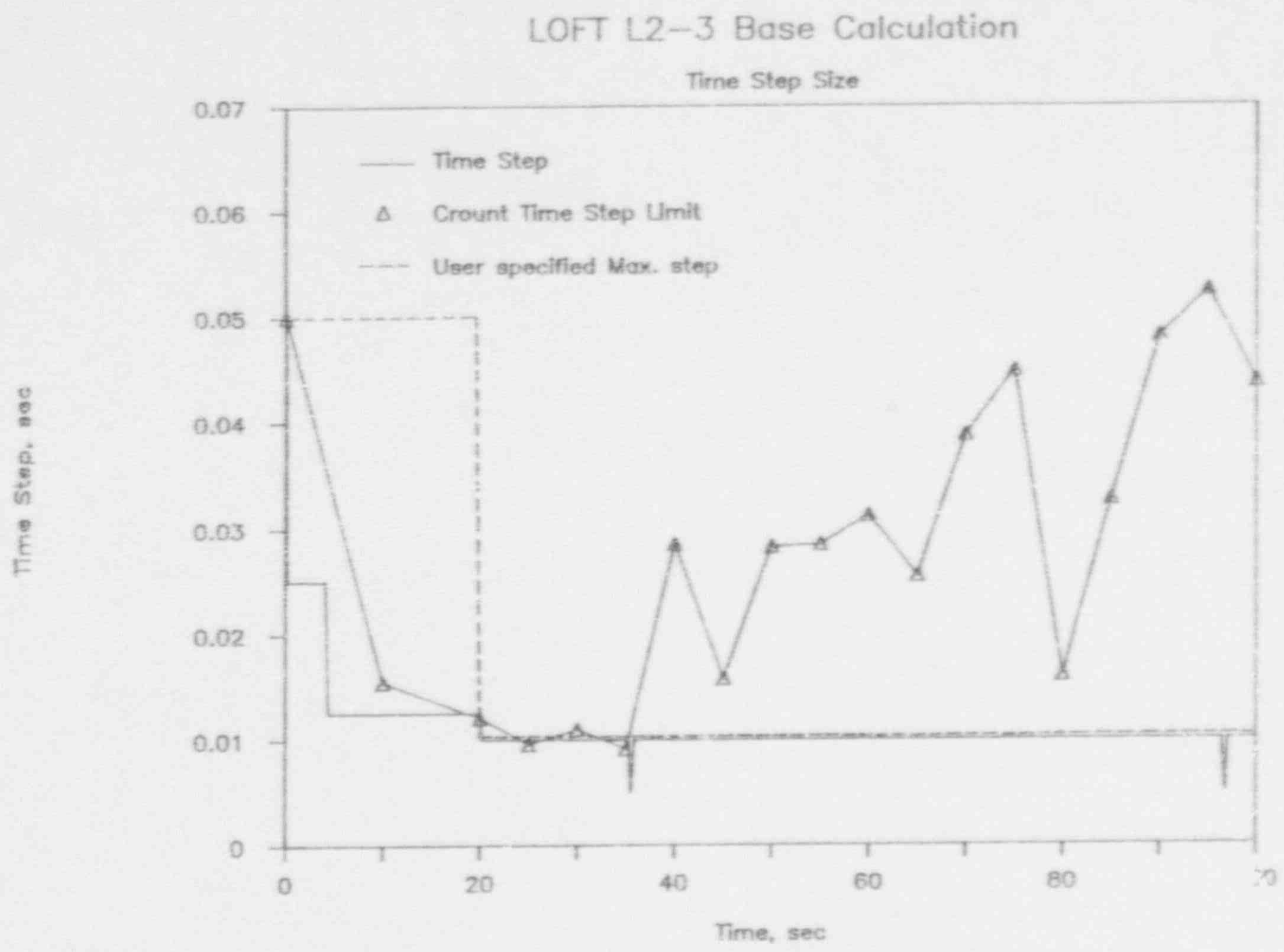


Fig.31 Time step size of base case calculation

Appendix A. Update List for RELAP5/MOD2 Cycle 36.04

APPENDIX A Update list for RELAP5/MOD2 Cycle 36.04

```
/JOB
RM364B,T200.
/USER
ATTACH,OLDPL=REL364S.
PURGE,RE364BS/NA.
PURGE,RE364BX/NA.
PURGE,RE364BL/NA.
* **************************
*  IMPORTANT !!             *
*   THE UPDATE DIRECTIVE    *
*   SHOULD HAVE *COMPILE DEFINE
*   AS THE FIRST DIERECTIVE
****************************
UPDATE,N=RE364BS.
UPDATE,P=RE364BS,Q,C=R5SEG.
REPLACE,R5SEG.
RETURN,OLDPL.
*DEFINE,RE364BS.
RETURN,RE364BS.
ATTACH,ENVRLX=ENVR41X.
LIBRARY,ENVRLX.
SELECTA,COMPILE,COMP.
LIBRARY.
RETURN,ENVRLX.
REWIND,COMP.
FTN5,I=COMP,DO,ET,STATIC,OPT=2,ROUND,LO=M/A/R/S,L=0.
RETURN,COMP.
REWIND,LGO.
ATTACH,RELAP5I=REL364L.
GTR,RELAP5I,ADD,REL/*
*DEFINE,RELAP50=RE364BL.
LIBEDIT,P=RELAP50,I=0,B=ADD,LO=F,U,C.
LIBEDIT,P=RELAP50,B=LGO,I=0,LO=F,U,C.
RETURN,NULL,LGO,RELAP5I.
RETURN,RLP5F1,RLP5F2.
ATTACH,ENVRL=ENVR41L.
FILE,RSTIN,RT=S,SBF=NO,USE,FO=SQ.
RFL,EC=200.
DEFINE,RE364BX.
SEGLOAD,I=R5SEG,B=RE364BX.
LDSET,LIB=RELAP50/ENVRL.
LDSET,PRESETA=NGINDEF,ERR=NONE,MAP=SB.
LDSET,STAT=RSTIN.
LIBLOAD,ENVRL,$HDR=$.
LIBLOAD,FTN5LIB,$FERCAP.$,$RPVCAP.$,$FTNRP2.$,$Q2NTRY.$.
NOGO.
PERMIT,RE364BX,KA41202.
RETURN,RELAP50,ENVRL,COMPILE.
SKIP,KKK.
EXIT.
ENDIF,KKK.
DAYFILE,KMRRDAY.
REPLACE,KMRRDAY.
/EOR
*COMPILE DEFINE
*ID CBD3604
*D DMK3601.484
```

```
*D PLOTMP.24
 901  FORMAT ('OPLOTFL SCRACH FILE GENERATED.')
*COMPILE DEFINE,SEGDIR
*COMPILE RELAP5
*D RJW3603.23
      DATA PTITLE/"RELAP5/2/3","6.04-NSC","REACTOR LO","SS UF COOL",
*/
*/    ENDIF
*/       *ID KWU01  ALREADY IMPLEMENTED IN RELAP5OLDPL3604C,
*/                  WHICH IS USED AS BASIS
*/       */    CORRECTIONS OF INDEX IN SUBROUTINE RACCUM
*/       *I RACCUM.618
*/             IELV=I
*/       *B DMK3602.581
*/       I=IELV
*COMPILE DEFINE,SEGDIR,RACCUM
*ID KWU01
*I RACCUM.618
        IELV=I
*B DMK3602.581
        I=IELV
*/      */     END OF KWU-UPDATES TO CYCLE 3604
*COMPILE DEFINE,SEGDIR
*IDENT SKI01
*/         THESE UPDATES ARE RECOMMENDED BY SKI TO BE
*/         IMPLEMENTED IN RELAP5/MOD2-36.04
*/         SOURCE:    LETTER FROM STUDSVIK (MR.SANDERVAG)
*/                    TO          KWU      (MR.GRUBER)
*/                    1987-06-25
*/
*/        COMPILE RELAP5
*/
*COMPILE IHTCMP
*/
*/       FIX AN INDEXING ERROR IN IHTCMP
*/       ERROR CAUSED ROD PLENUM VOLUME FOR GAP-GAS PRESSURE CALCULATION
*/       TO BE INCORRECT. FOUND AND FIXED BY D.CARAHER 20MAY87
*/       FIX ONLY CDC-VERSION CODING
*D IHTCMP.1041
      L=(.NOT.MASK(43).AND.IHTPTR(J))+FILNDX(8)
*/
*/        UPDATE ROUTINE IRFLHT TO ALLOW REFLOOD TO WORK
*/        HEAT STRUCTURE FILE GETS CHANGED ON RESTART (FOR
*/        EXAMPLE BY DELETING OR ALTERING SOME STRUCTURES)
*/  NOTE..HEAT STRS ASSOCIATED WITH REFLOOD CANNOT BE ALTERED
*/        ON RESTART AS IRFLHT IS NOW PROGRAMMED
*/
*COMPILE IRFLHT
*I IRFLHT.330
C         UPDATE THE GEOMETRY POINTER IN IGLRFL BITS 44-60 IN CASE THE
C         HEAT STRUCTURE FILE CHANGED ON RESTART.
      J=(.NOT.MASK(43).AND.IH) + IHT
      J=(.NOT.MASK(43).AND.IHTPTR(J)) + IHT
      NCOLS=.NOT.MASK(43).AND.INXGOM(J)
      IGLRFL(I)=(MASK(43).AND.IGLRFL(I)).OR.NCOLS
*/
*/    END OF UPDATES SKI01
*/
/EOR
*COMPILE SEGDIR
```

Appendix B. A Base Case Input Deck for a Steady State Calculation

```
/JOB
L23TRA2,T4000.
/USER
ATTACH,STH2XT,RE364BX.
FILE,RSTPLT,SBF=NO.
DEFINE,RSTPLT=L23RR.
RFL,CM=370000,EC=200.
REDUCE(-)
RE364BX,,*PL=50000.
/EOR
= LOFT L2-3 POST TEST ANALYSIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*     L2-3 INITIAL CONDITIONS
*
*                       POWER = 36.0 MW
*                    PCS FLOW = 199.0 KG/S
*                       TCOLD = 560.7 K
*                PCS PRESSURE = 15.06 MPA
*                   PZR LEVEL = 1.19 M (45 IN)
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  BASE CASE CALCULATION
*    TWO CORE FLOW CHANNEL MODELLING IMPLEMENTATIONN
*      CORE : HOT CHANNEL(231), AVERAGE CHANNEL(230)
*             HOT FUEL RODS(12311), AVERAGE FUEL RODS(12301)
*             INTERMIDIATE FUEL RODS(12302)
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000100   NEW       STDY-ST
0000101   RUN
0000105   5.0       10.0
*     TIME STEP CONTROL CARDS                          * REQUIRED
*         END TIME  MIN DT    MAX DT    OPTN MNR  MJR  RST
0000201   900.0     1.0-6     1.0   3    1   100  450
$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   MINOR EDIT VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEADY STATE PLOT REQUESTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000301   P          250010000      * PRIMARY PRESSURE
0000302   P          530010000      * SECONDARY PRESSURE
0000303   TEMPF      250010000      *  TE-1UP-001
0000304   TEMPF      185010000      *  TE-PC-001
0000305   TEMPF      515010000      * SECONDARY COOLANT TEMPERATURE
0000306   MFLOWJ     540000000      * FT-P004-012  STEM FLOW
0000307   MFLOWJ     985000000      * LETDOWN SINK FLOW
0000308   MFLOWJ     995000000      * CHAGING SOURCE FLOW
0000309   CNTRLVAR   1              * LT-P004-042  S/G LEVEL
0000310   CNTRLVAR   2              * LT-P139-007  PZR LEVEL
0000311   MFLOWJ     566000000      * FT-P004-72-2  FEEDWATER FLOW
0000312   CNTRLVAR   910            * TCONTROL
0000313   MFLOWJ     100010000      * FT-P139-27-1  INT.L.HOT L. FLOW
0000314   P          420010000      * PZR PRESSURE PE-PC-005
0000315   VOIDG      500010000      * SEPARATOR VOID
0000316    TEMPF    100010000     *  TE-PC-002 ILHL
0000317    TEMPF    114010000     *  TE-SG-001 S/G INLET
0000318    TEMPF    116010000     *  TE-SG-002 S/G OUTLET
0000319    TEMPF    300010000     *  TE-BL-002  BLHL
0000320    TEMPF    335010000     *  TE-BL-001  BLCL
```

```
0000321    TEMPF   702010000     *  TE-2ST-002  PC STALK 2
0000322    TEMPF   215010000     *   TE-5LP-001   LOWER PLENUM
*----  ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CLADDING TEMPERATURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*0000321   HTTEMP    001100210          *
*0000322   HTTEMP    001100310          *
*0000323   HTTEMP    002100210          *
*0000324   HTTEMP    002100310          *
*0000325   HTTEMP    002100410          *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FUEL CENTERLINE TEMPERATURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*0000326   HTTEMP    002100201          *
*0000327   HTTEMP    002100301          *
*0000328   HTTEMP    002100401          *
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*     TRIPS
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     501-504  TEST SPECIFIC TRIPS
*---- ----1----   --1---- ----1---- ----1---  ----1---- ----1----
*0000501   TIME  0  GE  NULL  0  0.0  L   * LOCE L2-3 INITIATION
*0000502   TIME  0  GE  NULL  0    103  L * REACTOR SCRAM
*0000503   TIME  0  GE  NULL  0  14.0   N * HPIS INITIATION
*0000504   TIME  0  GE  NULL  0  29.0   N * LPIS INITIATION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*   REPLACE TRIPS RELEVANT TO STEADY CALCULATION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000501   TIME  0  GE  NULL  0  1.0+6  L
0000502   TIME  0  GE  NULL  0  1.0+6  L
0000503   TIME  0  GE  NULL  0  1.0+6  L
0000504   TIME  0  GE  NULL  0  1.0+6  N
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*    CALCULATIONALLY REQUIRED TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000530    CNTRLVAR 2 LE  NULL  0  0.381   L  * PZR LOW PRES. ALARM
0000555    P   016010000  LE   NULL   0   1.0+6  L  * REFLOOD INITIATION
*---- ----1-- - ----1---- ----1---- ----1---- --- 1---- ----1----
*   PUMP TMDP SPEED TABLE TRIP FOR STEADY STEADY CONTROLLER ONLY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000510   TIME  0  GE  NULL  0  -1.0  L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     LT  681  ELC CHECK VALVE          CARD 6000301
*     ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000577   MFLOWJ     600000000 GE   NULL       0          0.0       N
0000578   P          605010000 GT   P          185010000 0.         N
0000681   577        AND       578         N
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     LT  682  ACCUMULATOR VALVE        CARD 6100301
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000579   TIME       0         GE   NULL       0          1.0+9     L
0000682   579        AND       579         L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LT  685-686  STEAM VALVE          CARD 5400301
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* OPEN TRIP
0000589   P          530010000 GT   NULL       0          7.1125+6 N
0000590   P          530010000 LT   NULL       0          6.9747+6 N
0000670   685        OR        589         N
```

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0000671   -590      AND       -686      N
0000685   671       AND       670       N
* CLOSE TRIP
0000591   P         530010000 GT   NULL      0         6.5613+6 N
0000592   [illegible] 530010000 LT   NULL      0         6.4924+6 N
0000672   686       OR        592       N
0000673   -591      AND       672       N
0000674   -685      AND       699       N
0000686   673       AND       674       N
*---- ----1---- ----1---- ----1----
* LT  695  PCP 1 TRIP              CARD 1350301
0000695   510       OR        510       N
*---- ----1---- ----1---- ----1----
* LT  696  PCP 1 VELOCITY TABLE    CARD 1356100
0000696   510       AND       510       N
*---- ----1---- ----1---- ----1----
* LT  697  PCP 2 TRIP              CARD 1650301
0000697   510       OR        510       N
*---- ----1---- ----1---- ----1----
* LT  698  PCP 2 VELOCITY TABLE    CARD 1656100
0000698   510       AND       510       N
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  LT 699  MSCV CLOSE TRIP BY SCRAM
0000699    502      OR    502       L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   INTACT LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - INTACT LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1000000   "RVN ILHL  "        BRANCH
1000001   2         0
1000101   0.0       1.58878   0.102752  0.0       0.0       0.0
1000102   4.0E-5    0.0       00
1000200   0         15009300. 1410030.  2458100.  .00000000
1001101   252010000 100000000 0.0634    0.1       0.1       0002
1002101   100010000 105000000 0.0       0.1       0.1       0000
1001201   4.6275000 4.6275000 0.0
1002201   4.6243000 4.6243000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CONNECTION TEE REACTOR VESSEL SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1050000   "PZR T RVS "        BRANCH
1050001   1         0
1050101   0.0634444 1.0531192 0.0       0.0       0.0       0.0
1050102   4.0E-5    0.0       00
1050200   0         15007600. 1410030.  2459730.  .00000000
1051101   105010000 107000000 0.0       0.12      0.12      0000
1051201   4.8409000 4.8409000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CONNECTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1070000   "PZR T     "        BRANCH
1070001   1         0
1070101   0.0620253 0.2810215 0.0       0.0       0.0       0.0
1070102   4.0E-5    0.0       00
1070200   0         15006000. 1328625.  2459750.  .00000000
1071101   107010000 110000000 0.0       0.135     0.135     0000
1071201   4.98      4.98      0.0
```

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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CONNECTION TEE STEAM GENERATOR SIDE
*---- ----1---- -- -1---- ----1---- ----1---- ----1---- ----1----
1100000    "PZR T SGS "        BRANCH
1100001    1         0
1100101    0.0606063 0.9207292 0.0       0.0       0.0       0.0
1100102    4.0E-5    0.0       00
1100200    0         15005300. 1410030.  2459800.  .00000000
1101101    110010000 112000000 0.0       0.15      0.15      0000
1101201    5.1146000 5.1146000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- -- -1----
1120000    "HOT LEG PP"        PIPE
1120001    2
1120101    0.0       2
1120201    0.0       1
1120301    1.38893   1
1120302    0.707687  2
1120401    0.0796973 1
1120402    0.0579614 2
1120501    0.0       2
1120601    0.0       1
1120602    90.0      2
1120701    0.0       1
1120702    0.246447  2
1120801    4.0E-5    0.0       2
1120901    0.20      0.20      1
1121001    00        2
1121101    0000      1
1121201    0         15002900. 1410030.  2459870.  .00000000 0.0       01
1121202    0         15005500. 1410030.  2459770.  .00000000 0.0       02
1121300    0
1121301    5.1146000 5.1146000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG INLET PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1140000    "SG IN PLNM"        BRANCH
1140001    2         0
1140101    0.0       0.629795  0.33532   0.0       90.0      0.512756
1140102    4.E-5     0.0102    00
1140200    0         14987200. 1410020.  2460000.  .00000000
1141101    112010000 114000000 0.0512    0.0       0.0       0100
1142101    114010000 115000000 0.0       0.0       0.0       0100
1141201    3.5832000 3.5832000 0.0
1142201    1.9414000 1.9414000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG U-TUBES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1150000    "SG TUBES  "        PIPE
1150001    8
1150101    0.0       8
1150201    0.151171  7
1150301    0.902     1
1150302    0.6096    3
1150303    0.462908  5
1150304    0.6096    7
1150305    0.902     8
1150401    0.136356  1
1150402    0.0921538 3
1150403    0.0699783 5
```

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1150404   0.0921538 7
1150405   0.136356  8
1150501   0.0       8
1150601   90.0      4
1150602   -90.0     8
1150701   0.902     1
1150702   0.6096    3
1150703   0.299572  4
1150704   -0.299572 5
1150705   -0.6096   7
1150706   -0.902    8
1150801   1.27-7    0.01022   8
1150901   0.0       0.0       7
1151001   00        8
1151101   0000      7
1151201   0         14979600. 1367230.  2460010.0 .00000000 0.0       01
1151202   0         14972800. 1333400.  2460020.0 .00000000 0.0       02
1151203   0         14967300. 1306120.  2460030.0 .00000000 0.0       03
1151204   0         14962900. 1288520.  2460040.0 .00000000 0.0       04
1151205   0         14962000. 1273520.  2460050.0 .00000000 0.0       05
1151206   0         14964300. 1257470.  2460040.0 .00000000 0.0       06
1151207   0         14967600. 1244800.  2460030.0 .00000000 0.0       07
1151208   0         14971800. 1233820.  2460020.0 .00000000 0.0       08
1151300   0
1151301   1.8921000 1.8921000 0.0       01
1151302   1.8565000 1.8565000 0.0       02
1151303   1.8299000 1.8299000 0.0       03
1151304   1.8134000 1.8134000 0.0       04
1151305   1.7997000 1.7997000 0.0       05
1151306   1.7856000 1.7856000 0.0       06
1151307   1.7746000 1.7746000 0.0       07
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG OUTLET PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1160000   "SG OUT PLN"        BRANCH
1160001   2         0
1160101   0.0       0.629795  0.33532   0.0       -90.0     -0.512756
1160102   4.E-5     0.0102    00
1160200   0         14976400. 1233810.  2460100.  .00000000
1161101   115010000 116000000 0.0       0.0       0.0       0100
1162101   116010000 118000000 0.0512    0.0       0.0       0100
1161201   1.7656000 1.7656000 0.0
1162201   3.2740000 3.2740000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SUCTION PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1180000   "PMP SUC PP"        PIPE
1180001   3
1180101   0.0       3
1180201   0.0       2
1180301   0.546638  1
1180302   0.688596  2
1180303   0.558577  3
1180401   0.0445625 1
1180402   0.0445137 2
1180403   0.0354278 3
1180501   0.0       3
1180601   -90.0     3
1180701   -0.498052 1
1180702   -0.688596 2
1180703   -0.355604 3
```

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1180801   4.E-5     0.0       3
1180901   0.083     0.083     1
1180902   0.104     0.104     2
1181001   00        3
1181101   0000      2
1181201   0         14965800. 1233810.  2460030.0 .00000000 0.0       01
1181202   0         14967700. 1233810.  2460033.0 .00000000 0.0       02
1181203   0         14970500. 1233810.  2460035.0 .00000000 0.0       03
1181300   0
1181301   4.1288000 4.1288000 0.0       01
1181302   4.2081000 4.2081000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SUCTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1200000   "PMP SCT T "        BRANCH
1200001   3         0
1200101   0.0       0.759614  0.0487901 0.0       0.0       0.0
1200102   4.0E-5    0.0       00
1200200   0         14974000. 1233810.  2460020.  .00000000
1201101   118010000 120000000 0.063427  0.0       0.0       0000
1202101   120010000 125000000 0.063427  1.075     1.25      0000
1203101   120010000 155000000 0.063427  1.075     1.25      0000
1201201   4.2080000 4.2080000 0.0
1202201   1.9967000 1.9967000 0.0
1203201   2.2113000 2.2113000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP1 SUCTION TEE OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1250000   "PMP1 SCT T"        BRANCH
1250001   1         0
1250101   0.0       1.00308   0.0640548 0.0       90.0      0.520704
1250102   4.0E-5    0.0       00
1250200   0         14974500. 1233810.  2460022.  .00000000
1251101   125010000 130000000 0.0       0.13      0.13      0000
1251201   3.2631000 3.2631000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 1 INLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1300000   "PMP1 INLET"        SNGLVOL
1300101   0.0       0.457201  0.0177444 0.0       90.0      0.457201
1300102   4.0E-5    0.0       00
1300200   0         14968300. 1233810.  2460030.  .00000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1350000   "PCPUMP1   "        PUMP
1350101   0.0       0.4572    0.0991    0.0       90.0      0.317900
1350102   0
1350108   130010000 0.0       0.017     0.017     0000
1350109   140000000 0.0       0.05      0.05      0000
1350200   0         15010900. 1233820.  2459500.  .00000000
1350201   0         3.2631000 3.2631000 0.0
1350202   0         3.4591000 3.4591000 0.0
1350301     0    0    0        -1        -1        0         0
1350302   369.00000 .35501355 .31550000 96.000000 500.60000 1.4310000
1350303   613.60000 .00000000 207.43300 .04440000 19.598700 .00000000
1350310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 1 OUTLET PUMP SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1400000   "PMP1 OUT P"        SNGLVOL
```

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1400101   0.0       0.502185  0.0183849 0.0       0.0       0.0
1400102   4.0E-5    0.0       00
1400200   0         15046700. 1233820.  2459000.  .00000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP1 OUTLET PIPE TEE SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1450000   "PMP1 OUT T"        BRANCH
1450001   2         0
1450101   0.0       1.40843   0.0633861 0.0       0.0       0.0
1450102   4.0E-5    0.0       00
1450200   0         15048400. 1233820.  2458800.  .00000000
1451101   140010000 145000000 0.0       0.0       0.0       0000
1452101   145010000 150000000 0.0       0.57456   0.050347  0000
1451201   3.4589000 3.4589000 0.0
1452201   2.8137000 2.8137000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP OUTLET TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1500000   "PMP OUT T "        BRANCH
1500001   1         0
1500101   0.0       0.496511  0.0316011 0.0       0.0       0.0
1500102   4.0E-5    0.0       00
1500200   0         15042300. 1233820.  2458700.  .00000000
1501101   150010000 175000000 0.063427  0.0       0.0       0000
1501201   4.2075000 4.2075000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 SUCTION TEE OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1550000   "PMP2 SCT T"        BRANCH
1550001   1         0
1550101   0.0       1.00308   0.0640548 0.0       90.0      0.520704
1550102   4.0E-5    0.0       00
1550200   0         14973600. 1233810.  2460020.  .00000000
1551101   155010000 160000000 0.0       0.13      0.13      0000
1551201   3.6137000 3.6137000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 INLET PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1600000   "PMP2 INLET"        SNGLVOL
1600101   0.0       0.457201  0.0177444 0.0       90.0      0.457201
1600102   4.0E-5    0.0       00
1600200   0         14966800. 1233810.  2460030.  .00000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1650000   "PCPUMP2   "        PUMP
1650101   0.0       0.514     0.0991    0.0       90.0      0.317900
1650102   0
1650108   160010000 0.0       0.017     0.017     0000
1650109   170000000 0.0       0.1       0.1       0000
1650200   0         15010900. 1233820.  2459500.  .00000000
1650201   0         3.6138000 3.6138000 0.0
1650202   0         3.7364000 3.7364000 0.0
1650301   135  135  135        -1        -1       0         0
1650302   369.00000 .35501355 .31550000 96.000000 500.60000 1.4310000
1650303   613.60000 .00000000 207.43300 .04440000 19.598700 .00000000
1650310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1700000   "PMP2 OUT T"        BRANCH
```

```
1700001   1         0
1700101   0.0       0.514071  0.0192958 0.0       0.0       0.0
1700102   4.0E-5    0.0       00
1700200   0         15046300. 1233820.  2459000.  ,00000000
1701101   170010000 150000000 0.036611  0.3847    0.6316    0000
1701201   3.8305000 3.8305000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INTACT LOOP COLD LEG PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1750000   "ILCL PIPE "        PIPE
1750001   2
1750101   0.0       2
1750201   0.0       1
1750301   0.558577  1
1750302   0.613244  2
1750401   0.035428  1
1750402   0.038895  2
1750501   0.0       2
1750601   0.0       2
1750701   0.0       2
1750801   4.0E-5    0.0       2
1750901   0.0       0.0       1
1751001   00        2
1751101   0000      1
1751201   0         15043000. 1233820.  2459500.0 .00000000 0.0       01
1751202   0         15042800. 1233820.  2459500.0 .00000000 0.0       02
1751300   0
1751301   4.2076000 4.2076000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CONNECTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1800000   "ECC T    "         BRANCH
1800001   1         0
1800101   0.0       1.15189   0.0730598 0.0       0.0       0.0
1800102   4.0E-5    0.0       00
1800200   0         15042500. 1233830.  2459500.  .00000000
1801101   175010000 180000000 0.0       0.0       0.0       0000
1801201   4.2076000 4.2076000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - INTACT LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1850000   "RVN ILCL  "        BRANCH
1850001   2         0
1850101   0.0       1.00965   0.0644920 0.0       0.0       0.0
1850102   4.0E-5    0.0       00
1850200   0         15041900. 1233830.  2459550.  .00000000
1851101   185010000 730000000 0.0634    2.8       2.8       0001
1852101   180010000 185000000 0.0       0.0       0.0       0000
1851201   4.2093000 4.2093000 0.0
1852201   4.2076000 4.2076000 0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   REACTOR VESSEL
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS UPPER VOLUME INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7000000   "INANUPRINT"        ANNULUS
7000001   1
7000101   0.1308530 1
7000301   0.1876129 1
```

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7000401   0.0        1
7000501   0.0        1
7000601   90.0       1
7000801   3.81-6     0.172     1
7001001   00         1
7001201   0          15028400. 1233830.  2459250.  .00000000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - UPPER TO LOWER INLET ANNULUS INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7010000   "INANMUINT "          SNGLJUN
7010101   730000000 700000000 0.129467  0.0000     0.0000     0100
7010201   0          .34062000 .34062000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS MIDDLE VOLUME INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7300000   "INANMIDINT"          ANNULUS
7300001   1
7300101   0.1308530 1
7300301   0.2851823 1
7300401   0.0        1
7300501   0.0        1
7300601   -90.0      1
7300801   3.81-6     0.172     1
7301001   00         1
7301201   0          15028400. 1233830.  2459250.  0.0       0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - MIDDLE TO LOWER INLET ANNULUS INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7310000   "INANMLINT "          SNGLJUN
7310101   730010000 702000000 0.0709408 0.0        0.0        0100
7310201   0          1.5959    1.5959    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS LOWER VOLUME INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7020000   "INANLWRINT"          ANNULUS
7020001   1
7020101   0.1464354 1
7020301   0.2525361 1
7020401   0.0        1
7020501   0.0        1
7020601   -90.0      1
7020801   3.81-6     0.172     1
7021001   00         1
7021201   0          15030600. 1233830.  2459300.  .00000000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - INLET ANNULUS TO DOWNCOMER INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7030000   "INAN2DCINT"          SNGLJUN
7030101   702010000 704000000 0.0709408 0.0000     0.0000     0100
7030201   0          1.5959000 1.5959000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER UPPER VOLUME INTACT SIDE
*---- ----1- -- ----1---- ----1---- ----1---- ----1---- ----1----
7040000   "DNCRUPRINT"          ANNULUS
7040001   1
7040101   0.0        1
7040301   1.5200561 1
7040401   0.1581866 1
7040501   0.0        1
7040601   -90.0      1
7040801   3.81-6     0.102     1
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7041001   00          1
7041201   0           15036100. 1233810.  2459350.  .00000000 0.0        01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - UPPER TO MIDDLE DOWNCOMER INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7050000   "UPR2MIDINT"          SNGLJUN
7050101   704010000 706000000 0.0709408 0.0000    0.0000    0100
7050201   0           1.5106000 1.5106000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER MIDDLE VOLUME INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7060000   "DNCRMIDINT"          ANNULUS
7060001   1
7060101   0.0         1
7060301   1.2616333 1
7060401   0.1217000 1
7060501   0.0         1
7060601   -90.0       1
7060801   3.81-6      0.102       1
7061001   00          1
7061201   0           15045800. 1233800.  2459500.  .00000000 0.0        01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - MIDDLE TO LOWER DOWNCOMER INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7070000   "MID2LWRINT"          SNGLJUN
7070101   706010000 708000000 0.0709408 0.0000    0.0000    0100
7070201   0           1.4821000 1.4821000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER LOWER VOLUME INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7080000   "DNCRLWRINT"          ANNULUS
7080001   1
7080101   0.0         1
7080301   1.0792591 1
7080401   0.0986806 1
7080501   0.0         1
7080601   -90.0       1
7080801   3.81-6      0.102       1
7081001   00          1
7081201   0           15054000. 1233790.  2458600.  .00000000 0.0        01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - LOWER DOWNCOMER TO LOWER PLENUM INTACT SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7090000   "LRDC2LPINT"          SNGLJUN
7090101   708010000 215000000 0.0709408 0.0000    0.0000    0100
7090201   0           1.4104000 1.4104000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS UPPER VOLUME BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7100000   "INANUPRBKN"          ANNULUS
7100001   1
7100101   0.1308530 1
7100301   0.1876129 1
7100401   0.0         1
7100501   0.0         1
7100601   90.0        1
7100801   3.81-6      0.172       1
7101001   00          1
7101201   0           15027200. 1233830.  2459250.  .00000000 0.0        01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - MIDDLE TO UPPER INLET ANNULUS BROKEN SIDE
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7110000   "INANMUBKN "        SNGLJUN
7110101   740000000 710000000 0.129467  0.0000    0.0000    0100
7110201   0         -.2873200 -.2873200 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS MIDDLE VOLUME BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7400000   "INANMIDBKN"        ANNULUS
7400001   1
7400101   0.1308530 1
7400301   0.2851823 1
7400401   0.0       1
7400501   0.0       1
7400601   -90.0     1
7400801   3.81-6    0.172     1
7401001   00        1
7401201   0         15028400. 1233830.  2459250   0.0       0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - MIDDLE TO LOWER INLET ANNULUS BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7410000   "INANMLBKN "        SNGLJUN
7410101   740010000 712000000 0.0709408 0.0       0.0       0100
7410201   0         .86411    .86411    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS LOWER VOLUME BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7120000   "INANLWRBKN"        ANNULUS
7120001   1
7120101   0.1464[illegible]54 1
7120301   0.252[illegible]1 1
7120401   0.0       1
7120501   0.0       1
7120601   -90.0     1
7120801   3.81-6    0.172     1
7121001   00        1
7121201   0         15029700. 1233820.  2459200.  .00000000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - INLET ANNULUS TO DOWNCOMER BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7130000   "INAN[illegible]CBKN"        SNGLJUN
7130101   712010000 714000000 0.0709408 0.0000    0.0000    0100
7130201   0         .86411000 .86411000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER UPPER VOLUME BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7140000   "DNCRUPRBKN"        ANNULUS
7140001   1
7140101   0.0       1
7140301   1.5200561 1
7140401   0.1581866 1
7140501   0.0       1
7140601   -90.0     1
7140801   3.81-6    0.102     1
7141001   00        1
7141201   0         15036100. 1233800.  2459350.  .00000000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - UPPER TO MIDDLE DOWNCOMER BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7150000   "UPR2MIDBKN"        SNGLJUN
7150101   714010000 716000000 0.0709408 0.0000    0.0000    0100
7150201   0         1.1432000 1.1432000 0.0
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER MIDDLE VOLUME BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7160000   "DNCRMIDBKN"         ANNULUS
7160001   1
7160101   0.0       1
7160301   1.2616333 1
7160401   0.1217000 1
7160501   0.0       1
7160601   -90.0     1
7160801   3.81-6    0 [illegible]    1
7161001   00
7161201   0         15045800. 1233780.  2459500.  .00000000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - MIDDLE TO LOWER DOWNCOMER BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7170000   "MID2LWRBKN"         SNGLJUN
7170101   716010000 718000000 0.0709408 0.0000    0.0000    0100
7170201   0         1.3175000 1.3175000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER LOWER VOLUME BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7180000   "DNCRLWRBKN"         ANNULUS
7180001   1
7180101   0.0       1
7180301   1.0792591 1
7180401   0.0986806 1
7180501   0.0       1
7180601   -90.0     1
7180801   3.81-6    0.102     1
7181001   00        1
7181201   0         15054000. 1233760.  2458600.  .00000000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - LOWER DOWNCOMER TO LOWER PLENUM BROKEN SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7190000   "LRDC2LPBKN"         SNGLJUN
7190101   718010000 215000000 0.0709408 0.0000    0.0000    0100
7190201   0         1.3892000 1.3892000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CROSSFLOW JUNCTION - UPPER INLET ANNULUS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7200000   "UPRINANNXF"         SNGLJUN
7200101   700000000 710000000 0.0296780 98.000    18.000    0003
7200201   0         .28732000 .28732000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CROSSFLOW JUNCTION - LOWER INLET ANNULUS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7220000   "LWRINANNXF"         SNGLJUN
7220101   702000000 712000000 0.0428706 98.000    18.000    0003
7220201   0         .38395000 .38395000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CROSSFLOW JUNCTION - UPPER DOWNCOMER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7240000   "UPRDNCMRXF"         SNGLJUN
7240101   704000000 714000000 0.03      98.0      18.0      0003
7240201   0         .19557000 .19557000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CROSSFLOW JUNCTION - MIDDLE DOWNCOMER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
7260000   "MIDDNCMRXF"         SNGLJUN
7260101   706000000 716000000 0.03      98.0      18.0      0003
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7260201  0         .10572000 .10572000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CROSSFLOW JUNCTION - LOWER DOWNCOMER
*---- ----1---- -- -1---- ----1---- ----1---- ----1---- ----1----
7280000  "LWRDNCMRXF"        SNGLJUN
7280101  708000000 718000000 0.03      98.0      18.0      0003
7280201  0         .07171910 .07171910 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PLENUM TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2150000  "LWR PL TOP"        BRANCH
2150001  2         0
2150101  0.0       0.3533183 0.2592277 0.0       -90.0     -0.3533183
2150102  3.81-6    0.0       00
2150200  0         15059400. 1233780.  2458550.  .00000000
2151101  215010000 220000000 0.0       0.005     0.005     0000
2152101  215000000 225000000 0.1499    1.5       1.5       0000
2151201  .571898-5 .571894-5 0.0
2152201  1.7076000 1.7076000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PLENUM BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2200000  "LWR PL BOT"        SNGLVOL
2200101  0.0       0.3741720 0.29656   0.0       -90.0     -0.3741720
2200102  4.0E-5    0.0       00
2200200  0         15062100. 1233780.  2458500.  .00000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER CORE SUPPORT STRUCTURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2250000  "L CORE SUP"        BRANCH
*2250001  2         0
2250001  3         0
2250101  0.2832456 0.5709989 0.0       0.0       90.0      0.5709989
2250102  3.81-6    0.095     00
2250200  0         14970400.  1230690.  2460590.  0.0
2251101  225010000  011000000  0.09790318  1.5  1.5  00100
2252101  225010000  021000000  0.01549682  1.5  1.5  00100
2253101  225010000  235000000  0.0        12.0 12.0  00100
2251201  2.0569000  2.0569000   0.0
2252201  2.0569000  2.0569000   0.0
2253201  0.0602599  0.15501     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  PERIPHERAL CORE VOLUME 1
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0110000  "PERI#1"   BRANCH
0110001  2         0
0110101  0.1582181  0.279404  0.0  0.0  90.0  0.279404
0110102  1.27-7    0.0       00
0110200  0         14965200.  1241610.  2460710.  0.0
0111101  011010000 012000000  0.        0.0  0.0  00100
0112101  011000000 021000000  0.239275  4.69  4.69  00003
0111201  1.3752    1.3752     0.0
0112201  0.0       0.0        0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  PERIPHERAL CORE VOLUME 2
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0120000  "PERI#1"   BRANCH
0120001  2         0
0120101  0.1462431  0.279404  0.0  0.0  90.0  0.279404
0120102  1.27-7    0.0       00
0120200  0         14965200.  1241610.  2460710.  0.0
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0121101   012010000 013000000  0.122946  0.66  0.66  00100
0122101   012000000 022000000  0.239275  4.69  4.69  00003
0121201   1.3752    1.3752     0.0
0122201   0.0       0.0        0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  PERIPHERAL CORE VOLUME 3
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0130000   "PERI#1"    BRANCH
0130001   2         0
0130101   0.1479421  0.279404  0.0   0.0   90.0   0.279404
0130102   1.27-7    0.0        00
0130200   0         14965200.  1241610.  2460710.  0.0
0131101   013010000 014000000  0.        0.0   0.0   00100
0132101   013000000 023000000  0.239275  4.69  4.69  00003
0131201   1.3752    1.3752     0.0
0132201   0.0       0.0        0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  PERIPHERAL CORE VOLUME 4
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0140000   "PERI#1"    BRANCH
0140001   2         0
0140101   0.1452617  0.279404  0.0   0.0   90.0   0.279404
0140102   1.27-7    0.0        00
0140200   0         14965200.  1241610.  2460710.  0.0
0141101   014010000 015000000  0.122946  0.66  0.66  00100
0142101   014000000 024000000  0.239275  4.69  4.69  00003
0141201   1.3752    1.3752     0.0
0142201   0.0       0.0        0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  PERIPHERAL CORE VOLUME 5
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0150000   "PERI#1"    BRANCH
0150001   2         0
0150101   0.1464111  0.279404  0.0   0.0   90.0   0.279404
0150102   1.27-7    0.0        00
0150200   0         14965200.  1241610.  2460710.  0.0
0151101   015010000 016000000  0.        0.0   0.0   00100
0152101   015000000 025000000  0.239275  4.69  4.69  00003
0151201   1.3752    1.3752     0.0
0152201   0.0       0.0        0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  PERIPHERAL CORE VOLUME 6
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0160000   "PERI#1"    BRANCH
0160001   1         0
0160101   0.1510117  0.279404  0.0   0.0   90.0   0.279404
0160102   1.27-7    0.0        00
0160200   0         14965200.  1241610.  2460710.  0.0
0161101   016000000 026000000  0.239275  4.69  4.69  00003
0161201   0.0       0.0        0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*  CENTRAL CORE VOLUME 1
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0210000   "CENT#1"    BRANCH
0210001    1        0
0210101    0.0250439  0.279404   0.0   0.0   90.0  0.279404
0210102    1.27-7    0.0   00
0210200    0         14965200.   1241610.  2460710.  0.0
0211101    021010000  022000000 0.0       0.0      0.0   00100
0211201    1.3752    1.3752      0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
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*   CENTRAL CORE VOLUME 1
*---- ----1---- ----1---- - --1---- ----1---- ----1----
0220000    "CENT#1"     BRANCH
0220001     1        0
0220101     0.0250439  0.279404   0.0   0.0   90.0  0.279404
0220102     1.27-7     0.0    00
0220200     0          14965200.   1241610.  2460710.  0.0
0221101     022010000  023000000 0.021054 0.66    0.66  00100
0221201     1.3752     1.3752     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*   CENTRAL CORE VOLUME 3
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0230000    "CENT#1"     BRANCH
0230001     1        0
0230101     0.0262243  0.279404   0.0   0.0   90.0  0.279404
0230102     1.27-7     0.0    00
0230200     0          14965200.   1241610.  2460710.  0.0
0231101     023010000  024000000 0.0      0.0     0.0   00100
0231201     1.3752     1.3752     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*   CENTRAL CORE VOLUME 4
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0240000    "CENT#1"     BRANCH
0240001     1        0
0240101     0.0250439  0.279404   0.0   0.0   90.0  0.279404
0240102     1.27-7     0.0    00
0240200     0          14965200.   1241610.  2460710.  0.0
0241101     024010000  025000000 0.021054 0.66    0.66  00100
0241201     1.3752     1.3752     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---
*   CENTRAL CORE VOLUME 5
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0250000    "CENT#1"     BRANCH
0250001     1        0
0250101     0.0250439  0.279404   0.0   0.0   90.0  0.279404
0250102     1.27-7     0.0    00
0250200     0          14965200.   1241610.  2460710.  0.0
0251101     025010000  026000000 0.0      0.0     0.0   00100
0251201     1.3752     1.3752     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*   CENTRAL CORE VOLUME 6
*---- ----1---- ----1---- ----1---- ----1---- ----1----
0260000    "CENT#1"     BRANCH
0260001     1        0
0260101     0.0262243  0.279404   0.0   0.0   90.0  0.279404
0260102     1.27-7     0.0    00
0260200     0          14965200.   1241610.  2460710.  0.0
0261101     026010000  240000000 0.021054 1.5     1.5   00100
0261201     1.3752     1.3752     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE BYPASS VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2350000    "CORE BYPSS"        PIPE
2350001    3
2350101    0.0129428 3
2350201    0.0       2
2350301    0.5588068 3
2350401    0.0       3
2350501    0.0       3
2350601    90.0      3
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2350801   3.81-6    0.003     3
2350901   0.0       0.0       2
2351001   00        3
2351101   0000      2
2351201   0         15048000. 1233790.  2459550.0 .00000000 0.0       01
2351202   0         15042400. 1233790.  2459550.0 .00000000 0.0       02
2351203   0         15036500. 1233790.  2459550.0 .00000000 0.0       03
2351300   0
2351301   .71258000 .71258000 0.0       01
2351302   .73579000 .73579000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER END BOXES AND SUPPORT STRUCTURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2400000   "UPR END BX"        BRANCH
2400001   2         0
2400101   0.2423341 0.5867979 0.0       0.0       90.0      0.5867979
2400102   3.81-6    0.145     00
2400200   0         14946300. 1422480.  2461120.  1.37821-3
2401101   016010000 240000000 0.122945736 1.5     1.5       00100
2402101   235010000 240000000 0.0       12.       12.       00100
2401201   .67053000 .87895000 0.0
2402201   .67053000 .87895000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER CORE SUPPORT STRUCTURE - CROSS FLOW REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2450000   "UPR CR SUP"        BRANCH
2450001   2         0
2450101   0.0       0.4933248 0.1280806 0.0     90.0      0.4933248
2450102   3.81-6    0.145     00
2450200   0         15025400. 1417510.  2459600.  .00000000
2451101   240010000 245000000 0.0       0.0       0.0       0000
2452101   245010000 251000000 0.0       0.0       0.0       0000
2451201   1.1669000 1.1669000 0.0
2452201   .439867-4 .439867-4 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER FLOW SKIRT REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2500000   "U FLW SKRT"        BRANCH
2500001   1         0
2500101   0.1547532 0.7850547 0.0       0.0       90.0      0.7850547
2500102   3.81-6    0.131     00
2500200   0         15020100. 1410020.  2459600.  .00000000
2501101   245010000 250000000 0.0       0.0       0.0       0000
2501201   1.8273000 1.8273000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DEAD END OF FUEL MODULES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2510000   "DE FL MODS"        SNGLVOL
2510101   0.0       0.7844123 0.1154214 0.0     90.0      0.7844123
2510102   3.81-6    0.214     00
2510200   0         15021500. 1424270.  2459600.  .00000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER HEAD
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2520000   "UPR HEAD  "        BRANCH
2520001   2         0
2520101   0.2622585 0.2869580 0.0       0.0       90.0      0.2869580
2520102   3.81-6    0.0       00
2520200   0         15019000. 1410020.  2459550.  .00000000
2521101   250010000 252000000 0.0       0.006     0.006     0000
2522101   730000000 252000000 0.0       0.90+4    0.90+4    0003
```

```
2521201   -.1334300 .1334300  0.0
2522201   .05329530 .05329530 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2550000   "UPR PL BOT"        BRANCH
2550001   2         0
2550101   0.2622585 0.6312304 0.0       0.0       90.0      0.6312304
2550102   3.81-6    0.0       00
2550200   0         15017200. 1410020.  2459500.  .00000000
2551101   250010000 255000000 0.0       0.006     0.006     0000
2552101   255010000 260000000 0.0       0.03      0.03      0000
2551201   -.0450137 -.0450137 0.0
2552201   .186978-4 .186979-4 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2600000   "UPR PL TOP"        SNGLVOL
2600101   0.0       0.7747094 0.1914909 0.0       90.0      0.7747094
2600102   3.81-6    0.0       00
2600200   0         15013400. 1410020.  2459500.  .00000000
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*    BROKEN LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3000000   "RVN BLHL  "        BRANCH
3000001   2         0
3000101   0.0       0.876303  0.0575418 0.0       0.0       0.0
3000102   4.0E-5    0.0       00
3000200   0         15018100. 1231960.  2459500.  .00000000
3001101   252010000 300000000 0.067014  0.7385868 1.2309481 0002
3002101   300010000 305000000 0.063426  0.1005    0.1005    0000
3001201   -.0578446 -.0578446 0.0
3002201   -.0611292 -.0611292 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3050000   "HLP-RABS T"        BRANCH
3050001   1         0
3050101   0.0       0.698336  0.0442927 0.0       0.0       0.0
3050102   4.0E-5    0.0       00
3050200   0         15018100. 1231980.  2459500.  .00000000
3051101   305010000 310000000 0.063426  0.1005    0.1005    0000
3051201   -.0611386 -.0611386 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG CONTRACTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3100000   "BLHL CONTR"        BRANCH
3100001   2         0
3100101   0.0       1.50013   0.0678467 0.0       0.0       0.0
3100102   4.0E-5    0.0       00
3100200   0         15018100. 1231950.  2459500.  .00000000
3101101   380010000 310000000 0.0388    0.84      0.84      0000
3102101   310010000 315000000 8.3647-3  0.553     1.09056   0000
3101201   .10016000 .10016000 0.0
3102201   .922485-3 .922485-3 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR AND PUMP SIMULATIOR
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3150000  "SG+PMP SIM"       PIPE
3150001  8
3150101  0.0       8
3150201  8.3647-3  1
3150202  1.12-2    2
3150203  0.105626  3
3150204  1.12-2    4
3150205  8.3647-3  7
3150301  0.919969  1
3150302  1.987956  2
3150303  0.849744  4
3150304  1.987956  5
3150305  1.371350  6
3150306  1.365029  7
3150307  1.674812  8
3150401  7.75291-3 1
3150402  0.1721108 2
3150403  8.97552-2 4
3150404  0.1721108 5
3150405  1.82303-2 6
3150406  5.46687-2 7
3150407  1.82489-2 8
3150601  90.0      3
3150602  -90.0     7
3150603  90.0      8
3150701  0.679201  1
3150702  1.987956  2
3150703  0.457202  3
3150704  0.457202  4
3150705  -1.987956 5
3150707  -1.371350 6
3150708  -0.520701 7
3150709  1.212851  8
3150801  4.0E-5    0.0       8
3150901  0.93596   0.93596   1
3150902  2.0       2.0       2
3150903  0.5       0.5       3
3150904  2.0       2.0       4
3150905  0.23025   0.23025   5
3150906  2.534     2.534     6
3150907  5.069     5.069     7
3151001  00        8
3151101  0000      7
3151201  0         15015600. 1243880.  2459924.  .00000000 0.0       01
3151202  0         15005700. 1237630.  2459924.  .00000000 0.0       02
3151203  0         14996600. 1237670.  2459924.  .00000000 0.0       03
3151204  0         14996600. 1237680.  2459924.  .00000000 0.0       04
3151205  0         15005600. 1237680.  2459924.  .00000000 0.0       05
3151206  0         15018100. 1237680.  2459924.  .00000000 0.0       06
3151207  0         15025100. 1237680.  2459924.  .00000000 0.0       07
3151208  0         15022500. 1237680.  2459924.  .00000000 0.0       08
3151300  0
3151301  .910345-3 .910345-3 0.0       01
3151302  .487913-3 .487915-3 0.0       02
3151303  .411825-4 .411825-4 0.0       03
3151304  .289111-3 .289109-3 0.0       04
3151305  .133199-3 .133198-3 0.0       05
3151306  .106449-3 .106449-3 0.0       06
3151307  .266103-4 .266103-4 0.0       07
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

```
* HOT LEG BREAK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3170000   "HL BREAK  "         VALVE
3170101   315010000 800000000 8.3647-3  0.94883   0.94883   0100
3170102   0.93      0.84
3170201   0         .00000000 .00000000 0.0
3170300   TRPVLV
3170301   501
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3350000   "RVN BLCL  "         BRANCH
3350001   2         0
3350101   0.0       0.749305  0.047979  0.0       0.0       0.0
3350102   4.0E-5    0.0       00
3350200   0         15028400. 1233660.  2459250.  .00000000
3351101   740000000 335000000 0.064130  1.455594  0.812933  0002
3352101   335010000 340000000 0.063426  0.1005    0.1005    0000
3351201   .06071680 .06071680 0.0
3352201   .06138070 .06138070 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3400000   "CLP-RABS T"         BRANCH
3400001   1         0
3400101   0.0       0.698336  0.0443927 0.0       0.0       0.0
3400102   4.0E-5    0.0       00
3400200   0         15028400. 1233140.  2459250.  .00000000
3401101   340010000 342000000 0.063426  0.1005    0.1005    0000
3401201   .06137130 .06137130 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG RABS TO DTT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3420000   "BLCL 2DTT "         BRANCH
3420001   1         0
3420101   0.0       0.5715069 0.0362484 0.0       0.0       0.0
3420102   4.0E-5    0.0       00
3420200   0         15028400. 1232540.  2459250.  .00000000
3421101   342000000 370000000 0.0388    0.84      0.84      0000
3421201   .10030000 .10030000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG DTT TO BREAK PLANE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3440000   "BLCL 2BRK "         BRANCH
3440001   1         0
3440101   0.0       0.9286231 0.0310679 0.0       0.0       0.0
3440102   4.0E-5    0.0       00
3440200   0         15028400. 1232300.  2459250.  .00000000
3441101   342010000 344000000 0.0540157 6.545     14.05     0000
3441201   .759199-5 .759199-5 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG BREAK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3470000   "CL BREAK  "         VALVE
3470101   344010000 805000000 8.3647-3  0.415     0.415     0100
3470102   0.93      0.84
3470201   0         .00000000 .00000000 0.0
3470300   TRPVLV
3470301   501
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - COLD LEG SIDE
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3700000   "RABS C L  "       PIPE
3700001   3
3700101   0.0388     2
3700102   0.0776     3
3700201   0.0388     2
3700301   0.0        3
3700401   0.0279     1
3700402   0.070      2
3700403   0.1165     3
3700601   90.0       1
3700602   0.0        3
3700701   0.64       1
3700702   0.0        3
3700801   4.0-5      0.0       3
3700901   0.28       0.28      1
3700902   0.84       0.84      2
3701001   00         3
3701101   0000       2
3701201   0          15026000. 1232040.  2459300.  .00000000 0.0       01
3701202   0          15023600. 1231420.  2459300.  .00000000 0.0       02
3701203   0          15023600. 1231430.  2459300.  .00000000 0.0       03
3701300   0
3701301   .10029000 .10029000 0.0       01
3701302   .10027000 .10027000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3750000   "RABS VALVS"       SNGLJUN
3750101   370010000 380000000 0.0       0.90+4    0.90+4    0000
3750201   0          .05011390 .05011390 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - HOT LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3800000   "RABS H L  "       PIPE
3800001   3
3800101   0.0776     1
3800102   0.0388     3
3800201   0.0388     2
3800301   0.0        3
3800401   0.0915     1
3800402   0.048      2
3800403   0.0489     3
3800601   0.0        1
3800602   -90.0      2
3800603   0.0        3
3800701   0.0        1
3800702   -0.64      2
3800703   0.0        3
3800801   4.0-5      0.0       3
3800901   0.84       0.84      1
3800902   0.28       0.28      2
3801001   00         3
3801101   0000       2
3801201   0          15013400. 1231620.  2459400.  .00000000 0.0       01
3801202   0          15015700. 1231730.  2459400.  .00000000 0.0       02
3801203   0          15018100. 1231820.  2459400.  .00000000 0.0       03
3801300   0
3801301   .10020000 .10020000 0.0       01
3801302   .10018000 .10018000 0.0       02
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
```

```
*
*   PRESSURIZER
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SURGE LINE PCS SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4000000   "SRG LN PCS"       BRANCH
4000001   2         0
4000101   1.44561-3 2.30      0.0       0.0       90.0      0.54
4000102   2.3622-5  0.0       00
4000200   0         15012400. 1418060.  2459400.  .00000000
4001101   107000000 400000000 1.44561-3 3.9       3.9       0002
4002101   400010000 405000000 1.44561-3 2.85      2.85      1000
4001201   -.0607909 -.0607909 0.0
4002201   -.0608265 -.0608265 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SURGE LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4050000   "SRG LN PZR"       PIPE
4050001   2
4050101   1.44561-3 2
4050201   1.44561-3 1
4050301   2.30      2
4050401   0.0       2
4050601   90.0      2
4050701   0.30      2
4050801   2.3622-5  0.0       2
4050901   2.85      2.85      1
4051001   00        2
4051101   1000      1
4051201   0         15010800. 1427980.  2459500.  .00000000 0.0       01
4051202   0         15010100. 1444040   2459500.  .00000000 0.0       02
4051300   0
4051301   -.0608633 -.0608633 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SURGE LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4100000   "SRG LINE  "       SNGLJUN
4100101   405010000 415000000 1.44561-3 0.42      1.00      1000
4100201   0         -.0608789 -.0608789 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4150000   "PZR VESSEL"       PIPE
4150001   6
4150101   0.0       2
4150102   0.5653    5
4150103   0.0       6
4150201   0.0       5
4150301   0.1815    1
4150302   0.1524    2
4150303   0.3967    3
4150304   0.5289    4
4150305   0.3967    5
4150306   0.1943    6
4150401   0.0684    1
4150402   0.0838    2
4150403   0.0       5
4150404   0.0732    6
4150501   0.0       6
4150601   90.0      6
```

```
4150801   4.0E-5    0.0       6
4151001   00        6
4151101   0000      5
4151201   0         15009100. 1586220.  2459600.  .00000000 0.0       01
4151202   0         15008000. 1586220.  2459600.  .00000000 0.0       02
4151203   0         15006300. 1586220.  2459600.  .00000000 0.0       03
4151204   0         15003800. 1586220.  2460000.  .03846070 0.0       04
4151205   0         15002300. 1586220.  2466560.  1.0000000 0.0       05
4151206   0         15002000. 1586220.  2468160.  1.0000000 0.0       06
4151300   0
4151301   -.23340-3 -.23340-3 0.0       01
4151302   -.15968-3 -.15968-3 0.0       02
4151303   -.19217-3 .36250000 0.0       03
4151304   -.4272500 -.48004-4 0.0       04
4151305   -.23263-4 -.23263-4 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER VESSEL TO TOP HAT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4170000   "VSSL-TPHAT"        SNGLJUN
4170101   415010000 420000000 0.0       0.0       0.0       0000
4170201   0         -.21090-4 -.21090-4 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER TOP HAT AND RELIEF CONNECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4200000   "PZR TOPHAT"        PIPE
4200001   2
4200101   0.0       2
4200201   0.0       1
4200301   0.1104915 2
4200401   0.0139870 2
4200601   90.0      2
4200801   4.E-5     0.346066  2
4201001   00        2
4201101   0000      1
4201201   0         15001900. 1509900.  2482590.  1.0000000 0.0       01
4201202   0         15001800. 1509900.  2484800.  1.0000000 0.0       02
4201300   0
4201301   -.11442-4 -.11442-4 0.0       01
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   STEAM GENERATOR SECONDARY SIDE
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY SEPARATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5000000   "SEPARATOR "        SEPARATR
5000001   3         0
5000101   0.0       0.4445    0.2425    0.0       90.0      0.4445
5000102   4.E-5     0.2840    00
5000200   0         5828810.0 1145280.  2580000.  .49664000
5001101   500010000 520000000 0.087745  0.0       0.0       0100
5002101   500000000 505000000 0.087745  0.0       0.0       0100
5003101   515010000 500000000 0.29187   0.4       0.4       0100
5001201   .30829000 1.0170000 0.0
5002201   1.1801000 .17265000 0.0
5003201   2.4900000 2.4900000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SEPARATOR BYPASS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5030000   "SEPBYPASS "        BRANCH
5030001   2         0
```

```
5030101   0.0       0.4445    0.4384    0.0       90.0      0.4445
5030102   4.E-5     0.3678    00
5030200   0         5827350.0 1150000.  2591270.  .99988000
5031101   505000000 503000000 0.98627   0.0       0.0       0100
5032101   503010000 520000000 0.98627   0.8       0.0       0100
5031201   -1.265400 .17607000 0.0
5032201   -.3871600 .07560020 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SEPARATOR OUTLET REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5050000   "LWR SEPAR "        BRANCH
5050001   1         0
5050101   0.0       1.2131    1.4850    0.0       -90.0     -1.2131
5050102   4.E-5     1.9048    00
5050200   0         5830080.0 1236530.  2580000.  .02870570
5051101   505010000 508000000 0.0       0.0       0.0       0100
5051201   .64364000 -2.022800 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED INLET VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5080000   "UPR DWNCMR"        BRANCH
5080001   1         0
5080101   0.0       0.6096    0.22 7    0.0       -90.0     -0.609
5080102   4.E-5     0.163697  00
5080200   0         5835210.0 1145280.  2580000.  .00000000
5081101   508010000 510000000 0.0       0.0       0.0       0100
5081201   .66587000 .66587000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR DOWNCOMER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5100000   "DWNCMR    "        ANNULUS
5100001   3
5100101   0.232     3
5100201   0.0       2
5100301   0.6096    3
5100401   0.0       3
5100601   -90.0     3
5100701   -0.6096   3
5100801   4.E-5     0.10793   3
5100901   0.0       0.0       2
5101001   00        3
5101101   0000      2
5101201   0         5839840.0 1145550.  2580000.  .00000000 0.0       01
5101202   0         5844480.0 1145820.  2580000.  .00000000 0.0       02
5101203   0         5849120.0 1146090.  2580000.  .00000000 0.0       03
5101300   0
5101301   .66594000 .66594000 0.0       01
5101302   .66602000 .66602000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION - DOWNCOMER TO BOILER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5130000   "DNCMR-BLR "        SNGLJUN
5130101   510010000 515000000 0.0       17.5      17.5      0100
5130201   0         .66609000 .88146000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR BOILER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5150000   "BOILER    "        PIPE
5150001   5
5150101   0.2776    4
5150102   0.306294  5
```

```
5150201   0.0        4
5150301   1.8288     4
5150302   1.2131     5
5150401   0.0        5
5150601   80.0       4
5150602   90.0       5
5150701   0.6096     4
5150702   1.2131     5
5150801   4.E-5      0.0234     4
5150802   4.E-5      0.5962     5
5150901   4.05       4.05       4
5151001   00         5
5151101   0100       4
5151201   0          5846670.0 1222840.  2580000.  .01975860 0.0       01
5151202   0          5842700.0 1274560.  2580000.  .05552290 0.0       02
5151203   0          5838650.0 1321180.  2580000.  .08907110 0.0       03
5151204   0          5834160.0 1360130.  2580000.  .11715000 0.0       04
5151205   0          5829740.0 1414230.  2580000.  .15606000 0.0       05
5151300   0
5151301   .83850000 1.1089000 0.0       01
5151302   1.3147000 1.8082000 0.0       02
5151303   1.7463000 2.4614000 0.0       03
5151304   2.1057000 2.9324000 0.0       04
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PORTION OF STEAM DOME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5200000   "LWR STM DM"         BRANCH
5200001   1          0
5200101   0.0        0.46956   0.705312  0.0       90.0      0.46956
5200102   4.E-5      1.383     00
5200200   0          5827210.0 1150000.  2591540.  .99979000
5201101   520010000 525000000 0.0       0.0       0.0       0000
5201201   -.0806823 .41903000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PORTION OF STEAM DOME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5250000   "UPR STM DM"         BRANCH
5250001   1          0
5250101   0.0        0.46956   0.705312  0.0       90.0      0.46956
5250102   4.E-5      1.383     00
5250200   0          5827070.0 1150000.  2591710.  .99990000
5251101   525010000 530000000 0.0       0.8       0.8       0100
5251201   13.328000 13.578000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM PIPE FROM GENERATOR TO CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5300000   "STEAM PIPE"         SNGLVOL
5300101   0.04635    25.074    0.0       0.0       0.0       0.0
5300102   4.E-5      0.0       00
5300200   0          5819190.0 1148038.  2591620.  1.0000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM FLOW CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5400000   "CV-P4-10  "         VALVE
5400101   530010000 541000000 0.0047772 0.0       0.0       1100
5400201   1          0.0       19.6      0.0
5400300   MTRVLV
5400301   685        686       0.05      0.44405   540
20254000  NORMAREA
20254001  0.0        0.0
20254002  9.25-4     9.25-4
```

```
20254003  1.0       1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPE DOWNSTREAM OF STEAM CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5410000   "COND INLET"        BRANCH
5410001   1         0
5410101   0.06557   54.44     0.0       0.0       0.0       0.0
5410102   4.E-5     0.0       00
5410200   0         2072970.0 914598.   2598620.  .86686000
5411101   541010000 542000000 0.0       0.0       0.0       0100
5411201   13.013000 25.588000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AIR COOLED CONDENSER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5420000   "CONDENSER "        TMDPVOL
5420101   0.21677   17.67     0.0       0.0       0.0       0.0
5420102   4.E-5     0.02      00
5420200   2                                                       *IC01
5420207   0.0       2.069E6   1.0                                 *IC01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SIMPLIFIED FEED SYSTEM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED STORAGE TANK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5650000   "FEED TANK "        TMDPVOL
5650101   29.81     3.048     0.0       0.0       0.0       0.0
5650102   4.E-5     0.0       00
5650200   3         502
5650201   0.0       7.58E6    482.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED WATER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5660000   "FEED      "        TMDPJUN
5660101   565000000 508000000 0.05
5660200   1         502
5660201   -100.0    19.150    0.0       0.0       *L2-3
5660202   0.0       19.150    0.0       0.0       *L2-3
5660203   0.5       10.0      0.0       0.0       *L2-5
5660204   1.0       2.50      0.0       0.0       *L2-5
5660205   1.5       1.00      0.0       0.0       *L2-5
5660206   2.0       0.25      0.0       0.0       *L2-5
5660207   2.5       0.00      0.0       0.0       *L2-5
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   ECC SYSTEM
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CHECK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6000000   "ECC CHKVLV"        VALVE
6000101   605010000 185000000 5.9896-3  0.935     0.935     1120
6000201   0         .00000000 .00000000 0.0
6000300   TRPVLV
6000301   681
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PLS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"        SNGLVOL
6050101   5.9896-3  5.0148    0.0       0.0       90.0      3.3071200
6050102   4.0-5     0.0       00
6050200   0         4.5E+6    172410.   2459920.  .00000000
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6100000   "ACCUM VLV "       VALVE
6100101   615010000 605000000 5.9896-3  6.278      6.278      1000
6100201   0         -.4902-15 .79206-11 0.0
6100300   TRPVLV
6100301   682
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "       SNGLVOL
6150101   0.0       25.997165 0.4074774 0.0        0.0        0.0
6150102   4.0-5     0.0       00
6150200   0         4.5E+6    112409.   2459920.  .00000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6200000   "ACCUMULATR"       ACCUM
6200101   0.0       1.8103    2.3422    0.0        -90.0      -1.8103
6200102   4.0-5     0.0       00
6200200   4.180+6   305.40
6201101   615000000 8.2132-3  40.0      40.0       0
6202200   0.0       1.0662    2.4509    1.6927     0.04445    0 0 0 0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BWST LPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6250000   "BWST LPIS "       TMDPVOL
6250101   20.44     5.0       0.0       0.0        90.0       5.0
6250102   4.0E-5    0.0       00
6250200   3
6250201   0.0       1.0+5     300.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOW PRESSURE INJECTION SYSTEM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6300000   "LPIS      "       TMDPJUN
6300101   625000000 605000000 5.9896-3
6300200   1         504       P         605010000
6300201   -1.0      0.0       0.0       0.0
6300202   0.0       0.0       0.0       0.0
6300203   8.483+4   7.045     0.0       0.0
6300204   4.297+5   6.091     0.0       0.0
6300205   7.745+5   5.045     0.0       0.0
6300206   9.448+5   4.312     0.0       0.0
6300207   1.119+6   3.454     0.0       0.0
6300208   1.186+6   3.173     0.0       0.0
6300209   1.257+6   2.673     0.0       0.0
6300210   1.326+6   2.159     0.0       0.0
6300211   1.395+6   1.536     0.0       0.0
6300212   1.464+6   0.7182    0.0       0.0
6300213   1.517+6   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BWST HPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6350000   "BWST HPIS "       TMDPVOL
6350101   20.44     5.0       0.0       0.0        90.0       5.0
6350102   4.0E-5    0.0       00
6350200   3
6350201   0.0       1.0+5     300.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HIGH PRESSURE INJECTION SYSTEM
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6400000   "HPIS      "        TMDPJUN
6400101   635000000 185000000 5.9896-3
6400200   1         503       P          185010000
6400201   -1.0      0.0       0.0        0.0
6400202   0.0       1.50000000 0.0       0.0
6400203   7.72514+6 1.5       0.0        0.0
6400204   8.3597+6  .31536281 0.0        0.0
6400205   17.2436+6 .31536281 0.0        0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*  CONTAINMENT
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CONTAINMENT BROKEN LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
8000000   "CONT BLHL "        TMDPVOL
8000101   0.0        1.0      0.1        0.0        0.0        0.0
8000102   0.0        0.0      00
8000200   2       501
8000201   0.0        1.0+5    1.0
8000202    1.0     2.1+5     1.0
8000203    1.2     1.65+5    1.0
8000204   20.0     2.9+5     1.0
8000205   24.0     2.9+5     1.0
8000206   28.0     2.83+5    1.0
8000207   40.0     2.67+5    1.0
8000208   48.0     2.67+5    1.0
8000209   52.0     2.6+5     1.0
8000210   60.0     3.0+5     1.0
8000211   70.0     3.3+5     1.0
8000212  100.0     3.0+5     1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CONTAINMENT BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
8050000   "CONT BLCL "        TMDPVOL
8050101   0.0        1.0      0.1        0.0        0.0        0.0
8050102   0.0        0.0      00
8050200   2       501
8050201   0.0        1.0+5    1.0
8050202    1.0     2.1+5     1.0
8050203    1.2     1.65+5    1.0
8050204   20.0     2.9+5     1.0
8050205   24.0     2.9+5     1.0
8050206   28.0     2.83+5    1.0
8050207   40.0     2.67+5    1.0
8050208   48.0     2.67+5    1.0
8050209   52.0     2.6+5     1.0
8050210   60.0     3.0+5     1.0
8050211   70.0     3.3+5     1.0
8050212  100.0     3.0+5     1.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   REACTOR VESSEL HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACTIVE CORE
* STATION 118.91 TO 182.94
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*     HOT FUEL RODS HEAT STRUCTURE  :12311
```

```
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12311000    6     10    2    1    0.0     555    1    8
12311001    7.869+6
12311011    1.0E-6    2.0E-6    0.0    0.0     6
12311100    0     1
12311101    5     4.65564-3
12311102    1     4.75106-3
12311103    3     5.36806-3
12311201    1     5
12311202   -2     6
12311203   -3     9
12311301    1.0   5
12311302    0.0   9
12311401    560.0  10
12311501    0     0     0     1     56.998416   06
12311601    021010000 1000000  1     1     56.998416   06
12311701    900    0.02306447     0.     0.     1
12311702    900    0.051034       0.     0.     2
12311703    900    0.05449747     0.     0.     3
12311704    900    0.0414851      0.     0.     4
12311705    900    0.02567737     0.     0.     5
12311706    900    0.0090072      0.     0.     6
12311901     0        0.013633    0.01504    1.6764    06
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*      AVERAGE FUEL RODS HEAT STRUCTURE  :12301
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12301000    6     10    2    1    0.0     555    1    8
12301001    7.869+6
12301011    1.0E-6    2.0E-6    0.0    0.0     6
12301100    0     1
12301101    5     4.65564-3
12301102    1     4.75106-3
12301103    3     5.36806-3
12301201    1     5
12301202   -2     6
12301203   -3     9
12301301    1.0   5
12301302    0.0   9
12301401    560.0  10
12301501    0     0     0     1     159.819088   06
12301601    011010000  1000000 1     1     159.819088   06
12301701    900    0.036746       0.     0.     1
12301702    900    0.0879275      0.     0.     2
12301703    900    0.0990847      0.     0.     3
12301704    900    0.0768387      0.     0.     4
12301705    900    0.0491237      0.     0.     5
12301705    900    0.0153074      0.     0.     6
12301901    0    0.013633    0.01504    1.6764    6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*      INTERMEDIATE FUEL RODS HEAT STRUCTURE  :12302
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12302000    6     10    2    1    0.0     555    1    8
12302001    7.869+6
12302011    1.0E-6    2.0E-6    0.0    0.0     6
12302100    0     1
```

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12302101    5       4.65564-3
12302102    1       4.75106-3
12302103    3       5.36805-3
12302201    1       5
12302202   -2       6
12302203   -3       9
12302301    1.0     5
12302302    0.0     9
12302401    560.0   10
12302501    0       0          0       1       146.407696   06
12302601    011010000  1000000 1       1       146.407696   06
12302701    900     0.0433049      0.      0.      1
12302702    900     0.103621287    0.      0.      2
12302703    900     0.116769857    0.      0.      3
12302704    900     0.09055324     0.      0.      4
12302705    900     0.05789154     0.      0.      5
12302706    900     0.01803'428    0.      0.      6
12302901    0    0.013633    0.01504    1.0764
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$
*
*   STEAM GENERATOR HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TUBING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
10060000  8          8          2          1          0.0051054
10060100  0          1
10060101  7          0.006343984
10050201  6          7
10060301  0.0        7
10060401  560.0      8
10060501  115010000 10000      1          1          1124.71   3
10060502  115040000 10000      1          1          849.063   5
10060503  115060000 10000      1          1          1124.71   8
10060601  515010000 10000      1          1          1124.71   3
10060602  515040000 0          1          1          849.063   4
10060603  515040000 0          1          1          849.063   5
10060604  515030000 -10000     1          1          1124.71   8
10060701  0          0          0          0          8
10060801  0          0          0          0          8
10060901  0          0          0          0          8
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$
*
*   HEAT STRUCTURE THERMAL PROPERTY DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100100  TBL/FCTN  1          1          * UO2
20100200  TBL/FCTN  3          1          * GAP
20100300  TBL/FCTN  1          1          * ZR
20100400  TBL/FCTN  1          1          * S-STEEL
20100500  C-STEEL
20100600  TBL/FCTN  1          1          * INCONEL 600
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UO2 - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100101  2.7315E2  8.44
20100102  4.1667E2  6.46
20100103  5.3315E2  5.782385
20100104  6.99817E2 4.633177
20100105  8.66483E2 3.880307
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20100106  1.03315E3 3.357625
20100107  1.08871E3 3.155129
20100108  1.19982E3 2.983[illegible]
20100109  1.28315E3 2.836674
20100110  1.36648E3 2.713792
20100111  1.53315E3 2.[illegible]21680
20100112  1.61648E3 2.448990
20100113  1.69982E3 2.391875
20100114  1.97759E3 2.289762
2010[illegible]15  2.25537E3 2.307069
20100116  2.53315E3 2.433413
20100117  2.81093E3 2.[illegible]070
20100118  3.08871E3 2.994171
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UO2 - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100151  2.73150E2 2.310427E6
20100152  3.23150E2 2.571985E6
20100153  3.73150E2 2.746357E6
20100154  6.7315E2  3.138694E6
20100155  1.37315E3 3.443844E6
20100156  1.77315E3 3.531030E6
20100157  1.97315E3 3.792588E6
20100158  2.17315E3 4.228518E6
20100159  2.37315E3 4.88241[illegible]E6
20100160  2.67315E3 6.015829E6
20100161  2.77315E3 6.320980E6
20100162  2.87315E3 6.582538E6
20100163  2.97315E3 6.713317E6
20100164  3.11315E3 6.805503E6
20100165  4.69982E3 6.800503E6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HELIUM(GAP) - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100201  HELIUM   1.00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HELIUM(GAP) - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100251  273.15    5.4
20100252  5000.0    5.4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - THERMAL CONDUCTIVITY          FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100301  380.4     13.6
20100302  469.3     14.6
20100303  577.6     15.8
20100304  685.9     17.3
20100305  774.8     18.4
20100306  872.0     19.8
20100307  973.2     21.6
20100308  1073.2    23.2
20100309  1123.2    25.4
20100310  1152.3    24.2
20100311  1232.2    25.5
20100312  1331.2    26.6
20100313  1404.2    28.2
20100314  1576.2    33.0
20100315  1625.2    36.7
20100316  1755.2    41.2
20100317  2273.2    55.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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* ZIRCALOY-4 - VOLUMETRIC HEAT CAPACITY      FROM MATPRO
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
20100351  300.0     1.841E6
20100352  400.0     1.978E6
20100353  640.0     2.168E6
20100354  1090.0    2.456E6
20100355  1093.0    3.288E6
20100356  1113.0    3.865E6
20100357  1133.0    4.028E6
20100358  1153.0    4.709E6
20100359  1173.0    5.345E6
20100360  1193.0    5.044E6
20100361  1213.0    4.054E6
20100362  1233.0    3.072E6
20100363  1243.0    2.332E6
20100364  1477.0    2.332E6
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
* S-STEEL - THERMAL CONDUCTIVITY
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
20100401  273.15    12.98
20100402  1199.82   25.1
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
* S-STEEL - VOLUMETRIC HEAT CAPACITY
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
20100451  273.15    3.83E6
20100452  366.5     3.83E6
20100453  477.59    4.190E6
20100454  588.59    4.336E6
20100455  699.82    4.504E6
20100456  810.93    4.639E6
20100457  922.04    4.773E6
20100458  1144.26   5.076E6
20100459  1366.5    5.376E6
20100460  1477.59   5.546E6
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
* INCONEL 600 - THERMAL CONDUCTIVITY
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
20100601  366.5     13.85
20100602  477.6     15.92
20100603  588.7     18.17
20100604  700.0     20.42
20100605  810.9     22.50
20100606  922.0     24.92
20100607  1033.2    26.83
20100608  1144.3    29.42
20100609  1477.6    36.06
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
* INCONEL-600 - VOLUMETRIC HEAT CAPACITY
*---- ----]---- ----]---- ----]---- ----]---- ----]---- ----]----
20100651  366.5     3.908+6
20100652  477.6     4.084+6
20100653  588.7     4.260+6
20100654  700.0     4.436+6
20100656  810.9     4.665+6
20100657  922.0     4.929+6
20100658  1033.2    5 105+6
20100659  1477.6    5.727+6
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*         CONTROL VARIABLES
*
```

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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  001-010  LEVEL CALCULATORS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 001 STEAM GENERATOR LEVEL
20500100  SGLVL      SUM        1.0        0.0        1
20500101  0.0        0.4445     VOIDF      503010000
20500102             1.2131     VOIDF      505010000
20500103             0.6096     VOIDF      508010000
20500104             0.6096     VOIDF      510010000
20500105             0.6096     VOIDF      510020000
20500106             0.6096     VOIDF      510030000
* 002 PRESSURIZER LEVEL
20500200  PZRLVL     SUM        1.0        0.0        1
20500201  0.0        0.1815     VOIDF      415010000
20500202             0.1524     VOIDF      415020000
20500203             0.3967     VOIDF      415030000
20500204             0.5289     VOIDF      415040000
20500205             0.3967     VOIDF      415050000
20500206             0.1943     VOIDF      415060000
20500207             0.1029     VOIDF      420010000
20500208             0.1029     VOIDF      420020000
* 003 REACTOR VESSEL LEVEL
20500300  RVLVL      SUM        1.0        0.0        1
20500301  0.0        0.84888    VOIDF      260010000
20500302             0.24333    VOIDF      255010000
20500303             0.9285337 VOIDF       250010000
20500304             0.4933248 VOIDF       245010000
20500305             0.4933248 VOIDF       240010000
20500312             0.4269792 VOIDF       225010000
20500313             0.3533183 VOIDF       215010000
20500314             0.3741720 VOIDF       220010000
* 004 ACCUMULATOR LEVEL
*20500400  ACCMLVL   INTEGRAL  -6.3480-3 2.0447    0
*20500401  VELFJ     620010000
* 007 REACTOR VESSEL DOWNCOMER LEVEL INTACT SIDE
20500700  RVDCLVLIN SUM        1.0        0.0        1
20500701  0.0        0.3302040 VOIDF       700010000
20500702             0.3951272 VOIDF       702010000
20500703             1.5200561 VOIDF       704010000
20500704             1.2616333 VOIDF       706010000
20500705             1.0792591 VOIDF       708010000
20500706             0.3533183 VOIDF       215010000
20500707             0.3741720 VOIDF       220010000
* 008 REACTOR VESSEL DOWNCOMER LEVEL BROKEN SIDE
20500800  RVDCLVLBK SUM        1.0        0.0        1
20500801  0.0        0.3302040 VOIDF       710010000
20500802             0.3951272 VOIDF       712010000
20500803             1.5200561 VOIDF       714010000
20500804             1.2616333 VOIDF       716010000
20500805             1.0792591 VOIDF       718010000
20500806             0.3533183 VOIDF       215010000
20500807             0.3741720 VOIDF       220010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*   CORE LEVEL : HOT CHANNEL 009,  AVERAGE 010
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*       HOT LEVEL
20500900    HOTLVL    SUM    1.0     0.0     1
20500901    0.0        0.279404 VOIDF   021010000
20500902             0.0279404  VOIDF   022010000
20500903             0.0279404  VOIDF   023010000
20500904            0.0279404  VOIDF   024010000
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20500905         0.0279404  VOIDF   025010000
20500906         0.0279404  VOIDF   026010000
*
*       AVERAGE LEVEL
20501000    HOTLVL    SUM      1.0      0.0       1
20501001    0.0      0.0279404  VOIDF   011010000
20501002             0.0279404  VOIDF   012010000
20501003             0.0279404  VOIDF   013010000
20501004             0.0279404  VOIDF   014010000
20501005             0.0279404  VOIDF   015010000
20501006             0.0279404  VOIDF   016010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  061-072  PRIMARY SYSTEM MASS CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 061 INTACT LOOP HOT LEG MASS
20506100  ILHLMASS  SUM        1.0         0.0         1
20506101  0.0        0.102752  RHO         100010000
20506102             7.57291-2 RHO         105010000
20506103             6.43178-2 RHO         110010000
20506104             7.96973-2 RHO         112010000
20506105             5.79614-2 RHO         112020000
* 062 STEAM GENERATOR PRIMARY MASS
20506200  SGPRIMASS SUM        1.0         0.0         1
20506201  0.0        0.335320  RHO         114010000
20506202             0.136356  RHO         115010000
20506203             9.21538-2 RHO         115020000
20506204             9.71538-2 RHO         115030000
20506205             6.99783-2 RHO         115040000
20506206             6.99783-2 RHO         115050000
20506207             9.21538-2 RHO         115060000
20506208             9.21538-2 RHO         115070000
20506209             0.136356  RHO         115080000
20506210             0.335320  RHO         116010000
* 063 PUMP SUCTION PIPING MASS
20506300  PMPSUMASS SUM        1.0         0.0         1
20506301  0.0        4.45625-2 RHO         118010000
20506302             4.45137-2 RHO         118020000
20506303             3.54278-2 RHO         118030000
20506304             4.87901-2 RHO         120010000
20506305             6.40548-2 RHO         125010000
20506306             1.77444-2 RHO         130010000
20506307             6.40548-2 RHO         155010000
20506308             1.77444-2 RHO         160010000
* 064 INTACT LOOP COLD LEG MASS
20506400  ILCLMASS  SUM        1.0         0.0         1
20506401  0.0        9.91000-2 RHO         135010000
20506402             1.83849-2 RHO         140010000
20506403             6.33861-2 RHO         145010000
20506404             3.16011-2 RHO         150010000
20506405             9.91000-2 RHO         165010000
20506406             1.92958-2 RHO         170010000
20506407             3.54280-2 RHO         175010000
20506408             3.88950-2 RHO         175020000
20506409             7.30598-2 RHO         180010000
20506410             6.44920-2 RHO         185010000
* 065 DOWNCOMER/LOWER PLENUM MASS
20506500  DCLPMASS  SUM        1.0         0.0         1
20506501  0.0        0.0432082 RHO         700010000
20506502             0.0578606 RHO         702010000
20506503             0.1581866 RHO         704010000
20506504             0.1217000 RHO         706010000
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20506505            0.0986806 RHO        708010000
20506506            0.0432082 RHO        710010000
20506507            0.0578606 RHO        712010000
20506508            0.1581866 RHO        714010000
20506509            0.1217000 RHO        716010000
20506510            0.0986806 RHO        718010000
20506511            0.24520   RHO        215010000
20506512            0.296[illegible] RHO        220010000
* 067 CORE/UPPER PLENUM MASS
20506700  CRUPMASS  SUM       1.0        0.0       1
20506701  0.0       0.12094   RHO        225010000
*20506702            0.0683340 RHO        821010000
*20506703            0.0478582 RHO        822010000
*20506704            0.0483329 RHO        823010000
*20506705            0.0479138 RHO        824010000
*20506706            0.0479052 RHO        825010000
*20506707            0.0750459 RHO        826010000
20506708            0.0091280 RHO        235010000
20506709            0.0072325 RHO        235020000
20506710            0.0088095 RHO        235030000
20506711            0.1195494 RHO        240010000
20506712            0.1280806 RHO        245010000
20506713            0.1436936 RHO        250010000
20506714            0.1154214 RHO        251010000
20506715            0.083595  RHO        255010000
20506716            0.310967  RHO        260010000
* 068 BROKEN LOOP HOT LEG MASS
20506800  BLHLMASS  SUM       1.0        0.0       1
20506801  0.0       5.75410-2 RHO        300010000
20506802            4.42927-2 RHO        305010000
20506803            6.78467-2 RHO        310010000
20506804            7.75291-3 RHO        315010000
20506805            1.72111-1 RHO        315020000
20506806            8.97552-2 RHO        315030000
20506807            8.97552-2 RHO        315040000
20506808            1.72111-1 RHO        315050000
20506809            1.82303-2 RHO        315060000
20506810            5.46687-2 RHO        315070000
20506811            1.82489-2 RHO        315080000
20506812            9.15000-2 RHO        380010000
20506813            4.80000-2 RHO        380020000
20506814            4.89000-2 RHO        380030000
* 069 BROKEN LOOP COLD LEG MASS
20506900  BLCLMASS  SUM       1.0        0.0       1
20506901  0.0       4.79790-2 RHO        335010000
20506902            4.43927-2 RHO        340010000
20506903            3.62484-2 RHO        342010000
20506904            3.10679-2 RHO        344010000
20506907            2.79000-2 RHO        370010000
20506908            7.00000-2 RHO        370020000
20506909            1.16500-1 RHO        370030000
* 070 PRESSURIZER MASS
20507000  PZRMASS   SUM       1.0        0.0       1
20507001  0.0       3.33500-3 RHO        400010000
20507002            3.33500-3 RHO        405010000
20507003            3.33500-3 RHO        405020000
20507004            6.84000-2 RHO        415010000
20507005            8.38000-2 RHO        415020000
20507006            2.24255-1 RHO        415030000
20507007            2.98987-1 RHO        415040000
20507008            2.24255-1 RHO        415050000
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20507009            7.32000-2 RHO       415060000
20507010            1.42000-2 RHO       420010000
20507011            1.42000-2 RHO       420020000
20507012            2.12609-3 RHO       430010000
* 071 REACTOR VESSEL TOTAL MASS
20507100  RVMASS    SUM       1.0       0.0       1
20507101  0.0       1.0       CNTRLVAR  65
20507103            1.0       CNTRLVAR  67
* 072 PCS TOTAL MASS
20507200  PCSMASS   SUM       1.0       0.0       1
20507201  0.0       1.0       CNTRLVAR  61
20507202            1.0       CNTRLVAR  62
20507203            1.0       CNTRLVAR  63
20507204            1.0       CNTRLVAR  64
20507205            1.0       CNTRLVAR  68
20507206            1.0       CNTRLVAR  69
20507207            1.0       CNTRLVAR  70
20507208            1.0       CNTRLVAR  71
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*    RUN STATISTICS DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20507800   O[illegible]     SUM      1.    0.    0
20507801   0       [illegible]      [illegible]RLVAR  79
*
20507900   N[illegible]     [illegible]     [illegible]    0.    0
20507901   0.      [illegible]      [illegible]    [illegible]
*
20508100   TSTEP      [illegible]    1.    0.    0
20508101    0.     -1.     CNTRLVAR     78
20508102            1.     CNTRLVAR     79
*
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   GENERAL TABLE DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*     TABLE
*     NUMBER       DESCRIPTION
*     ------       -----------
*
*      900         REACTOR POWER VS TIME AFTER SCRAM
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER     502       1.0       36.0+6
20290001  -1.0    1.0
20290002  0.0       1.0
20290003  0.1       0.900689  * FROM L2-3 POSTTEST
20290004  0.2       0.274300
20290005  0.3       0.153171
20290006  0.4       0.110821
20290007  0.5       0.091625
20290008  0.6       0.083212
20290009  0.8       0.073556
20290010  1.0       0.062500
20290011  1.5       0.063089
20290012  2.0       0.059854
20290013  3.0       0.057265
20290014  4.0       0.055204
20290015  6.0       0.052085
20290016  8.0       0.049776
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20290017  10.0      0.047947
20290018  15.0      0.044575
20290019  20.0      0.042176
20290020  30.0      0.038783
20290021  40.0      0.035348
20290022  60.0      0.031546
20290023  1.+5      0.001460  * FROM LTR LO-08-81-173
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351100   1                   1
1351101   0.000000E+00        1.403600E+00
1351102   1.906100E-01        1.363600E+00
1351103   3.896300E-01        1.318600E+00
1351104   5.939600E-01        1.232800E+00
1351105   7.902000E-01        1.133600E+00
1351106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351200   1                   2
1351201   0.000000E+00        -6.700000E-01
1351202   2.000000E-01        -5.000000E-01
1351203   4.000000E-01        -2.500000E-01
1351204   5.755400E-01        0.000000E+00
1351205   7.443200E-01        2.583000E-01
1351206   7.734800E-01        3.778000E-01
1351207   8.631300E-01        6.326000E-01
1351208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351300   1                   3
1351301   -1.000000E+00       2.472200E+00
1351302   -8.057400E-01       2.047400E+00
1351303   -6.069000E-01       1.831000E+00
1351304   -4.068300E-01       1.624000E+00
1351305   -2.001710E-01       1.470500E+00
1351306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351400   1                   4
1351401   -1.000000E+00       2.472200E+00
1351402   -8.229700E-01       1.996800E+00
1351403   -6.333200E-01       1.589700E+00
1351404   -4.553400E-01       1.327900E+00
1351405   -2.710900E-01       1.194900E+00
1351406   -1.771600E-01       1.060500E+00
1351407   -9.073000E-02       1.015600E+00
1351408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351500   1                   5
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1351501   0.000000E+00        2.500000E-01
1351502   2.000000E-01        2.800000E-01
1351503   4.000000E-01        3.400000E-01
1351504   4.118000E-01        2.768000E-01
1351505   5.976300E-01        4.584000E-01
1351506   7.934670E-01        6.992000E-01
1351507   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351600   1                   6
1351601   0.000000E+00        9.342790E-01
1351602   9.109900E-02        9.229000E-01
1351603   1.865090E-01        8.963000E-01
1351604   2.717620E-01        8.750000E-01
1351605   4.558720E-01        8.433000E-01
1351606   5.744060E-01        8.355000E-01
1351607   7.405760E-01        8.466000E-01
1351608   7.666190E-01        8.469000E-01
1351609   8.714710E-01        8.838000E-01
1351610   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351700   1                   7
1351701   -1.000000E+00       -1.000000E+00
1351702   -8.000000E-01       -6.300000E-01
1351703   -6.000000E-01       -3.000000E-01
1351704   -4.000000E-01       -5.000000E-02
1351705   -2.000000E-01       1.500000E-01
1351706   0.000000E+00        2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351800   1                   8
1351801   -1.000000E+00       -1.000000E+00
1351802   -8.000000E-01       -9.700000E-01
1351803   -6.000000E-01       -9.500000E-01
1351804   -4.000000E-01       -8.800000E-01
1351805   -2.000000E-01       -8.000000E-01
1351806   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351900   2                   1
1351901   0.000000E+00        6.032000E-01
1351902   1.930000E-01        6.325000E-01
1351903   3.930000E-01        7.369000E-01
1351904   5.955200E-01        8.331000E-01
1351905   7.978200E-01        9.229000E-01
1351906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352000   2                   2
1352001   0.000000E+00        -6.700000E-01
1352002   4.000000E-01        -2.500000E-01
1352003   5.000000E-01        1.500000E-01
1352004   7.372550E-01        5.265860E-01
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1352005   7.680490E-01        6.065940E-01
1352006   8.672300E-01        7.436600E-01
1352007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352100   2                   3
1352101   -1.000000E+00       1.984300E+00
1352102   -8.009600E-01       1.394000E+00
1352103   -6.063800E-01       1.097500E+00
1352104   -4.068600E-01       8.220000E-01
1352105   -1.992800E-01       6.648000E-01
1352106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352200   2                   4
1352201   -1.000000E+00       1.984300E+00
1352202   -8.223400E-01       1.830800E+00
1352203   -6.337100E-01       1.682400E+00
1352204   -4.585300E-01       1.557000E+00
1352205   -2.670230E-01       1.436200E+00
1352206   -1.761070E-01       1.387900E+00
1352207   -8.931000E-02       1.348100E+00
1352208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352300   2                   5
1352301   0.000000E+00        -4.500000E-01
1352302   4.000000E-01        -2.500000E-01
1352303   5.000000E-01        0.000000E+00
1352304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352400   2                   6
1352401   0.000000E+00        1.233610E+00
1352402   9.064300E-02        1.196500E+00
1352403   1.885690E-01        1.109600E+00
1352404   2.734700E-01        1.041600E+00
1352405   4.586690E-01        8.958000E-01
1352406   5.744800E-01        7.807000E-01
1352407   7.381600E-01        6.134000E-01
1352408   7.685200E-01        5.849000E-01
1352409   8.700570E-01        4.877000E-01
1352410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352500   2                   7
1352501   -1.000000E+00       -1.000000E+00
1352502   -3.000000E-01       -9.000000E-01
1352503   -1.000000E-01       -5.000000E-01
1352504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352600   2                   8
1352601   -1.000000E+00       -1.000000E+00
1352602   -2.500000E-01       -9.000000E-01
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1352603   -8.000000E-02        -8.000000E-01
1352604    0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353000    0
1353001    0.000000E+00         0.000000E+00
1353002    1.000000E-01         0.000000E+00
1353003    2.000000E-01         1.000000E-01
1353004    3.000000E-01         2.000000E-01
1353005    3.500000E-01         3.000000E-01
1353006    4.000000E-01         6.000000E-01
1353007    5.000000E-01         6.000000E-01
1353008    6.000000E-01         6.000000E-01
1353009    7.000000E-01         6.000000E-01
1353010    8.000000E-01         5.000000E-01
1353011    9.000000E-01         3.000000E-01
1353012    1.000000E+00         0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353100    0
1353101    0.000000E+00         0.000000E+00
1353102    1.000000E-01         0.000000E+00
1353103    2.000000E-01         1.000000E-01
1353104    3.000000E-01         3.000000E-01
1353105    3.500000E-01         5.000000E-01
1353106    4.000000E-01         7.500000E-01
1353107    5.000000E-01         7.500000E-01
1353108    6.000000E-01         7.500000E-01
1353109    7.000000E-01         7.500000E-01
1353110    8.000000E-01         7.500000E-01
1353111    9.000000E-01         5.000000E-01
1353112    1.000000E+00         0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354100    1                    1
1354101    0.000000E+00         1.000000E+00
1354102    1.000000E+00         1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354200    1                    2
1354201    0.000000E+00         1.000000E+00
1354202    1.000000E+00         1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354300    1                    3
1354301   -1.000000E+00        -1.160000E+00
1354302   -9.000000E-01        -1.240000E+00
1354303   -8.000000E-01        -1.770000E+00
1354304   -7.000000E-01        -2.360000E+00
1354305   -6.000000E-01        -2.790000E+00
1354306   -5.000000E-01        -2.910000E+00
1354307   -4.000000E-01        -2.670000E+00
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1354308   -2.500000E-01        -1.690000E+00
1354309   -1.000000E-01        -5.000000E-01
1354310   0.000000E+00         0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354400   1                    4
1354401   -1.000000E+00        -1.160000E+00
1354402   -9.000000E-01        -7.800000E-01
1354403   -8.000000E-01        -5.000000E-01
1354404   -7.000000E-01        -3.100000E-01
1354405   -6.000000E-01        -1.700000E-01
1354406   -5.000000E-01        -8.000000E-02
1354407   -3.500000E-01        0.000000E+00
1354408   -2.000000E-01        5.000000E-02
1354409   -1.000000E-01        8.000000E-02
1354410   0.000000E+00         1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354500   1                    5
1354501   0.000000E+00         0.000000E+00
1354502   2.000000E-01         -3.400000E-01
1354503   4.000000E-01         -6.500000E-01
1354504   6.000000E-01         -9.300000E-01
1354505   8.000000E-01         -1.190000E+00
1354506   1.000000E+00         -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354600   1                    6
1354601   0.000000E+00         1.100000E-01
1354602   1.000000E-01         1.300000E-01
1354603   2.500000E-01         1.500000E-01
1354604   4.000000E-01         1.300000E-01
1354605   5.000000E-01         7.000000E-02
1354606   6.000000E-01         -4.000000E-02
1354607   7.000000E-01         -2.300000E-01
1354608   8.000000E-01         -5.100000E-01
1354609   9.000000E-01         -9.100000E-01
1354610   1.000000E+00         -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354700   1                    7
1354701   -1.000000E+00        0.000000E+00
1354702   0.000000E+00         0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354800   1                    8
1354801   -1.000000E+00        0.000000E+00
1354802   0.000000E+00         0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354900   2                    1
1354901   0.000000E+00         1.000000E+00
1354906   1.000000E+00         1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355000  2             2
1355001  0.000000E+00  1.000000E+00
1355007  1.000000E+00  1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355100  2              3
1355101  -1.000000E+00  1.984300E+00
1355102  -8.009600E-01  1.394000E+00
1355103  -6.063800E-01  1.097500E+00
1355104  -4.068600E-01  8.220000E-01
1355105  -1.992800E-01  6.648000E-01
1355106  0.000000E+00   6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355200  2              4
1355201  -1.000000E+00  1.984300E+00
1355202  -8.223400E-01  1.830800E+00
1355203  -6.337100E-01  1.682400E+00
1355204  -4.585300E-01  1.557000E+00
1355205  -2.670230E-01  1.436200E+00
1355206  -1.761070E-01  1.387900E+00
1355207  -8.931000E-02  1.348100E+00
1355208  0.000000E+00   1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355300  2             5
1355301  0.000000E+00  -4.500000E-01
1355302  4.000000E-01  -2.500000E-01
1355303  5.000000E-01  0.000000E+00
1355304  1.000000E+00  3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355400  2             6
1355401  0.000000E+00  1.233610E+00
1355402  9.064300E-02  1.196500E+00
1355403  1.885690E-01  1.109600E+00
1355404  2.734700E-01  1.041600E+00
1355405  4.586690E-01  8.958000E-01
1355406  5.744800E-01  7.807000E-01
1355407  7.381600E-01  6.134000E-01
1355408  7.685200E-01  5.849000E-01
1355409  8.700570E-01  4.877000E-01
1355410  1.000000E+00  3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355500  2              7
1355501  -1.000000E+00  -1.000000E+00
1355502  -3.000000E-01  -9.000000E-01
1355503  -1.000000E-01  -5.000000E-01
1355504  0.000000E+00   -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355600  2              8
1355601  -1.000000E+00  -1.000000E+00
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1355602   -2.500000E-01        -9.000000E-01
1355603   -8.000000E-02        -8.000000E-01
1355604   0.000000E+00         -6.700000E-01
* $$$ REMOVE ALL REMAINING DATA CARDS AFTER ACHIEVING STEADY STATE
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651100   1                    1
1651101   0.000000E+00         1.403300E+00
1651102   1.906100E-01         1.363600E+00
1651103   3.896300E-01         1.318600E+00
1651104   5.939600E-01         1.232800E+00
1651105   7.902000E-01         1.133600E+00
1651106   1.000000E+00         1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651200   1                    2
1651201   0.000000E+00         -6.700000E-01
1651202   2.000000E-01         -5.000000E-01
1651203   4.000000E-01         -2.500000E-01
1651204   5.755400E-01         0.000000E+00
1651205   7.443200E-01         2.583000E-01
1651206   7.734800E-01         3.778000E-01
1651207   8.631300E-01         6.326000E-01
1651208   1.000000E+00         1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651300   1                    3
1651301   -1.000000E+00        2.472200E+00
1651302   -8.057400E-01        2.047400E+00
1651303   -6.069000E-01        1.831000E+00
1651304   -4.068300E-01        1.624000E+00
1651305   -2.001710E-01        1.470500E+00
1651306   0.000000E+00         1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651400   1                    4
1651401   -1.000000E+00        2.472200E+00
1651402   -8.229700E-01        1.996800E+00
1651403   -6.333200E-01        1.589700E+00
1651404   -4.553400E-01        1.327900E+00
1651405   -2.710900E-01        1.194900E+00
1651406   -1.771600E-01        1.060500E+00
1651407   -9.073000E-02        1.0156[illegible]0E+00
1651408   0.000000E+00         9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651500   1                    5
1651501   0.000000E+00         2.500000E-01
1651502   2.000000E-01         2.800000E-01
1651503   4.000000E-01         3.400000E-01
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1651504   4.118000E-01       2.768000E-01
1651505   5.976300E-01       4.584000E-01
1651506   7.934670E-01       6.992000E-01
1651507   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651600   1                  6
1651601   0.000000E+00       9.342790E-01
1651602   9.109900E-02       9.229000E-01
1651603   1.865090E-01       8.963000E-01
1651604   2.717620E-01       8.750000E-01
1651605   4.558720E-01       8.433000E-01
1651606   5.744060E-01       8.355000E-01
1651607   7.405760E-01       8.466000E-01
1651608   7.666190E-01       8.469000E-01
1651609   8.714710E-01       8.838000E-01
1651610   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651700   1                  7
1651701   -1.000000E+00      -1.000000E+00
1651702   -8.000000E-01      -6.300000E-01
1651703   -6.000000E-01      -3.000000E-01
1651704   -4.000000E-01      -5.000000E-02
1651705   -2.000000E-01      1.500000E-01
1651706   0.000000E+00       2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651800   1                  8
1651801   -1.000000E+00      -1.000000E+00
1651802   -8.000000E-01      -9.700000E-01
1651803   -6.000000E-01      -9.500000E-01
1651804   -4.000000E-01      -8.800000E-01
1651805   -2.000000E-01      -8.000000E-01
1651806   0.000000E+00       -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651900   2                  1
1651901   0.000000E+00       6.032000E-01
1651902   1.930000E-01       6.325000E-01
1651903   3.930000E-01       7.369000E-01
1651904   5.955200E-01       8.331000E-01
1651905   7.978200E-01       9.229000E-01
1651906   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652000   2                  2
1652001   0.000000E+00       -6.700000E-01
1652002   4.000000E-01       -2.500000E-01
1652003   5.000000E-01       1.500000E-01
1652004   7.372550E-01       5.265860E-01
1652005   7.680490E-01       6.065940E-01
1652006   8.672300E-01       7.436300E-01
1652007   1.000000E+00       1.000000E+00
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652100   2                 3
1652101   -1.000000E+00     1.984300E+00
1652102   -8.009600E-01     1.394000E+00
1652103   -6.063800E-01     1.097500E+00
1652104   -4.068600E-01     8.220000E-01
1652105   -1.992800E-01     6.648000E-01
1652106   0.000000E+00      6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652200   2                 4
1652201   -1.000000E+00     1.984300E+00
1652202   -8.223400E-01     1.830800E+00
1652203   -6.337100E-01     1.682400E+00
1652204   -4.585300E-01     1.557000E+00
1652205   -2.670230E-01     1.436200E+00
1652206   -1.761070E-01     1.387900E+00
1652207   -8.931000E-02     1.348100E+00
1652208   0.000000E+00      1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652300   2                 5
1652301   0.000000E+00      -4.500000E-01
1652302   4.000000E-01      -2.500000E-01
1652303   5.000000E-01      0.000000E+00
1652304   1.000000E+00      3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652400   2                 6
1652401   0.000000E+00      1.233610E+00
1652402   9.064300E-02      1.196500E+00
1652403   1.885690E-01      1.109600E+00
1652404   2.734700E-01      1.041600E+00
1652405   4.586690E-01      8.958000E-01
1652406   5.744800E-01      7.807000E-01
1652407   7.381600E-01      6.134000E-01
1652408   7.685200E-01      5.849000E-01
1652409   8.700570E-01      4.877000E-01
1652410   1.000000E+00      3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652500   2                 7
1652501   -1.000000E+00     -1.000000E+00
1652502   -3.000000E-01     -9.000000E-01
1652503   -1.000000E-01     -5.000000E-01
1652504   0.000000E+00      -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652600   2                 8
1652601   -1.000000E+00     -1.000000E+00
1652602   -2.500000E-01     -9.000000E-01
1652603   -8.000000E-02     -8.000000E-01
1652604   0.000000E+00      -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1653000   0
1653001   0.000000E+00        0.000000E+00
1653002   1.000000E-01        0.000000E+00
1653003   2.000000E-01        1.000000E-01
1653004   3.000000E-01        2.000000E-01
1653005   3.500000E-01        3.000000E-01
1653006   4.000000E-01        6.000000E-01
1653007   5.000000E-01        6.000000E-01
1653008   6.000000E-01        6.000000E-01
1653009   7.000000E-01        6.000000E-01
1653010   8.000000E-01        5.000000E-01
1653011   9.000000E-01        3.000000E-01
1653012   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1653100   0
1653101   0.000000E+00        0.000000E+00
1653102   1.000000E-01        0.000000E+00
1653103   2.000000E-01        1.000000E-01
1653104   3.000000E-01        3.000000E-01
1653105   3.500000E-01        5.000000E-01
1653106   4.000000E-01        7.500000E-01
1653107   5.000000E-01        7.500000E-01
1653108   6.000000E-01        7.500000E-01
1653109   7.000000E-01        7.500000E-01
1653110   8.000000E-01        7.500000E-01
1653111   9.000000E-01        5.000000E-01
1653112   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654100   1                   1
1654101   0.000000E+00        1.000000E+00
1654102   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654200   1                   2
1654201   0.000000E+00        1.000000E+00
1654202   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654300   1                   3
1654301   -1.000000E+00       -1.160000E+00
1654302   -9.000000E-01       -1.240000E+00
1654303   -8.000000E-01       -1.770000E+00
1654304   -7.000000E-01       -2.360000E+00
1654305   -6.000000E-01       -2.790000E+00
1654306   -5.000000E-01       -2.910000E+00
1654307   -4.000000E-01       -2.670000E+00
1654308   -2.500000E-01       -1.690000E+00
1654309   -1.000000E-01       -5.000000E-01
1654310   0.000000E+00        0.000000E+00
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654400   1                   4
1654401   -1.000000E+00       -1.160000E+00
1654402   -9.000000E-01       -7.800000E-01
1654403   -8.000000E-01       -5.000000E-01
1654404   -7.000000E-01       -3.100000E-01
1654405   -6.000000E-01       -1.700000E-01
1654406   -5.000000E-01       -8.000000E-02
1654407   -3.500000E-01       0.000000E+00
1654408   -2.000000E-01       5.000000E-02
1654409   -1.000000E-01       8.000000E-02
1654410   0.000000E+00        1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654500   1                   5
1654501   0.000000E+00        0.000000E+00
1654502   2.000000E-01        -3.400000E-01
1654503   4.000000E-01        -6.500000E-01
1654504   6.000000E-01        -9.300000E-01
1654505   8.000000E-01        -1.190000E+00
1654506   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654600   1                   6
1654601   0.000000E+00        1.100000E-01
1654602   1.000000E-01        1.300000E-01
1654603   2.500000E-01        1.500000E-01
1654604   4.000000E-01        1.300000E-01
1654605   5.000000E-01        7.000000E-02
1654606   6.000000E-01        -4.000000E-02
1654607   7.000000E-01        -2.300000E-01
1654608   8.000000E-01        -5.100000E-01
1654609   9.000000E-01        -9.100000E-01
1654610   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654700   1                   7
1654701   -1.000000E+00       0.000000E+00
1654702   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654800   1                   8
1654801   -1.000000E+00       0.000000E+00
1654802   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654900   2                   1
1654901   0.000000E+00        1.000000E+00
1654906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655000   2                   2
1655001   0.000000E+00        1.000000E+00
```

```
1655007   1.000000E+00         1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655100   2                    3
1655101   -1.000000E+00        1.984300E+00
1655102   -8.009600E-01        1.394000E+00
1655103   -6.063800E-01        1.097500E+00
1655104   -4.068600E-01        8.220000E-01
1655105   -1.992800E-01        6.648000E-01
1655106   0.000000E+00         6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655200   2 *                  4
1655201   -1.000000E+00        1.984300E+00
1655202   -8.223400E-01        1.830800E+00
1655203   -6.337100E-01        1.682400E+00
1655204   -4.585300E-01        1.557000E+00
1655205   -2.670230E-01        1.436200E+00
1655206   -1.761070E-01        1.387900E+00
1655207   -8.931000E-02        1.348100E+00
1655208   0.000000E+00         1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655300   2                    5
1655301   0.000000E+00         -4.500000E-01
1655302   4.000000E-01         -2.500000E-01
1655303   5.000000E-01         0.000000E+00
1655304   1.000000E+00         3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655400   2                    6
1655401   0.000000E+00         1.233610E+00
1655402   9.064300E-02         1.196500E+00
1655403   1.885690E-01         1.109600E+00
1655404   2.734700E-01         1.041600E+00
1655405   4.586690E-01         8.958000E-01
1655406   5.744800E-01         7.807000E-01
1655407   7.381600E-01         6.134000E-01
1655408   7.685200E-01         5.849000E-01
1655409   8.700570E-01         4.877000E-01
1655410   1.000000E+00         3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655500   2                    7
1655501   -1.000000E+00        -1.000000E+00
1655502   -3.000000E-01        -9.000000E-01
1655503   -1.000000E-01        -5.000000E-01
1655504   0.000000E+00         -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655600   2                    8
1655601   -1.000000E+00        -1.000000E+00
1655602   -2.500000E-01        -9.000000E-01
1655603   -8.000000E-02        -8.000000E-01
1655604   0.000000E+00         -6.700000E-01
```

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*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*    STEADY STATE CONTROL SYSTEM
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP SPEED CONTROLLERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CALCULATE MASS FLOW ERROR
*---- ----1---- ----1---- ----1----
20590100  MSSERR    SUM       1.0       0.0       1
20590101  199.00    -1.0      MFLOWJ    100010000
*---- ----1---- ----1---- ----1----
* PUMP 1 SPEED
*---- ----1---- ----1---- ----1----
20590200  PCP1SPD   INTEGRAL  0.34482   133.000   1
20590201  CNTRLVAR  901
*---- ----1---- ----1---- ----1----
* PCP1 PUMP VELOCITY TABLE
*---- ----1---- ----1---- ----1----
1356100   510       CNTRLVAR  902
1356101   0.0       0.0
1356102   369.0     369.0
*---- ----1---- ----1---- ----1----
* MODIFY PCP1 PUMP DATA
*---- ----1---- ----1---- ----1----
1350301   0    0    0         -1        0         695       0
*---- ----1---- ----1---- ----1----
* PUMP 2 SPEED
*---- ----1---- ----1---- ----1----
20590300  PCP2SPD   INTEGRAL  0.34482   139.790   1
20590301  CNTRLVAR  901
*---- ----1---- ----1---- ----1----
* PCP2 PUMP VELOCITY TABLE
*---- ----1---- ----1---- ----1----
1656100   510       CNTRLVAR  903
1656101   0.0       0.0
1656102   369.0     369.0
*---- ----1---- ----1---- ----1----
* MODIFY PCP2 PUMP DATA
*---- ----1---- ----1---- ----1----
1650301   0    0    0         -1        0         697       0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SPRAY VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPRAY LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4300000   "SPRAY    "         BRANCH
4300001   1         0
4300101   0.0003363 6.322     0.0       0.0       90.0      2.9905
4300102   4.0-5     0.0       00
4300200   0         15037900. 1238620.  2459550.  .00000000
4301101   150000000 430000000 0.0       0.0       0.0       0000
4301201   .777018-4 .777018-4 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPRAY VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4350000   "SPRVLV   "         VALVE
4350101   430010000 415010000 3.3451E-4 1.5432E01 1.5432E01 0100
4350201   0         .00000000 .00000000 0.0
4350300   SRVVLV
```

```
4350301   904       999
*----- ----1---- ----1---- ----1----
* SPRAY VALVE POSITION CALCULATOR
*----- ----1---- ----1---- ----1----
20590400  SPRAY     SUM       -1.0      0.0       1         * CONTIN
+         3         0.0       1.0
20590401  15.06+6   -1.0      P         420010000
*----- ----1---- ----1---- ----1----
* POSITION VS AREA TABLE
*----- ----1---- ----1---- ----1----
20299900  NORMAREA
20299901  0.0       0.0
20299902  0.0001    0.0
20299903  1.0       1.0
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER HEATERS IN INITIALIZATION
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER HEATER TRIPS
*----- ----1---- ----1---- ----1----
* LT  693  CYLCING HEATERS         CARD 20241700
0000585   P         420010000 GT   NULL      0         15.06+6   N
0000586   P         420010000 LT   NULL      0         15.0599+6 N
0000666   586       OR        693       N
0000667   -585      AND       666       N
0000693   -503      AND       667       N
*----- ----1---- ----1---- ----1----
* LT  694  BACKUP HEATERS          CARD 20241800
0000587   P         420010000 GT   NULL      0         15.01+6   N
0000588   P         420010000 LT   NULL      0         15.0099+6 N
0000668   588       OR        694       N
0000669   -587      AND       668       N
0000694   -503      AND       669       N
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER HEATERS
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14172000  2         9         2         1         0.0
14172100  0         1
14172101  8         8.3820E-3
14172201  4         8
14172301  1.0       8
14172401  615.0     9
14172501  0         0         0         1         5.4864    1
14172502  0         0         0         1         1.8288    2
14172601  415040000 0         1         1         5.4864    1
14172602  415040000 0         1         1         1.8288    2
14172701  417       1.0       0.0       0.0       1         * CYCLING
14172702  418       1.0       0.0       0.0       2         * BACKUP
14172901  0         1.6764E-2 1.6764E-2 5.4864    1
14172902  0         1.6764E-2 1.6764E-2 1.8288    2
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CYCLING HEATERS
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20241700  POWER     693
20241701  0.0       0.0
20241702  1.0       3.6+4
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER BACKUP HEATERS
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20241800  POWER     694
20241801  0.0       0.0
20241802  1.0       1.2+4
```

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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER LEVEL CONTROL USING CHARGING AND LETDOWN COMPONENTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MODIFY PZR LEVEL CONTROL VARIABLE
*---- ----1---- ----1---- ----1----
20500206            0.1249    VOIDF     415060000
20500[illegible]            0.02477   VOIDF     420010000
20500[illegible]            0.02477   VOIDF     420020000
*---- ----1---- ----1---- ----1----
* CHARGING RESERVIOR
*---- ----1---- ----1---- ----1----
9800000   "CHRG RESRV"        TMDPVOL
9800101   1.0       1.0       0.0       0.0       0.0       0.0
9800102   4.0-5     0.0       00
9800200   3
9800201   0.0       2.07+07   559.2
*---- ----1---- ----1---- ----1----
* CHARGING VALVE
*---- ----1---- ----1---- ----1----
9850000   "CHRG VALVE"        VALVE
9850101   980000000 185000000 3.8E-05   0.0       0.0       0100
9850201   0         .608458-3 .608458-3 0.0
9850300   SRVVLV
9850301   905       999
*---- ----1---- ----1---- ----1----
* CHARGING VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590500  CHARGE    SUM       7.7       0.0       1         *CONTIN
+         3         0.0       1.0
20590501  1.18      -1.0      CNTRLVAR  2
*---- ----1---- ----1---- ----1----
* LETDOWN SINK
*---- ----1---- ----1---- ----1----
9900000   "LTDWN SINK"        TMDPVOL
9900101   1.0       1.0       0.0       0.0       0.0       0.0
9900102   4.0-5     0.0       00
9900200   3
9900201   0.0       1.4+7     559.2
*---- ----1---- ----1---- ----1----
* LETDOWN VALVE
*---- ----1---- ----1---- ----1----
9950000   "LTDWN VLV "        VALVE
9950101   185000000 990000000  2.5-5    0.0       0.0       0100
9950201   0         .00000000 .00000000 0.0
9950300   SRVVLV
9950301   906       999
*---- ----1---- ----1---- ----1----
* LETDOWN VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590600  LETDOWN   SUM       -7.7      0.0       1         *CONTIN
+         3         0.0       1.0
20590601  1.1430    -1.0      CNTRLVAR  2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CHANGES TO STEAM VALVE
*---- ----1---- ----1---- ----1----
5400201   0         13.604000 13.604000 0.0
5400300   SRVVLV
5400301   910       540
20254000  NORMAREA
```

```
20254001  0.0       0.0
20254002  0.0001    0.0
20254003  1.0       1.0
*---- ----1---- ----1---- ----1----
* COMPUTE DELTA T ERROR
*---- ----1---- ----1---- ----1----
20590700  "DELTA T" SUM       1.0       0.0       1
20590701  560.7     -1.       TEMPF     185010000
*---- ----1---- ----1---- ----1----
* FILTER DELTA T THRU DEADBAND
*---- ----1---- ----1---- ----1----
20590800  DEADBAND  FUNCTION  1.0       0.0       1
20590801  CNTRLVAR  907       908
20290800  REAC-T
20290801  -100.     -100.
20290802  -0.1      -0.1
20290803  -0.1      0.0
20290804  0.1       0.0
20290805  0.1       0.1
20290806  100.      100.
*---- ----1---- ----1---- ----1----
* INTEGRATE DELTA T ERROR
*---- ----1---- ----1---- ----1----
20590900  "INT D T" INTEGRAL  1.0       0.0       1
20590901  CNTRLVAR  908
*---- ----1---- ----1---- ----1----
* STEAM VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20591000  TCONTROL  SUM       1.0       0.44405   0         *CONTI
*         3         0.40      0.55
20591001  0.44405   -0.0564   CNTRLVAR  908
20591002            -0.0059   CNTRLVAR  909
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SIMPLIFIED FEED SYSTEM CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SIMPLIFIED FEED LOGIC
*---- ----1---- ----1---- ----1----
20591100  SGLVLERR  SUM       1.0       0.0       1
20591101  3.11      -1.0      CNTRLVAR  001
20591200  FEEDFLOW  SUM       1.0       0.0       1
20591201  0.0       1.0       MFLOWJ    540000000
20591202            48.4      CNTRLVAR  911
*---- ----1---- ----1---- ----1----
* REPLACE FEED JUNCTION TABLE
*---- ----1---- ----1---- ----1----
5660200   1         0         CNTRLVAR  912
5660201   -100.0    19.15     0.0       0.0
5660202   -1.0      0.0       0.0       0.0
5660203   0.0       0.0       0.0       0.0
5660204   50.0      50.0      0.0       0.0
5660205
5660206
5660207
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE REACTOR POWER TABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
. . . . . RELAP5 END CARD
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Appendix C. A Base Case Input Deck for a Transient Calculation

```
L23BTR2,T5000.
/USER
ATTACH,RSTIN=L23R2.
ATTACH,STH2XT,RE364BX.
DEFINE,RSTPLT=L23RSTT.
FILE,RSTIN,SBF=NO.
FILE,RSTPLT,SBF=NO.
*DEFINE,PLOTFL=L23HPLO.
RFL,CM=300000,FC=200.
REDUCE(-)
RE364BX,,*PL=50000.
/EOR
= LOFT L2-3 BASE TRANSIENT TO 100 SEC
0000100   RESTART   TRANSNT
0000101   RUN
0000103    5237
0000105   5.0       10.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000201    20.0     1.0-6    0.05    3    2  200  1000
0000202    100.0    1.0-6    0.01    3    10    500  2500
* REMCVE PUMP SPEED CONTROLLERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20590100  MSSERR    DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590200  PCP1SPD   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590300  PCP2SPD   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PUMP1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1350000   "PCPUMP1  "         PUMP
1350101   0.0        0.4572    0.0991    0.0        90.0       0.317900
1350102   0
1350108   130010000 0.0        0.017     0.017      0000
1350109   140000000 0.0        0.05      0.05       0000
1350200   0          1.49288+7 1.23094+6 2.46151+6 0.
1350201   0          3.0790    3.0790    0.0
1350202   0          3.2641    3.2641    0.0
1350301     0   0    0          -1        -1          0          0
1350302   369.00000 .35501355 .31550000 96.000000 500.60000 1.4310000
1350303   613.60000 .00000000 207.43300 .04440000 19.598700 .00000000
1350310   0.0        0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351100   1                   1
1351101   0.000000E+00        1.403600E+00
1351102   1.906100E-01        1.363600E+00
1351103   3.896300E-01        1.318600E+00
1351104   5.939600E-01        1.232800E+00
1351105   7.902030E-01        1.133600E+00
1351106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351200   1                   2
1351201   0.000000E+00        -6.700000E-01
1351202   2.000000E-01        -5.000000E-01
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1351203   4.000000E-01       -2.500000E-01
1351204   5.755400E-01       0.000000E+00
1351205   7.443200E-01       2.583000E-01
1351206   7.734800E-01       3.778000E-01
1351207   8.631300E-01       5.326000E-01
1351208   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351300   1                  3
1351301   -1.000000E+00      2.472200E+00
1351302   -8.057400E-01      2.047400E+00
1351303   -6.060000E-01      1.831000E+00
1351304   -4.068300E-01      1.624000E+00
1351305   -2.001710E-01      1.470500E+00
1351306   0.000000E+00       1.403500E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351400   1                  4
1351401   -1.000000E+00      2.472200E+00
1351402   -8.229700E-01      1.996800E+00
1351403   -6.333200E-01      1.589700E+00
1351404   -4.553400E-01      1.327900E+00
1351405   -2.710900E-01      1.194900E+00
1351406   -1.771600E-01      1.060500E+00
1351407   -9.073000E-02      1.015600E+00
1351408   0.000000E+00       9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351500   1                  5
1351501   0.000000E+00       2.500000E-01
1351502   2.000000E-01       2.800000E-01
1351503   4.000000E-01       3.400000E-01
1351504   4.118000E-01       2.768000E-01
1351505   5.976300E-01       4.584000E-01
1351506   7.934670E-01       6.992000E-01
1351507   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351600   1                  6
1351601   0.000000E+00       9.342790E-01
1351602   9.109900E-02       9.329000E-01
1351603   1.865090E-01       8.963000E-01
1351604   2.717620E-01       8.750000E-01
1351605   4.558720E-01       8.433000E-01
1351606   5.744060E-01       8.355000E-01
1351607   7.405760E-01       8.466000E-01
1351608   7.666190E-01       8.469000E-01
1351609   8.714710E-01       8.838000E-01
1351610   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351700   1                  7
1351701   -1.000000E+00      -2.000000E+00
1351702   -8.000000E-01      -6.400000E-01
1351703   -6.000000E-01      -3.000000E-01
1351704   -4.000000E-01      -5.000000E-02
1351705   -2.000000E-01      1.500000E-01
1351706   0.000000E+00       2.500000E-01
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351800   1                  8
1351801   -1.000000E+00      -1.000000E+00
1351802   -8.[illegible]00000E-01      -9.700000E-01
1351803   -6.000000E-01      -9.500000E-01
1351804   -4.000000E-01      -8.800000E-01
1351805   -2.000000E-01      -8.000000E-01
1351806   0.000000E+00       -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351900   2                  1
1351901   0.000000E+00       6.032000E-01
1351902   1.930000E-01       6.325000E-01
1351903   3.930000E-01       7.369000E-01
1351904   5.955200E-01       8.331000E-01
1351905   7.978200E-01       9.229000E-01
1351906   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352000   2                  2
1352001   0.000000E+00       -6.790000E-01
1352002   4.000000E-01       -2.500000E-01
1352003   5.000000E-01       1.500000E-01
1352004   7.372550E-01       5.265860E-01
1352005   7.680490E-01       6.065940E-01
1352006   8.672300E-01       7.436600E-01
1352007   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352100   2                  3
1352101   -1.000000E+00      1.984300E+00
1352102   -8.009800E-01      1.394000E+00
1352103   -6.063800E-01      1.097500E+00
1352104   -4.068600E-01      8.220000E-01
1352105   -1.992800E-01      6.648000E-01
1352106   0.000000E+00       6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352200   2                  4
1352201   -1.000000E+00      1.984300E+00
1352202   -8.223400E-01      1.830800E+00
1352203   -6.337100E-01      1.682400E+00
1352204   -4.585300E-01      1.557000E+00
1352205   -2.670230E-01      1.436200E+00
1352206   -1.761070E-01      1.387900E+00
1352207   -8.931000E-02      1.348100E+00
1352208   0.000000E+00       1.237610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352300   2                  5
1352301   0.000000E+00       -4.500000E-01
1352302   4.000000E-01       -2.500000E-01
1352303   5.000000E-01       0.000000E+00
1352304   1.000000E+00       3.569000E-01
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*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352400   2                    6
1352401   0.000000E+00         1.233610E+00
1352402   9.064300E-02         1.196500E+00
1352403   1.885690E-01         1.109600E+00
1352404   2.734700E-01         1.041600E+00
1352405   4.586690E-01         8.958000E-01
1352406   5.744800E-01         7.807000E-01
1352407   7.381600E-01         6.134000E-01
1352408   7.685200E-01         5.849000E-01
1352409   8.700570E-01         4.877000E-01
1352410   1.000000E+00         3.569000E-01
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352500   2                    7
1352501   -1.000000E+00        -1.000000E+00
1352502   -3.000000E-01        -9.000000E-01
1352503   -1.000000E-01        -5.000000E-01
1352504   0.000000E+00         -4.500000E-01
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352600   2                    8
1352601   -1.000000E+00        -1.000000E+00
1352602   -2.500000E-01        -9.000000E-01
1352603   -8.000000E-02        -8.000000E-01
1352604   0.000000E+00         -6.700000E-01
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353000   0
1353001   0.000000E+00         0.000000E+00
1353002   1.000000E-01         0.000000E+00
1353003   2.000000E-01         1.000000E-01
1353004   3.000000E-01         2.000000E-01
1353005   3.500000E-01         3.000000E-01
1353006   4.000000E-01         6.000000E-01
1353007   5.000000E-01         6.000000E-01
1353008   6.000000E-01         6.000000E-01
1353009   7.000000E-01         6.000000E-01
1353010   8.000000E-01         5.000000E-01
1353011   9.000000E-01         3.000000E-01
1353012   1.000000E+00         0.000000E+00
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*----- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353100   0
1353101   0.000000E+00         0.000000E+00
1353102   1.000000E-01         0.000000E+00
1353103   2.000000E-01         1.000000E-01
1353104   3.000000E-01         3.000000E-01
1353105   3.500000E-01         5.000000E-01
1353106   4.000000E-01         7.500000E-01
1353107   5.000000E-01         7.500000E-01
1353108   6.000000E-01         7.500000E-01
1353109   7.000000E-01         7.500000E-01
1353110   8.000000E-01         7.500000E-01
1353111   9.000000E-01         5.000000E-01
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1353112   1.000000E+00          0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354100   1                     1
1354101   0.000000E+00          1.000000E+00
1354102   1.000000E+00          1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354200   1                     2
1354201   0.000000E+00          1.000000E+00
1354202   1.000000E+00          1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354300   1                     3
1354301   -1.000000E+00         -1.160000E+00
1354302   -9.000000E-01         -1.240000E+00
1354303   -8.000000E-01         -1.770000E+00
1354304   -7.000000E-01         -2.360000E+00
1354305   -6.000000E-01         -2.790000E+00
1354306   -5.000000E-01         -2.910000E+00
1354307   -4.000000E-01         -2.670000E+00
1354308   -2.500000E-01         -1.690000E+00
1354309   -1.000000E-01         -5.000000E-01
1354310   0.000000E+00          0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354400   1                     4
1354401   -1.000000E+00         -1.160000E+00
1354402   -9.000000E-01         -7.800000E-01
1354403   -8.000000E-01         -5.000000E-01
1354404   -7.000000E-01         -3.100000E-01
1354405   -6.000000E-01         -1.700000E-01
1354406   -5.000000E-01         -8.000000E-02
1354407   -3.500000E-01         0.000000E+00
1354408   -2.000000E-01         5.000000E-02
1354409   -1.000000E-01         8.000000E-02
1354410   0.000000E+00          1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354500   1                     5
1354501   0.000000E+00          0.000000E+00
135[illegible]   2.000000E-01          -3.400000E-01
[illegible]   4.000000E-01          -6.500000E-01
[illegible]   6.000000E-01          -9.300000E-01
[illegible]54505   8.000000E-01          -1.190000E+00
1354506   1.000000E+00          -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354600   1                     6
1354601   0.000000E+00          1.100000E-01
1354602   1.000000E-01          1.300000E-01
1354603   2.500000E-01          1.500000E-01
1354604   4.000000E-01          1.300000E-01
1354605   5.000000E-01          7.000000E-02
1354606   6.000000E-01          -4.000000E-02
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1354607  7.000000E-01          -2.300000E-01
1354608  8.000000E-01          -5.100000E-01
1354609  9.000000E-01          -9.100000E-01
1354610  1.000000E+00          -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354700  1                     7
1354701  -1.000000E+00         0.000000E+00
1354702  0.000000E+00          0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354800  1                     8
1354801  -1.000000E+00         0.000000E+00
1354802  0.000000E+00          0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354900  2                     1
1354901  0.000000E+00          1.000000E+00
1354906  1.000000E+00          1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355000  2                     2
1355001  0.000000E+00          1.000000E+00
1355007  1.000000E+00          1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355100  2                     3
1355101  -1.000000E+00         1.984300E+00
1355102  -8.069600E-01         1.394000E+00
1355103  -6.063800E-01         1.097500E+00
1355104  -4.068600E-01         8.220000E-01
1355105  -1.992800E-01         6.648000E-01
1355106  0.000000E+00          6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355200  2                     4
1355201  -1.000000E+00         1.984300E+00
1355202  -8.223400E-01         1.830800E+00
1355203  -6.337100E-01         1.682400E+00
1355204  -4.585300E-01         1.557000E+00
1355205  -2.670230E-01         1.436200E+00
1355206  -1.761070E-01         1.387900E+00
1355207  -8.931000E-02         1.348100E+00
1355208  0.000000E+00          1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355300  2                     5
1355301  0.000000E+00          -4.500000E-01
1355302  4.000000E-01          -2.500000E-01
1355303  5.000000E-01          0.000000E+00
1355304  1.000000E+00          3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355400  2                     6
1355401  0.000000E+00          1.233610E+00
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1355402   9.064300E-02        1.196500E+00
1355403   1.885690E-01        1.109600E+00
1355404   2.734700E-01        1.041600E+00
1355405   4.586690E-01        8.958000E-01
1355406   5.744800E-01        7.807000E-01
1355407   7.381600E-01        6.134000E-01
1355408   7.685200E-01        5.849000E-01
1355409   8.700570E-01        4.877000E-01
1355410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1----   --1----
1355500   2                   7
1355501   -1.000000E+00       -1.000000E+00
1355502   -3.000000E-01       -9.000000E-01
1355503   -1.000000E-01       -5.000000E-01
1355504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355600   2                   8
1355601   -1.000000E+00       -1.000000E+00
1355602   -2.500000E-01       -9.000000E-01
1355603   -8.000000E-02       -8.000000E-01
1355604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PUMP 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1650000   "PCPUMP2  "         PUMP
1650101   0.0       0.514     0.0991    0.0       90.0      0.317900
1650102   0
1650108   160010000 0.0       0.017     0.017     0000
1650109   170000000 0.0       0.1       0.1       0000
1650200   0         1.49287+7 1.23094+6 2.46151+6 0.
1650201   0         3.4623    3.4623    0.0
1650202   0         3.5798    3.5798    0.0
1650301   135  135  135       -1        -1        0         0
1650302   369.00000 .36859079 .31550000 95.000000 500.60000 1.4310000
1650303   613.60000 .00000000 207.43300 .04440000 19.598700 .00000000
1650310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE SPRAY LINE, SPRAY VALVE, AND CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4300000   SPRAY     DELETE
4350000   SPRVLV    DELETE
20590400  SPRAY     DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PRESSURIZER MASS CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20507000  PZRMASS   SUM       1.0       0.0       1
20507001  0.0       3.33500-3 RHO       400010000
20507002            3.33500-3 RHO       405010000
20507003            3.33500-3 RHO       405020000
20507004            6.84000-2 RHO       415010000
20507005            8.38000-2 RHO       415020000
20507006            2.24255-1 RHO       415030000
20507007            2.98987-1 RHO       415040000
20507008            2.24255-1 RHO       415050000
20507009            7.32000-2 RHO       415060000
20507010            1.42000-2 RHO       420010000
20507011            1.42000-2 RHO       420020000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*   REPLACE PRESSURIZER BACKUP/CYCLING HEATERS POWER TABLE
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*   INSTEAD OF REMOVING PRESSURIZER HEAT STRUCTURE COMPNENTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----
20241700  POWER   693
20241701    0.0    0.0
20241702    1.0    0.0
20241800   POWER  694
20241801    0.0    0.0
20241802    1.0    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE PRESSURIZER LEVEL CONTROLLERS, CHARGING COMPONENT, AND
* LETDOWN COMPONENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20500200  PZRLVL     SUM       1.0       0.0       1
20500201  0.0        0.1815    VOIDF     415010000
20500202             0.1524    VOIDF     415020000
20500203             0.3967    VOIDF     415030000
20500204             0.5289    VOIDF     415040000
20500205             0.3967    VOIDF     415050000
205[illegible]       0.1943    VOIDF     415060000
205[illegible]       0.1029    VOIDF     420010000
20500208             0.1029    VOIDF     420020000
9800000   "CHRG R"   DELETE
9850000   "CHRG V"   DELETE
20590500  CHARGE     DELETE    0.0  0.0  0.0  0.0  0.0  0.0
9900000   "LTDWN S"  DELETE
9950000   "LTDWN V"  DELETE
20590600  LETDOWN    DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE STEAM VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5400000   "CV-P4-10  "         VALVE
5400101   530010000 541000000 0.0047772 0.0        0.0        0100
5400201   0          14.541    13.536    0.0
5400300   MTRVLV
5400301   685        686       0.05      .416170   540
20254000  NORMAREA
20254001  0.0        0.0
20254002  9.25-4     9.25-4
20254003  1.0        1.0
20590700  "DELTA T"  DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590800  DEADBAND   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590900  "INT D T"  DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20591000  TCONTROL   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20290800  DELETE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE FEED SYSTEM CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20591100  SGLVLERR   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20591200  FEEDFLOW   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
5660000   "FEED      "         TMDPJUN
5660101   565000000  508000000 0.05
5660200   1          502
5660201   -100.0     19.150    0.0       0.0       *L2-5
5660202   0.0        19.150    0.0       0.0       *L2-5
5660203   0.5        10.0      0.0       0.0       *L2-5
5660204   1.0        2.50      0.0       0.0       *L2-5
5660205   1.5        1.00      0.0       0.0       *L2-5
5660206   2.0        0.25      0.0       0.0       *L2-5
5660207   2.5        0.00      0.0       0.0       *L2-5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     REPLACE TRIPS FOR L2-3 TRANSIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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0000501    TIME  0   GE    NULL   0   0.0    L    * BREAK OPEN
0000502    TIME  0   GE    NULL   0   0.103  L    * REACTOR SCRAM
0000503    TIME  0   GE    NULL   0   14.0   N    * HPIS STRAT
0000504    TIME  0   GE    NULL   0   29.0   N    * LPIS START
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MINOR EDIT VARIABLES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000301   P          250010000     * PRIMARY PRESSURE PE-1UP-001
0000302   P          530010000     * SECONDARY PRESSURE
0000303   TEMPF      250010000     * UPPER PLENUM TEMP.
0000304   TEMPF      215010000     * LOWER PLENUM TEMP.
0000305   MFLOWJ     340010000     * BLCL MASS FLOW
0000306   MFLOWJ     305010000     * BLHL MASS FLOW
0000307   RHO        100010000     * ILHL DENSITY
0000308   RHO        340010000     * BLCL DENSITY
0000309   RHO        305010000     * BLHL DENSITY
0000310   RHO        185010000     * ILCL DENSITY
0000311   RHO        180010000     * PUMP EXIT DEN.
0000312   MFLOWJ     630000000     * LPSI MASS
0000313   MFLOWJ     640000000     * HPSI
0000314   MFLOWJ     600000000     * ECC MASS
0000315   MFLOWJ     610000000     * ACCUM MASS FLOW
0000316   CNTRLVAR   4             * ACCUMULATOR LEVEL
0000317   PMPVEL     135           * PUMP 1 SPEED
0000318   P          100010000     * ILHL PRESSURE
0000319   VOIDGJ     317000000     * HL BREAK JUNC VOID
0000320   VOIDGJ     347000000     * CL BREAK JUNC VOID
0000321   CNTRLVAR   2             * PZR LEVEL
0000322   CNTRLVAR   1             * S/G LEVEL
0000323   CNTRLVAR   7             * DC LEVEL (INTACT)
0000324   CNTRLVAR   8             * DC LEVEL (BROKEN)
0000325   CNTRLVAR   9             * HOT CORE LEVEL
0000326   CNTRLVAR   10            * AVER CORE LEVEL
0000327   CNTRLVAR   12            * TOTAL COLLAPSED LEVEL
0000328   CNTRLVAR   59            * AVERAGE CORE MASS
0000329   CNTRLVAR   60            * HOT CORE MASS
0000330   CNTRLVAR   71            * CORE MASS
0000331   CNTRLVAR   72            * PCS TOTAL MASS
0000332   CNTRLVAR   75            * TOTAL INJECTED MASS
0000333   CNTRLVAR   77            * TOTAL DISCHARGED MASS
0000334   CNTRLVAR   81            * TIME STEP SIZE
0000335   CPUTIME    0
0000336   MFLOWJ     180010000     * PUMP DISCHAGE MASS
0000337   MFLOWJ     185010000     * ILCL MASS FLOW
0000338   MFLOWJ     701000000     * DC UPPER ANNULUS MASS
0000339   MFLOWJ     731000000     * DC DOWNWARD MASS
0000340   MFLOWJ     722000000     * CROSS FLOW 1
0000341   MFLOWJ     724000000     * CROSS FLOW 2
0000342   MFLOWJ     726000000     * CROSS FLOW 3
0000343   MFLOWJ     728000000     * CROSS FLOW 4
0000344   MFLOWJ     719000000     * BR.SIDE DC DOWNWARD MASS
0000345   MFLOWJ     225010000     * AVER CORE MASS FLOW
0000346   MFLOWJ     225020000     * HOT CORE MASS FLOW
0000347   MFLOWJ     225030000     * CORE BYPASS FLOW
*
0000348   VOIDG      021010000     * HOT CH  5 INCH VOID
0000349   VOIDG      023010000     * HOT CH 28 INCH VOID
0000350   VOIDG      025010000     * HOT CH 39 INCH VOID
0000351   VOIDG      013010000     * AVER CH 28 INCH VOID
0000352   VOIDG      015010000     * AVER CH 39 INCH VOID
0000353   OIDG       225010000     * LOWER PLENUM VOID
0000354   VOIDG      240010000     * UPPER PLENUM VOID
```

```
0000355    HTTEMP   231100110    * TE-5H5-002
0000356    HTTEMP   231100210    * TE-5J9-005
0000357    HTTEMP   231100310    * TE-5I8-008
0000359    HTTEMP   231100410    * TE-5J7-011
0000360    HTTEMP   231100510    * TE-5H5-015
0000361    HTTEMP   231100610    *
*
0000362    HTTEMP   230100110
0000363    HTTEMP   230100210    * TE-4E8-011
0000364    HTTEMP   230100310    * TE-4F7-015
0000365    HTTEMP   230100410    * TE-4G8-021
0000366    HTTEMP   230100510    * TE-4F8-028
0000367    HTTEMP   230100610    * TE-4F8-032
0000368    TEMPF    712010000    * TE-1ST-001
0000369    TEMPF    714010000
0000370    TEMPF    716010000
0000371    TEMPF    718010000
0000372    TEMPF    225010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*    ACCUMULATOR, TRIPS, AND CONTROL VARIABLE
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000579   MFLOWJ    610000000 GE        NULL      0    0.0      N
0000580   CNTRLVAR  4         LT        NULL      0    1.0      L
0000682   579       AND       -580      N
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR LEVEL CONTROL VARIABLE
*---- ----1---- -    ---- ----1---- ----1---- ----1---- ----1----
20500400  ACCMLVL    NTEGRAL  -4.776E-3   2.04    0
20500101  VELFJ     610000000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CHECK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6000000   "ECC CHKVLV"        VALVE
6000101   605010000 185000000 0.0       1.3869    1.3869    0100
6000201   0         0.0       0.0       0.0
6000300   TRPVLV
6000301   681
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"        SNGLVOL
6050101   5.989E-3  4.8247    0.0       0.0       90.0      2.2061
6050102   1.0165-5  0.0       10
6050200   0         4.18E+6    125472.   2600290.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6100000   "ACCUM VLV "        VALVE
6100101   615010000 605000000 0.0       8.1009    8.1009    0000
6100201   0         0.0       0.0       0.0
6100300   TRPVLV
6100301   682
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "        SNGLVOL
```

```
6150101   0.01608   24.5486   0.0       0.0       0.0       0.0
6150102   1.0165-5  0.0       10
6150200   3         4.18E+6   303.2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6200000   "ACCUMULATR"        ACCUM
620010(   1.254     1.8261563 0.0       0.0       -90.0     -1.8261563
6200102   2.286-5   0.0       10
6200200   4.18E+6   303.2
6201101   615000000 8.213E-3 40.0000   40.0000   0
6202200   1.45      0.0       4.0251    0.67056   0.04445   0 0 0 0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - THERMAL CONDUCTIVITY         FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100300  TBL/FCTN    1         1
20100301  300.0     12.68
*20100301  380.4    13.6
20100302  469.3     14.6
20100303  577.6     15.8
20100304  685.9     17.3
20100305  774.8     18.4
20100306  872.0     19.8
20100307  973.2     21.8
20100308  1073.2    23.2
20100309  1123.2    25.4
20100310  1152.3    24.2
20100311  1232.2    25.5
20100312  1331.2    26.6
20100313  1404.2    28.2
20100314  1576.2    33.0
20100315  1625.2    36.7
20100316  1755.2    41.2
20100317  2273.2    55.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - VOLUMETRIC HEAT CAPACITY      FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100351  300.0     1.841E6
20100352  400.0     1.978E6
20100353  640.0     2.168E6
20100354  1090.0    2.456E6
20100355  1093.0    3.288E6
20100356  1113.0    3.865E6
20100357  1133.0    4.028E6
20100358  1153.0    4.709E6
20100359  1173.0    5.345E6
20100360  1193.0    5.044E6
20100361  1213.0    4.054E6
20100362  1233.0    3.072E6
20100363  1243.0    2.332E6
20100364  1477.0    2.332E6
*---- ----1---- ----1---- ----1
*     PLOT EDIT REQUEST
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20300100  P         250010000   * PRIMARY PRESSURE PE-1UP-001
20300200  P         530010000   * SECONDARY PRESSURE
20300300  TEMPF     250010000   * UPPER PLENUM TEMP.
20300400  TEMPF     215010000   * LOWER PLENUM TEMP.
20300500  MFLOWJ    340010000   * BLCL MASS FLOW
20300600  MFLOWJ    305010000   * BLHL MASS FLOW
20300700  RHO       100010000   * ILHL DENSITY
20300800    RHO     340010000   * BLCL DENSITY
20300900    RHO     305010000   * BLHL DENSITY
```

```
20301000    RHO     185010000      * ILCL DENSITY
20301100    RHO     180010000      * PUMP EXIT DEN.
20301200    MFLOWJ  630000000      * LPSI MASS
20301300    MFLOWJ  640000000      * HPSI
20301400    MFLOWJ  600000000      * ECC MASS
20301500    MFLOWJ  610000000      * ACCUM MASS FLOW
20301600    CNTRLVAR  4            * ACCUMULATOR LEVEL
20301700    PMPVEL    135          * PUMP 1 SPEED
20301800    P     100010000        * ILHL PRESSURE
20301900    VOIDGJ  317000000      * HL BREAK JUNC VOID
20302000    VOIDGJ  347000000      * CL BREAK JUNC VOID
20302100    CNTRLVAR  2            * PZR LEVEL
20302200    CNTRLVAR  1            * S/G LEVEL
20302300    CNTRLVAR  7            * DC LEVEL (INTACT)
20302400    CNTRLVAR  8            * DC LEVEL (BROKEN)
20302500    CNTRLVAR  9            * HOT CORE LEVEL
20302600    CNTRLVAR 10            * AVER CORE LEVEL
20302700    CNTRLVAR 12            * TOTAL COLLAPSED LEVEL
20302800    CNTRLVAR 59            * AVERAGE CORE MASS
20302900    CNTRLVAR 60            * HOT CORE MASS
20303000    CNTRLVAR 71            * CORE MASS
20303100    CNTRLVAR 72            * PCS TOTAL MASS
20303200    CNTRLVAR 75            * TOTAL INJECTED MASS
20303300    CNTRLVAR 77            * TOTAL DISCHARGED MASS
20303400    CNTRLVAR 81            * TIME STEP SIZE
20303500    CPUTIME   0
20303600    MFLOWJ  180010000      * PUMP DISCHAGE MASS
20303700    MFLOWJ  185010000      * ILCL MASS FLOW
20303800    MFLOWJ  701000000      * DC UPPER ANNULUS MASS
20303900    MFLOWJ  731000000      * DC DOWNWARD MASS
20304000    MFLOWJ  722000000      * CROSS FLOW 1
20304100    MFLOWJ  724000000      * CROSS FLOW 2
20304200    MFLOWJ  726000000      * CROSS FLOW 3
20304300    MFLOWJ  728000000      * CROSS FLOW 4
20304400    MFLOWJ  719000000      * BR.SIDE DC DOWNWARD MASS
20304500    MFLOWJ  225010000      * AVER CORE MASS FLOW
20304600    MFLOWJ  225020000      * HOT CORE MASS FLOW
20304700    MFLOWJ  225030000      * CORE BYPASS FLOW
*
20304800    VOIDG   021010000      * HOT CH 11 INCH VOID
20304900    VOIDG   023010000      * HOT CH 21 INCH VOID
20305000    VOIDG   025010000      * HOT CH 45 INCH VOID
20305100    VOIDG   013010000      * AVER CH 21 INCH VOID
20305200    VOIDG   015010000      * AVER CH 45 INCH VOID
20305300    VOIDG   225010000      * LOWER PLENUM VOID
20305400    VOIDG   240010000      * UPPER PLENUM VOID
*
20305500    HTTEMP  231100110      * TE-5H5-002
20305600    HTTEMP  231100210      * TE-5J9-005
20305700    HTTEMP  231100310      * TE-518-008
20305800    HTTEMP  231100410      * TE-5J7-011
20305900    HTTEMP  231100510      * TE-5H5-015
20306000    HTTEMP  231100610      *
*
20306100    HTTEMP  230100110
20306200    HTTEMP  230100210      * TE-4E8-011
20306300    HTTEMP  230100310      * TE-4F7-015
20306400    HTTEMP  230100410      * TE-4G8-021
20306500    HTTEMP  230100510      * TE-4F8-028
20306600    HTTEMP  230100610      * TE-4F8-032
20306700    TEMPF   712010000      * TE-1ST-001
20306800    TEMPF   714010000
20306900    TEMPF   716010000
```

```
20307000  TEMPF   718010000
20307100  TEMPF   225010000
*---- ----1---- ----1---- ----1---- ----1---- ----1-- - ----1----
*  ADDED OR CHANGED CONTROL VARIABLE IN TRANSIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 012 TOTAL COLLAPSED CORE LEVEL
20501200  CCCLEVEL  SUM   1.0    0.0   1
20501201  0.0       1.0    CNTRLVAR  3
20501202            1.0    CNTRLVAR  9
*  013 BOTTOM BASE LEVEL
20501300  BBLEVEL  SUM     1.0      0.0      1
20501301  1.298489  -1.0  CNTRLVAR  12
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  CHANGED OR ADDED CCONTROL VARIABLES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20505900  AVCOMS  SUM   1.0   0.0   1
20505901  0.0     0.044204786   RHO   011010000
20505902         0.0442044786   RHO   012010000
20505903         0.044204786    RHO   013010000
20505904          0.044204786   RHO   014010000
20505905          0.044204786   RHO   015010000
20505906          0.044204786   RHO   016010000
20506000  HCOMS    SUM   1.0    0.0    1
20506001  0.0     0.006997366   RHO  021010000
20506002          0.006997366   RHO  022010000
20506003          0.006997366   RHO  023010000
20506004          0.006997366   RHO  024010000
20506005          0.006997366   RHO  025010000
20506006          0.006997366   RHO  026010000
*
*    REACTOR VESSEL MASS
*
20507100    RVMASS    SUM    1.0   0.0     1
20507101    0.0      1.0      CNTRLVAR    59
20507102             1.0      CNTRLVAR    60
20507103             1.0      CNTRLVAR    65
20507104             1.0      CNTRLVAR    67
*
*    PRIMARY COOLANT TOTAL MASS
*
20507200    PCSMASS   SUM    1.0     0.0    1
2050720.    0.0    1.0      CNTRLVAR    61
20507202           1.0      CNTRLVAR    62
20507203           1.0      CNTRLVAR    63
20507204           1.0      CNTRLVAR    64
20507205            1.0       CNTRLVAR  68
20507206            1.0       CNTRLVAR  69
20507207            1.0       CNTRLVAR  70
20507203            1.0       CNTRLVAR  71
*
*     TOTAL INJECTICN MASS
*
20507400     TOINFL     SUM      1.0       0.0     1
20507401     0.         1.0      MFLOWJ    600000000
20507402                1.0      MFLOWJ    640000000
20507500     INJMASS    INTEGRAL  1.0      0.0     1
20507501                CNTRLVAR   74
*
*     TOTAL DISCHARGE MASS
*
20507600     TOBREL     SUM      1.0       0.0     1
20507601     0.         1.0      MFLOWJ    317000000
20507602                1.0      MFLOWJ    347000000
```

```
20507700     BRMASS     INTEGRAL  1.0    0.0     1
20507701                CNTRLVAR    76
20507701                CNTRLVAR    76
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     END OF INPUT
#EOR
#EOR
```

Appendix D. Updat List for PSI-EIR 83 based on RELAP5/MOD2 Cycle 36.04

APPENDIX D Update list for a updated RELAP5/MOD2 Cycle 36.04

```
/JOB
RM364T,T200.
/USER
ATTACH,OLDPL=REL364S.
PURGE,RE364TS/NA.
PURGE,RE364TX/NA.
PURGE,RE364TL/NA.
* ***************************
*  IMPORTANT !!             *
*   THE UPDATE DIRECTIVE    *
*   SHOULD HAVE *COMPILE DEFINE
*   AS THE FIRST DIERECTIVE
****************************
UPDATE,N=RE364TS.
UPDATE,P=RE364TS,Q,C=R5SEG.
REPLACE,R5SEG.
RETURN,OLDPL.
*DEFINE,RE364TS.
RETURN,RE364TS.
ATTACH,ENVRLX=ENVR41X.
LIBRARY,ENVRLX.
SELECTA,COMPILE,COMP.
LIBRARY.
RETURN,ENVRLX.
REWIND,COMP.
FTN5,I=COMP,DO,ET,STATIC,OPT=2,ROUND,LO=M/A/R/S.
RETURN,COMP.
REWIND,LGO.
ATTACH,RELAP5I=REL36IL.
GTR,RELAP5I,ADD.REL/*
*DEFINE,RELAP5O=RE364TL.
LIBEDIT,P=RELAP5O,I=0,B=ADD,LO=F,U,C.
LIBEDIT,P=RELAP5O,B=LGO,I=0,LO=F,U,C.
RETURN,NULL,LGO,RELAP5I.
RETURN,RLP5F1,RLP5F2.
ATTACH,ENVRL=ENVR41L.
FILE,RSTIN,RT=S,SBF=NO,USE,FO=SQ.
RFL,EC=200.
DEFINE,RE364TX.
SEGLOAD,I=R5SEG,B=RE364TX.
LDSET,LIB=RELAP5O/ENVRL.
LDSET,PRESETA=NGINDEF,ERR=NONE,MAP=SB.
LDSET,STAT=RSTIN.
LIBLOAD,ENVRL,$HDR=$.
LIBLOAD,FTN5LIB,$FERCAP.$,$RPVCAP.$,$FTNRP2.$,$Q2NTRY.$.
NOGO.
RETURN,RELAP5O,ENVRL,COMPILE.
SKIP,KKK.
EXIT.
ENDIF,KKK.
DAYFILE,KMRRDAY.
REPLACE,KMRRDAY.
/EOR
*COMPILE DEFINE
*ID CBD3604
*D DMK3601.484
*D PLOTMD.24
```

```
 901  FORMAT ('OPLOTFL SCRACH FILE GENERATED.')
*COMPILE DEFINE,SEGDIR
*COMPILE RELAP5
*D RJW3603.23
      DATA PTITLE/"RELAP5/2/3","6.04-PSI","REACTOR LO","SS OF COOL",
*/
*/    ENDIF
*/        *ID KWU01  ALREADY IMPLEMENTED IN RELAP5OLDPL3604C,
*/                   WHICH IS USED AS BASIS
*/        */    CORRECTIONS OF INDEX IN SUBROUTINE RACCUM
*/        *I RACCUM.618
*/              IELV=I
*/        *B DMK3602.581
*/        I=IELV
*COMPILE DEFINE,SEGDIR,RACCUM
*ID KWU01
*I RACCUM.618
           IELV=I
*B DMK3602.581
          I=IELV
*/        */     END OF KWU-UPDATES TO CYCLE 3604
*COMPILE DEFINE,SEGDIR
*IDENT SKI01
*/          THESE UPDATES ARE RECOMMENDED BY SKI TO BE
*/          IMPLEMENTED IN RELAP5/MOD2-36.04
*/          SOURCE:     LETTER FROM STUDSVIK (MR.SANDERVAG)
*/                      TO          KWU      (MR.GRUBER)
*/                      1987-06-25
*/
*/         COMPILE RELAP5
*/
*COMPILE IHTCMP
*/
*/        FIX AN INDEXING ERROR IN IHTCMP
*/        ERROR CAUSED ROD PLENUM VOLUME FOR GAP-GAS PRESSURE CALCULATION
*/        TO BE INCORRECT. FOUND AND FIXED BY D.CARAHER 20MAY87
*/        FIX ONLY CDC-VERSION CODING
*D IHTCMP.1041
      L=(.NOT.MASK(43).AND.IHTPTR(J))+FILNDX(8)
*/
*/         UPDATE ROUTINE IRFLHT TO ALLOW REFLOOD TO WORK
*/         HEAT STRUCTURE FILE GETS CHANGED ON RESTART (FOR
*/         EXAMPLE BY DELETING OR ALTERING SOME STRUCTURES)
*/  NOTE..HEAT STRS ASSOCIATED WITH REFLOOD CANNOT BE ALTERED
*/         ON RESTART AS IRFLHT IS NOW PROGRAMMED
*/
*COMPILE IRFLHT
*I IRFLHT.330
C          UPDATE THE GEOMETRY POINTER IN IGLRFL BITS 44-60 IN CASE THE
C          HEAT STRUCTURE FILE CHANGED ON RESTART.
      J=(.NOT.MASK(43).AND.IH) + IHT
      J=(.NOT.MASK(43).AND.IHTPTR(J)) + IHT
      NCOLS=.NOT.MASK(43).AND.INXGOM(J)
      IGLRFL(I)=(MASK(43).AND.IGLRFL(I)).OR.NCOLS
*/
*/    END OF UPDATES SKI01
*/
*/  START OF PSI UPDATE
*/
```

```
*ID MARTIN
*I PHAINT.9
          COMMON/IFLG2/IFLAG2(1000)
          DIMENSION IFLAG1(1000)
*I PHAINT.151
          IIFL1=(I-IV+IVSKP)/IVSKP
          IFLAG1(IIFL1)=0
*I PHAINT.294
          TGSAT=TGSAT-40.*VOIDF(I)
*I PHAINT.370
       IF(FBUB.GT.0.0.OR.FSLUG.GT.0.0.AND.DIAMV(I).LT.0.018)
     1  IFLAG1(IIFL1)=1
*I PHAINT.390
      IF(DIAMV(I).LT.0.018) THEN
      FIC=65.0*VOIDG(I)*VOIDF(I)**3.0*RHOG(I)/DIAMV(I)
      ENDIF
*I PHAINT.421
      IF(DIAMV(I).LT.0.018) THEN
      FIC1=65.0*VOIDG(I)*VOIDF(I)**3.0*RHOG(I)/DIAMV(I)
      ENDIF
*I PHAINT.424
      IF(DIAMV(I).GE.0.018) THEN
*I PHAINT.425
      ENDIF
*I PHAINT.495
      IF(DIAMV(I).LT.0.018) FIC1=FIC1*0.5
*I PHAINT.633
      IF(DIAMV(I).LT.0.018) THEN
      FIC1=VOID*(FIC1*0.5+1.225*0.4*RHOG(I)*SLSLG*VOID**2.)
      ELSE
*I PHAINT.634
      ENDIF
*I PHAINT 5C6
      IF(DIAMV(I).LT.0.018) FIC=FIC*0.5
*I PHAINT.462
      IF(DIAMV(I).LT.0.018) FIC=FIC*0.5
*I PHAINT.855
      IIFL2= (I-IJ+IJSKP)/IJSKP
      IFLAG2(IIFL2)=0
*I PHAINT.919
      INDK=(K-IV+IVSKP)/IVSKP
      INDL=(L-IV+IVSKP)/IVSKP
      IF(IFLAG1(INDK).EQ.1.OR.IFLAG1(INDL).EQ.1) IFLAG2(IIFL2)=1
*D QFHTRC.156
      HTV2(INDZ)=HCCHFA*EXP(-0.0175*TERM)+GTERM*EXP(-0.012*TERM)
*D QFHTRC.178
      FACBR = (1.+0.025*AMAX1(0.,SATT(IDX)-TEMPF(IDX)))
      HCBR=AMAX1(HTV2(INDZ),(CONVAP*TERM1*TERM2*((SATHG(IDX)-SATHG(IDX))
*D QFHTRC.179
     1/AMAX1(TMPBDY-SATT(IDX),0.01)+0.68*CSUBPG(IDX))*9.81/(2.*3.14159)
*D QFHTRC.180
     2    *SQRT(9.81*TERM1/SIGMA(IDX))/VISCG(IDX))**0.25*0.62*FACBR)
      VELD=AMAX1(VELG(IDX)-VELF(IDX),0.001)
      DDROP=3.*SIGMA(IDX)/(RHOG(IDX)*VELD**2)
       IF(DDROP.LT.1.5E-4)DDROP=1.5E-4
       IF(DDROP.GT.3.0E-3)DDROP=3.0E-3
      TERM5=1./(1.+0.35*CSUBPG(IDX)*AMAX1(TMPBDY-SATT(IDX),0.0001)
     1     /AMAX1(SATHG(IDX)-SATHF(IDX),0.01))**3.
      HCFO=0.4*3.14159/4.*(6.*(1.-VOIDG(IDX))/3.14159)**0.6666667
```

```
     1    *(9.81*RHOF(IDX)*RHOG(IDX)*AMAX1(SATHG(IDX)-SATHF(IDX),0.01)
     2    *TERM5*CONVAP/(AMAX1(TMPBDY-TEMPF(IDX),0.0001)*VISCG(IDX)
     3    *(3.14159/6.)**0.3333333*DDROP))**0.25
      IF(VOIDG(IDX).LE.0.6)THEN
       HCFB=HCBR
      ELSE
        IF(VOIDG(IDX).GE.0.8) THEN
          HCFB=HCFO
        ELSE
          HCFB=(VOIDG(IDX)-0.6)/0.2*HCFO+(0.8-VOIDG(IDX))/0.2
     1        *HCBR
        ENDIF
      ENDIF
*D QFHTRC.187,188
      TERM=TERM2+HCFB
*D QFHTRC.209
     1    *AMAX1(0.023*(REYN2)**0.4/DIAMV(IDX),TERM4)
*D QFHTRC.221,223
      VELD=AMAX1(VELG(IDX)-VELF(IDX),0.001)
      DDROP=3.*SIGMA(IDX)/(RHOG(IDX)*VELD**2)
      IF(DDROP.LT.1.5E-4) DDROP = 1.5E-4
      IF(DDROP.GT.3.0E-3) DDROP = 3.0E-3
      TERM5=1./(1.+0.35*CSUBPG(IDX)*AMAX1(TMPBDY-SATT(IDX),0.0001)
     1     /(SATHG(IDX)-SATHF(IDX)))**3.
      HCFO=0.4*3.14159/4.*(6.*(1.-VOIDG(IDX))/3.14159)**0.6666667
     1    *(9.81*RHOF(IDX)*RHOG(IDX)*(SATHG(IDX)-SATHF(IDX))
     2    *TERM5*CONVAP/(AMAX1(TMPBDY-TEMPF(IDX),0.0001)*VISCG(IDX)
     3    *(3.14159/6.)**0.3333333*DDROP))**0.25
      HCFB=HCFO
*I VEXPLT.9
      COMMON/IFLG2/IFLAG2(1000)
*I VEXPLT.322
      C0=1.0
      C1=1.0
      IIFL2=(I-IJ+IJSKP)/IJSKP
      IF(IFLAG2(IIFL2).EQ.1) THEN
        C0=1.2
        C1=(1.0-C0*VOIDGA)/AMAX1((1.-VOIDGA),1.0E-5)
        IF(C1.LT.0.7) C1=0.7
      ENDIF
*D VEXPLT.323
      FJFG=(FIJ(I)*DX*(ABS(C1*VELGJO(I)-C0*VELFJO(I))+0.01)
*D VEXPLT.507
        DIFF=SCRACH+(FRICFJ+C0*FJFG+VPGNX+HLOSSF)*DT
*D VEXPLT.508
        DIFG=-SCRACH-(FRICGJ+C1*FJFG+VPGNX+HLOSSG)*DT
*I VIMPLT.8
      COMMON/IFLG2/IFLAG2(1000)
*I VIMPLT.435
      C0=1.0
      C1=1.0
      IIFL2=(I-IJ+IJSKP)/IJSKP
      IF(IFLAG2(IIFL2).EQ.1) THEN
        C0=1.2
        C1=(1.0-C0*VOIDGA)/AMAX1((1.-VOIDGA),1.0E-5)
        IF(C1.LT.0.7) C1=0.7
      ENDIF
*D VIMPLT.436
      FJFG=(FIJ(I)*DX*(ABS(C1*VELGJO(I)-C0*VELFJO(I))+0.01)
```

```
*D VIMPLT.591
        COEFV(IDG-1) = (FRICFJ+C0*FJFG+VPGNX+HLOSSF)*DT + SCRACH
*D VIMPLT.592
        COEFV(IDG)   =-(FRICGJ+C1*FJFG+VPGNX+HLOSSG)*DT - SCRACH
*C DEFINE,PHAINT,QFHTRC,VEXPLT,VIMPLT
*/
*/   END OF PSI UPDATE
*/
*/
*COMPILE ACCUM,PHAINT,DTSTEP
*/
*/ PROTECTS SIGMA (SURFACE TENSION) BY 1.0E-7 IN SUBROUTINE PHAINT
*/
*DELETE,PHAINT.200
      DSTAR(I) =DIAMV(I)*SQRT(9.8*RHOFG/AMAX1(SIGMA(I),1.0E-7))
*DELETE,PHAINT.326
   55 VCRIT=2.5*SQRT(SQRT(AMAX1(SIGMA(I),1.0E-7)*RHOFG)/RHOG(I))
*/
*/ CORRECT ERROR IN SUBROUTINE DTSTEP INTRODUCED IN CYCLE 30 SO THAT
*/ STATE PROPERTIES ARE NOT RESET WHEN AT A MINIMUM TIMESTEP DUE TO
*/ MASS ERROR
*/
*DELETE,DTSTEP.161
       IF (NANY .EQ. 0) WRITE (OUTPT,2003)
*/
*/ REWET CRITERIA REDUCTION (89/5/23 AKSAN & ICAP)
*IDENT MARTIN2
*I HTRC1.60
      GGT = RHOF(IV)*VOIDF(IV)*VELF(IV)+
     1      RHOG(IV)*VOIDG(IV)*VELF(IV)
*I HTRC1.111
      IF(GGT.GT.-100.) GO TO 12
*D HTRC1.112
       IF(XE.GT.XEC.OR.TW.GT.(1250.-TSAT)) GO TO 2000
      GO TO 13
   12 IF(XE.GE.XEC) GO TO 2000
   13 CONTINUE
*I HTRC1.82
      IF(GGT.GT.-100.) GO TO 11
*D HTRC1.83
      IF(TW.GT.1250.-TSAT) GO TO 2000
   11 CONTINUE
*I PSTDNB.28
      GGT = RHOF(IV)*VOIDF(IV)*VELF(IV)+
     1      RHOG(IV)*VOIDG(IV)*VELG(IV)
*I PSTDNB.29
       IF(GGT.GT.-100.) GO TO 231
*D PSTDNB.30
      IF(XE.GT.XEC.OR.TW.GT.(1250.-TSAT)) GO TO 235
*I PSTDNB.31
      GO TO 232
  231 IF(XE.GT.XEC) GO TO 235
  232 CONTINUE
*I PSTDNB.124
      IF(GGT.GT.-100.) GO TO 401
*D PSTDNB.126
     1   (1250.-TSAT)) TRANS = .FALSE.
*I PSTDNB.141
      GO TO 499
```

```
 401 IF(XE.GE.XEC)TRANS=.FALSE.
     IF(TRANS) THEN
     GO TO 402
     ELSE
     GO TO 403
      ENDIF
 402 HTCF=AMAX1(HTBF,HFB)
     HTCG=AMAX1(HTBG,HV)
     QFFO=AMAX1(QTFBF,QFBF)
     QFGO=AMAX1(QTFBG,QFBG)
     GO TO 450
 403 HTCF=HFB
     HTCG=HV
     QFFO=QFBF
     QFGO=QFBG
 499 CONTINUE
*D PSTDNB.42
     IF(GGT.LT.-100) THEN
     FL=EXP(-5.0*THETA*AMIN1(ABS(TW-TWRTO),SQRT(DTSAT)))
     ELSE
     IF(GGT.GE.-100..AND.GGT.LE.0) THEN
     FL=((EXP(-2.0*THETA*AMIN1(ABS(TW-TWRTO),SQRT(DTSAT)))
    1   -EXP(-5.0*THETA*AMIN1(ABS(TW-TWRTO),SQRT(DTSAT))))/100.)*GGT+
    2    EXP(-2.0*THETA*AMIN1(ABS(TW-TWRTO),SQRT(DTSAT)))
      ELSE
     FL= EXP(-2.0*THETA*AMIN1(ABS(TW-TWRTO),SQRT(DTSAT)))
     ENDIF
      ENDIF
     FL = FL*AMIN1(1.,(((1.-ALPH)/0.05)**4))
*D PSTDNB.67
     HFB = 0.92163*(SQRT(HFB/SIGMA(IV))
*I PSTDNB.69
     HCBR = HFB
     VAMA = AMAX1(VELG(IV)-VELF(IV),0.001)
     VFG2 = VAMA**2.
     XA= AMAX1(3.*SIGMA(IV),1.E-10)
     RDIAM =RHOG(IV)*VFG2/XA
     DDROP = 1./RDIAM
     IF(DDROP.LT.1.0E-4) DDROP=1.0E-4
     IF(DDROP.LT.3.0E-3) DDROP=3.0E-3
     TERM5=1./(1.+0.35*CSUBPG(IV)*AMAX1(TW-TSAT,0.001)
    1     /AMAX1(SATHG(IV)-SATHF(IV),0.001))**3.
     HCFO=0.2*3.14159/4.*(6.*(1.-VOIDG(IV))/3.14159)**0.6666667
    1    *(9.81*RHOF(IV)*RHOG(IV)*AMAX1(SATHG(IV)-SATHF(IV),0.01)
    2    *TERM5*THCONS**3/(AMAX1(TW-TEMPF(IV),0.01)*VISCS
    3    *(3.14159/6.)**0.3333333*DDROP))**0.25
       HCFO = 0.001*HCFO
     IF(VOIDG(IV).LE.0.60) THEN
     HFB=HCBR
      ELSE
     IF(VOIDG(IV).GE.0.80) THEN
     HFB=HCFO
       ELSE
     HFB=(VOIDG(IV)-0.60)/0.2*HCFO+(0.80-VOIDG(IV))/0.2
    1 *HCBR
       ENDIF
         ENDIF
     IF(GGT.LT.0.) THEN
     HHHH=AMAX1(1.E-7,RHOF(IV)-RHOG(IV))
```

```
      HFB=1.09680*VOIDF(IV)*SQRT((1./1.)
     1    *THCONS**3*RHOG(IV)*HHHH*(HFG+0.5*DTSAT*CSUBPG(IV))
     2    /(VISCS*DTSAT))**.25
      ENDIF
*C HTRC1,PSTDNB,PREDNB
*/
*/  END OF AKSAN UPDATE
*/
/EOR
*COMPILE SEGDIR
```

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11. ABSTRACT *(200 words or less)*

The LOFT LOCE L2-3 was simulated using the RELAP5/MOD2 Cycle 36.04 code to assess its capability to predict the thermal-hydraulic phenomena in LBLOCA of the PWR. The reactor vessel was simulated with two core channels and split downcomer modelling for a base case calculation using the frozen code. From the results of the base case calculation, deficiencies of the critical flow model and the CHF correlation at high flow rate were identified, and the severeness of the rewetting criteria were also found. Additional calculation using an updated version of RELAP5/MOD2 Cycle 36.04 including modifications of the rewet criteria shows a substantial improvement in the core thermal response.

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