



# International Agreement Report

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

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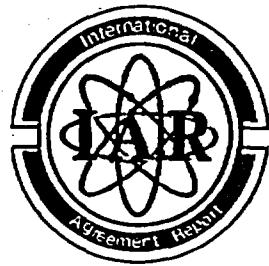
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**ICAP**

**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 severity 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 nucleate 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 phenomena occurring 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 sysystem, blowdown suppression system, emergency core cooling system and secondary coolant system, and also includes instrumentations. The lengths 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 the 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 respectively, 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 (L PSI) 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 assessment 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, according 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 respectively. 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 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 accumulator 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 accumulator liquid level was well agreed to the experiment. The overprediction of mass flow rate during 20 to 40 sec can be due to an 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 an 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 available, 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 2. 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, respectively. 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/m<sup>2</sup> 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 rewetting 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)  $(T_w + T_{sat}) < 1250 \text{ K}$
- 2) Equilibrium quality less than 0.99
- 3) Mass flux less than  $-100 \text{ kg/sec m}^2$

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.

$$\text{Computer time, } \text{CPU} = 1795.36 - 3.121 = 1792.239 \text{ (sec)}$$

$$\text{Number of time step, } DT = 9635 - 76 = 9559$$

$$\text{Number of volume, } C = 128$$

$$\text{Transient real time, } RT = 100 \text{ (sec)}$$

$$\text{Grind time} = \text{CPU} \times 1000 / (C * DT) = 1.4647 \text{ CPU m sec/vol/step}$$

## 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 fairly 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 reasonably 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.

## References

1. Ransom, V.H. and Wagner, R.J. RELAP5/MOD2 Code Manuals, NUREG/CR-4312, EGG-2396, EG&G Idaho Inc., Dec. 1985.
2. Prassinos, P.G., et al, Experimental Data Report for LOFT Power Ascension Experiment L2-3, NUREG/CR-0792, TREE-1326, July 1979.
3. Carbajo, J.J, "A Study on the Rewetting Temperature," Nuclear Engineering and Design, Vol 84, pp 21-52, 1985.
4. Aksan, S.N., "Investigation on Rapid Cladding Cooling and Quench During the Blowdown Phase of a LBLOCA Using RELAP5/MOD2," Presentation on the Fourth International Topical Meeting on Nuclear Reactor Thermal-Hydraulics(NURETH-4), Karlsruhe, FRG, Oct. 1989
5. Driskell W.E. et al, Summary of ICAP Assessment Results for RELAP5/MOD2, Draft of ICAP Annul Report for 1989, INEL.
6. Aksan, S.N., Analytis, G.Th., and Lubbesmeyer, D., Switzerland's Code Assessment Activities in Support of the ICAP the 16th Water Reactor Safety Meeting, Oct. 1988, Gaithersburg, USA
7. Reeder, P.L., LOFT System and Test Descriptions, NUREG/CR-0247, July 1978
8. Young Seok Bang, et al, Assessment of RELAP5/MOD2 Cycle 36.04 Using LOFT Large Break Experiment L2-5, NUREG/IA (to be published), KAERI, Korea, 1990.
9. Demmie, P.N., et al, Best Estimate Prediction for LOFT Nuclear Experiment L2-3, EGG-LOFT-5869, EG&G, INEL, May 1982.

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

Parameter	Measured	Calculated
<b>• Primary Coolant System</b>		
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
<b>• Reactor Vessel</b>		
Power level , MW	36.0	36.0
Maximum linear heat generation rate(MLHGR), kW/m	39.4	39.8
<b>• Pressurizer</b>		
Liquid temperature , K	615.3	613.8
Pressure , MPa	15.06	15.066
Liquid level*, m	1.19	1.1723
Water volume, m <sup>3</sup>	0.67	0.627
<b>• Steam Generator sec.side</b>		
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	**
Accumulator 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 variables from the measured data

Table 4. Summary of the important items in nodalization

items	Description
<b>Core</b>	
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 %
<b>Downcomer</b>	
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

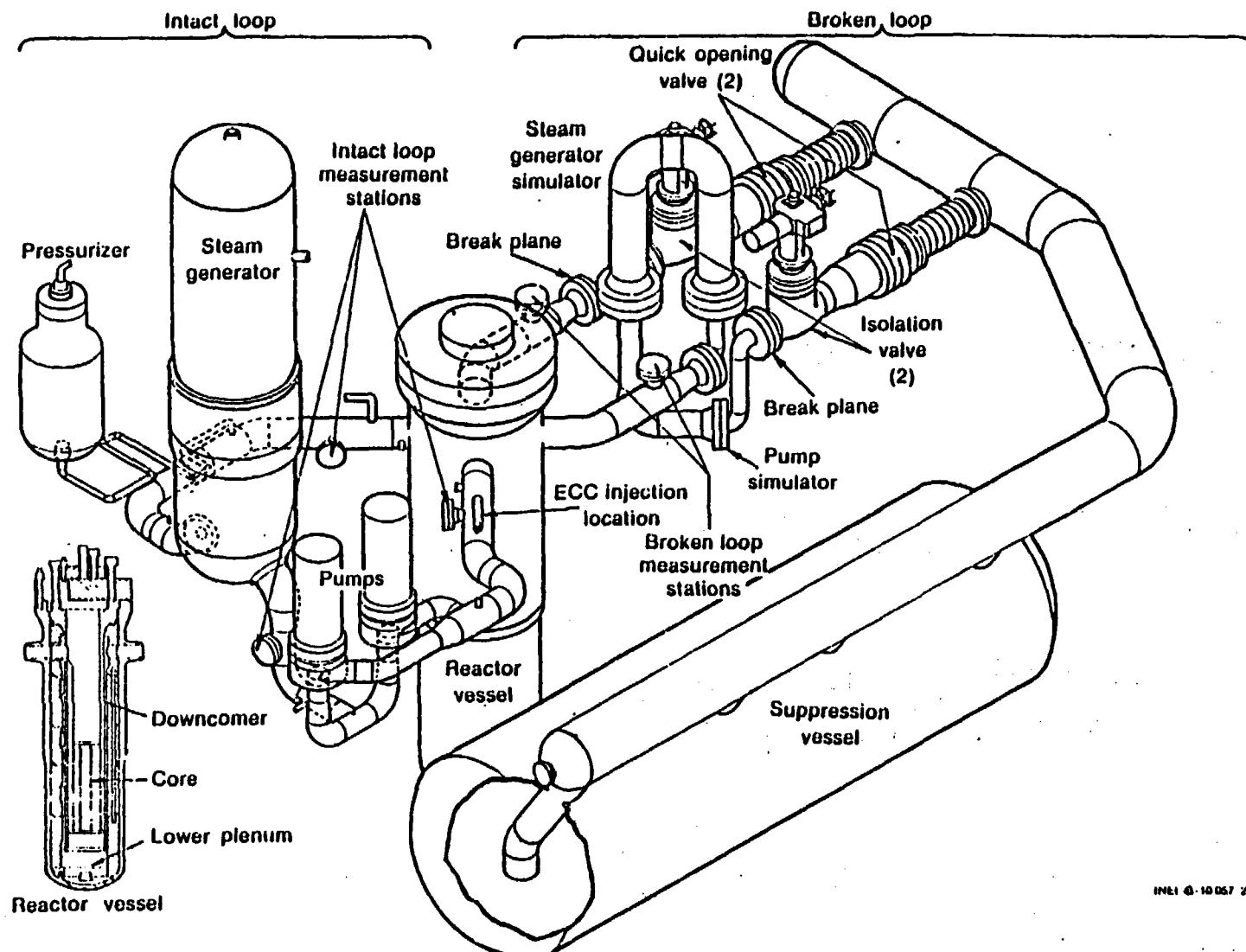


Fig.1 Axonometric configuration of LOFT L2-3 test

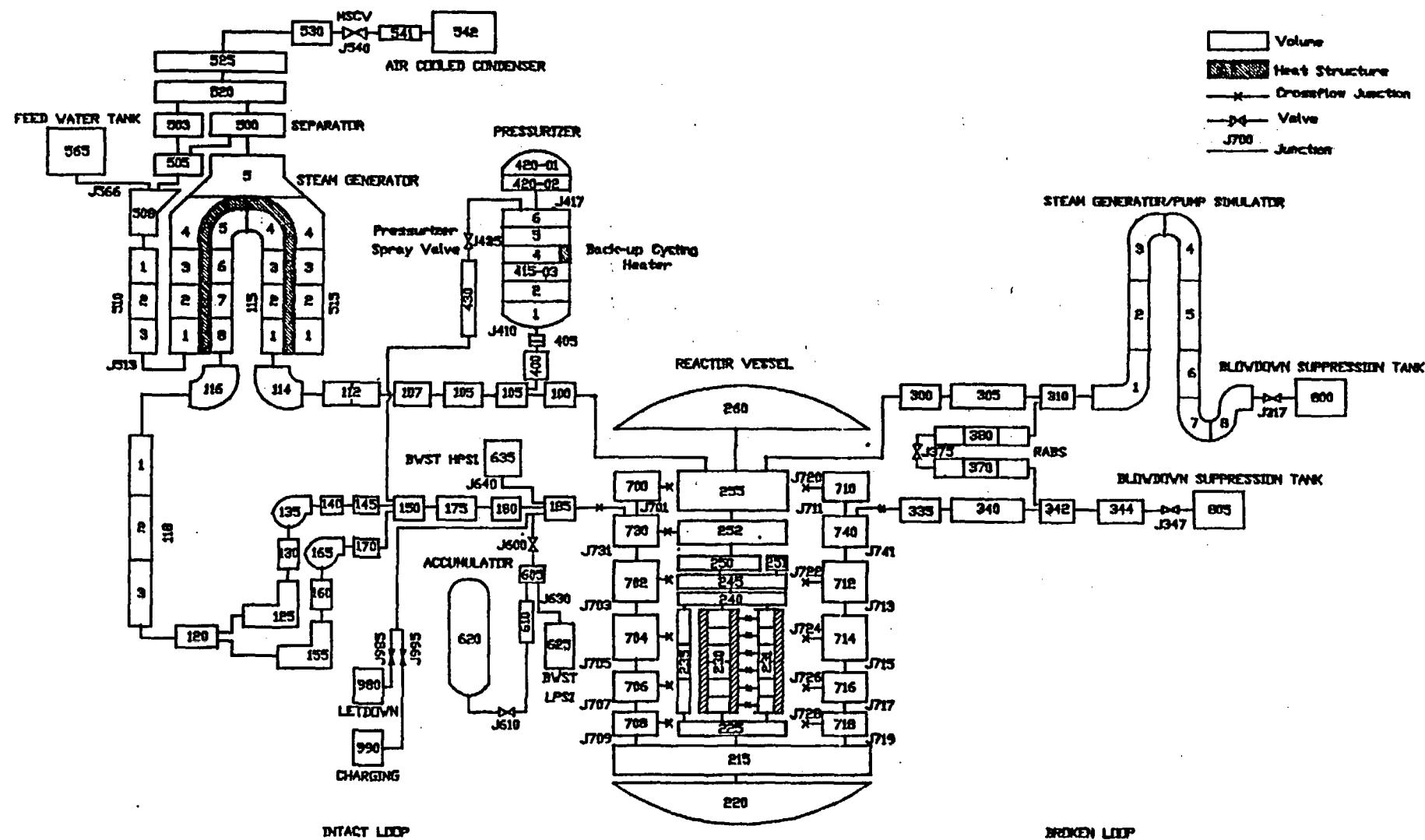


Fig.2 Nodalization diagram for base case calculation of LOFT L2-3 test

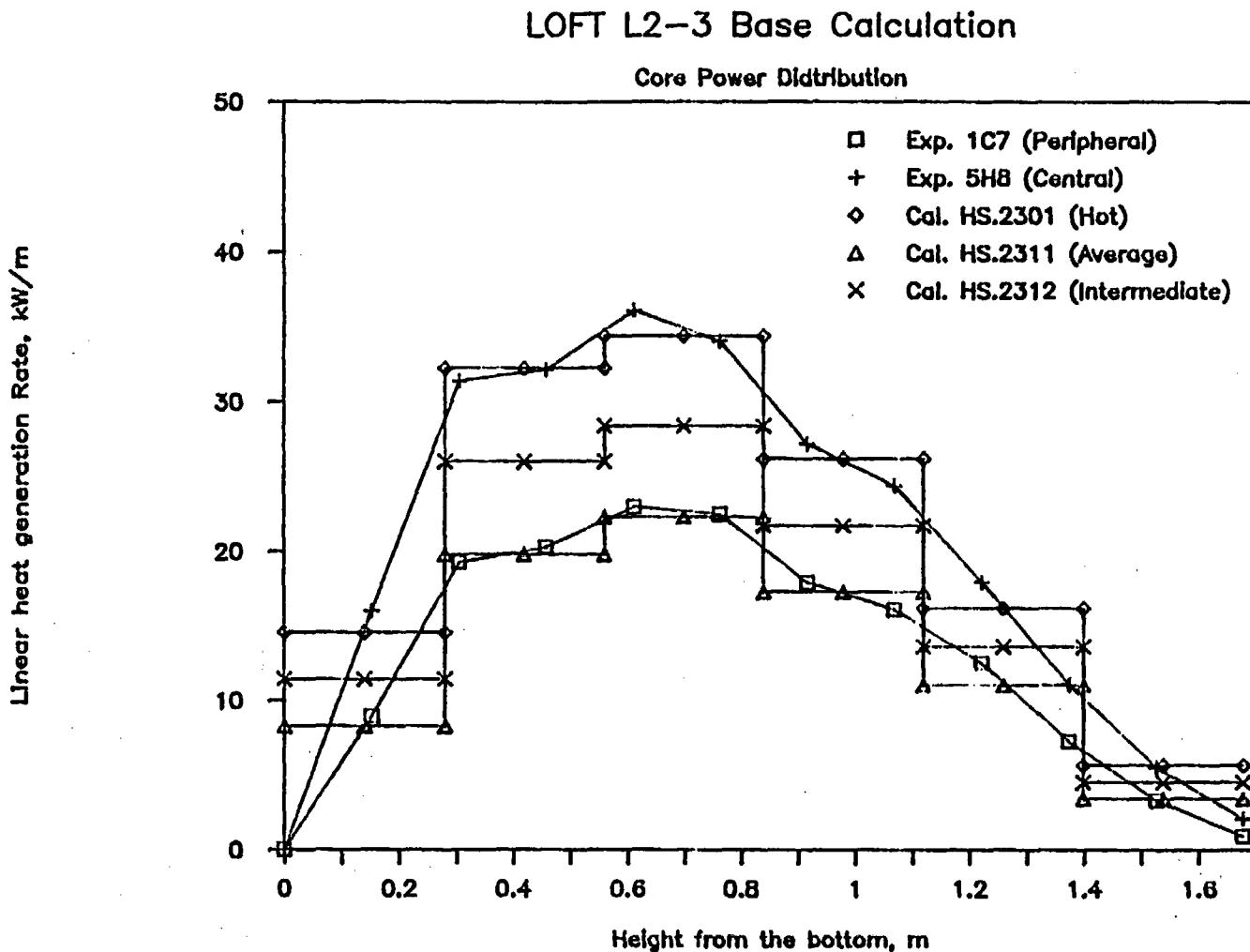


Fig.3 Axial power distribution in base case calculation of L2-3 test

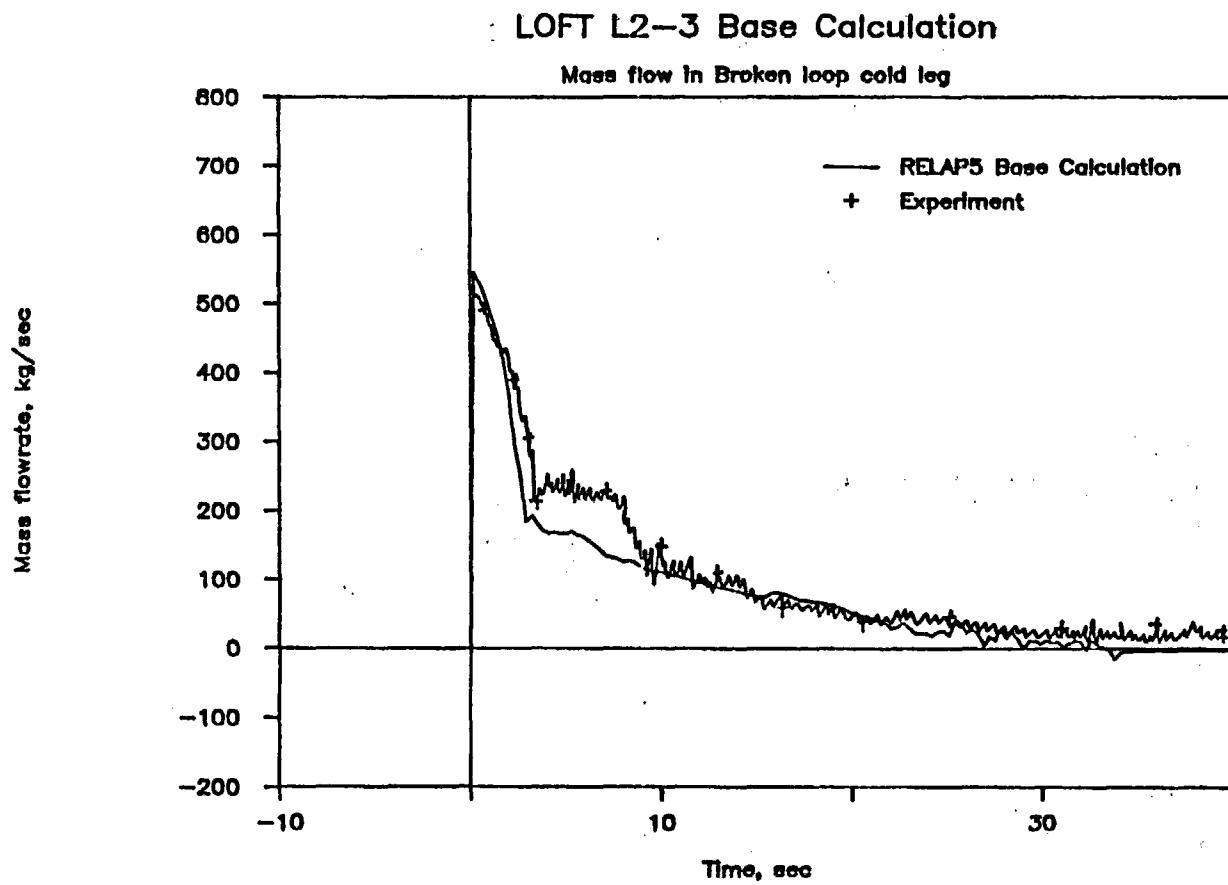


Fig.4 Comparison of mass flow rate at broken loop cold leg between the base case calculation and the experiment

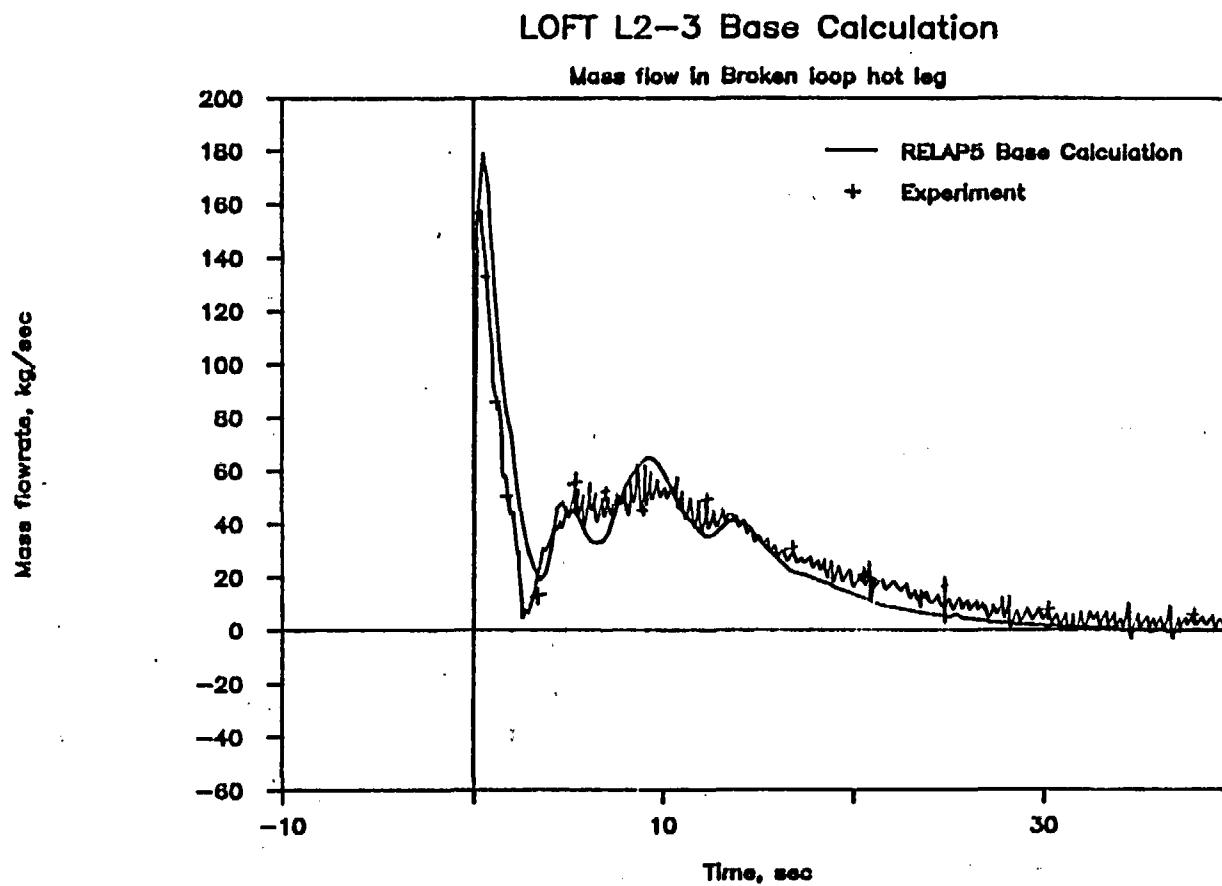


Fig.5 Comparison of mass flow rate at broken loop hot leg between the base case calculation and the experiment

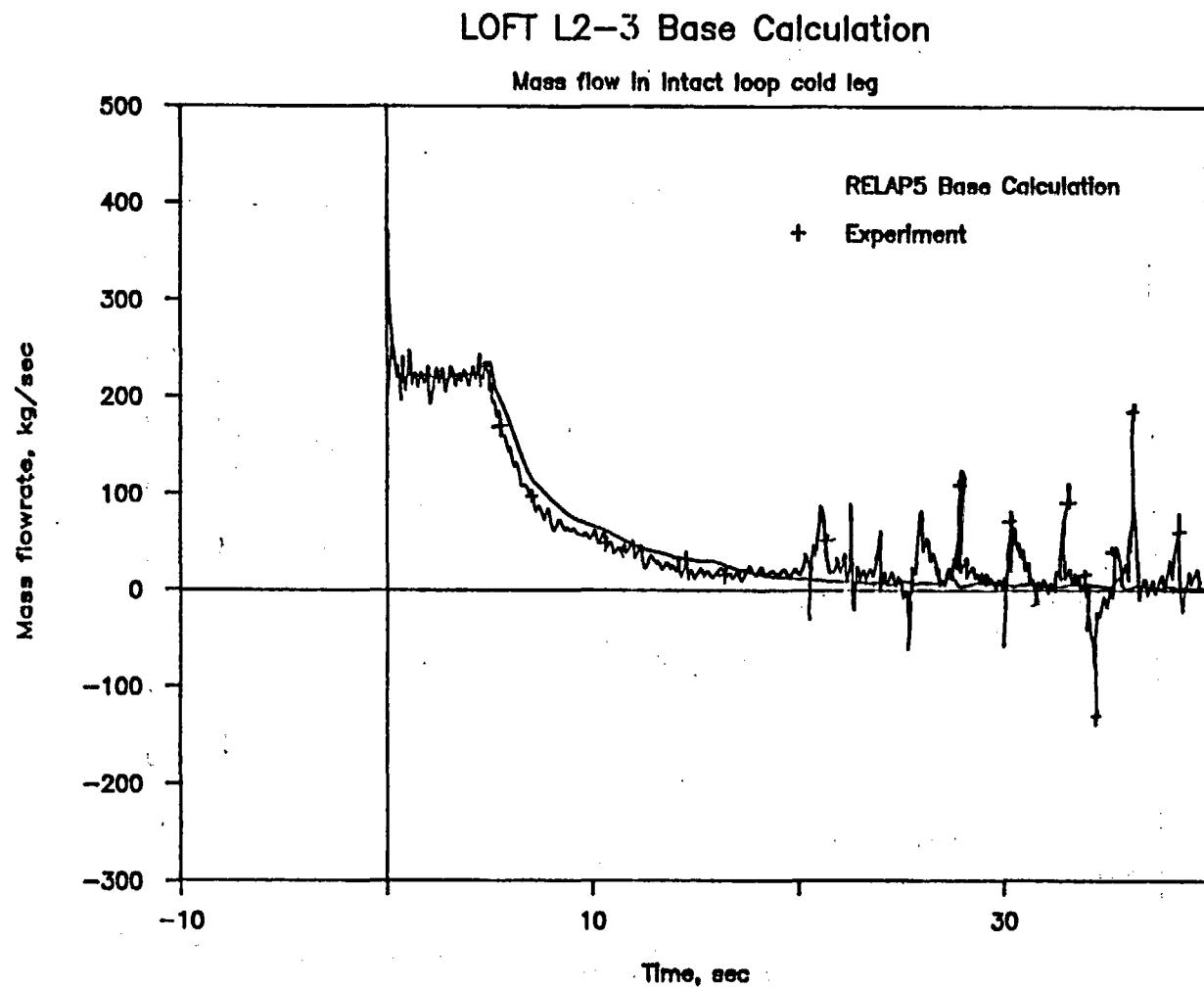


Fig.6 Comparison of mass flow rate at intact loop cold leg between the base case calculation and the experiment

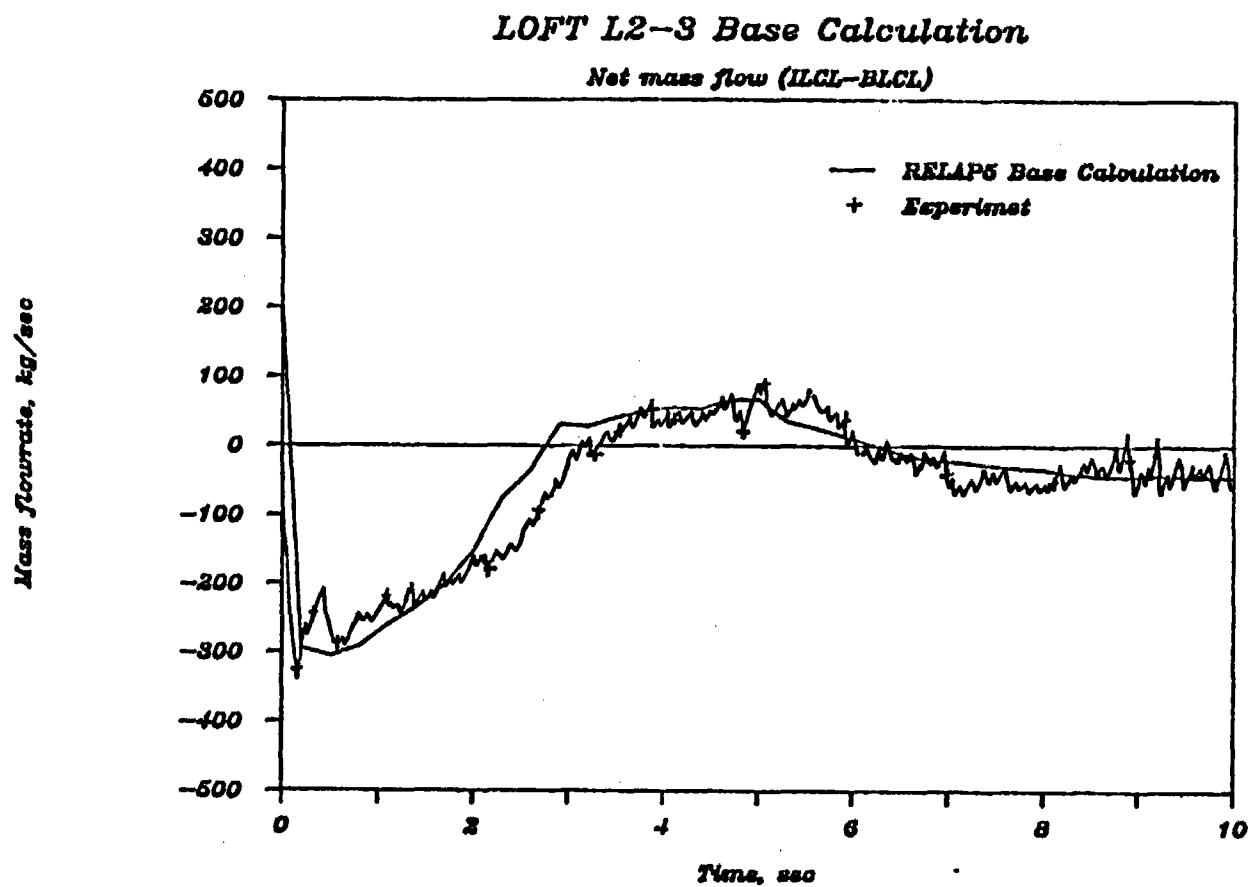


Fig.7 Comparison of net mass flow rate into the core between the base case calculation and the experiment

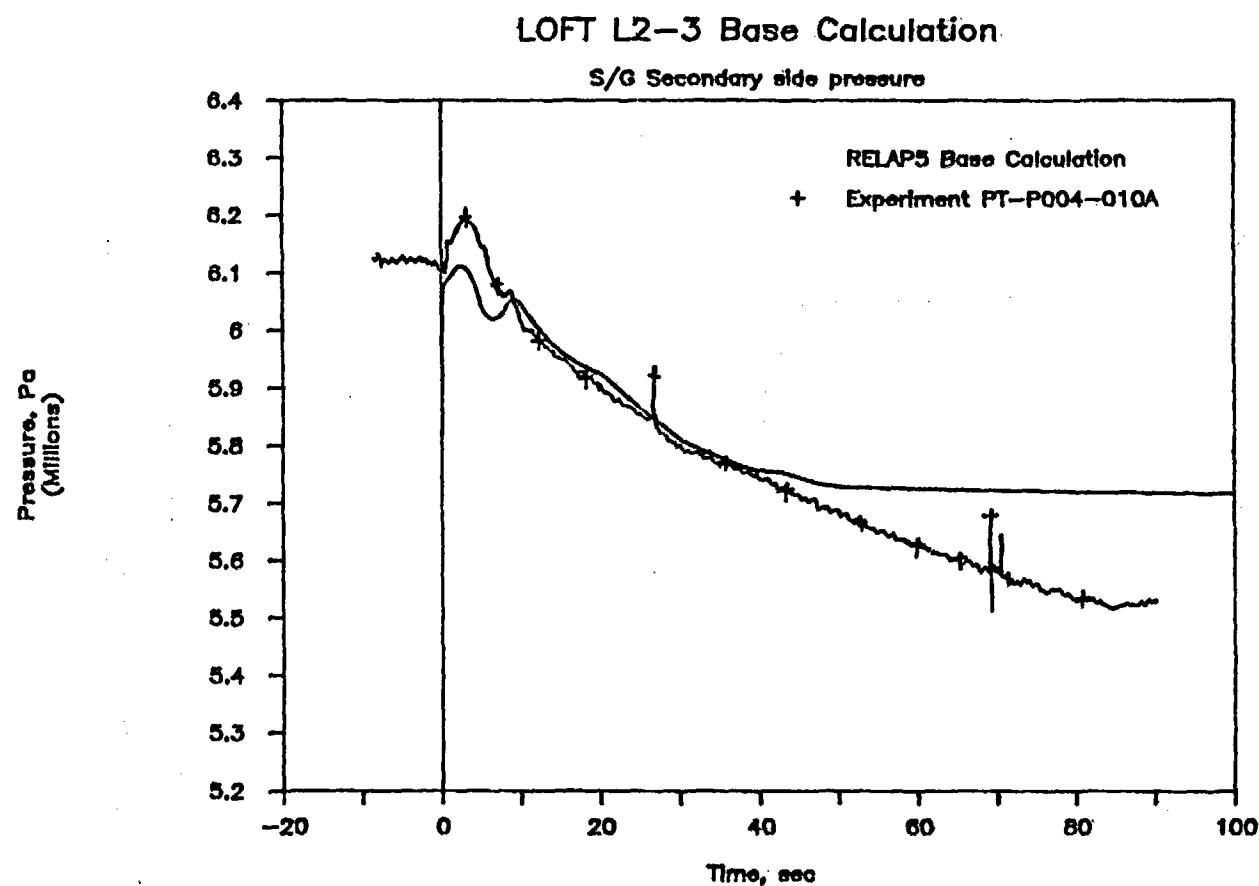


Fig.8 Comparison of steam dome pressure at S/G secondary side between the base case calculation and the experiment

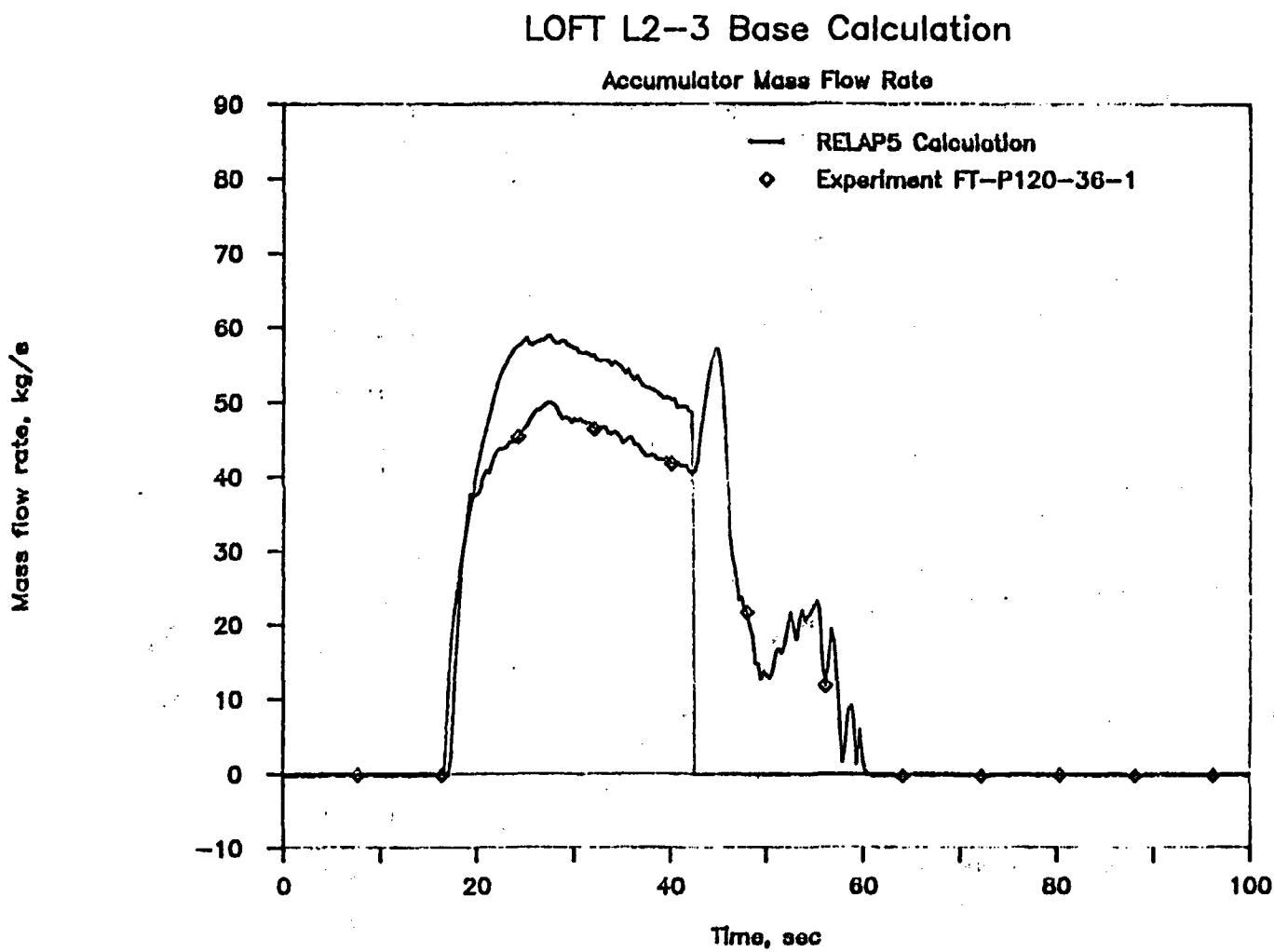


Fig.9 Comparison of accumulator injection flow rate between the base case calculation and the experiment

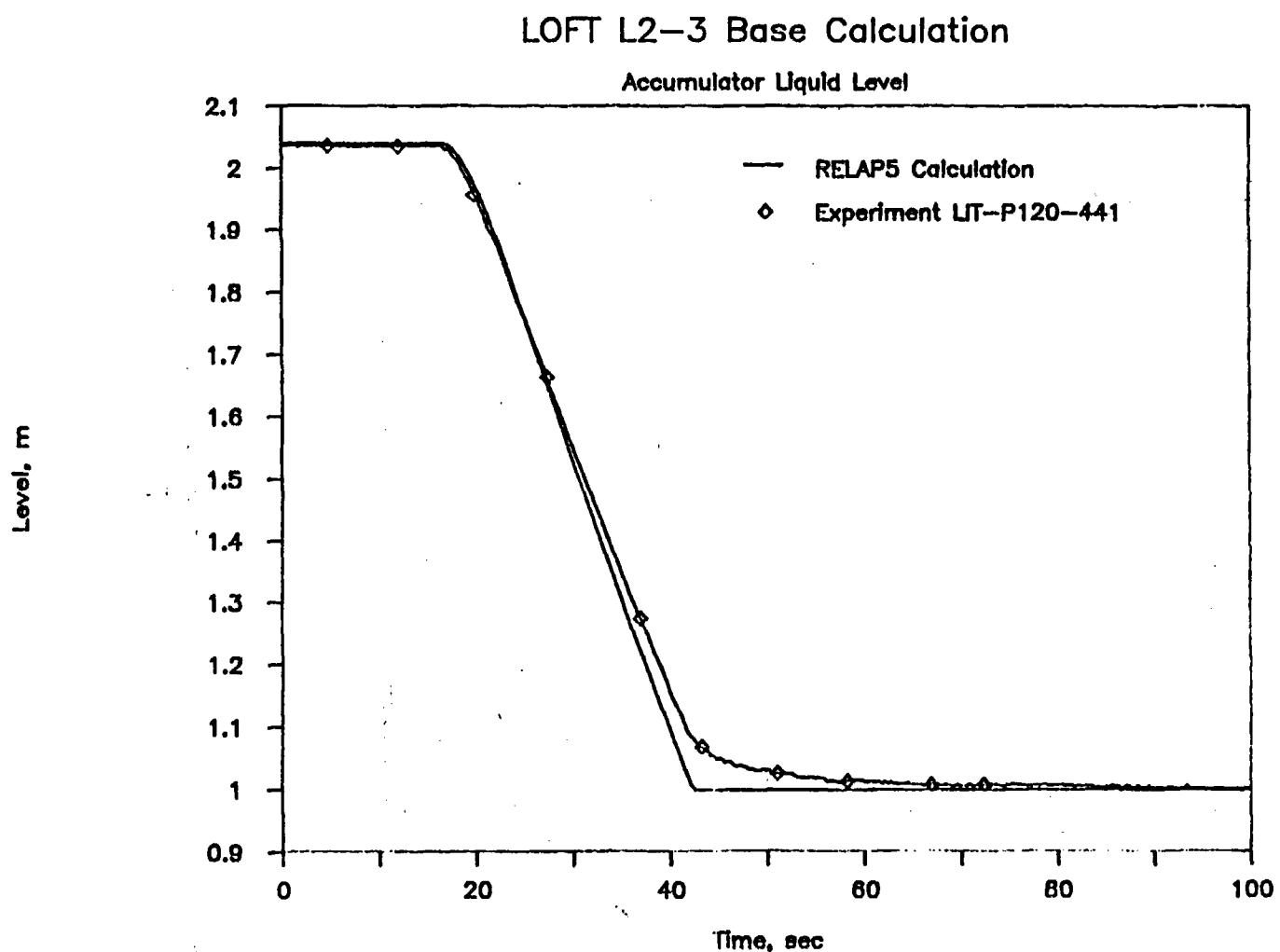


Fig.10 Comparison of accumulator liquid level between the base case calculation and the experiment

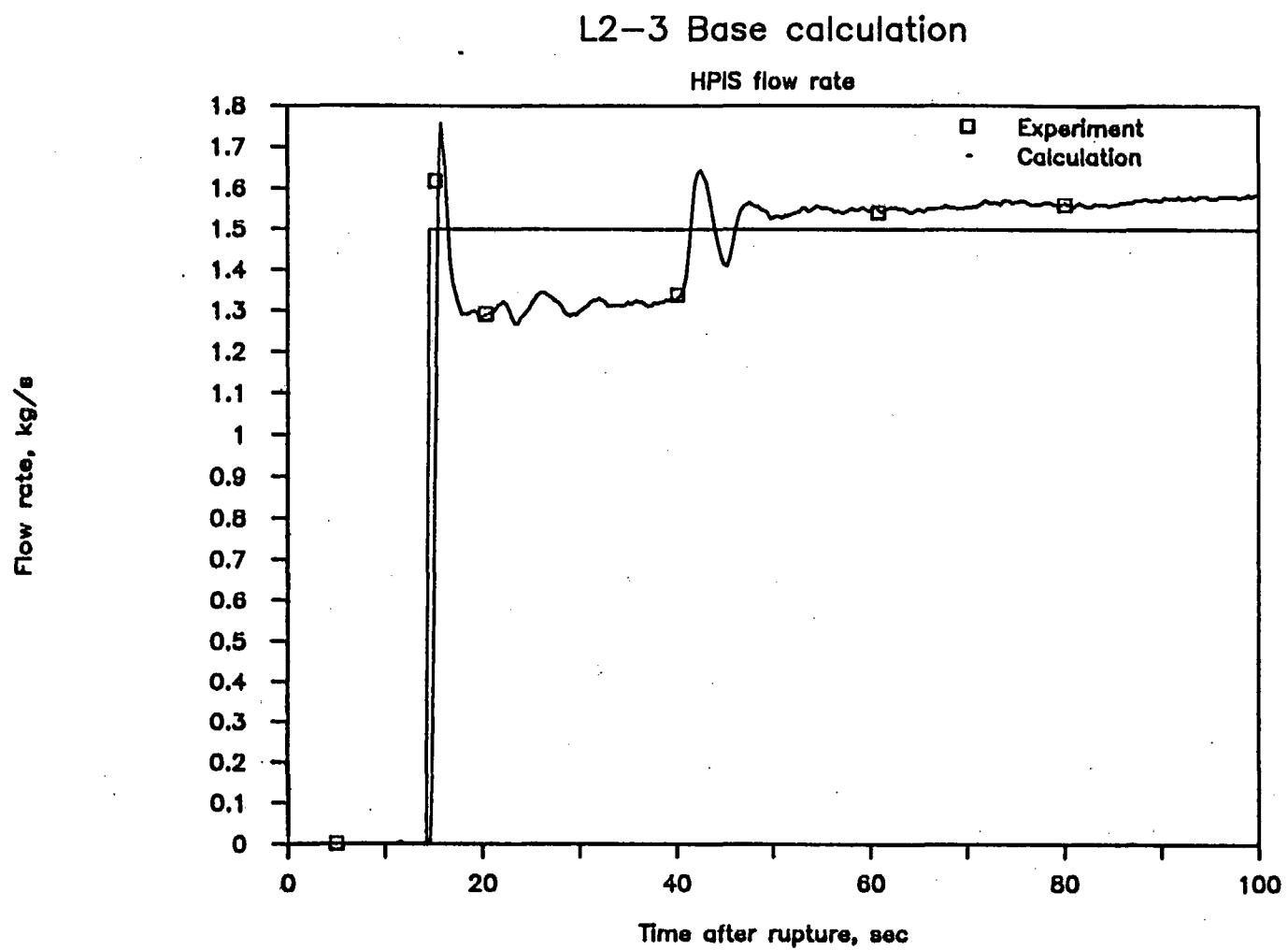


Fig.11 Comparison of HPSI flow rate between the base case calculation and the experiment

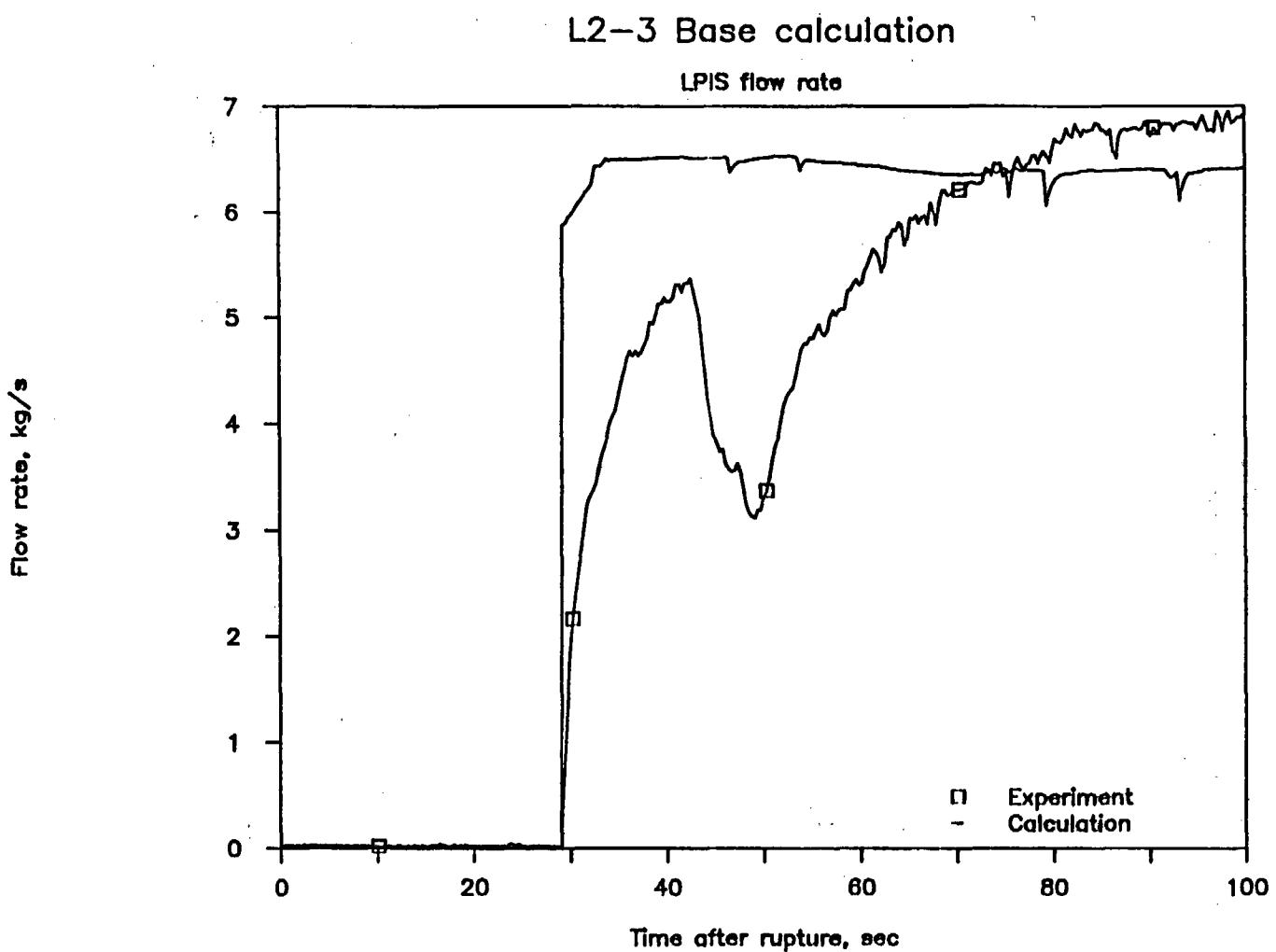


Fig.12 Comparison of LPSI flow rate  
between the base case calculation and the experiment

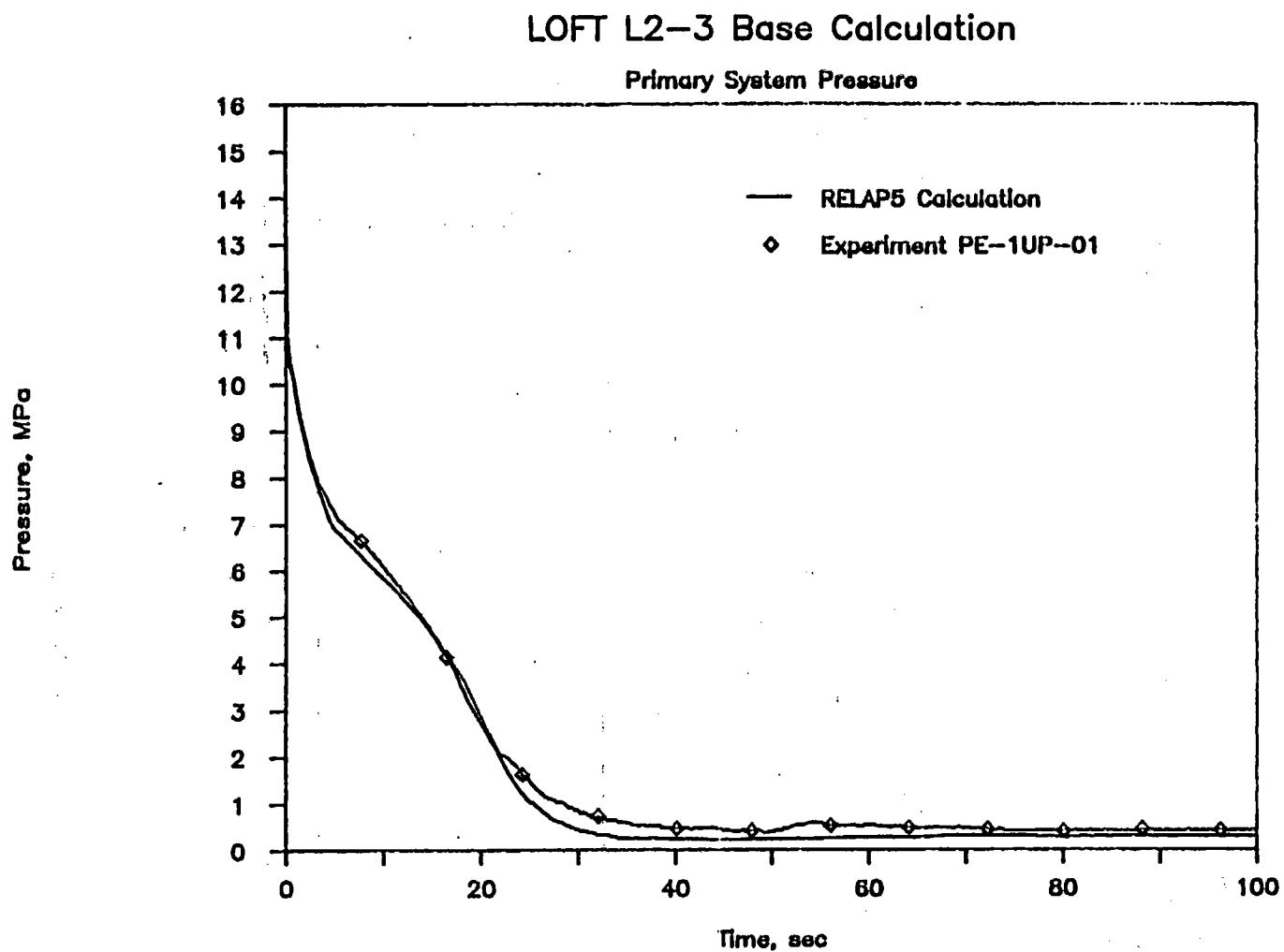


Fig.13 Comparison of primary system pressure between the base case calculation and the experiment

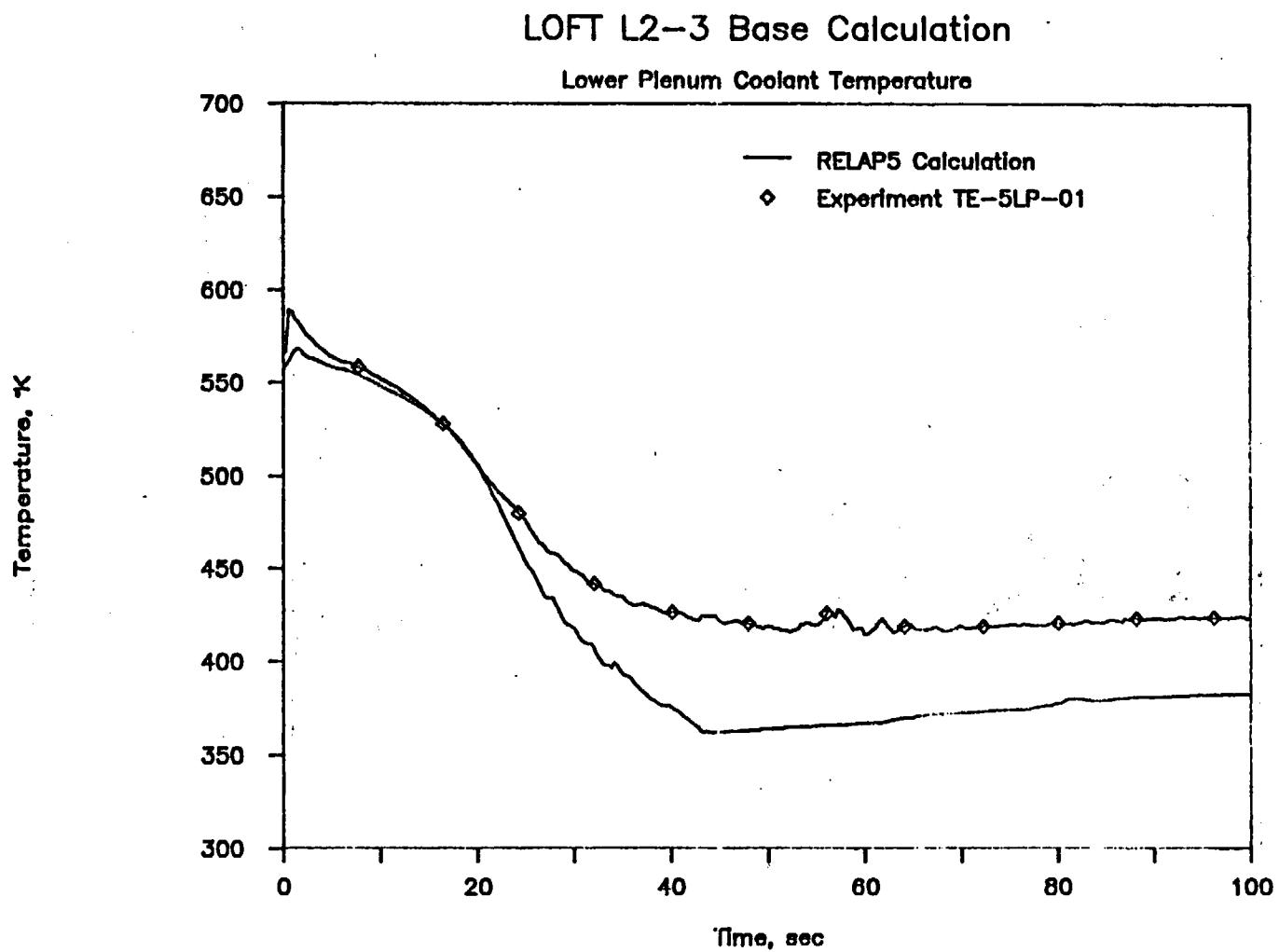


Fig.14 Comparison of coolant temperature in lower plenum between the base case calculation and the experiment

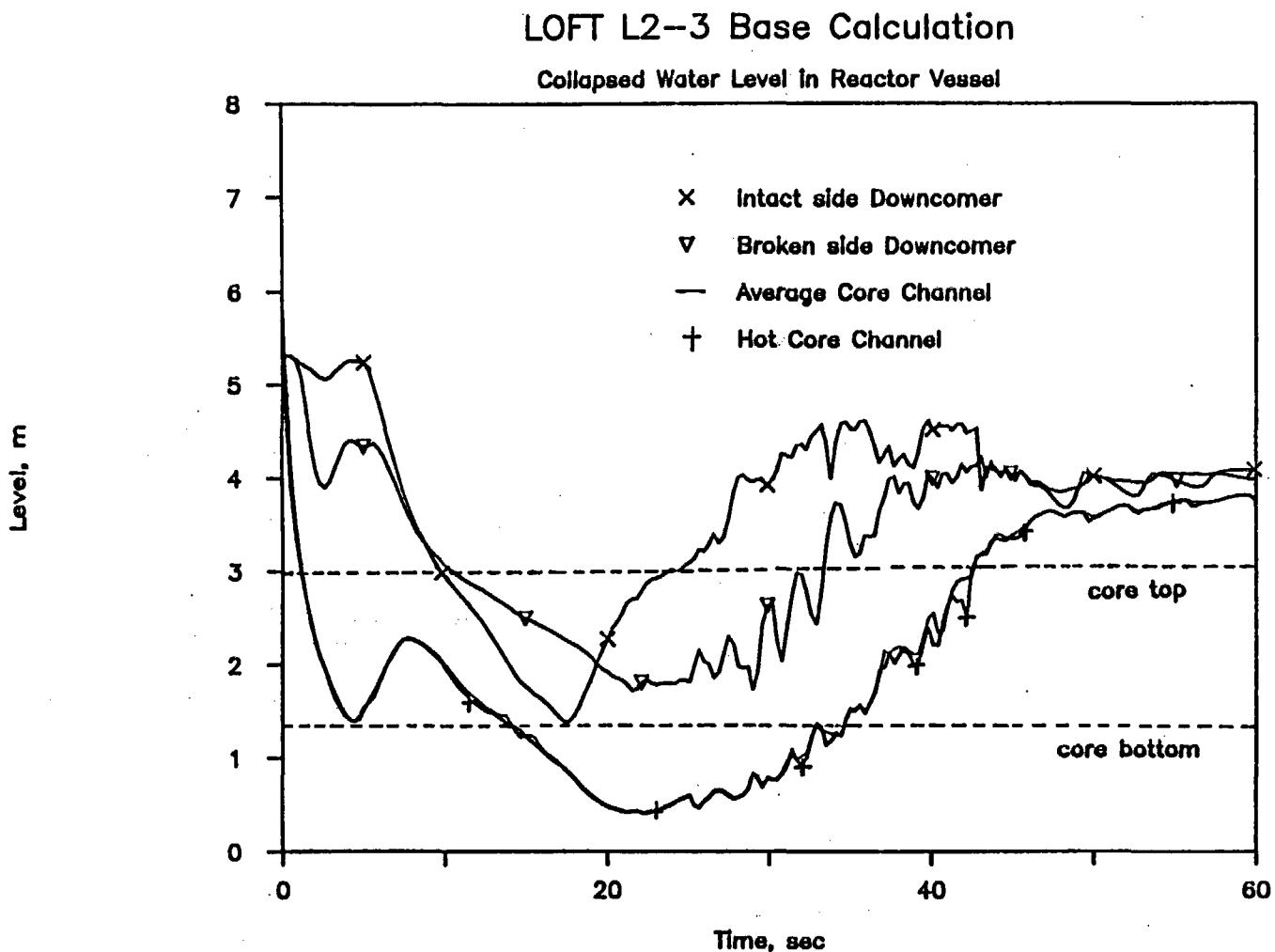


Fig.15 Collapsed liquid levels calculated in the base case calculation for the broken side downcomer, intact side downcomer, hot core channel and average core channel of the reactor vessel

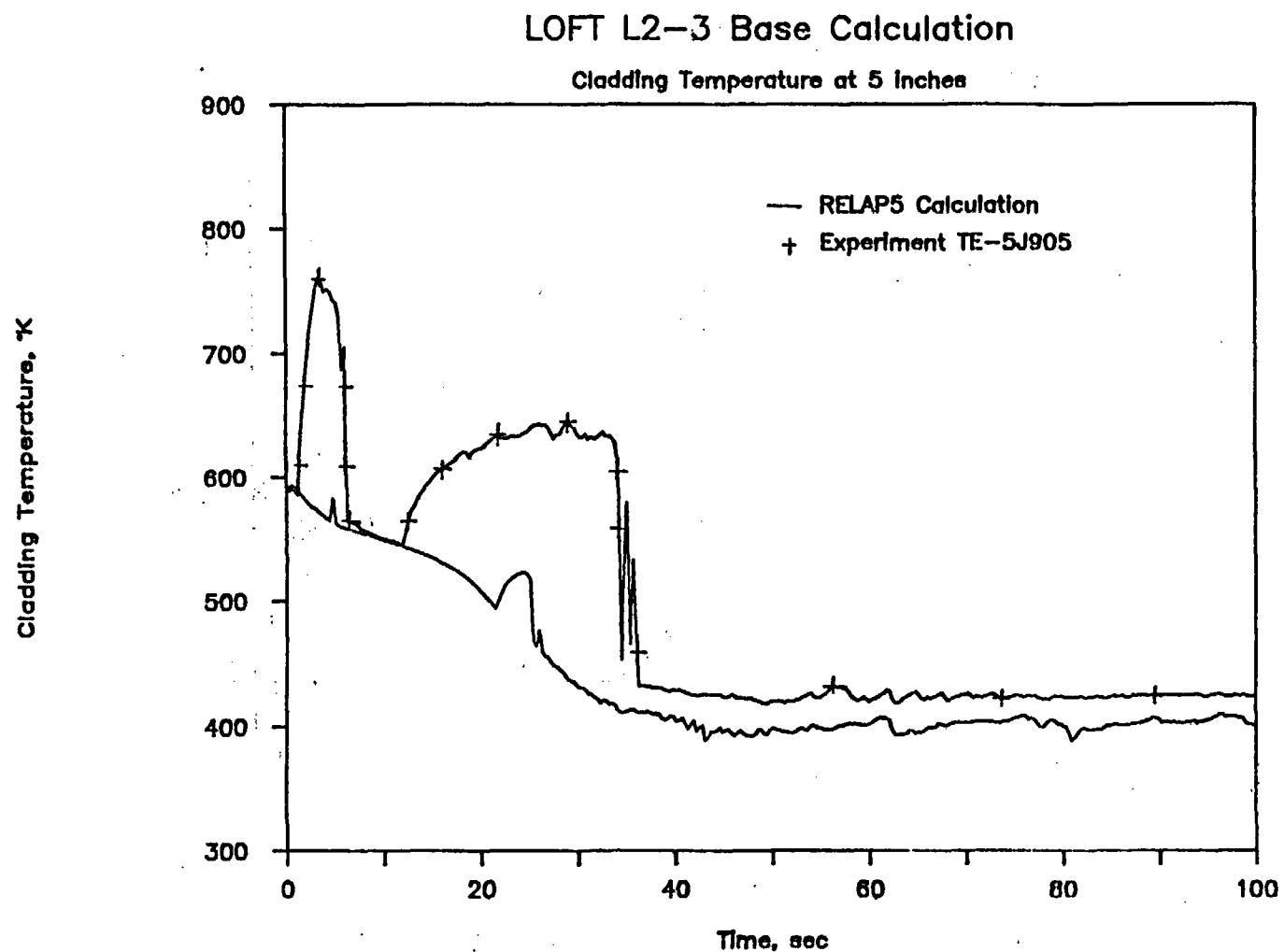


Fig.16 Comparison of cladding temperature at 5 inches of hot fuel between the base case calculation and the experiment

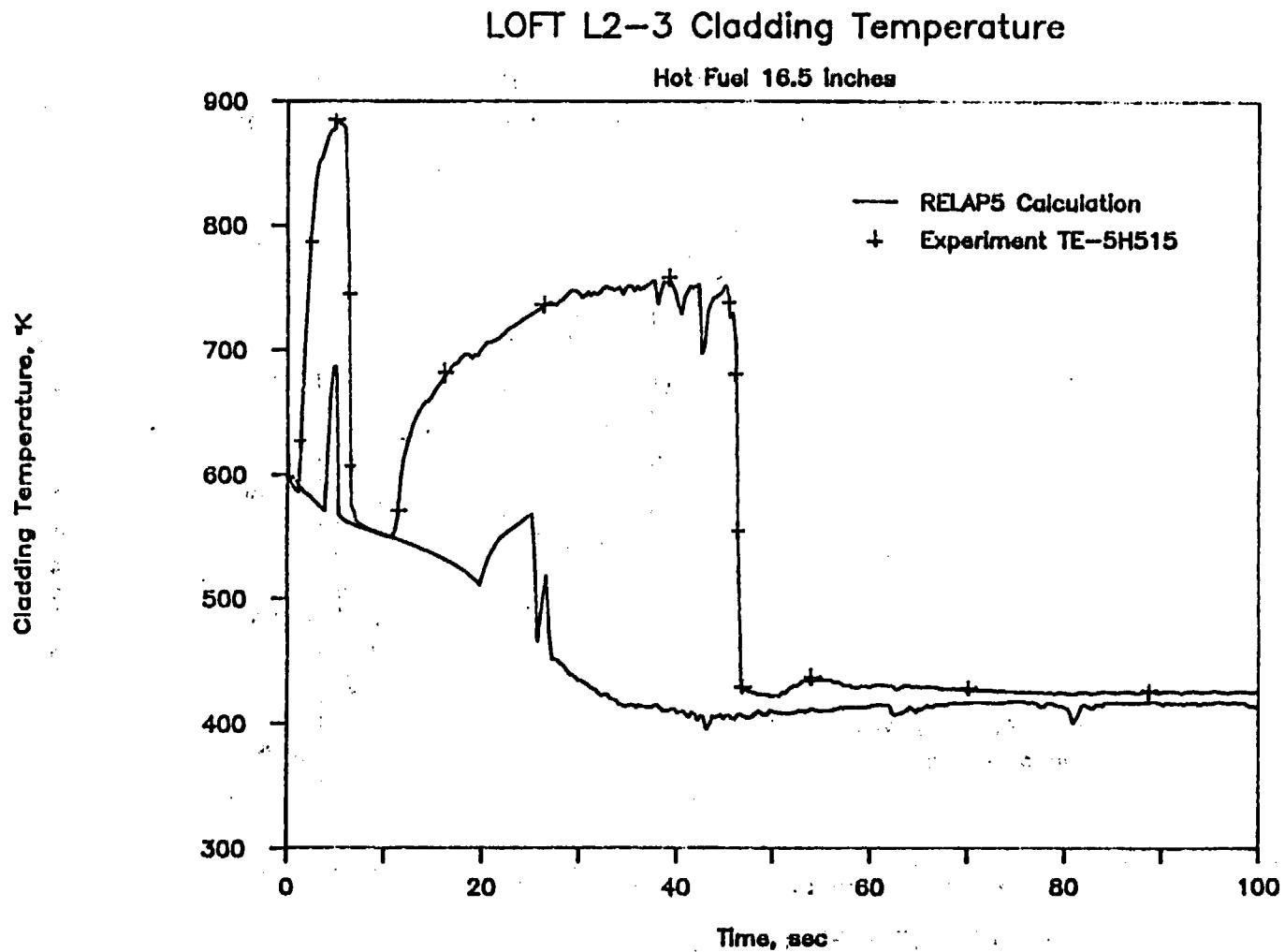


Fig.17 Comparison of cladding temperature at 16.5 inches of hot fuel between the base case calculation and the experiment

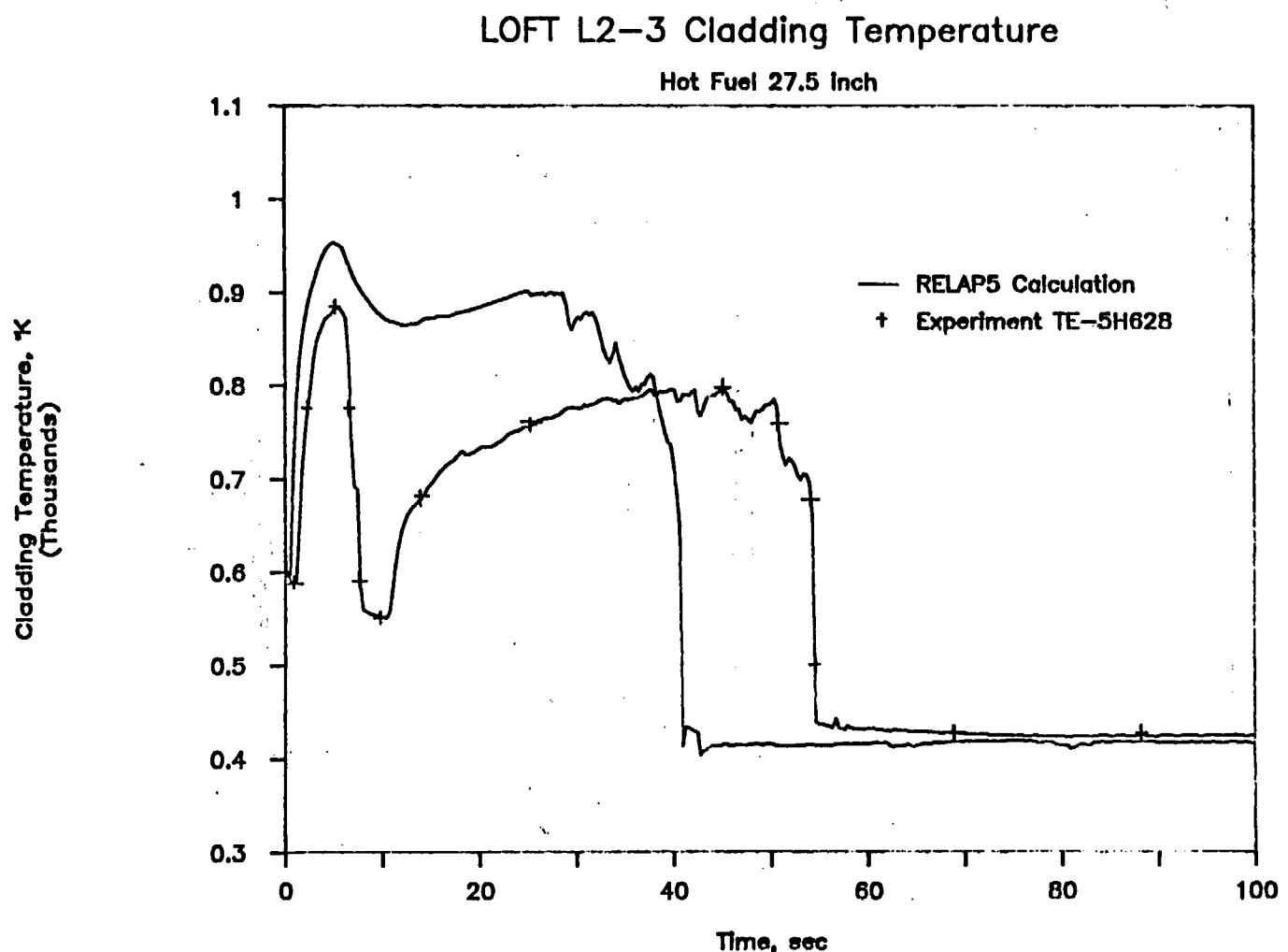


Fig.18 Comparison of cladding temperature at 27.5 inches of hot fuel between the base case calculation and the experiment

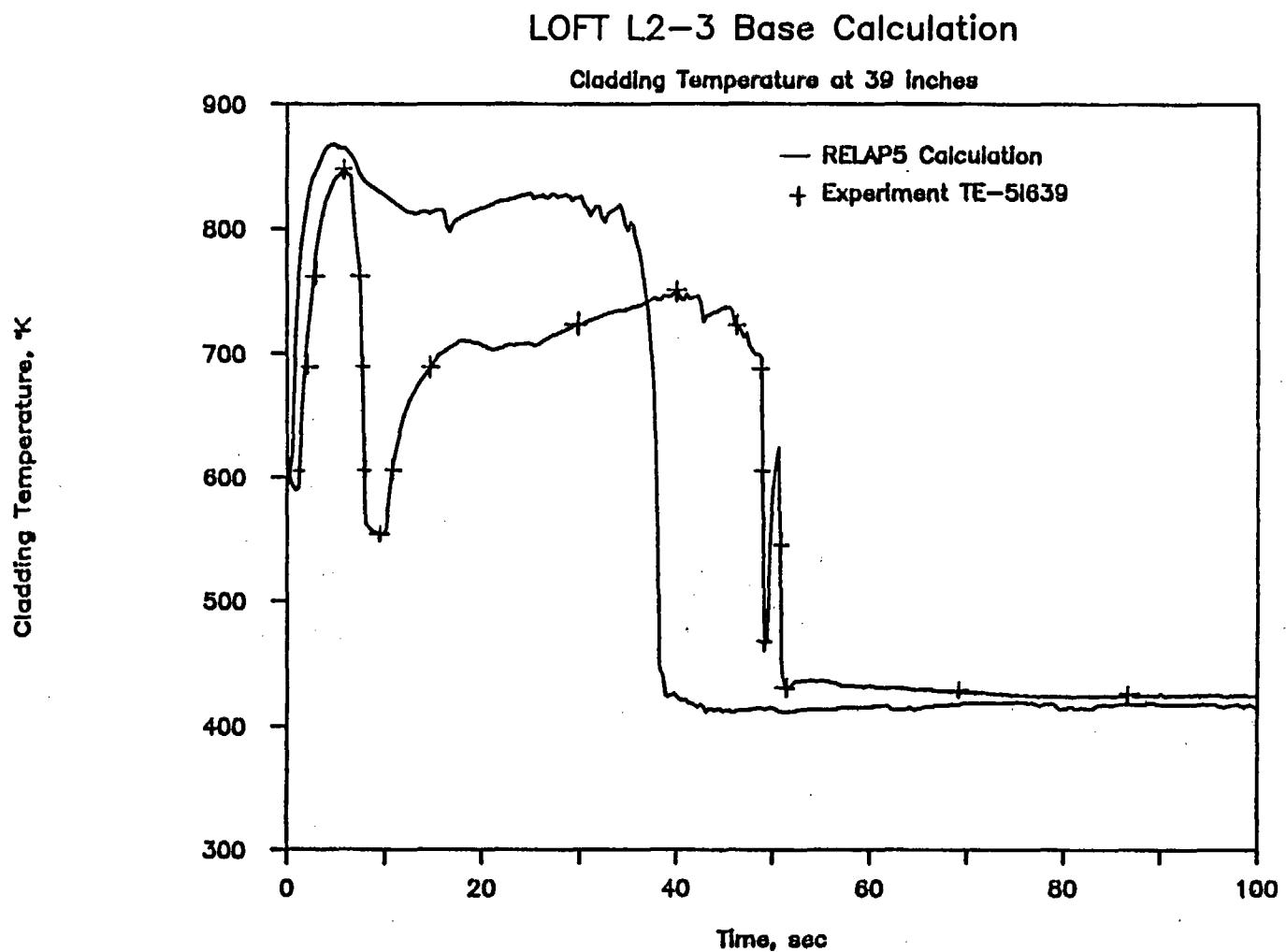


Fig.19 Comparison of cladding temperature at 39 inches of hot fuel between the base case calculation and the experiment

4

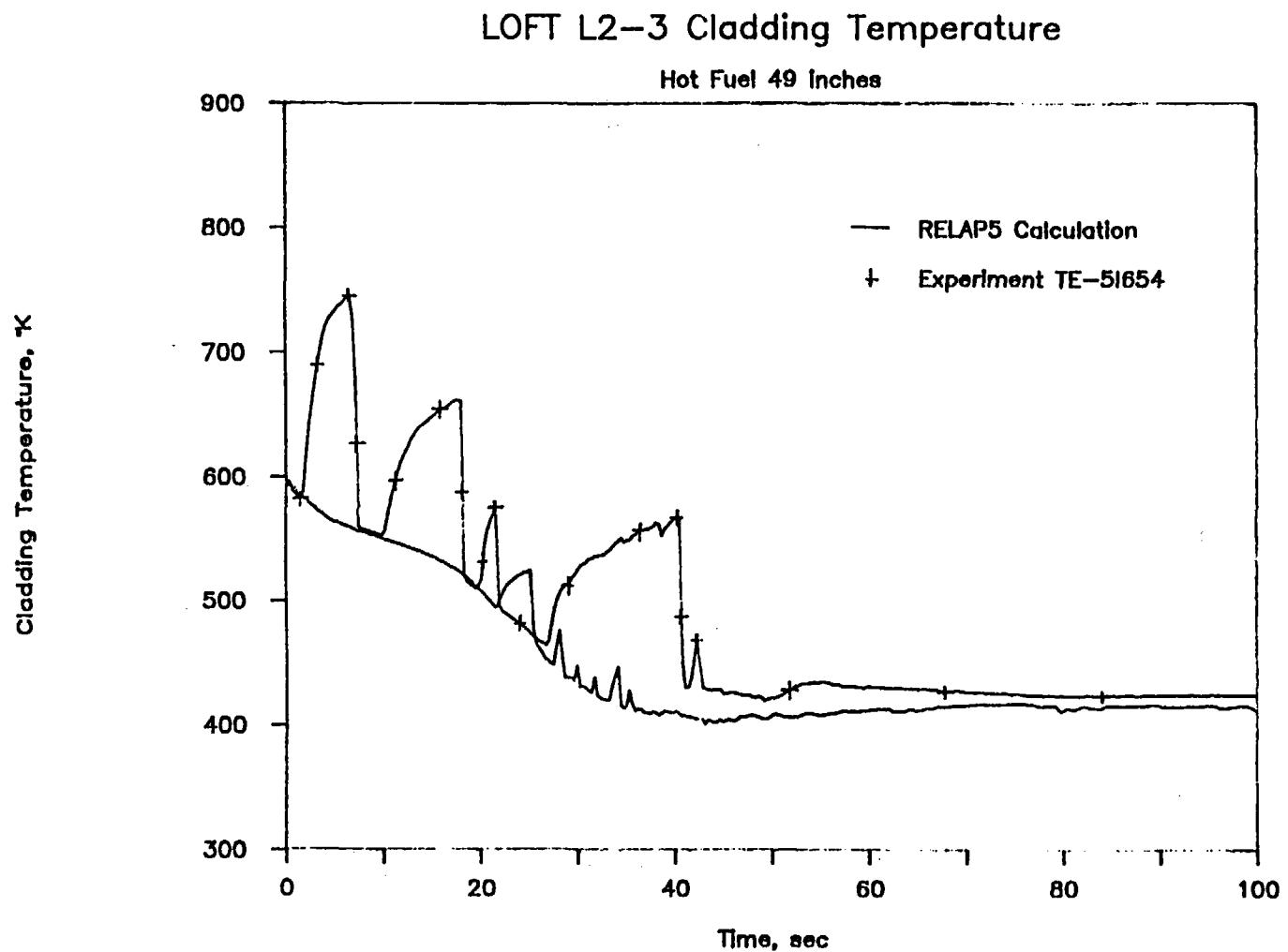


Fig. 20 Comparison of cladding temperature at 49.5 inches of hot fuel between the base case calculation and the experiment

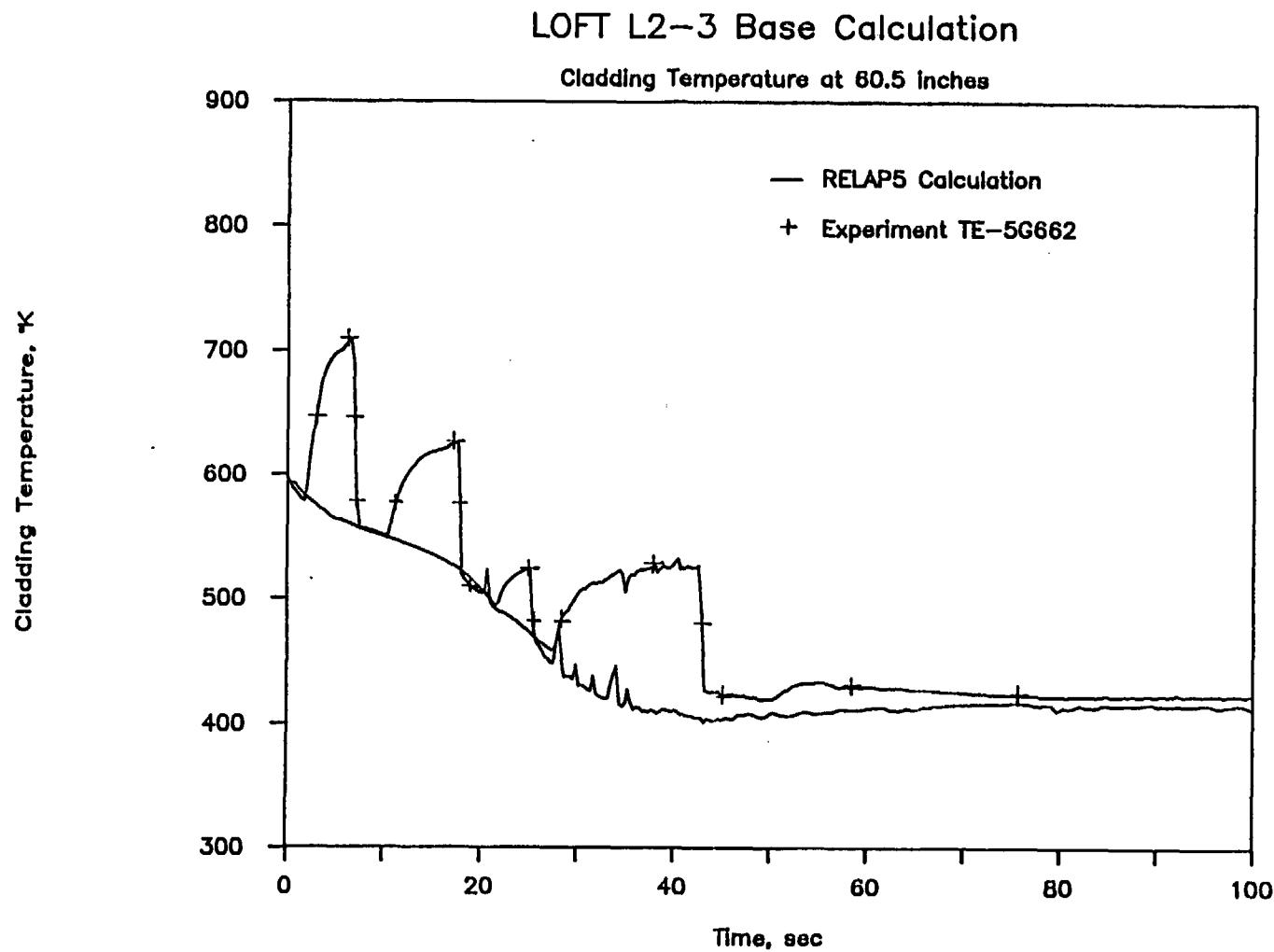


Fig.21 Comparison of cladding temperature at 60 inches of hot fuel between the base case calculation and the experiment

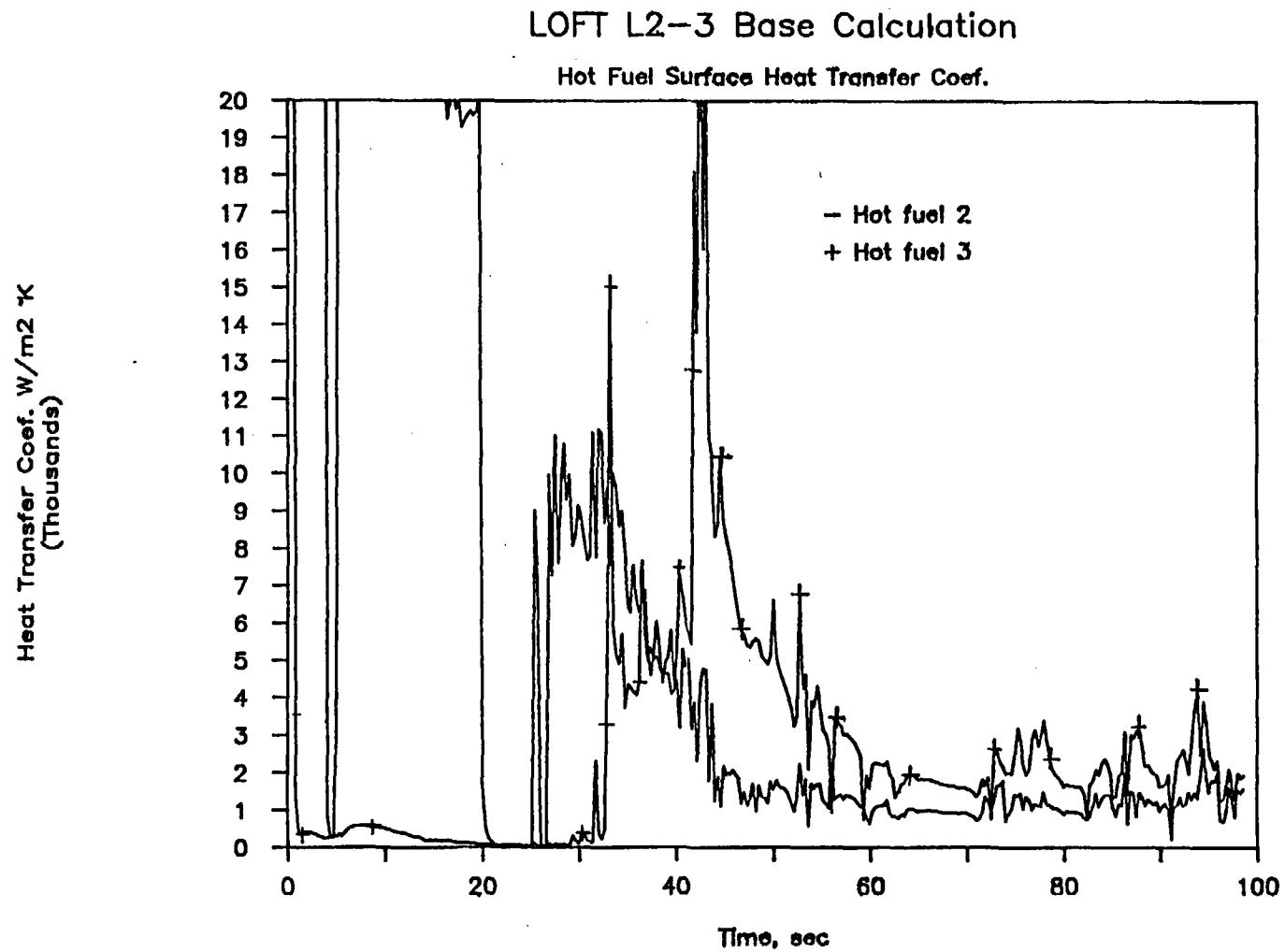


Fig.22 Wall heat transfer coefficients calculated in the base case calculation at volume 2 and 3 of hot fuel

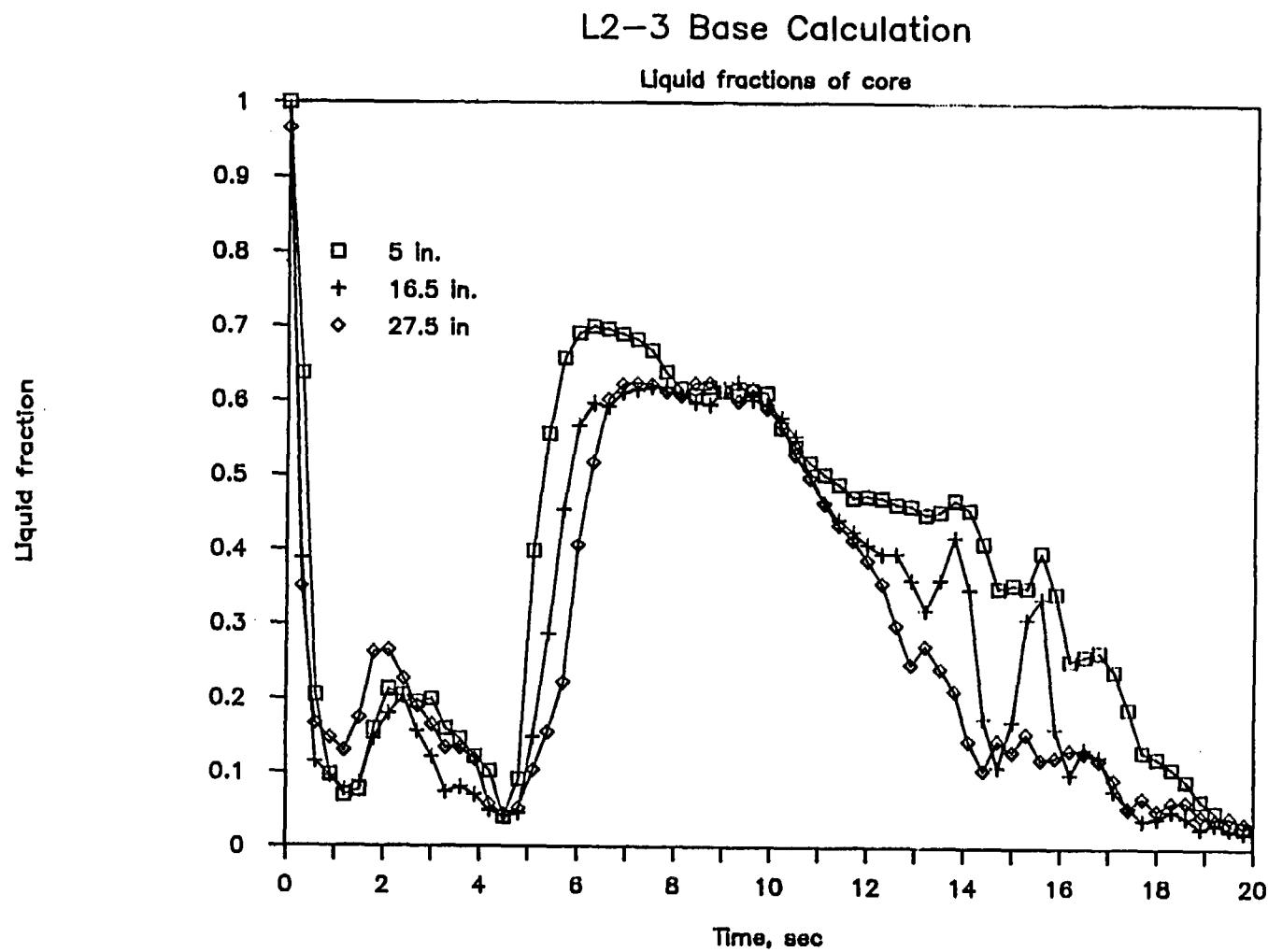


Fig.23 Liquid fractions calculated in the base case calculation at volume 2 and 3 of hot fuel

## LOFT L2-3 Base Calculation

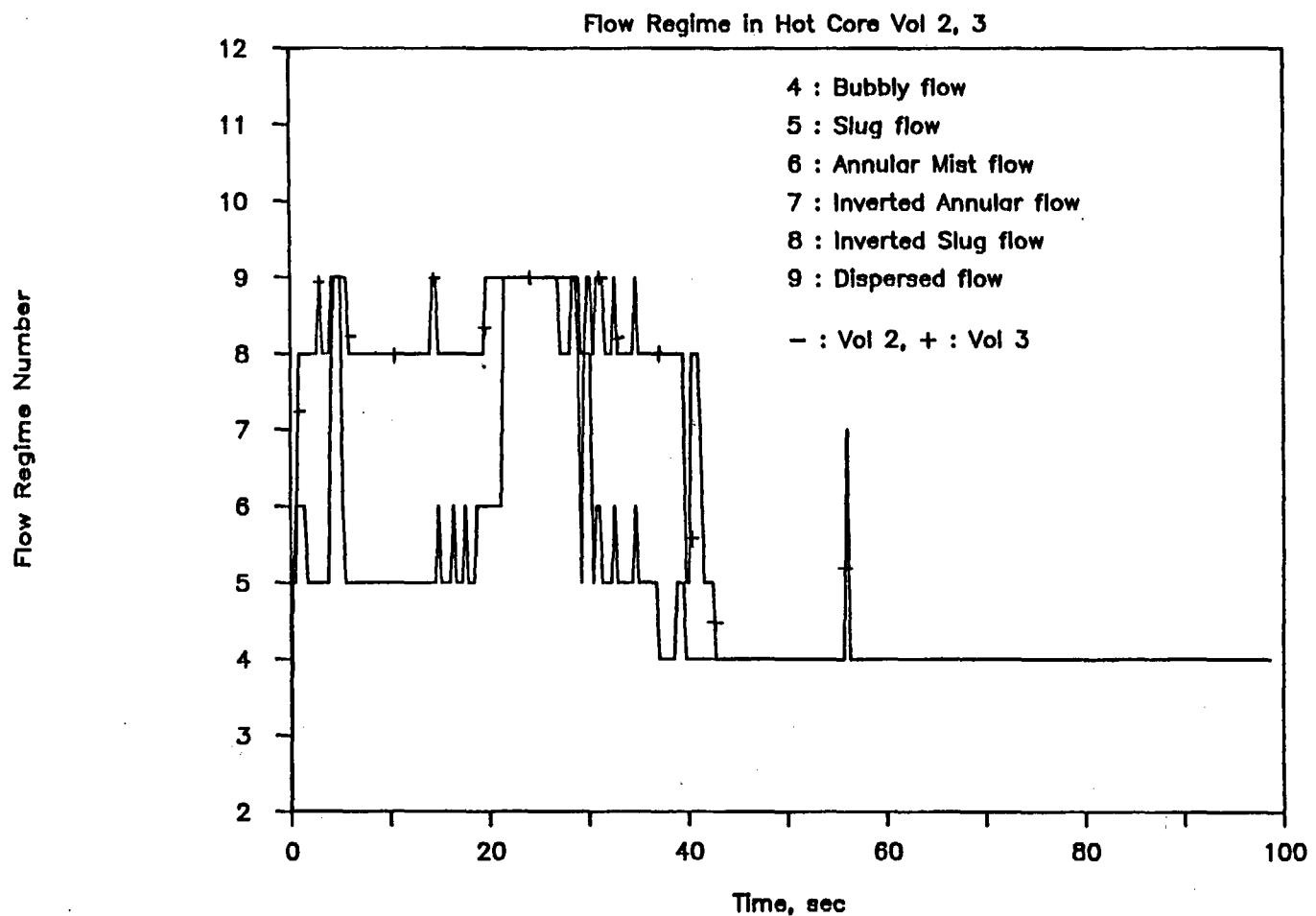


Fig.24 Flow regimes predicted in the base case calculation at volume 2 and 3 cf hot core channel

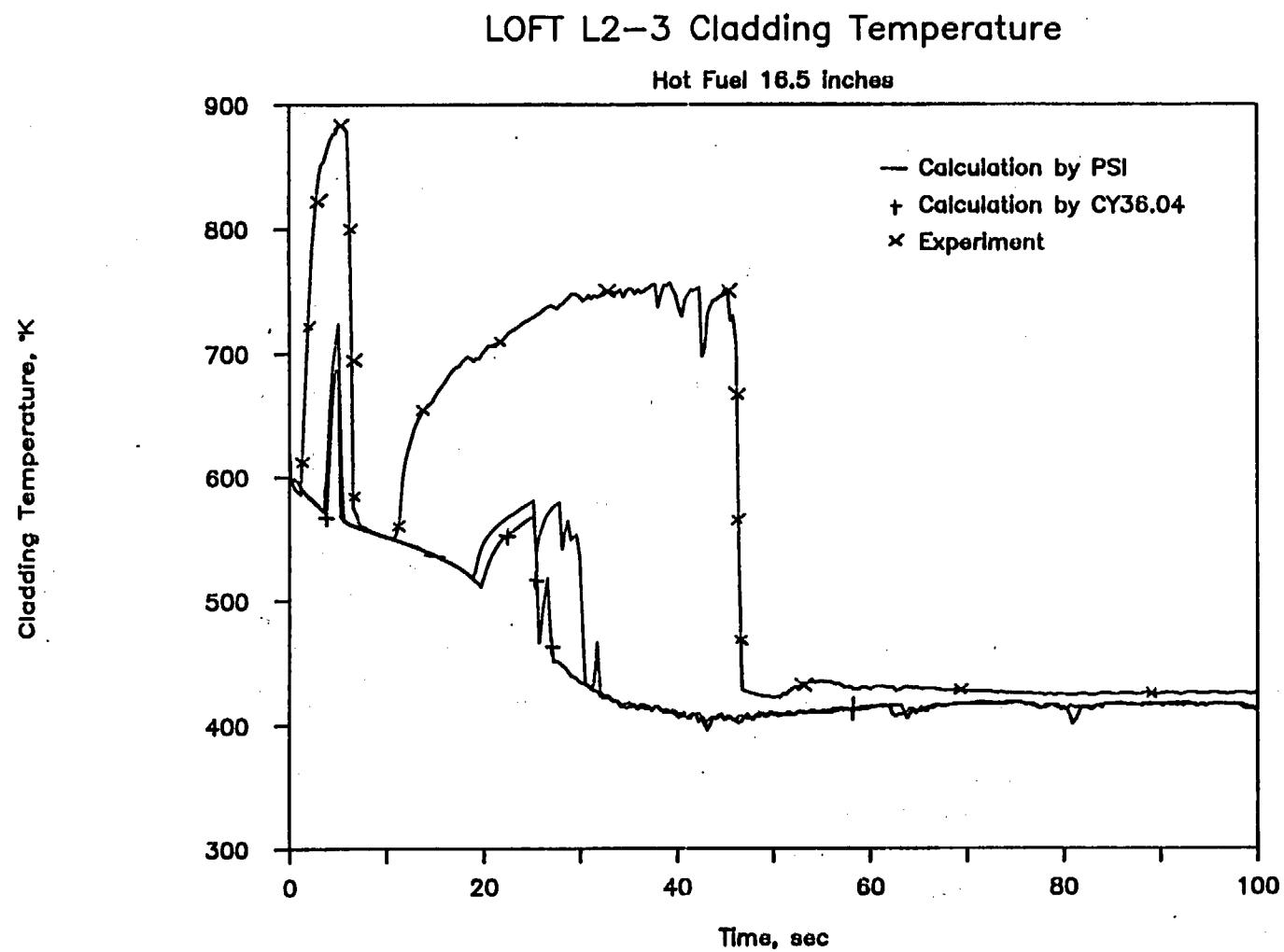


Fig.25 Comparison of cladding temperature at 16.5 inches of hot fuel between the base case calculation and the sensitivity calculation

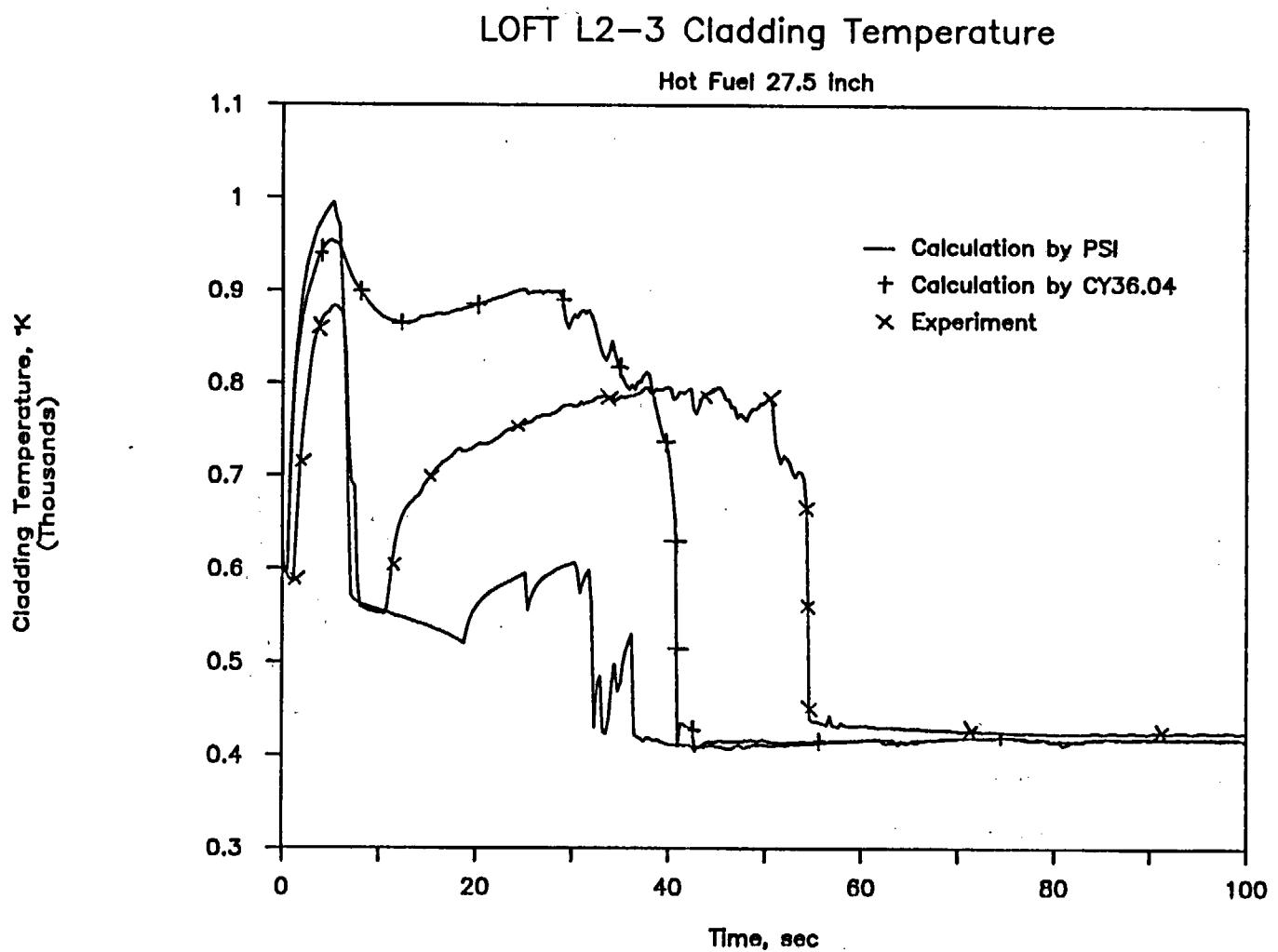


Fig. 26 Comparison of cladding temperature at 27.5 inches of hot fuel between the base case calculation and the sensitivity calculation

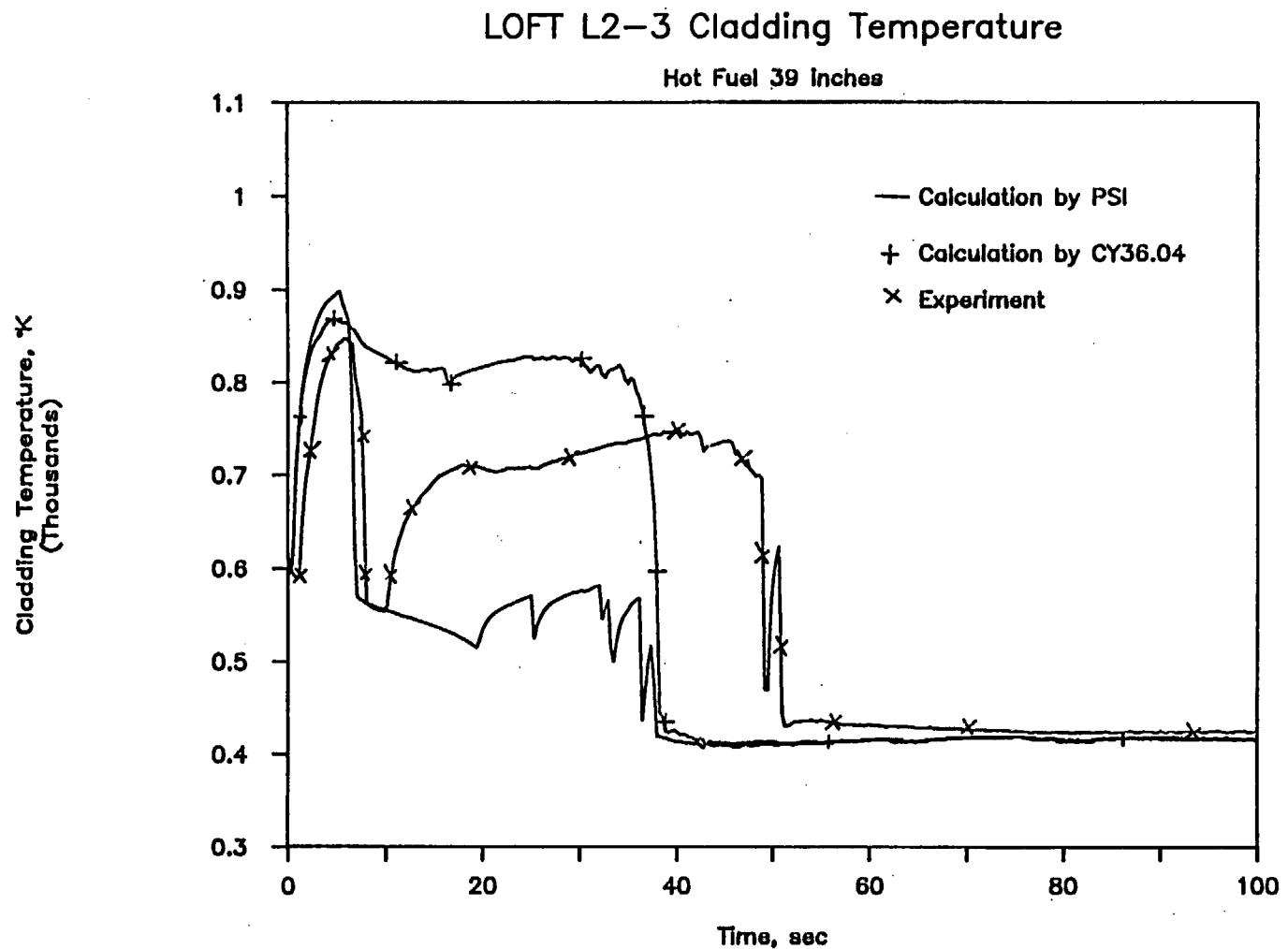


Fig.27 Comparison of cladding temperature at 39 inches of hot fuel between the base case calculation and the sensitivity calculation

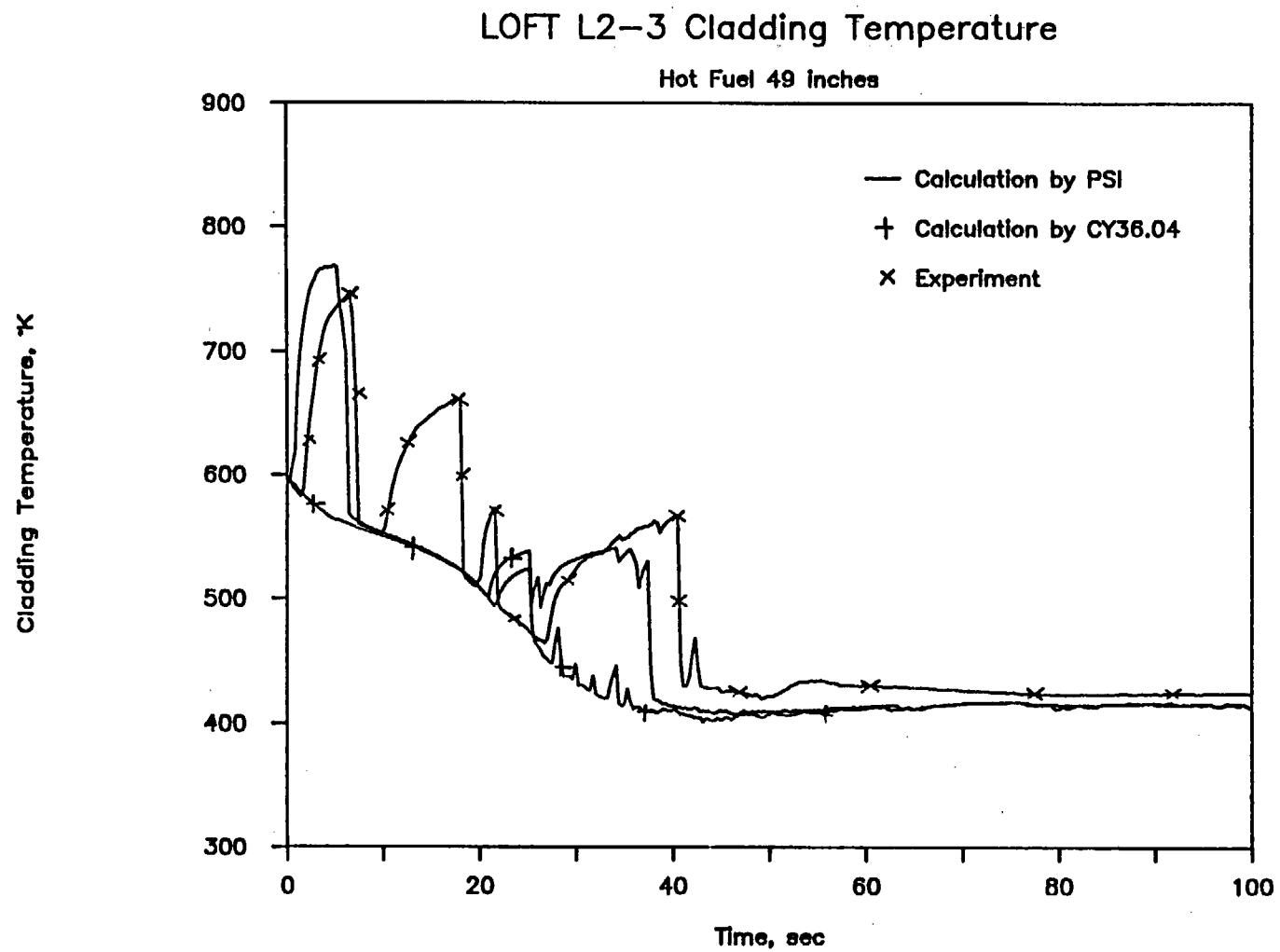


Fig.28 Comparison of cladding temperature at 49.5 inches of hot fuel between the base case calculation and the sensitivity calculation

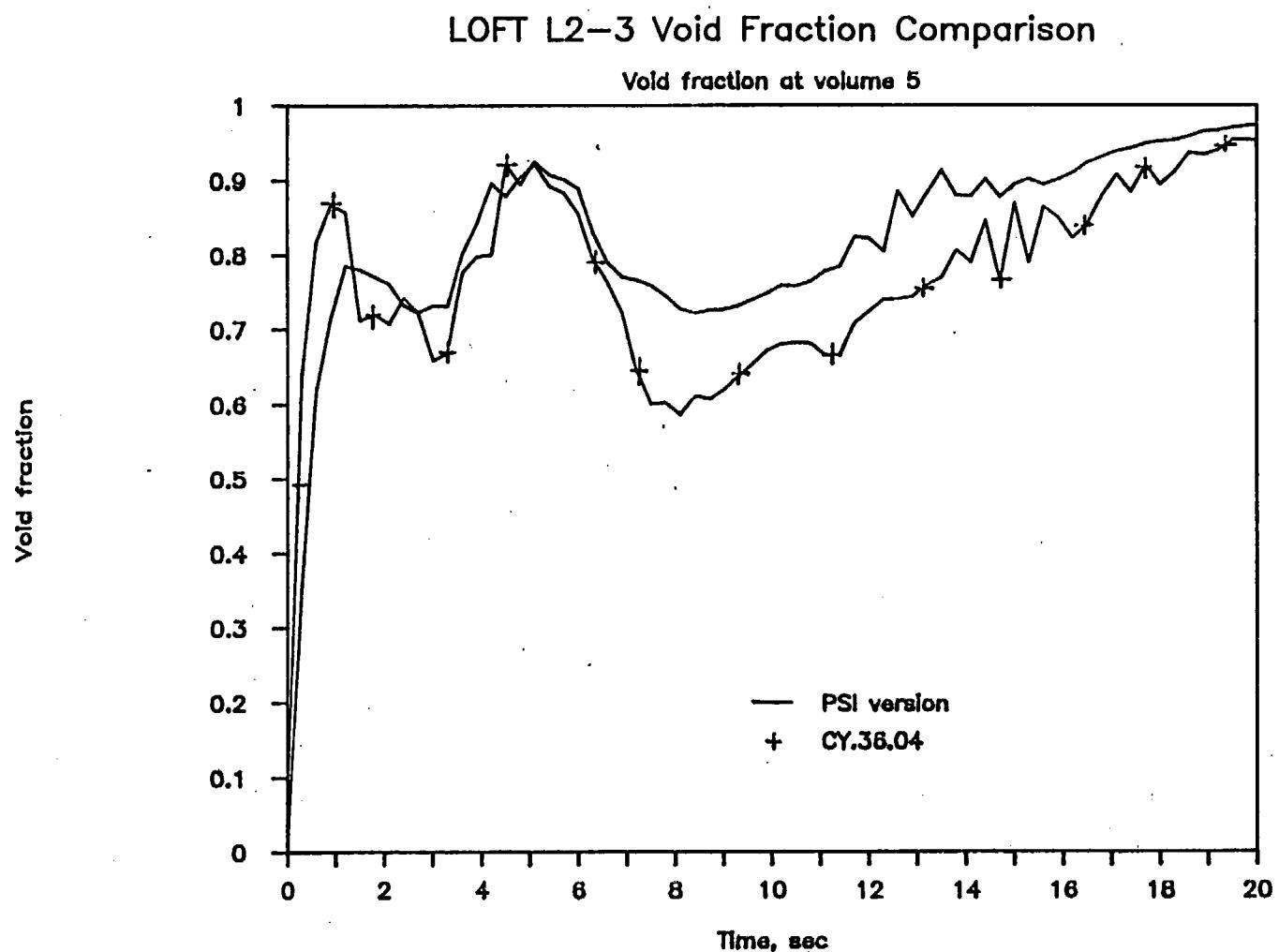


Fig.29      Comparison of void fraction at volume 5 of hot core channel  
between the base case calculation and the sensitivity calculation

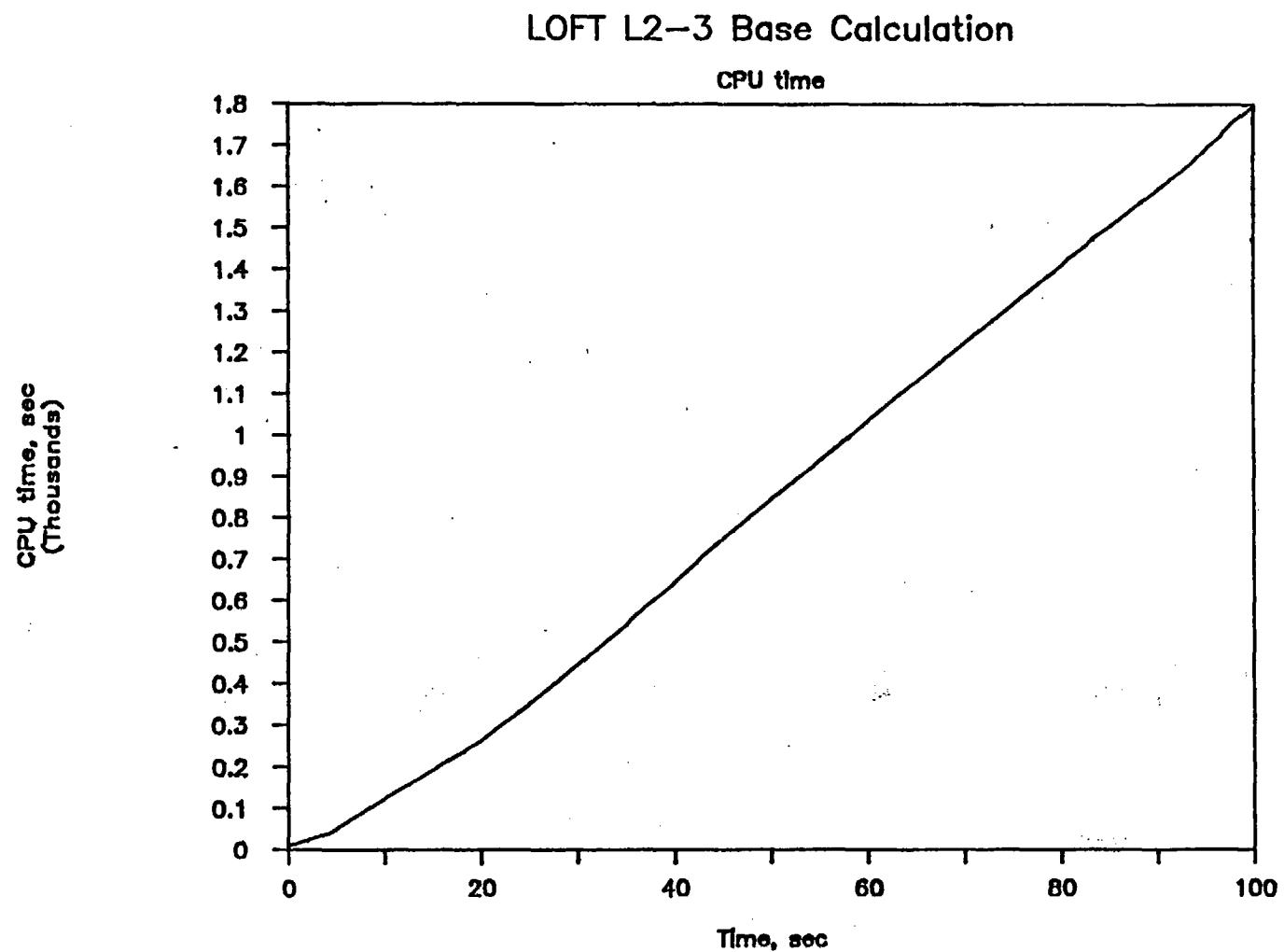


Fig.30 The required CPU time versus the advanced time in the base case calculation

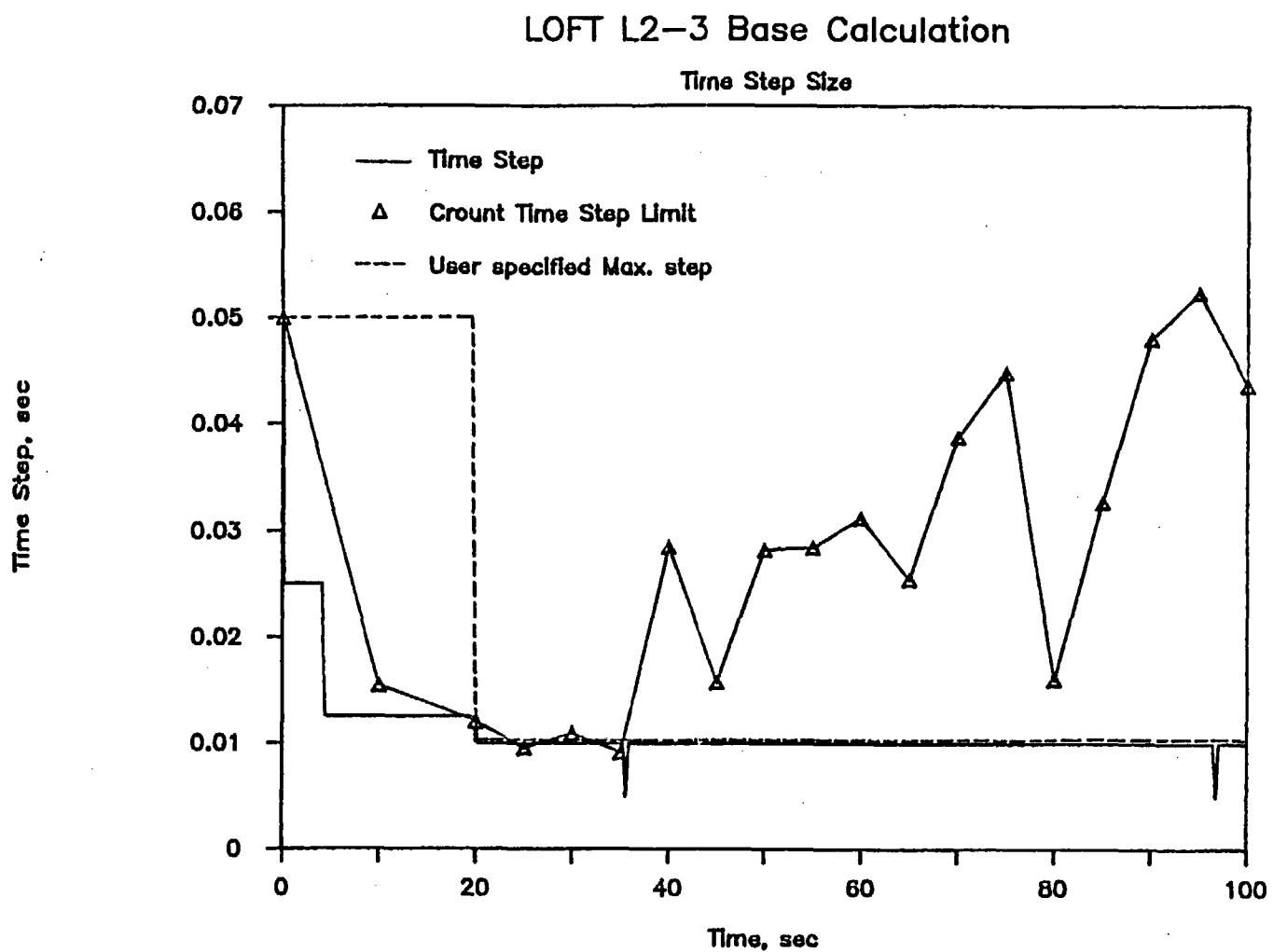


Fig.31 Time step size of base case calculation

**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 DIERCTIVE  
*****  
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 PLOTMD.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 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
*/
*/
/EOR
*COMPILE SEGDIR

```

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







0000671	-590	AND	-686	N		
0000685	671	AND	670	N		
* CLOSE TRIP						
0000591	P	530010000	GT	NULL	0	6.5613+6 N
0000592	P	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	-----1	-----1	-----1
* LT 695 PCP 1 TRIP CARD 1350301						
0000695	510	OR	510	N		
*****	1	-----1	-----1	-----1	-----1	-----1
* LT 696 PCP 1 VELOCITY TABLE CARD 1356100						
0000696	510	AND	510	N		
*****	1	-----1	-----1	-----1	-----1	-----1
* LT 697 PCP 2 TRIP CARD 1650301						
0000697	510	OR	510	N		
*****	1	-----1	-----1	-----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			

\*-----1-----1-----1-----1-----1-----1-----1-----

\* PRESSURIZER CONNECTION TEE STEAM GENERATOR SIDE

\*-----1-----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-----1-----

\* HOT LEG PIPING

\*-----1-----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
1121202	0	15005500.	1410030.	2459770.	.00000000	0.0
1121300	0					
1121301	5.1146000	5.1146000	0.0	01		

\*-----1-----1-----1-----1-----1-----1-----1-----

\* SG INLET PLENUM

\*-----1-----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
1142101	3.5832000	3.5832000	0.0			
1142201	1.9414000	1.9414000	0.0			

\*-----1-----1-----1-----1-----1-----1-----1-----

\* SG U-TUBES

\*-----1-----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				

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-----1-----								
* SG OUTLET PLENUM								
-----1-----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	0.0	0100	
1162101	116010000	118000000	0.0512	0.0	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-----1-----								
* PUMP SUCTION PIPING								
-----1-----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						

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-----1-----1-----							
* PUMP SUCTION TEE							
-----1-----1-----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-----1-----1-----							
* PUMP1 SUCTION TEE OUTLET							
-----1-----1-----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-----1-----1-----							
* PUMP 1 INLET							
-----1-----1-----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-----1-----1-----							
* PRIMARY COOLANT PUMP 1							
-----1-----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-----1-----1-----							
* PUMP 1 OUTLET PUMP SIDE							
-----1-----1-----1-----1-----1-----1-----1-----1-----							
1400000	"PMP1 OUT P"		SNGLVOL				





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-----1-----1-----1-----1-----  
 \* JUNCTION - UPPER TO LOWER INLET ANNULUS INTACT SIDE  
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----  
 \* INLET ANNULUS MIDDLE VOLUME INTACT SIDE  
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----  
 \* JUNCTION - MIDDLE TO LOWER INLET ANNULUS INTACT SIDE  
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----  
 \* INLET ANNULUS LOWER VOLUME INTACT SIDE  
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----  
 \* JUNCTION - INLET ANNULUS TO DOWNCOMER INTACT SIDE  
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----  
 \* DOWNCOMER UPPER VOLUME INTACT SIDE  
 \*-----1-----1-----1-----1-----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





\*-----1-----1-----1-----1-----1-----1-----1-----1  
 \* DOWNCOMER MIDDLE VOLUME BROKEN SIDE  
 \*-----1-----1-----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 0.102 1  
 7161001 00 1  
 7161201 0 15045800. 1233780. 2459500. .00000000 0.0 01  
 \*-----1-----1-----1-----1-----1-----1-----1-----1  
 \* JUNCTION - MIDDLE TO LOWER DOWNCOMER BROKEN SIDE  
 \*-----1-----1-----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-----1-----1  
 \* DOWNCOMER LOWER VOLUME BROKEN SIDE  
 \*-----1-----1-----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-----1-----1  
 \* JUNCTION - LOWER DOWNCOMER TO LOWER PLENUM BROKEN SIDE  
 \*-----1-----1-----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-----1-----1  
 \* CROSSEFLOW JUNCTION - UPPER INLET ANNULUS  
 \*-----1-----1-----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-----1-----1  
 \* CROSSEFLOW JUNCTION - LOWER INLET ANNULUS  
 \*-----1-----1-----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-----1-----1  
 \* CROSSEFLOW JUNCTION - UPPER DOWNCOMER  
 \*-----1-----1-----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-----1-----1  
 \* CROSSEFLOW JUNCTION - MIDDLE DOWNCOMER  
 \*-----1-----1-----1-----1-----1-----1-----1-----1  
 7260000 "MIDDNCMRXF" SNGLJUN  
 7260101 706000000 716000000 0.03 98.0 18.0 0003



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-----1-----						
* PERIPHERAL CORE VOLUME 3						
*-----1-----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-----1-----						
* PERIPHERAL CORE VOLUME 4						
*-----1-----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-----1-----						
* PERIPHERAL CORE VOLUME 5						
*-----1-----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-----1-----						
* PERIPHERAL CORE VOLUME 6						
*-----1-----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-----1-----						
* CENTRAL CORE VOLUME 1						
*-----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-----1-----						



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-----1-----1-----							
* UPPER END BOXES AND SUPPORT STRUCTURE							
*-----1-----1-----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-----1-----1-----							
* UPPER CORE SUPPORT STRUCTURE - CROSS FLOW REGION							
*-----1-----1-----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-----1-----1-----							
* UPPER FLOW SKIRT REGION							
*-----1-----1-----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-----1-----1-----							
* DEAD END OF FUEL MODULES							
*-----1-----1-----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-----1-----1-----							
* UPPER HEAD							
*-----1-----1-----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	00Q3	



	1	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-----1-----

\* HOT LEG BREAK VALVE

-----1-----1-----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-----1-----1-----  
\* REACTOR VESSEL NOZZLE - BROKEN LOOP COLD LEG

-----1-----1-----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 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-----1-----1-----  
\* COLD LEG PIPE TO REFLOOD ASSIST BYPASS TEE

-----1-----1-----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 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-----1-----1-----  
\* BROKEN LOOP COLD LEG RABS TO DTT

-----1-----1-----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 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-----1-----1-----  
\* BROKEN LOOP COLD LEG DTT TO BREAK PLANE

-----1-----1-----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 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-----1-----1-----  
\* COLD LEG BREAK VALVE

-----1-----1-----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-----1-----1-----  
\* REFLOOD ASSIST BYPASS PIPING - COLD LEG SIDE



\*
   
 \* PRESSURIZER
   
 \*
   
 \*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----1
   
 \* SURGE LINE PCS SIDE
   
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1
   
 \* PRESSURIZER SURGE LINE
   
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1
   
 \* PRESSURIZER SURGE LINE
   
 \*-----1-----1-----1-----1-----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-----1-----1-----1-----1
   
 \* PRESSURIZER VESSEL
   
 \*-----1-----1-----1-----1-----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-----1-----1-----							
* PRESSURIZER VESSEL TO TOP HAT							
*-----1-----1-----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-----1-----1-----							
* PRESSURIZER TOP HAT AND RELIEF CONNECTION							
*-----1-----1-----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-----1-----1-----							
* PRIMARY SEPARATOR							
*-----1-----1-----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-----1-----1-----							
* SEPARATOR BYPASS							
*-----1-----1-----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
5032101	-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	0.22107	0.0	-90.0	-0.6096
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
5101202	0	5844480.0	1145820.	2580000.	.00000000	0.0
5101203	0	5849120.0	1146090.	2580000.	.00000000	0.0
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	60.0	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-----1-----							
* LOWER PORTION OF STEAM DOME							
*-----1-----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-----1-----							
* UPPER PORTION OF STEAM DOME							
*-----1-----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-----1-----							
* STEAM PIPE FROM GENERATOR TO CONTROL VALVE							
*-----1-----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-----1-----							
* STEAM FLOW CONTROL VALVE							
*-----1-----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					



```

*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----
* ACCUMULATOR VALVE
*-----1-----1-----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-----1-----1-----1-----
* ACCUMULATOR PIPE
*-----1-----1-----1-----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-----1-----1-----1-----
* ACCUMULATOR VESSEL
*-----1-----1-----1-----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-----1-----1-----1-----
* BWST LPIS
*-----1-----1-----1-----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-----1-----1-----1-----
* LOW PRESSURE INJECTION SYSTEM
*-----1-----1-----1-----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      4.313     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-----1-----1-----1-----
* BWST HPIS
*-----1-----1-----1-----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-----1-----1-----1-----
* HIGH PRESSURE INJECTION SYSTEM

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\*

12311000	6	10	2	1	0.0	555	1	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-----1-----1-----1-----1-----

\*

\* AVERAGE FUEL RODS HEAT STRUCTURE :12301

\*

12301000	6	10	2	1	0.0	555	1	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			
12301706	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-----1-----1-----1-----1-----1-----1-----1-----1-----

\*

\* INTERMEDIATE FUEL RODS HEAT STRUCTURE :12302

\*

12302000	6	10	2	1	0.0	555	1	1	8
12302001	7.869+6								
12302011	1.0E-6	2.0E-6		0.0	0.0	6			
12302100	0	1							

12302101	5	4.65564-3				
12302102	1	4.75106-3				
12302103	3	5.36806-3				
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	0.018039428	0.	0.	6	
12302901	0	0.013633	0.01504	1.6764	6	

\*-----1-----1-----1-----1-----1-----1-----1-----

## \* STEAM GENERATOR HEAT STRUCTURES

\*--- -1--- -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	0.006348984				
10060201	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

20100100	TBL/FCTN	1	1	1	1	1
20100200	TBL/FCTN	3	1	*	U02	
20100300	TBL/FCTN	1	1	*	GAP	
20100400	TBL/FCTN	1	1	*	ZR	
20100500	C-STEEL			*	S-STEEL	
20100600	TBL/FCTN	1	1	*	INCONEL 600	

## \* 002 - THERMAL CONDUCTIVITY

20100106	1.03315E3	3.357625
20100107	1.08871E3	3.155129
20100108	1.19982E3	2.983787
20100109	1.28315E3	2.836674
20100110	1.36648E3	2.713792
20100111	1.53315E3	2.521680
20100112	1.61648E3	2.448990
20100113	1.69982E3	2.391875
20100114	1.97759E3	2.289762
20100115	2.25537E3	2.307069
20100116	2.53315E3	2.433413
20100117	2.81093E3	2.661870
20100118	3.08871E3	2.994171
*-----1-----1-----1-----1-----1-----1-----1-----1-----		
* U02 - VOLUMETRIC HEAT CAPACITY		
*-----1-----1-----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	4.882412E6
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-----1-----1-----		
* HELIUM(GAP) - THERMAL CONDUCTIVITY		
*-----1-----1-----1-----1-----1-----1-----1-----1-----		
20100201	HELIUM	1.00
*-----1-----1-----1-----1-----1-----1-----1-----1-----		
* HELIUM(GAP) - VOLUMETRIC HEAT CAPACITY		
*-----1-----1-----1-----1-----1-----1-----1-----1-----		
20100251	273.15	5.4
20100252	5000.0	5.4
*-----1-----1-----1-----1-----1-----1-----1-----1-----		
* ZIRCALOY-4 - THERMAL CONDUCTIVITY FROM MATPRO		
*-----1-----1-----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	21.8
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-----1-----1-----		

\* 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				
*-----1-----1-----1-----1-----1-----1-----1-----						
* S-STEEL - THERMAL CONDUCTIVITY						
*-----1-----1-----1-----1-----1-----1-----1-----						
20100401	273.15	12.98				
20100402	1199.82	25.1				
*-----1-----1-----1-----1-----1-----1-----1-----						
* S-STEEL - VOLUMETRIC HEAT CAPACITY						
*-----1-----1-----1-----1-----1-----1-----1-----						
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				
*-----1-----1-----1-----1-----1-----1-----1-----						
* INCONEL-600 - THERMAL CONDUCTIVITY						
*-----1-----1-----1-----1-----1-----1-----1-----						
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				
*-----1-----1-----1-----1-----1-----1-----1-----						
* INCONEL-600 - VOLUMETRIC HEAT CAPACITY						
*-----1-----1-----1-----1-----1-----1-----1-----						
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				

\*\$\*\$\$\*

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\*        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	

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-----1-----1-----1-----

\* 061-072 PRIMARY SYSTEM MASS CALCULATOR

\*-----1-----1-----1-----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		9.21538-2	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	

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		0.29656	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	BLHIMASS	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	



20290017	10.0	0.047947
20290018	15.0	0.044575
20290019	20.0	0.042176
20290020	30.0	0.038783
20290021	40.0	0.036348
20290022	60.0	0.031546
20290023	1.+5	0.001460 * FROM LTR LO-08-81-173
*-----*		
* PUMP DATA		
*-----*		
*-----1-----1-----1-----1-----1-----1-----1-----*		
* SINGLE PHASE HEAD CURVES		
*-----1-----1-----1-----1-----1-----1-----1-----*		
* HEAD CURVE NO. 1		
*-----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-----1-----*		
* HEAD CURVE NO. 2		
*-----1-----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-----1-----*		
* HEAD CURVE NO. 3		
*-----1-----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-----1-----*		
* HEAD CURVE NO. 4		
*-----1-----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-----1-----*		
* HEAD CURVE NO. 5		
*-----1-----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-----1-----		
* HEAD CURVE NO. 6		
*-----1-----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-----1-----		
* HEAD CURVE NO. 7		
*-----1-----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-----1-----		
* HEAD CURVE NO. 8		
*-----1-----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-----1-----		
* SINGLE PHASE TORQUE DATA		
*-----1-----1-----1-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 1		
*-----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-----1-----		
* TORQUE CURVE NO. 2		
*-----1-----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

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-----1-----1-----1-----		
* TORQUE CURVE NO. 3		
*-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 4		
*-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 5		
*-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 6		
*-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 7		
*-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 8		
*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----		
1352600	2	8
1352601	-1.000000E+00	-1.000000E+00
1352602	-2.500000E-01	-9.000000E-01



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-----1-----1-----1-----1-----		
* HEAD CURVE NO. 4		
*-----1-----1-----1-----1-----1-----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-----1-----1-----1-----1-----1-----		
* HEAD CURVE NO. 5		
*-----1-----1-----1-----1-----1-----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-----1-----1-----1-----1-----1-----		
* HEAD CURVE NO. 6		
*-----1-----1-----1-----1-----1-----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-----1-----1-----1-----1-----1-----		
* HEAD CURVE NO. 7		
*-----1-----1-----1-----1-----1-----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-----1-----1-----1-----1-----1-----		
* HEAD CURVE NO. 8		
*-----1-----1-----1-----1-----1-----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-----1-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 1		
*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 2		

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*-----1-----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-----1-----
* TORQUE CURVE NO. 3
*-----1-----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-----1-----
* TORQUE CURVE NO. 4
*-----1-----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-----1-----
* TORQUE CURVE NO. 5
*-----1-----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-----1-----
* TORQUE CURVE NO. 6
*-----1-----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-----1-----
* TORQUE CURVE NO. 7
*-----1-----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-----1-----
* TORQUE CURVE NO. 8
*-----1-----1-----1-----1-----1-----1-----1-----
1355600 2 8
1355601 -1.000000E+00 -1.000000E+00

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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	7.436600E-01
1652007	1.000000E+00	1.000000E+00

*-----	1	-----1	-----1	-----1	-----1
* TORQUE CURVE NO. 3					
*-----	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
* TORQUE CURVE NO. 4					
*-----	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
* TORQUE CURVE NO. 5					
*-----	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
* TORQUE CURVE NO. 6					
*-----	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
* TORQUE CURVE NO. 7					
*-----	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
* TORQUE CURVE NO. 8					
*-----	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

\* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA

	1	1	1	1	1
* HEAD CURVE	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			
* TORQUE CURVE	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			
* PUMP 2-PHASE DIFFERENCE DATA	1	1	1	1	1
* HEAD CURVE NO. 1	1	1	1	1	1
1654100	1	1			
1654101	0.000000E+00	1.000000E+00			
1654102	1.000000E+00	1.000000E+00			
* HEAD CURVE NO. 2	1	1	1	1	1
1654200	1	2			
1654201	0.000000E+00	1.000000E+00			
1654202	1.000000E+00	1.000000E+00			
* HEAD CURVE NO. 3	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			

```

*-----1-----1-----1-----1-----1-----1-----1-----
* HEAD CURVE NO. 4
*-----1-----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-----1-----
* HEAD CURVE NO. 5
*-----1-----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-----1-----
* HEAD CURVE NO. 6
*-----1-----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-----1-----
* HEAD CURVE NO. 7
*-----1-----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-----1-----
* HEAD CURVE NO. 8
*-----1-----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-----1-----
* TORQUE CURVE NO. 1
*-----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-----1-----
* TORQUE CURVE NO. 2
*-----1-----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-----1-----1-----1-----		
* TORQUE CURVE NO. 3		
*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 4		
*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 5		
*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 6		
*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 7		
*-----1-----1-----1-----1-----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-----1-----1-----1-----1-----		
* TORQUE CURVE NO. 8		
*-----1-----1-----1-----1-----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

\*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----1-----  
 \* STEADY STATE CONTROL SYSTEM  
 \*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----1-----  
 \* PRIMARY COOLANT PUMP SPEED CONTROLLERS  
 \*-----1-----1-----1-----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-----1-----1-----1-----1-----  
 \* PRESSURIZER SPRAY VALVE CONTROLLER  
 \*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----  
 \*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----  
 \* SPRAY LINE  
 \*-----1-----1-----1-----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-----1-----1-----1-----  
 \* SPRAY VALVE  
 \*-----1-----1-----1-----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	-1	-1	-1	
* SPRAY VALVE POSITION CALCULATOR							
*	-1	-1	-1	-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	-1	-1	-1	
* POSITION VS AREA TABLE							
*	-1	-1	-1	-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	-1
* PRESSURIZER HEATERS IN INITIALIZATION							
*	-1	-1	-1	-1	-1	-1	-1
* PRESSURIZER HEATER TRIPS							
*	-1	-1	-1	-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	-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	-1
* PRESSURIZER HEATERS							
*	-1	-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	-1
* PRESSURIZER CYCLING HEATERS							
*	-1	-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	-1
* PRESSURIZER BACKUP HEATERS							
*	-1	-1	-1	-1	-1	-1	-1
20241800	POWER	694					
20241801	0.0	0.0					
20241802	1.0	1.2+4					

```

*-----1-----1-----1-----1-----1-----1-----1-----1-----1-----
* PRESSURIZER LEVEL CONTROL USING CHARGING AND LETDOWN COMPONENTS
*-----1-----1-----1-----1-----1-----1-----1-----1-----
* MODIFY PZR LEVEL CONTROL VARIABLE
*-----1-----1-----1-----
20500206      0.1249  VOIDF    415060000
20500207      0.02477 VOIDF    420010000
20500208      0.02477 VOIDF    420020000
*-----1-----1-----1-----
* CHARGING RESERVIOR
*-----1-----1-----1-----
98000000 "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-----
98500000 "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-----
99000000 "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-----
99500000 "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-----1-----
* STEAM VALVE CONTROLLER
*-----1-----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

```



## **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,EC=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-----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
* REMOVE PUMP SPEED CONTROLLERS
*-----1-----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-----1-----
* RENODALIZE PUMP1
*-----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          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-----1-----
*
* PUMP DATA
*
*-----1-----1-----1-----1-----1-----1-----1-----
* SINGLE PHASE HEAD CURVES
*-----1-----1-----1-----1-----1-----1-----1-----
* HEAD CURVE NO. 1
*-----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-----1-----
* HEAD CURVE NO. 2
*-----1-----1-----1-----1-----1-----1-----1-----
1351200  1          2
1351201  0.000000E+00 -6.700000E-01
1351202  2.000000E-01 -5.000000E-01

```



```

* HEAD CURVE NO. 8
*-----1-----1-----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-----1-----1

* SINGLE PHASE TORQUE DATA
*-----1-----1-----1-----1-----1-----1-----1-----1
* TORQUE CURVE NO. 1
*-----1-----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-----1-----1

* TORQUE CURVE NO. 2
*-----1-----1-----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
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-----1-----1

* TORQUE CURVE NO. 3
*-----1-----1-----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-----1-----1

* TORQUE CURVE NO. 4
*-----1-----1-----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-----1-----1

* TORQUE CURVE NO. 5
*-----1-----1-----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-----1-----  
 \* TORQUE CURVE NO. 6  
 \*-----1-----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-----1-----  
 \* TORQUE CURVE NO. 7  
 \*-----1-----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-----1-----  
 \* TORQUE CURVE NO. 8  
 \*-----1-----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-----1-----  
 \* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA  
 \*-----1-----1-----1-----1-----1-----1-----1-----  
 \* HEAD CURVE  
 \*-----1-----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-----1-----  
 \* TORQUE CURVE  
 \*-----1-----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-----1-----  
\* PUMP 2-PHASE DIFFERENCE DATA  
\*-----1-----1-----1-----1-----1-----1-----1-----  
\* HEAD CURVE NO. 1  
\*-----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-----1-----  
\* HEAD CURVE NO. 2  
\*-----1-----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-----1-----  
\* HEAD CURVE NO. 3  
\*-----1-----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-----1-----  
\* HEAD CURVE NO. 4  
\*-----1-----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-----1-----  
\* HEAD CURVE NO. 5  
\*-----1-----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-----1-----  
\* HEAD CURVE NO. 6  
\*-----1-----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

1354608	8.000000E-01	-2.300000E-01
1354609	9.000000E-01	-5.100000E-01
1354610	1.000000E+00	-9.100000E-01
1354700	1	-1.470000E+00
1354701	-1.000000E+00	7
1354702	0.000000E+00	0.000000E+00
1354800	1	8
1354801	-1.000000E+00	0.000000E+00
1354802	0.000000E+00	0.000000E+00
1354900	2	1
1354901	0.000000E+00	1.000000E+00
1354906	1.000000E+00	1.000000E+00
1355000	2	2
1355001	0.000000E+00	1.000000E+00
1355007	1.000000E+00	1.000000E+00
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
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
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
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-----1-----							
* TORQUE CURVE NO. 7							
*-----1-----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-----1-----							
* TORQUE CURVE NO. 8							
*-----1-----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-----1-----							
* RENODALIZE PUMP 2							
*-----1-----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	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-----1-----							
* REMOVE SPRAY LINE, SPRAY VALVE, AND CALCULATOR							
*-----1-----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
*-----1-----1-----1-----1-----1-----1-----1-----							
* RENODALIZE PRESSURIZER MASS CALCULATOR							
*-----1-----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-----1-----							
* REPLACE PRESSURIZER BACKUP/CYCLING HEATERS POWER TABLE							

\* INSTEAD OF REMOVING PRESSURIZER HEAT STRUCTURE COMPONENTS

\*-----1-----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-----1-----

\* REMOVE PRESSURIZER LEVEL CONTROLLERS, CHARGING COMPONENT, AND  
\* LETDOWN COMPONENT

\*-----1-----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  
20500206 0.1943 VOIDF 415060000  
20500207 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-----1-----

\* REMOVE STEAM VALVE CONTROLLER

\*-----1-----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-----1-----

\* REMOVE FEED SYSTEM CONTROLLER

\*-----1-----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-----1-----

\* REPLACE TRIPS FOR L2-3 TRANSIENT

\*-----1-----1-----1-----1-----1-----1-----1-----

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-----	-----1-----	-----1-----	-----1-----	-----1-----
* MINOR EDIT VARIABLES								
*	-----1-----	-----1-----	-----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	VOIDG	225010000						* LOWER PLenum VOID
0000354	VOIDG	240010000						* UPPER PLenum VOID



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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-----1-----
* ACCUMULATOR VESSEL
*-----1-----1-----1-----1-----1-----1-----1-----
6200000 "ACCUMULATR" ACCUM
6200101 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-----1-----
* ZIRCALOY-4 - THERMAL CONDUCTIVITY FROM MATPRO
*-----1-----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-----1-----
* ZIRCALOY-4 - VOLUMETRIC HEAT CAPACITY FROM MATPRO
*-----1-----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-----1-----1-----1-----1-----
* PLOT EDIT REQUEST
*-----1-----1-----1-----1-----1-----1-----1-----
20300100 P 250010000 * PRIMARY PRESSURE PE-1UP-001
20300200 P 530010000 * SECONDARY PRESSURE
20300300 TEMPF 250010000 * UPPER PLUNUM TEMP.
20300400 TEMPF 215010000 * LOWER PLUNUM 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

```

20301100	RHO	180010000	* DENS DENSITY
20301200	MFLOWJ	630000000	* PUMP EXIT DEN.
20301300	MFLOWJ	640000000	* LPSI MASS
20301400	MFLOWJ	600000000	* HPSI
20301500	MFLOWJ	610000000	* ECC MASS
20301600	CNTRLVAR	4	* ACCUM MASS FLOW
20301700	PMPVEL	135	* ACCUMULATOR LEVEL
20301800	P	100010000	* PUMP 1 SPEED
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-5I8-008
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	



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=REL361L.  
GTR,RELAP5I,ADD.REL/*  
*DEFINE,RELAP50=RE364TL.  
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,F0=SQ.  
RFL,EC=200.  
DEFINE,RE364TX.  
SEGLOAD,I=R5SEG,B=RE364TX.  
LDSET,LIB=RELAP50/ENVRL.  
LDSET,PRESETA=NGINDEF,ERR=NONE,MAP=SB.  
LDSET,STAT=RSTIN.  
LIBLOAD,ENVRL,$HDR=$.  
LIBLOAD,FTN5LIB,$FERCAP.$,$RPVCAP.$,$FTNRP2.$,$Q2NTRY.$.  
NOGO.  
RETURN,RELAP50,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 RELAPS
*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 STUDVIK (MR.SANDERVAG)
*/
      TO KWU (MR.GRUBER)
*/
      1987-06-25
*/
*/
      COMPILE RELAPS
*/
*/
*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.CARAHEN 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.656
    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+IJSPK)/IJSPK
    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.*(.*(1.-VOIDG(IDX))/3.14159)**0.6666667

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```

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.)*0.333333*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
      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.)*0.333333*DDROP)**0.25
  HCFB=HCFB
*I VEXPLT.9
  COMMON/IFLG2/IFLAG2(1000)
*I VEXPLT.322
  CO=1.0
  C1=1.0
  IIFL2=(I-IJ+IJSPK)/IJSPK
  IF(IFLAG2(IIFL2).EQ.1) THEN
    CO=1.2
    C1=(1.0-CO*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)-CO*VELFJO(I))+0.01)
*D VEXPLT.507
  DIFF=SCRACH+(FRICFJ+CO*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
  CO=1.0
  C1=1.0
  IIFL2=(I-IJ+IJSPK)/IJSPK
  IF(IFLAG2(IIFL2).EQ.1) THEN
    CO=1.2
    C1=(1.0-CO*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)-CO*VELFJO(I))+0.01)

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```

*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,VEXPLOT,VIMPLT
*/
*/
*/ END OF PSI UPDATE
*/
*/
*COMPILE ACCUM,PHAINT,DTSTEP
*/
/* PROTECTS SIGMA (SURFACE TENSION) BY 1.OE-7 IN SUBROUTINE PHAINT
*/
*DELETE,PHAINT.200
    DSTAR(I) =DIAMV(I)*SQRT(9.8*RHOFG/AMAX1(SIGMA(I),1.OE-7))
*DELETE,PHAINT.326
    55 VCRIT=2.5*SQRT(SQRT(AMAX1(SIGMA(I),1.OE-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)
*I 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)
    QFF0=AMAX1(QTBF,BF)
    QFG0=AMAX1(QTBF,BG)
    GO TO 450
403 HTCF=HFB
    HTCG=HV
    QFF0=QFBF
    QFG0=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.OE-4) DDROP=1.OE-4
    IF(DDROP.LT.3.OE-3) DDROP=3.OE-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*RHO(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.)**0.333333*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,RHO(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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(See instructions on the reverse)

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Large Break LOCE L2-3

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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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WASHINGTON, D.C. 20555

SPECIAL FOURTH-CLASS RATE  
POSTAGE AND FEES PAID  
USNRC  
PERMIT NO. G-67

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300