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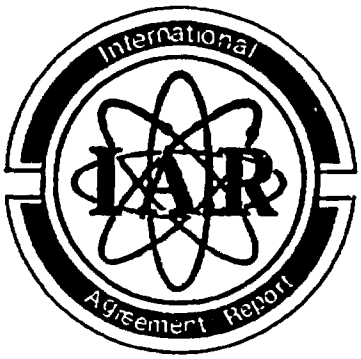

International Agreement Report

Assessment of RELAP5/MOD2 Cycle 36.04 Using LOFT Intermediate Break Experiment L5–1

Prepared by
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Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
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April 1992

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ICAP

ASSESSMENT OF RELAP5/MOD2, Cycle 36.04

USING LOFT INTERMEDIATE BREAK EXPERIMENT L5-1

Abstract

The LOFT intermediate break experiment L5-1, which simulates 12 inch diameter ECC line break in a typical PWR, has been analyzed using the reactor thermal/hydraulic analysis code RELAP5/MOD2, Cycle 36.04. The base calculation, which modeled the core with single flow channel and two heat structures without using the options of reflood and gap conductance model, has been successfully completed and compared with experimental data. Sensitivity studies were carried out to investigate the effects of nodalization at reactor vessel and core modeling on major thermal hydraulic parameters, especially on peak cladding temperature(PCT). These sensitivity items are: single flow channel and single heat structure (Case A), two flow channel and two heat structures (Case B), reflood option added (Case C) and both reflood and gap conductance options added (Case D). The code,RELAP5/MOD2 Cycle 36.04 with the base modeling, predicted the key parameters of LOFT IBLOCA Test L5-1 better than Cases A,B,C and D. Thus, it is concluded that the single flow channel modeling for core is better than the two flow channel modeling and two heat structure is also better than single heat structure modeling to predict PCT at the central fuel rods. It is recommended to use the reflood option and not to use gap conductance option for this L5-1 type IBLOCA.

LIST OF CONTENTS

List of Tables

List of Figures

Executive Summary

This report describes the assessment calculations using RELAP5/MOD2 Cycle 36.04, a frozen version of the code, to predict the thermal-hydraulic responses of the Loss of Fluid Test (LOFT) L5-1 Intermediate Break Loss of Coolant Accident (IBLOCA). LOFT IBLOCA Test L5-1 simulated 12 inch diameter ECC line break in a typical PWR. The objectives of the present assessment are to provide the applicability and optimum modeling of RELAP5/MOD2 Cycle 36.04 for LOFT IBLOCA Test L5-1. Since ICAP assessment requires sensitivity studies for nodalization and models, the effect of two nodalization and two model option sensitivities on PCT are performed under LOFT L5-1 configuration and sequence. Therefore, the results from this IBLOCA assessment will be helpful to model a similiar transient of a typical PWR IBLOCA. RELAP5/MOD2 Cycle 36.04, used in this assessment, was receieved in October 1986 from USNRC. Indexing errors were corrected in subroutine RACCUM, IHTCMP and IRFLHT from the frozen code version. There are no changes in physical models and hence the corrected version can also be regarded as RELAP5/MOD2 Cycle 36.04. Results indicated that the base case modeling (single channel and two heat structures) predicted the PCT at the central rods better than Case A and Case B.

However, Case A improved to predict the clad temperature rising time by 10 seconds while Case B improved to predict the PCT in peripheral rods. The code with reflood option underpredicted the PCT than the base case by 7 K. The code, with both reflood and gap conductance model used, also underpredicted the PCT than the base case by 15 K. Conclusively the code, RELAP5/MOD2 Cycle 36.04 with the base modeling, predicted the key parameters of LOFT IBLOCA Test L5-1 better than Cases A, B, C and D. Therefore, it is recommended to use single flow channel and two heat structure modeling; and, to use the reflood option and not to use gap conductance option for this L5-1 type IBLOCA.

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1. INTRODUCTION

The International Code Assessment and Applications Program (ICAP) has been conducted by fourteen nations and multinational organizations under the auspices of the USNRC [1][2]. The USNRC selected two Best Estimate (BE) codes: RELAP5/MOD2 [3][4] and TRAC/PF1/MOD1. The goal of the program is to assess the prediction capabilities and models [5] of the current BE thermal hydraulic(T/H) codes utilizing the available facility test and plant data in the world. The USNRC has plans to replace its present 10 CFR 50 Appendix K LOCA/ECCS rule with a best-estimate approach and an evaluation of uncertainty [2]. The USNRC plans to employ the results from code assessment works to provide conclusions relative to code accuracy and uncertainties through ICAP. The present ICAP aims to quantify uncertainties in the codes so that the code may be used for licensing purposes.

Korean contributions to ICAP include the assessments of RELAP5/MOD2 using ten experiments and five acutal plant data. Six of the assessments are performed with LOFT Integral Effect Test (IET) data [6] and two with semiscale IET data. Two Separate Effect Test (SET) data for critical flow and condensation are used to assess the code RELAP5/MOD2. The work has been conducted by KAERI (Korea Atomic Energy Research Institute), KEPCO (Korea Electric Power Company) and the overall ICAP work inside Korea has been organized and performed in KNSC (Korea Nuclear Safety Center), which is regulatory body in Korea.

Key thermal and hydraulic phenomena such as blowdown, refill and reflood regarding on LBLOCA and SBLOCA separatly are well identified over the past

years. Now, it is necessary to investigate the key phenomena of intermediate break loca (IBLOCA). The LOFT IBLOCA experiment L5-1 [8] simulated 12 inch diameter ECC line break (14 % break of 32 inch main piping) in a typical PWR by utilizing a 0.047 m diameter orifice. As quick look report for Test L5-1 [9] summarized the overalls of the experiment, the objective of experiment L5-1 is to provide data to assess the analytical techniques used to model the principal phenomena of an intermediate size break.

The RELAP5/MOD2/cycle 36.04 [3] was implemented in 1986 on a CDC 170-875 computer of KAERI. The code was corrected regarding to indexing errors in subroutines RACCUM and IHTCMP from the frozen version [11]. There are no changes in physical models and hence the corrected version can also be considered as RELAP5/MOD2 Cycle 36.04. Chen and Modro used RELAP5/MOD1 Cycle 13 for pretest [7] and posttest [12] calculations for LOFT L5-1. E. J. Lee and present authors [10] assessed RELAP5/MOD2 Cycle 36.05 by using LOFT SBLOCA Test data L3-7. The input deck for the LOFT IBLOCA Test L5-1 was basically equivalent to that used for LOFT L3-7 simulation with some modifications, which will be explained in Section 3.2.

The base calculation, which modeled the core with single flow channel and two heat structures without using the options of reflood and gap conductance model, has been successfully completed and compared with experimental data. Two types of nodalization sensitivity studies and two types of model option sensitivity studies were carried out to investigate the following effects on PCTs: single flow channel and single heat structure (Case A), two flow channel and two heat structures (Case B), reflood option added (Case C) and both reflood and gap conductance options added (Case D).

To summarize the objectives, this report aims to provide the applicability and optimum modeling of RELAP5/MOD2 Cycle 36.04 for LOFT IBLOCA Test L5-1. Since ICAP assessment requires sensitivity studies for nodalization and models, the effect of two nodalization and two model option sensitivities on PCT will be quantified under LOFT L5-1 configuration and experiment sequence. Thus, the results from this IBLOCA assessment will be helpful to model a similiar transient of typical PWR.

To address these objectives, the report composed of the following sections. The descriptions of the LOFT system and the experiment L5-1 are provided in Chapter 2. The code and modelling for a base calculation are described in Chapter 3. The results of the base case calculation are discussed in Chapter 4 in terms of thermal and hydraulic behaviors. The scope and results of nodalization and model sensitivity studies are presented in Chapter 6. Final conclusions and recommendations from this assessment are presented in Chapter 7. Appendix A contains the input listing used for base case calculation.

2. FACILITY AND TEST

2.1 LOFT

The LOFT Integral Effect Test (IET) facility [50 MWt] has been designed to simulate the major components and system responses of a commercial four-loop PWR [1]. The LOFT facility consists of (1) a reactor vessel with a nuclear core(4 wt% U-235), (2) an intact loop (a steam generator and two primary pumps parallel), (3) a broken loop (simulated pump and steam generator and two quick opening valves), (4) the blowdown suppression system and (5) the emergency core coolant (ECC) system (two LPIS, two HPIS pumps and two accumulators). To relate LOFT into a PWR, the test facility is designed as follows: (1) the same linear heat generation rate of the large reactor is used, (2) LOFT powers are scaled according to component volumes (1:60), (3) flow areas are scaled to provide the identical flow to large reactor values, (4) pipe break areas are set in the ratio of core volume and (5) pressure, temperature and mass flux are identical to large reactor values.

2.2 L5-1

The LOFT intermediate break experiment series L5 was designed to identify and evaluate the LOFT system thermal-hydraulic response during an intermediate size break LOCE. Experiment L5-1 was initially operated at thermal power of 45.9 MWt, vessel temperature difference of 27.0 K, mass flow rate of 308.2 kg/s at 14.93 MPa system pressure. The specific objectives of experiment L5-1 are to (1) obtain sufficient data to characterize the prevalent phenomena caused by an ECCS injection line rupture, (2) generate

applicable data for use as a base line in the future planning of intermediate size break, (3) provide data to assess the analytical techniques used to model the principal phenomena of an intermediate size break. Also, data aquisition system was validated during this experiment L5-1.

3. CODE AND MODELING

3.1 RELAP5/MOD2 Cycle 36.04

RELAP5/MOD2 Cycle 36.04, a frozen version of RELAP5/MOD2 used in this assessment, was received at October 1986 from USNRC. The code was corrected regarding to indexing errors in subroutine RACCUM, IHTCMP and IRFLHT. There are no changes in physical models and hence the corrected version can also be regarded as RELAP5/MOD2 Cycle 36.04. These corrections were based on the update work of KWU and STUDSVIK [11].

3.2 Modeling and Nodalization

Break, vessel and system modeling including boundary conditions are described in this section. The break for the IBLOCA was modeled with a motor valve whose rate of change for the normalized valve area was 14.0 unit per sec. The full open area, for instance, of LOFT SBLOCA Test L3-7 was 1.278E-5 m2 while the area of L5-1 break was 173.49E-5 m2 so that the area ratio of two experiments was about 138. For example, L3-7 simulated 1 inch SBLOCA while L5-1 simulated 11.2 inch I.D. accumulator line rupture. The diameter of actual orifice used in L5-1 experiment was 0.047 m [9] while a 0.004 m diameter orifice was used for L3-7 and so the diameter ratio of two experiments was 11.7. The option of normal junction, nonhomogeneous, smooth area change and choking modeling applied (0000) were used to model L5-1 break.

The pellet stack length of core was 1.68 m and five sets of 15X15 and

four sets of 12X12 nuclear fuel assemblies existed [8]. Among 1300 fuel rods in the LOFT core, the central 204 fuels were modeled as a central hotter pin and the other 1096 fuels were described as a peripheral heat structure. The core basically was modeled as one flow channel which has six almost equal volume length of 0.221 m. Two heat structures were used to model the central assemblies (12300000) and the peripheral (12310000) assemblies respectively. Thus, a multiplication factor for the 204 central pins was calculated as 57.12 (1.68X204/6) while the factor for the 1096 peripheral pins was 306.88 (1.68X1096/6). Both reflood and gap conductance option were not used since the primary pressure was kept higher than 1.0 MPa during the period of interest and a tabular form of temperature vs. gap conductance data was used.

The input deck for LOFT L5-1 was basically from the deck equivalent to that for LOFT L3-7 simulation [10]. Some correction were made from the deck. For instance, core length was corrected to 1.68 from 1.98 m. HPIS was modeled with a time dependent junction connected directly into cold leg. HPIS injection was initiated based on a set pressure , 10.6 MPa of hot leg pressure. Accumulator was modeled with "ACCUM" , single volume and a valve. The initial accumulator water level was corrected to be 1.54 m as in experiment and activated when the cold leg pressure was lower than 1.66 MPa. The model "ACCUM" was disconnected in the calculation when accumulator was emptied to overcome an accumulator related error. The flows from accumulator and LPIS were merged into a single volume ECCS header. The values for LPIS capacity were corrected based on the experiment L5-1 and LPIS was activated when the RCS pressure decreased to 1.08 MPa. Primary coolant pump was set to trip at 4.0 seconds. Thermal power was inputted with the combined data from

fission and decay power [8]. Other hydraulic and thermal modelings for primary and secondary loop were conceptually the same as the one used for L3-7 SBLOCA assessment work [10].

The RELAP5/MOD2 nodalization diagram of the base case is shown in Figure 1. The nodalization has 130 volumes, 136 junctions, 143 heat structures and 793 mesh points. Basically the same nodalization concept as L3-7 was applied to L5-1. The nodalization for L3-7 [10] is the reference and few changes were added as described above. Figure 2 shows the comparisons of linear heat generation rate (kW/m) for experiment and calculation along the core height. The history of thermal power from fission and decay was properly described in the input deck.

3.3 Initial and Boundary Conditions

The decks L51S12 and L51T12 in Cyber 170-875 were prepared for the purpose of assessment. Convergency was not achieved with the steady deck but the key values for the initial stages (Table 1) were generally within tolerable ranges at 300 second steady calculation. So, the values at 300 seconds were taken as the initial conditions for the following transient calculation. Table 1 shows the initial conditions of both experiment and calculation. The code predicted the primary system mass flow as 308.27 kg/s, hot leg temperature as 581.34 K and cold leg temperature as 553.76 K. Other T/H values for reactor vessel, pressurizer and accumulator were well predicted except the temperatures for the broken loop. The code overpredicted the broken loop hot leg temperature as 561.75 K which was 7.45 K higher than experiment. However, the discrepancy would not affect the

results of later transient because of the small mass flow (about 2.88 kg/s) rate through the broken loop. The major values for the steam generator secondary side were also fairly well predicted. The pressure was 5.00 MPa and steam mass flow rate was 31.5 kg/s initially. Figure 7 shows the initial condition and the transient of primary system inventory. Primary system coolant inventory mass was about 5000 kg and its measurement uncertainty was about 300 kg. The initial offset from the measurement occurred because the mass in the broken loop steam generator and pump was not included in the experiment and analysis [12]. Later, an extra calculation with a revised initial condition might be required to assess its effect on primary system pressure, accumulator and LPSI flow rates, and PCT.

Boundary conditions, composed of initial condition and sequence of event, should be matched with actual experimental conditions to describe the dynamic system boundary properly. Table 2 shows the sequence of events for experiment L5-1 and the base calculation. Within one second, reactor was scrammed and the secondary side inlet/outlet valves were closed and HPIS trip point was reached (10.6 MPa). HPIS injection was initiated with 2.48 seconds delay. Lowest in-core thermal excursion started at 184 and 182 seconds in experiment and base calculation. Accumulator (1.66 MPa) was injected at 185.8 and 189 seconds respectively. Maximum fuel cladding temperature reached 715 K at 198 seconds in experiment and 676 K at 210 seconds in base calculation. So the code underpredicted the PCT by 39 K. Finally LPIS (1.08 MPa) flow was initiated at 201 seconds in calculation and 227 seconds in experiment.

4. RESULTS AND DISCUSSIONS FROM BASE CASE CALCULATION

Table 3 summarizes the list of assessment parameters. It describes the identification of calculated and measured parameter in addition to uncertainties of measurements. The corresponding figure numbers to the assessment parameters are also listed in Table 3. The system phenomena governing the response of L5-1 are classified as hydraulic and thermal behavior for the purpose of further discussions. Hydraulic behavior can be explained primarily with discharge flow rate, depressurization, external ECCS flow, system inventory and core mixture level. Thermal behavior can be catagorized with the core thermal power, S/G secondary operation, core void and PCT. Since the break diameter is greater than 9 inch, it experiences a relatively rapid depressurization process compared with a typical SBLOCA. Thus, the transient can be characterized by a blowdown/refill process occurred relatively slower than typical LBLOCA and the safety is mainly affected by accumulator and LPIS flow rather than HPIS flow.

4.1 Hydraulic Behavior

The upper plenum pressure was depressurized very rapidly to 7 MPa in 20 seconds, and then, slowly depressurized at a rate of 1 MPa per 50 seconds until LPIS was initiated (Figure 3). The steam dome pressure was well predicted (Figure 4) besides the mass flow rates of steam generator inlet (Figure 5) and outlet (Figure 6). The primary system inventory was well represented indicating that the discharge and incharge flows from ECCS were properly described (Figure 7). However, Figure 8 shows the density of ILHL overpredicted in 50 sec and 250 sec, probably due to overpredicted system

pressure (Figure 3) and overestimated LPIS flow (Figure 12). Figure 9 and 10 show the density of BLHL and HPIS flow rate matching with the experiment fairly well. Figure 11 shows the liquid level of accumulator;and, interestingly a 15 sec stagnant existed in 215 sec because of the repressurized system pressure (Figure 3) due to LPIS flow (Figure 12). Figure 13 shows the flow rate of ILHL and Figure 14 shows the reflooding rate, which influences the PCT most. Figure 14 indicates the negative flow after 37 sec till accumulator injects. The positive mass flow is less than 50 kg/s in reflood phase. The slow depressurization occurred because the energy removed through the break (Figure 15) was less than the energy generated in the reactor core. After the interface between liquid and vapor fell below the break elevation, the rate of energy removal through the break increased. The RCS continued to depressurize after pressurizer was emptied (Figure 16) until accumulator injected.

The calculations showed that a large volume of water supplied from accumulator and LPIS more than compensated for the loss of reactor coolant inventory and repressurized again at 217 seconds (Figure 3, 11 and 12). It was verified again that accumulator and LPIS influenced more on safety than HPIS for this type of larger SBLOCA, i.e. IBLOCA transient (Figure 21). In core wise, the liquid was drained off at 180 seconds and started to be filled up again at 190 seconds due to the accumulator injection at 189 seconds. Significant core uncovery occurred but the core quenches again due to the accumulator flow initiation (Figure 18).

Although the primary pressure decreased to 1 MPa in 200 seconds (Figure 3), the accumulator flow was injected at 186 seconds so that the fuel

cladding temperature quickly dropped thereafter (Figure 21). The steam dome pressure was predicted initially properly and overpredicted by 0.2 MPa at 25 seconds but,after 90 seconds, underpredicted upto by 0.8 MPa (Figure 4). The ILHL density at 50 seconds and 250 seconds were overestimated (Figure 8) probably due to overestimated ILHL mass flow rate (Figure 13). The overestimated mass flow rates were caused by overpumping HPIS (Figure 10) and LPIS (Figure 12) flow rates. These overestimated flow rates caused a 17 second stagnant of accumulator water level (Figure 11) at 217 second and it also affected the plateau of core mixture level. The base calculation predicted the key parameters of L5-1 experiment fairly well except two cases: the starting time of cladding temperature rise (dry-out) and earlier heat up in peripheral PCT measured. The base calculation predicted the start time of PCT rise 30 seconds later than the experiment (Figure 21). Figure 15 showed that the integrated break flow was predicted fairly well within maximum range of 200 kg. Figure 7 indicated that the primary system inventory was initially overpredicted by 500 kg and this affected to overpredict the inventory by 400 - 500 kg over the transient. The overestimated water inventory probably caused the heatup to start later. Otherwise the low mass flux CHF correlation from modified Zuber [5] has a deficiency in the operating range because core mass flow was less than order of 20 kg and flow area was 0.17 m2 and, therefore, the mass flux surely less than 100 kg/m2/s. Providing that the discharge flow rate and the inventory were well predicted, Modified Zuber correlation overpredicted Q(CHF) and needs to be examined for this low range mass flux and pressure. Also, fuel cladding temperature measurements in a peripheral assembly 4 at 45 inch (T-4E8-45) indicated an early heat-up, quenching, reheat-up and final quenching (Figure 24). However, the calculation did not catch the early heat-up.

Therefore, nodalization sensitivity study including two-flow channel effect on the peripheral fuel clad temperature is motivated to investigate whether the source of the deficiency comes from the code, modelling or experiment.

4.2 Thermal Behavior

This assessment used a combined thermal power from fission and decay power. History of thermal power from Reference 8 shows that the magnitude of fission power is very small after 10 seconds and thereafter the decay power, ranging from 2 MW to 1 MW, is dominant. A rapid core mixture level drop lead to a core uncovering. As two-phase circulation through the primary loop stops, the mixture levels in the S/G tubes drop steadily on both uphill and downhill side moving into a reflux cooling mode. The vessel mixture level also drops slowly during this S/G tube draining period until the mixture level reaches the bottom of the hot leg. Once the level reaches the bottom of the hot leg, it starts to decrease very rapidly because of the lack of a significant water supplied to the core from S/G. The mixture level affecting the fuel cladding temperature strongly decreases or increases depending upon loop seal clearing or degree of ECCS water supply. In this case, the mixture level increased again due to sufficient ECCS water supply.

Liquid void fraction of 230040000 became zero at 150 sec (Figure 25) and, then, thermal excursion started. At 198 seconds, maximum fuel cladding temperature of 715 K measured while the code predicted the start time of dry-out later by 25 second and the peak as 675 K (Figure 21). At the central and 26 inch (T-5F4-026) location of fuel assemblies, the code still predicted

the start of heatup later with the same heatup rate and underpredicted the peak by 15 K (Figure 20). At the central and 49 inch (T-5E8-49), the code predicted the start time of core heatup 25 seconds later than the one of the experiment and still underpredicted the peak by 40 K (Figure 22). At the peripheral and 26 inch (T-4F9-26), the code overpredicted the peak by 150 K due to highly estimated LHGR at the peripheral locations (Figure 23). The measured peak cladding temperature of 715 K at 198 second was obtained at the central and 37 inch (T-5D8-37) measurement location. The calculation, at central 36.5 inch, with single flow channel and two heat structures underestimated the peak as 675 K at 210 seconds while the experiment produced the PCT as 715 K at 198 seconds.

Consequently, it showed again that compensating effects of discharge flow, decay power and external ECCS water supply decided the mixture level of the core. Considering heat transfer mechanism in core side, the core experienced a slow downward liquid drain off until 180 seconds (blowdown phase) and started to be filled up again from 190 seconds (refill/reflood phase). The first part can be considered as a slow blowdown phase and the second part as a refill or reflood period. Core mixture level increased again due to the flows from accumulator and LPIS. Accumulator and LPIS flow injection finally cooled down the fuel.

The effect of two flow channel and even single heat structure on PCT would be interesting to quantify its effect. The base modeling did not use the options of reflood and gap conductance model. Therefore, the effects of each options on PCT will be demonstrated as alternatives of model sensitivity studies.

5. NODALIZATION AND SENSITIVITY STUDIES

From the discussions in the base calculations, two types (Case A and Case B) of nodalization and two types (Case C and Case D) of model option sensitivity studies were proposed to quantify its effect on a key safety parameter, PCT. The central PCT measured at T-5D8-37 was compared with HTTEMP 2300410 and a peripheral PCT measured at T-4E8-45 compared with HTTEMP 2310510. First, reflood option was added to the base modeling and, then, recalculation has been done with gap conductance option added as model sensitivity items.

5.1 Nodalization Sensitivity Study

5.1.1 Single Flow Channel and Single Heat Structure (Case A)

Case A, which modeled the core as single flow channel and single heat structure, indicated the start time of clad temperature rise 10 seconds earlier and underpredicted the PCT by 25 K in comparison with the base case. A later peak was calculated due to a stagnation of accumulator flow. Consequently, single pin modeling had advantage of predicting earlier dry-out time but disadvantage of PCT prediction when compared with the base case, which modeled the core as single flow channel and two heat structures (Figure 28).

5.1.2 Two Flow Channel and Two Heat Structures (Case B)

Case B, two flow channel and two heat structures, showed a later heatup

and still lower PCT but better than Case A. However, a second peak was observed and not appeared in the experiment, which was directly due to the stagnant flow from accumulator. Two flow channel and two pin model did not improve the central PCT prediction but the peripheral PCT was predicted better. Figure 29 and 30 showed an earlier measurement peak, which was not predicted in calculations. The earlier peak probably was caused by a liquid deentrainment during the experiment and the modeling concept based on one-dimensional could not catch the earlier heatup.

5.2 Model Sensitivity Study

5.2.1 Reflood Option Added (Case C)

Case C, reflood option only added, predicted the PCT 10 K lower than the base case (Figure 29). The reflood initiation pressure at Volume 230060000 was set as 2.0 MPa because the overall system pressure did not go below 1.0 MPa in experiment and to turn on the reflood option as in the experiment. Case C did not include the accompanying peak during quenching, which was experienced in the base calculation. This straight quenching without the peak behaved more closely to the experiment than the base case. Therefore, using the reflood option is recommended even for the transient process pressure about 2.00 MPa.

5.2.2 Reflood and Gap Conductance Option Added (Case D)

Case D, both reflood and gap conductance option used, indicated the start time of clad temperature rise 10 seconds later and even lower PCT by 25

K than the base (Figure 29). The second peak during quenching was observed but the magnitude was negligible. Both models contributed to calculate the PCT lower than the base case. The higher gap conductance values, the lower PCTs were calculated. This study also indicated that the gap conductance data given in the base deck were lower than the data calculated by gap conductance model. Since the heatup rates of the two cases were similar and the PCT was underestimated, it is not recommended to use the gap conductance option for this type IBLOCA;and, instead, tabular form used in the base case is more preferable.

5.3 Inventory Sensitivity Study

Primary system inventory mass is the one of key safety parameters for a LOCA. It affects primarily to primary system pressure, ECCS flow rates, core blowdown/flooding rates, and PCT finally. Thus, the effect of the inventory mass was investigated to see its effects on the key T/H parameters for L5-1 type IBLOCA. Figure 31 shows the changes of the primary system inventory, which excluded the mass in the simulated steam generator and pump of the broken loop so that the initial mass and inventory were reduced during the overall transient. Figure 32 shows the effect of the mass inventory on primary system pressure. The reduced one was able to follow the transient of the experiment more closely till blowdown period around 100 seconds. Afterwards, it depressurized more rapidly so that the core started to boil off earlier and, also, the accumulator (Figure 33) and LPIS (Figure 34) were turned on earlier, too. The earlier actuation of the ECCS components resulted in quenching the heater rod to heat up earlier. Therefore, the reduced inventory affected the heater rod to heatup 10 seconds earlier but

the maximum PCT was underestimated due to the earlier ECCS actuation.

6. RUN STATISTICS

The input models for the base case of LOFT L5-1 included 130 volumes, 136 junctions and 143 heat structures. Figure 26 compared time step size, DT vs. transient time. Figure 27 compared CPU time vs. transient time. The ratio of CPU vs transient time came out to be about 1537/300, i.e. 5.12 for the base case calculation.

During the transient calculation the following resources were used :

	Base
Computer time CPU (s)	1537
Number of time step DT	6539
Number of Volumes C	130
Transient real time RT(s)	300

The calculated grind time (code efficiency factor) for 300 s is

$$\frac{CPU * 1000}{C * DT} = \frac{(1537) * 1000}{(130)\ (6539)} = 1.80 \quad \text{(m sec/vol/step) for Base Case}$$

The computer used was a cyber 170-875

7. CONCLUSIONS

RELAP5/MOD2 Cycle 36.04 code was assessed using LOFT L5-1 IBLOCA test data. A base case calculation including single flow channel and two heat structures was carried out without using reflood and gap conductance models as a reference case. Two cases of nodalization studies and two types of model sensitivity studies were conducted to quantify their effects primarily on PCT. Case A modeled the core as single flow channel and single heat structure while Case B modeled the core as two flow channels and two heat structures. Case C used reflood option over the base modeling and Case D added gap conductance option to Case C. Additional calculation with the revised initial inventory showed that it affected to reduce the primary system pressure more rapidly and, therefore, the fuel rod started to heat up 10 seconds earlier so that the accumulator and LPIS were turned on earlier, too. Consequently the revised one improved to predict the core heatup time but the maximum PCT was predicted not more accurately due to the earlier injection flows from accumulator and LPIS. Based on the results from the given scope, the following conclusions can be made.

1) Using LOFT IBLOCA test data L5-1, a base case calculation with a base nodalization was successfully executed and matched fairly well with the LOFT IBLOCA L5-1 experimental data.

2) The code with base nodalization showed that core clad temperature rise occurred 25 sec later and underpredicted the PCT by 40 K in comparison with the experiment. The modeling with a single flow channel and a single heat structure improved the start of clad temperature rise (heatup) by 10 seconds

but underpredicted the PCT worse by 50 K, compared with the experiment. The model with two-channel and two heat structures predicted the PCT a little better than Case A by 5 K but heatup started later than the base case by 10 seconds. Therefore, the base modeling, a single flow channel and two heat structures, proves to be better than the Case A and the Case B to predict the PCT for LOFT IBLOCA L5-1 transient.

3) The base modeling did not predict the early peak occurred at 125 sec as in temperature measurement at T-4E8-045 (Figure 30) and the limitation of one dimensional modeling caused not to predict the earlier peak observed in the experiment. The model with two channels and two pins improved to predict the PCT in the peripheral assemblies by 20 K compared with the base case; but, still the code overpredicted the reflood PCT at the peripheral assemblies because the modeling assumed higher LHGR.

4) Model sensitivity studies revealed that the case with reflood model option underpredicted the PCT more than the base case by 10 K. The case with both reflood and gap conductance option underpredicted the PCT even worse than the base case by 20 K. Consequently, if both model options were added, then lower PCT was calculated. The higher the gap conductance values, the lower PCTs were calculated. This means that the gap conductance data inputted to the base deck are lower than the values calculated from gap conductance model. So it is recommended to use reflood option and not to use gap conducatnce option additionally for the IBLOCA application.

5) 25 seconds later dry-out time encountered in calculating the core thermal behavior was not significantly improved through the four proposed sensitivity

studies although Case A improved the start time of dry-out by 10 seconds. Results with the revised initial inventory mass indicated that the reduced inventory improved the core heatup time 10 seconds but the maximum PCT was underestimated due to the earlier injection of accumulator and LPIS. The code should model the depressurization properly to predict the heatup and the CHF modeling at the corresponding pressure and flow rates during the blowdown was the area for further improvements[12,13,14]. So, the originally proposed L5-1 base modelling is the optimum for LOFT IBLOCA Test L5-1 simulation among the tested cases.

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Table 1 INITIAL CONDITIONS FOR EXPERIMENT L5-1

Parameter	Experiment L5-1 Measured Value (EDR [8])	REALP5/MOD2/Cycle 36.04 Calculated Value (L51S12) [I.C. of L51T12]
Primary System		
Mass flow (kg/s)	308.20	308.27
Hot leg pressure (MPa)[a]	14.93	14.87
Cold leg temperature (K)	552.30	553.76
Hot leg temperature (K)	579.10	581.34
Boron concentration (ppm)	669.00	-
Vessel DT (K)	26.80	27.58
Reactor Vessel		
Power level (MW)	45.90	45.77
Max LHGR (kW/m)	46.00	42.50
Pressurizer		
Vapor volume (m3)	0.33	-
Liquid volume (m3)	0.60	-
Liquid temperature (K)	615.00	614.48
Liquid level (m) [a]	1.13	1.10
Broken Loop		
Cold leg temperature (K)	549.20	557.40
Hot leg temperature (K)	554.30	561.75
Steam Generator Secondary Side		
Liquid level (m) [b]	0.27	0.287
Liquid temperature (K)	537.80	533.210
Pressure (MPa)	5.05	5.010
Mass flow (kg/s)	25.30	24.493
Accumulator A		
Liquid level (m) [c]	1.49	1.490
Pressure (MPa)	1.66	1.660
Liquid temperature (K)	308.20	308.200

[a] Out of specification, but did not impair results
[b] The liquid level is defined as 0.0 at 2.95 m above the top of the tube sheet
[c] Liquid level is measured from 0.32 m above the bottom of the accumulator vessel

Table 2 SEQUENCE OF EVENTS FOR EXPERIMENT L5-1

Events	Time after Experiment Initiation (s)		
	Experiment L5-1 [8]	Calculation L51T12	
Cold leg QOBV opened [a]	0.0	0.0	
Reactor scrammed	0.17	0.06	
Main feed pump tripped and steam control valve started to close	0.17	0.07	
Upper plenum reached saturation	0.20	0.25	
HPIS trip point reached (10.6 MPa)	0.40	0.30	
HPIS injection flow initiated	2.88	2.90	
Primary coolant pump tripped	4.00	4.00	B.C.
Broken loop cold leg reached saturation	10.50	11.00	
Steam generator steam control valve closed	12.10	12.00	
Pressurizer indicated empty	15.50	15.00	
Primary pressure dropped below secondary	53.00	50.00	
Fuel cladding thermal excursion started	108.40	141.00	
Lowest in-core thermal excursion level reached	184.00	181.00	
Accumulator A injection started	185.80	187.25	
Maximum fuel cladding temperature reached (715 K for Experiment L5-1)	198.00	207.00 (675 K at 23004)	
LPIS flow initiated	201.00	195.49	

[a] Experiment initiation is defined to be the time when the broken loop cold leg pressure began to increase.

Table 3 List of Assessment Parameters (LOFT L5-1)

Description	Calculation	Measurement	Uncertainty	Figure
Primary System Pressure (Pa)	P 25001	PE-1UP-001A	0.140-0.777 EDR [8]	3
Steam Dome Pressure (Pa)	P 53001	PE-SGS-001	0.087-0.077	4
Steam Mass Flow rate (kg/s)	MFLOWJ 54000	FT-P004-012	0.28	5
Feedwater Mass Flow Rate (kg/s)	MFLOWJ 56900	FT-P004-722	2.40	6
Primary System Inventory (kg)	CNTRVAR 72	Fig 4 EDR	300.0	7
ILHL Density (Mg/m3)	RHO 10001	DE-PC-002B	0.13	8
BLCL Density (Mg/m3)	RHO 34501	DE-BL-002B	0.099	9
HPIS Volume Flow Rate (L/s)	MFLOWJ 64000	FT-P128-104	0.014	10
Accumulator Level (m)	CNTRVAR 4	LE-ECC-01A	0.007	11
LPIS Volume Flow Rate (L/s)	MFLOWJ 63000	FT-P120-085	0.37	12
ILHL Mass Flow Rate (kg/s)	MFLOWJ 10001	FT-P139-272	4.6	13
Reflooding Mass Flow Rate (kg/s)	MFLOWJ 23001	-	-	14
Integrated Break Mass Flow Rate (kg/s)	CNTRVAR 51	QLR [9]	-	15
Pressurizer Level (m)	CNTRVAR 2		-	16
Steam Generator Level (m)	CNTRVAR 1		-	17
Reactor Water Level (m)	CNTRVAR 10		-	18
Cladding Temp (K) (Central, 15 inch)	2300110 (7.5 ") 2300210 (19.5 ")	T-5E8-015	4.2 K at 600 K	19
Cladding Temp (K) (Central, 21 & 26 ")	2300310 (27.5 ")	T-5F4-021 T-5F4-026	" "	20
Cladding Temp (K) (Central, 37 inch)	2300410 (36.5 ")	T-5D8-037	"	21
Cladding Temp (K) (Central, 49 inch)	2300510 (45.5 ") 2300610 (52.5 ")	T-5E8-049	"	22
Cladding Temp (K) (Peripheral, 26 ")	2310310 (27.5 ")	T-4F9-026	"	23
Cladding Temp (K) (Peripheral, 45 ")	2310510 (45.5 ")	T-4E8-045	"	24
Void Fraction	VOIDF 23001 - 06		-	25
Time Step,DT (sec)	CNTRVAR 81	-	-	26
CPU time (sec)	CPUTIME	-	-	27

- Not available

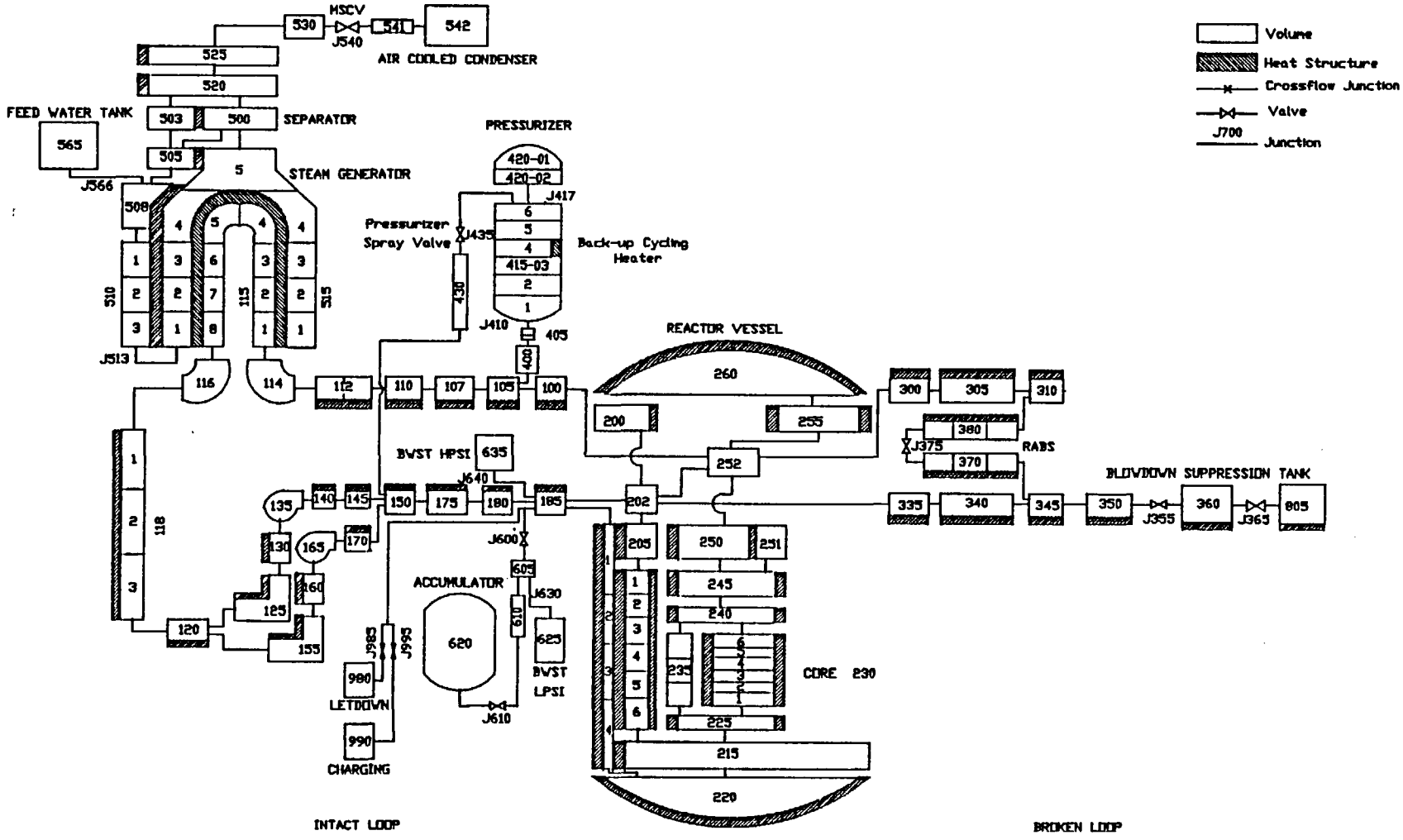

Figure 1. RELAP5 Nodalization for LOFT Test L5-1

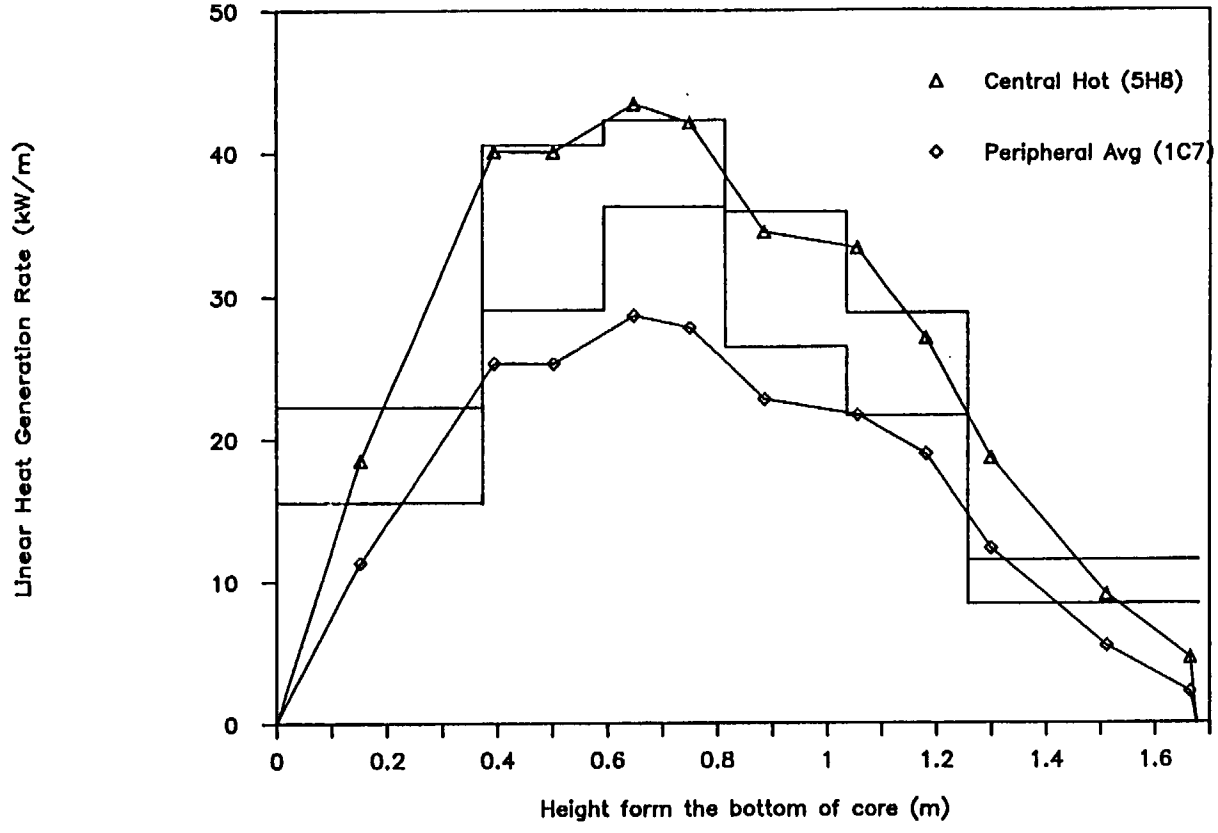

Figure 2. Axial profile of linear heat generation rate for Test L5-1

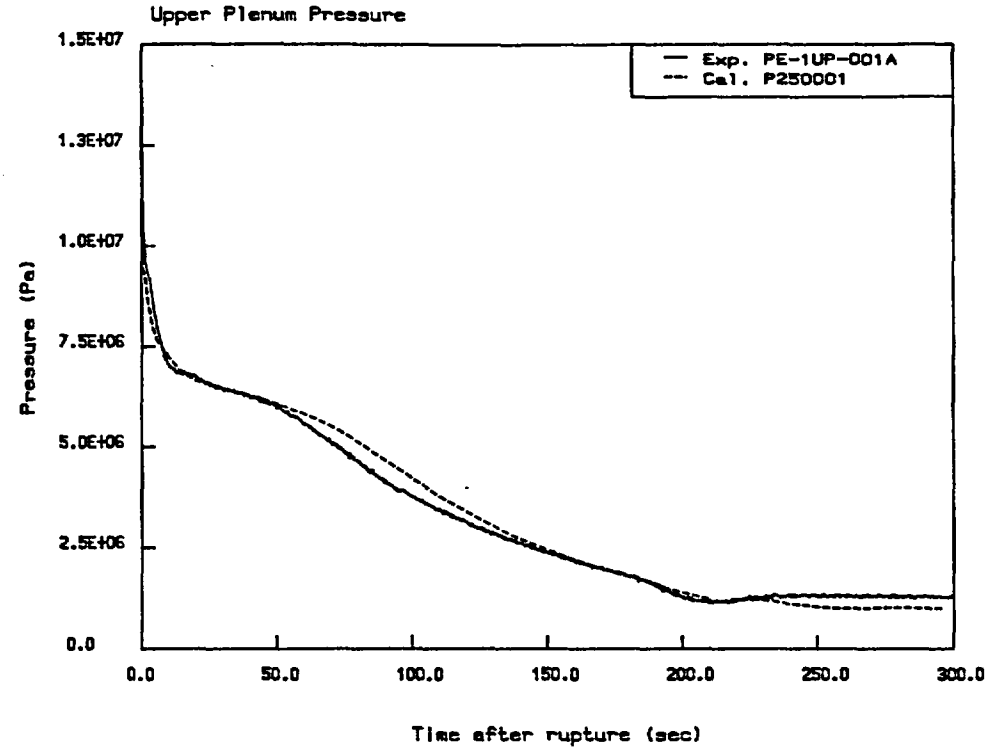

Figure 3. Upper plenum pressure transient

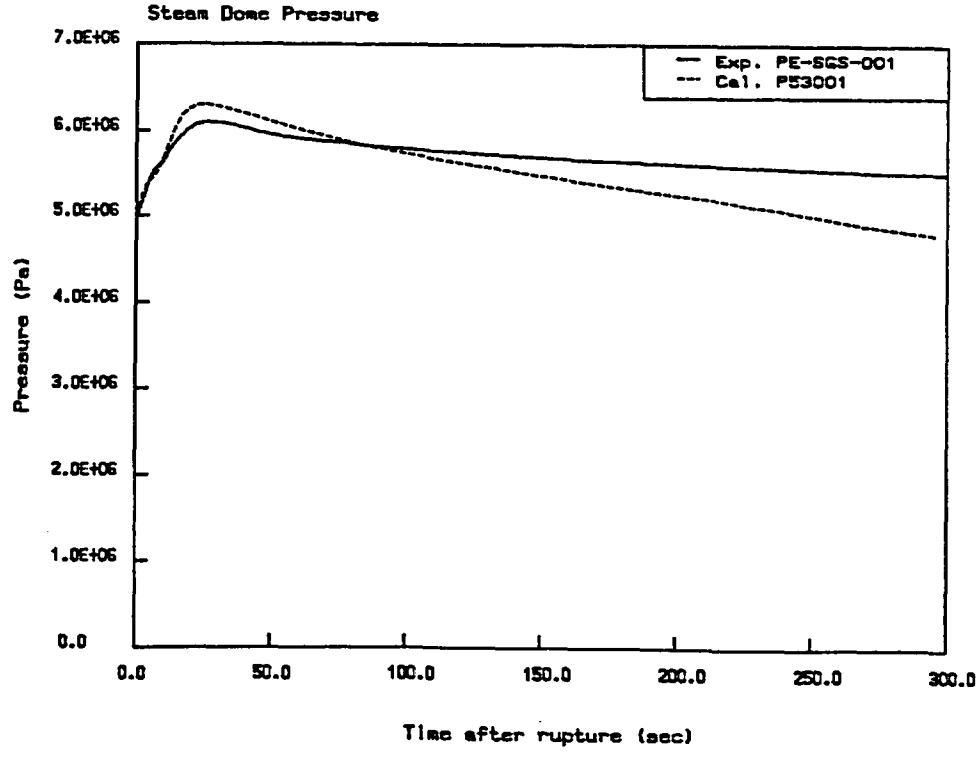

Figure 4. Steam dome pressure transient

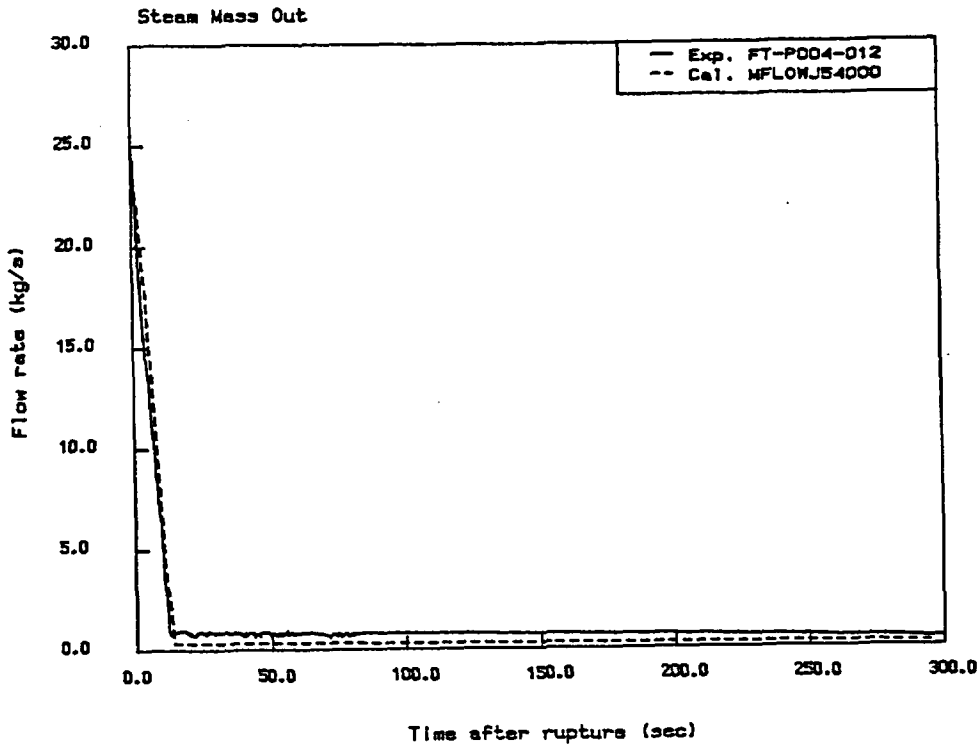

Figure 5. Steam mass flow rate transient

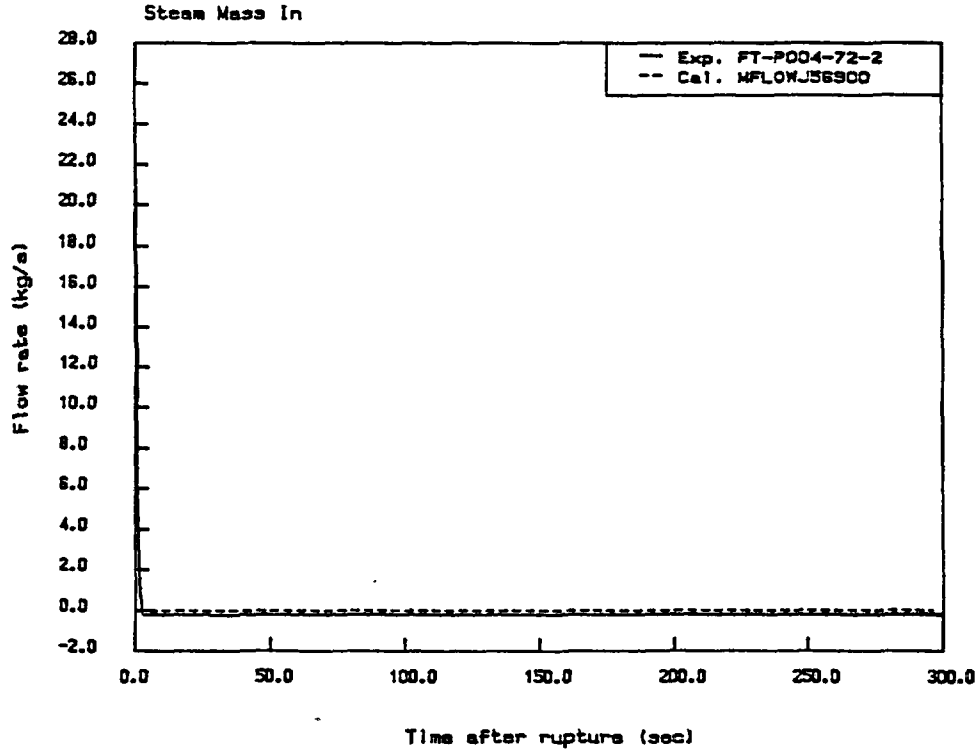

Figure 6. Feedwater mass flow rate transient

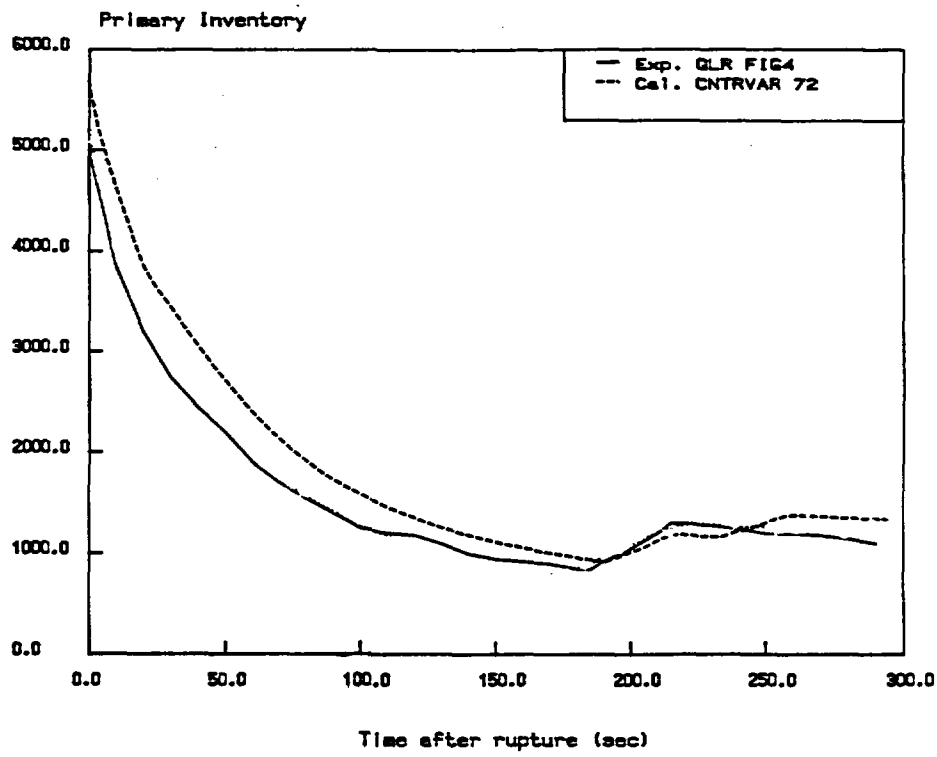

Figure 7. Primary system inventory transient

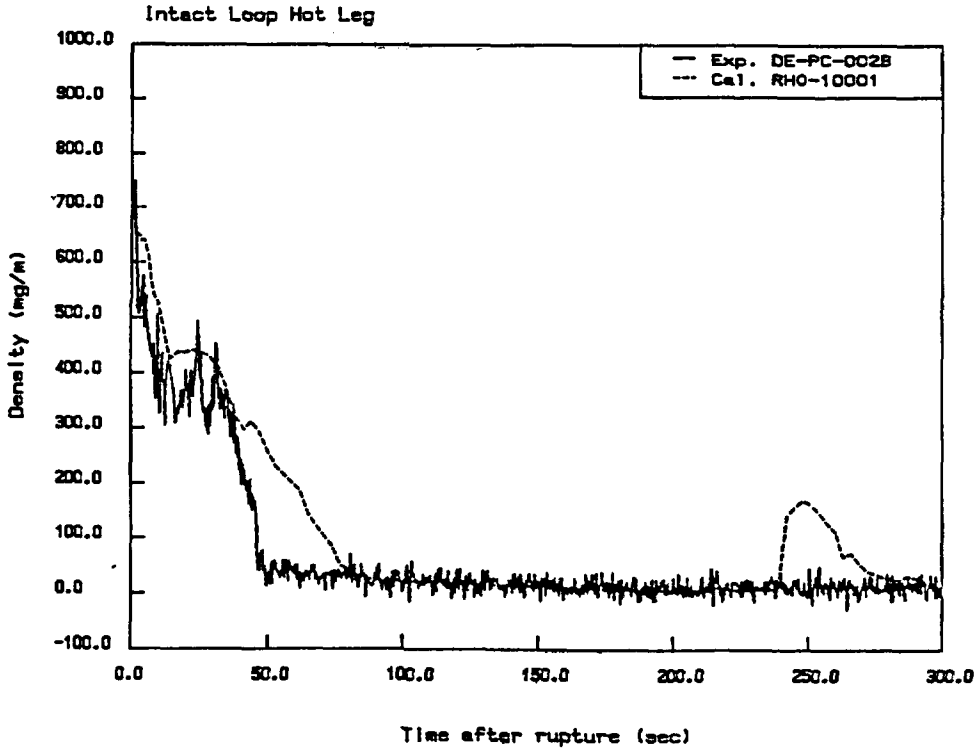

Figure 8. Intact Loop Hot Leg density transient

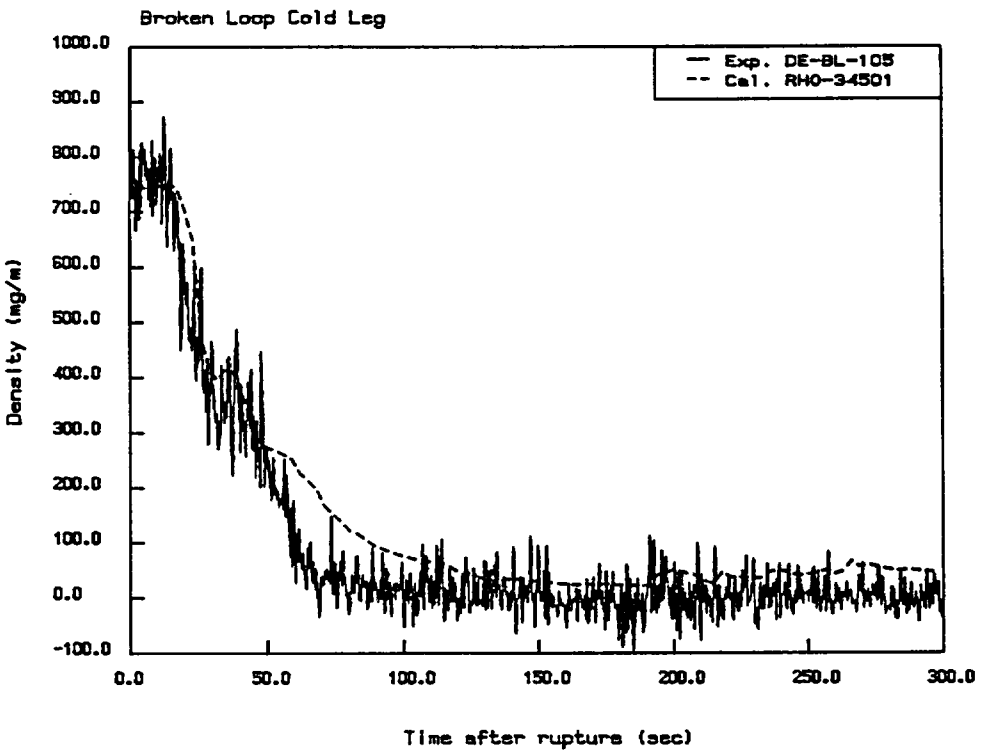

Figure 9. Broken Loop Cold Leg density transient

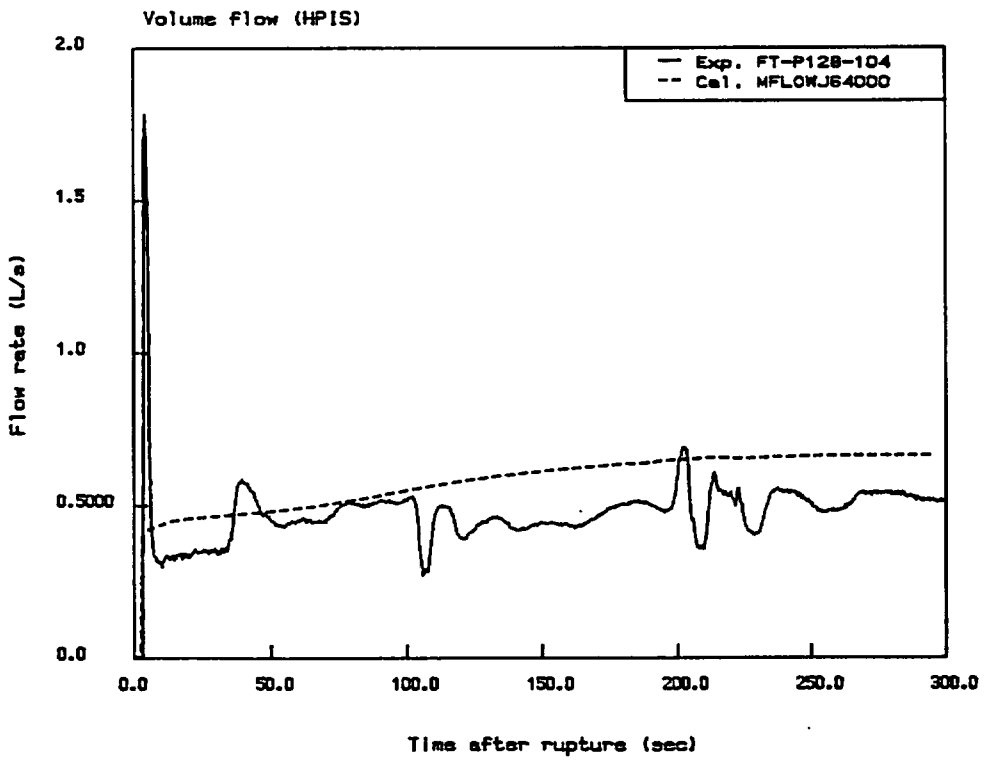

Figure 10. HPIS volume flow rate transient

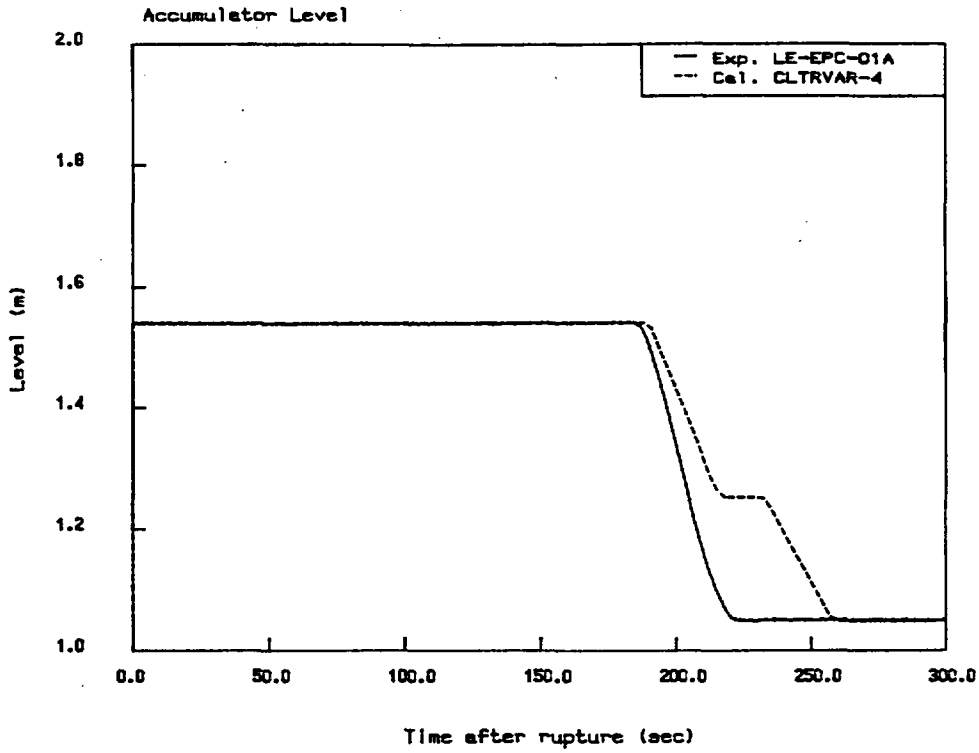

Figure 11. Accumulator level transient

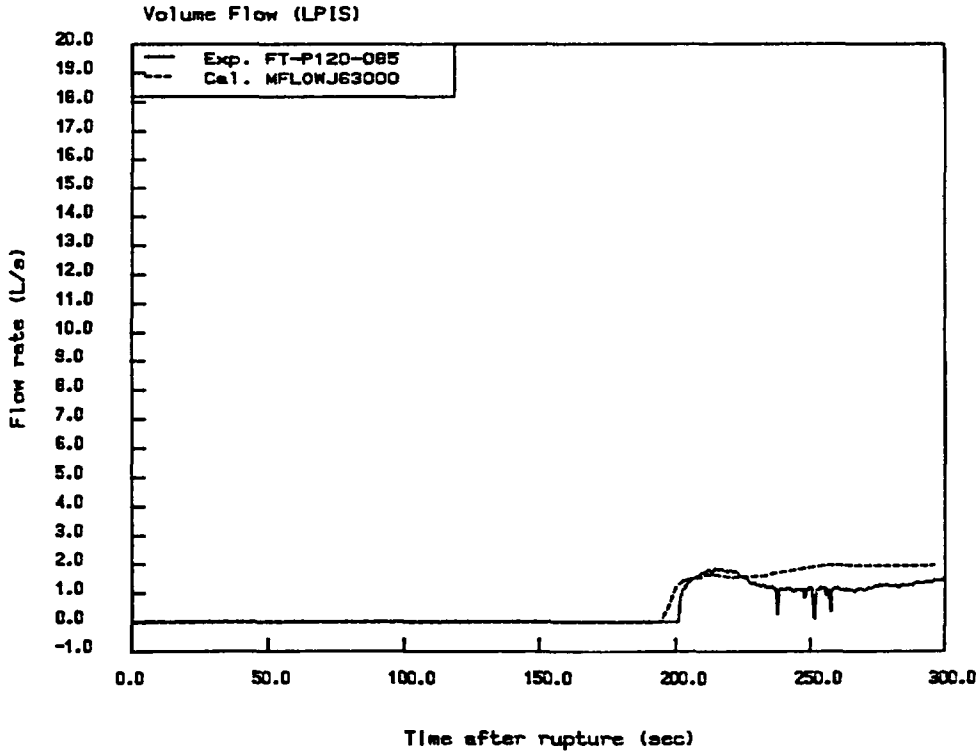

Figure 12. LPIS volume flow rate transient

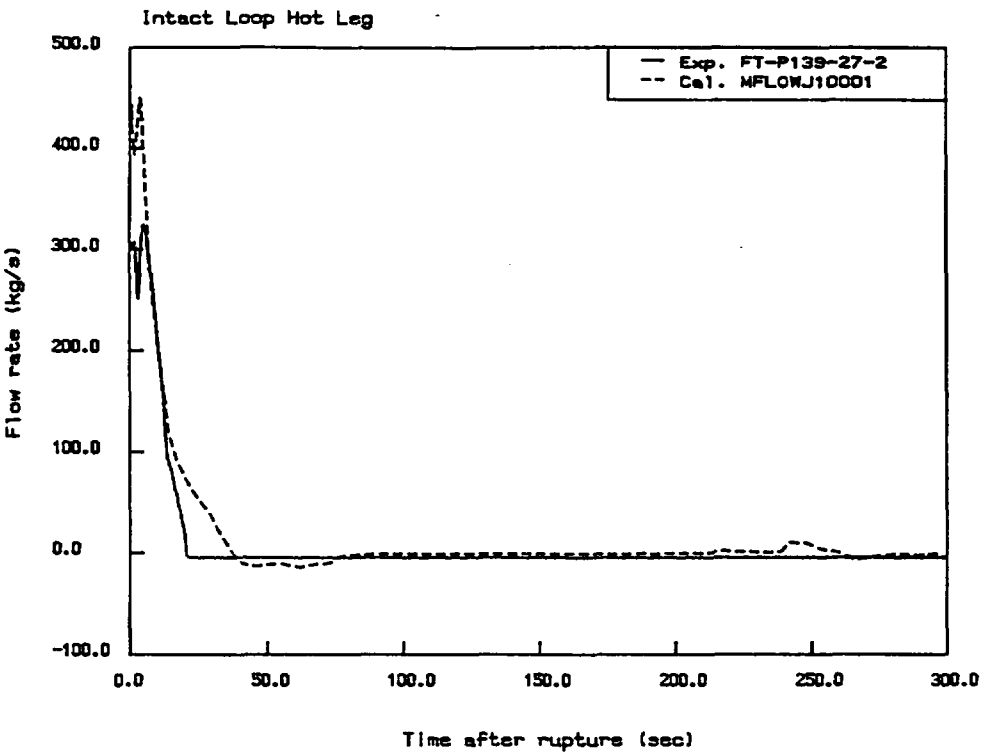

Figure 13. Intact Loop Hot Leg mass flow rate transient

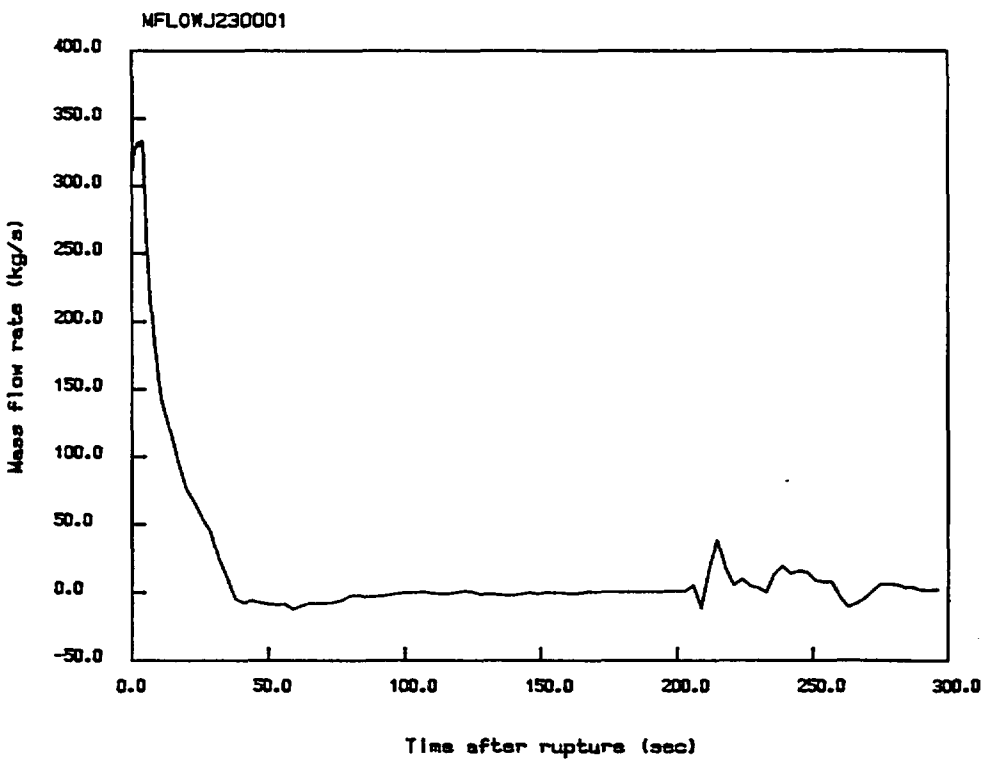

Figure 14. Reflooding mass flow rate transient

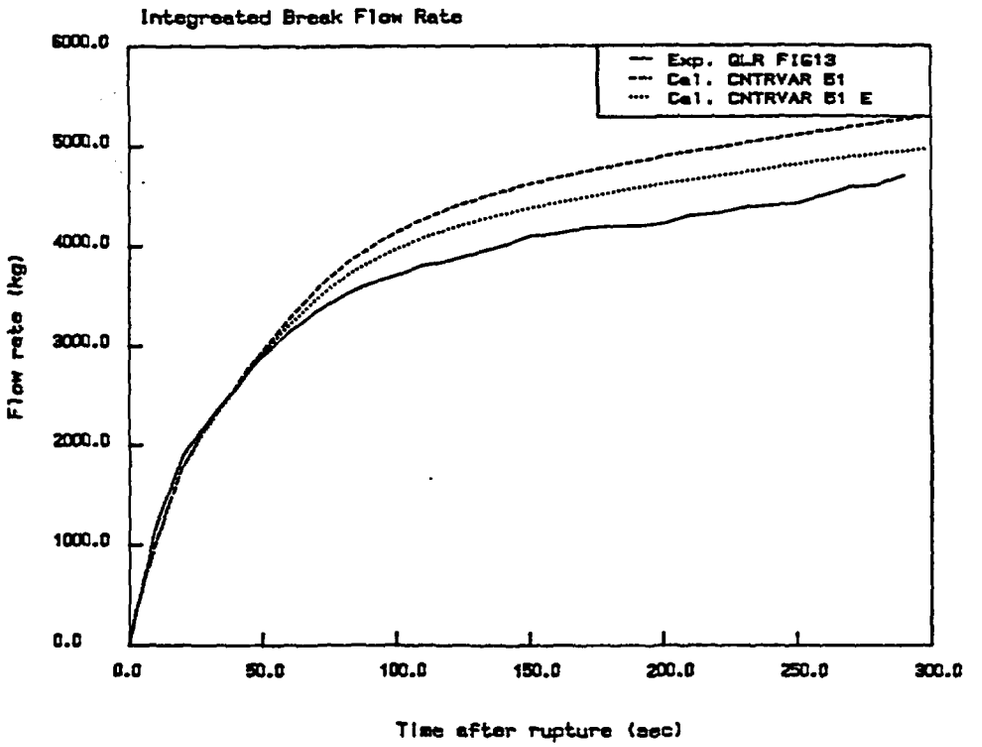

Figure 15. Integrated break mass transient

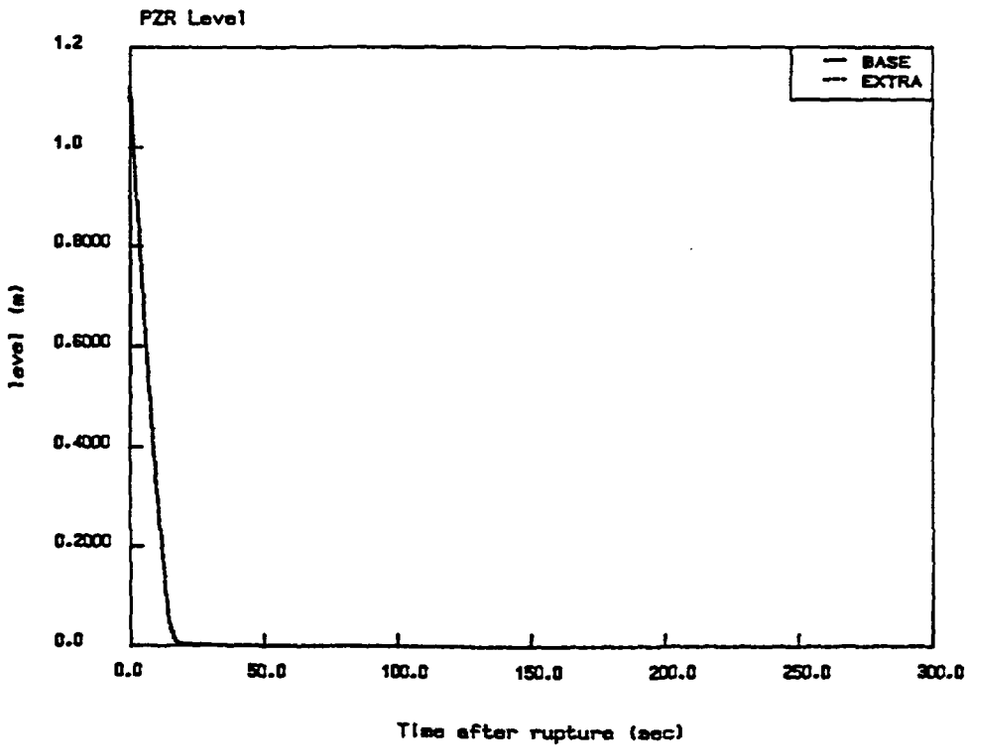

Figure 16. Pressurizer level transient

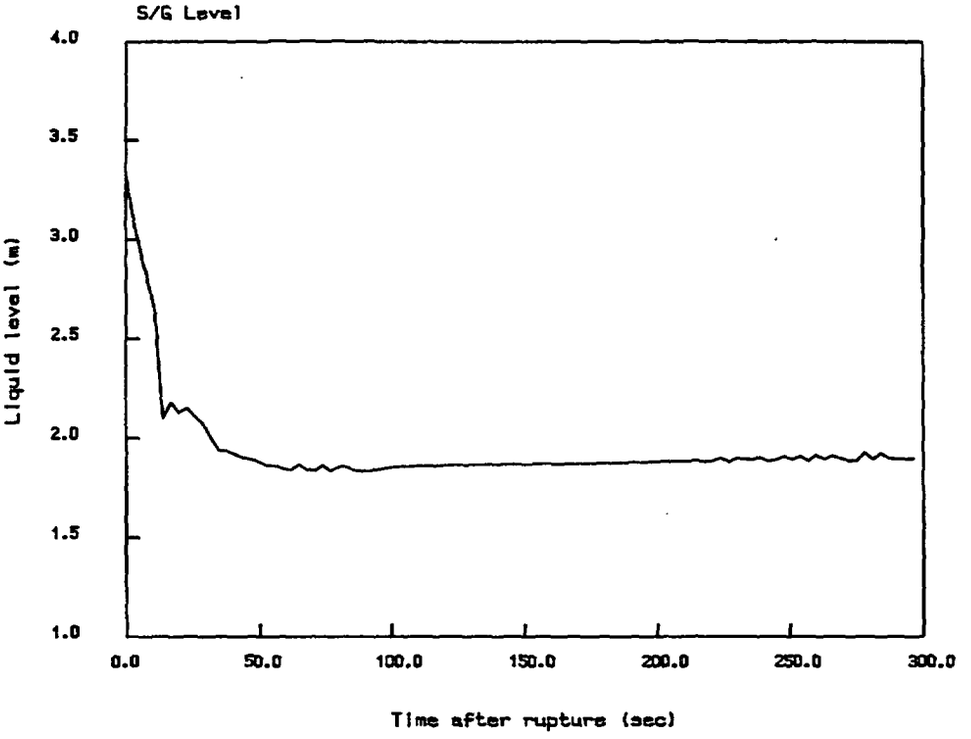

Figure 17. Steam generator level transient

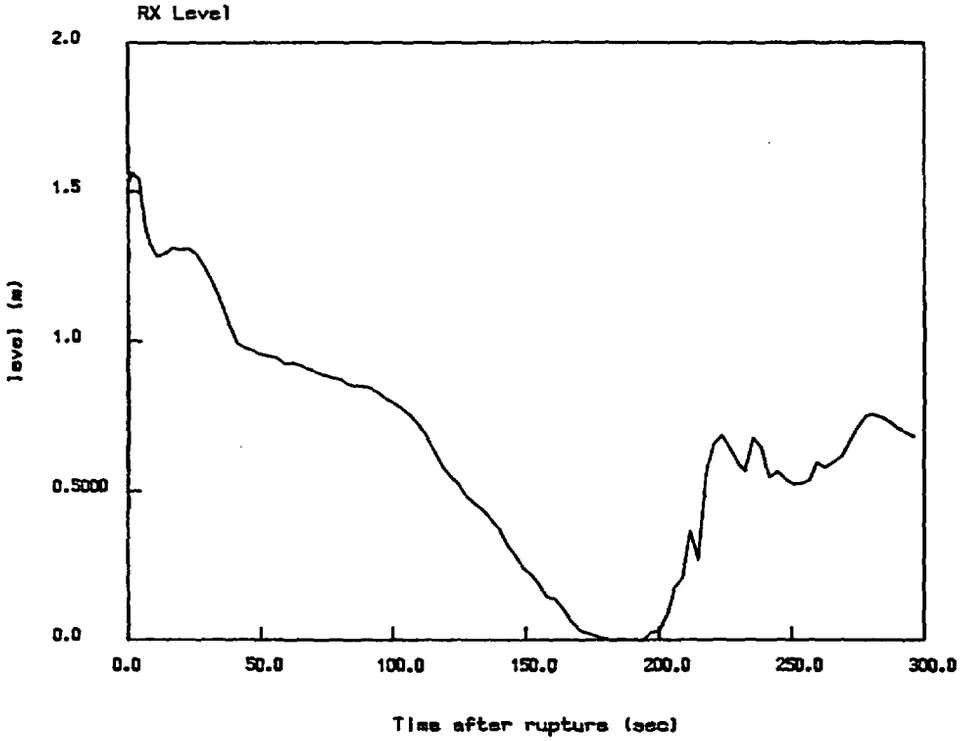

Figure 18. Reactor liquid collapsed level transient

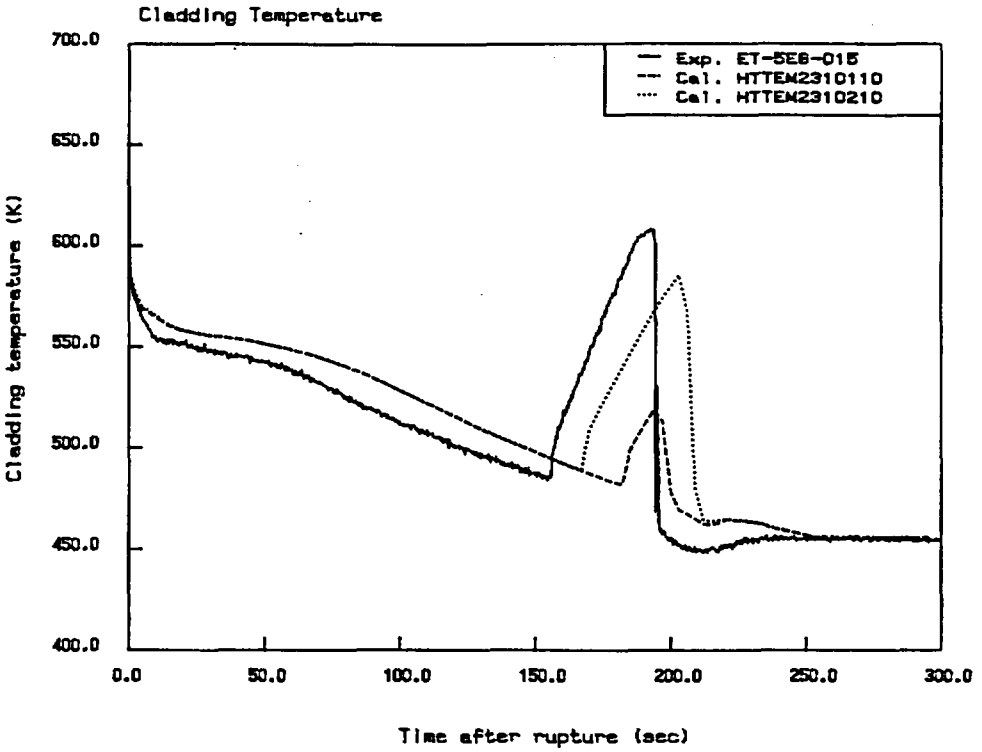

Figure 19. Cladding temperatures at central 15 inch

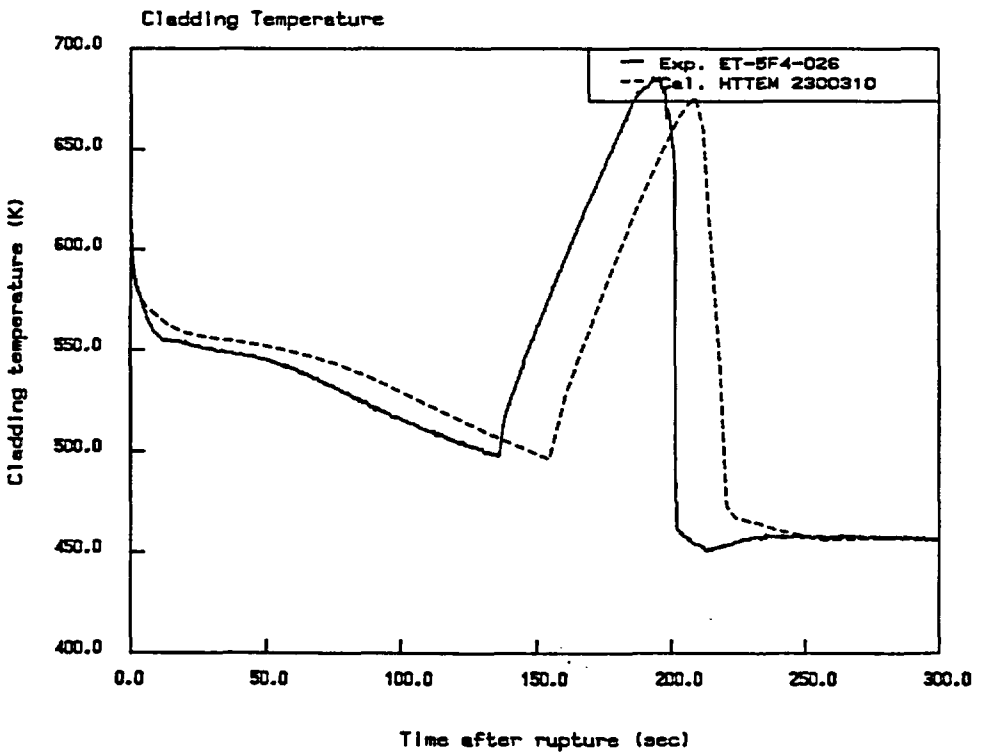

Figure 20. Cladding temperatures at central 21 and 26 inches

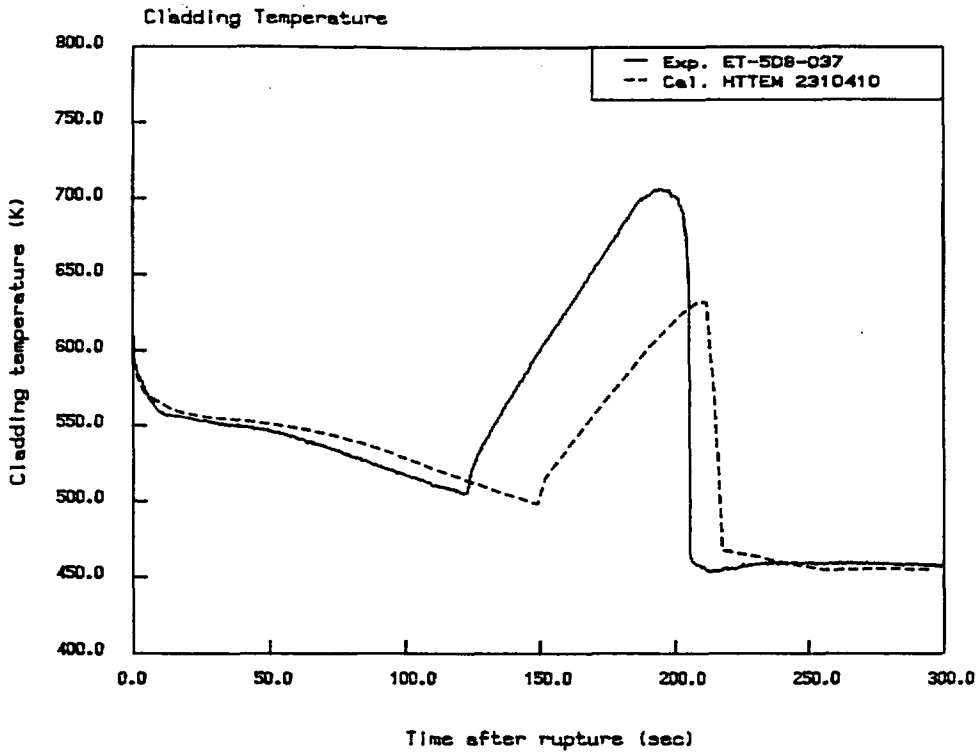

Figure 21. Cladding temperatures at central 37 inch

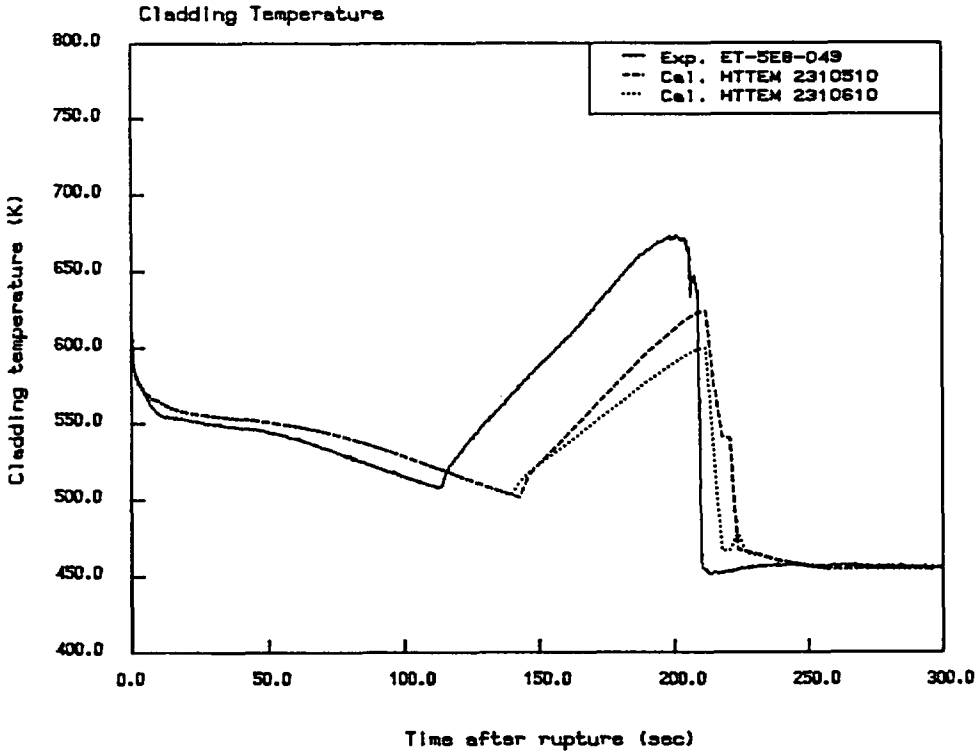

Figure 22. Cladding temperatures at central 49 inch

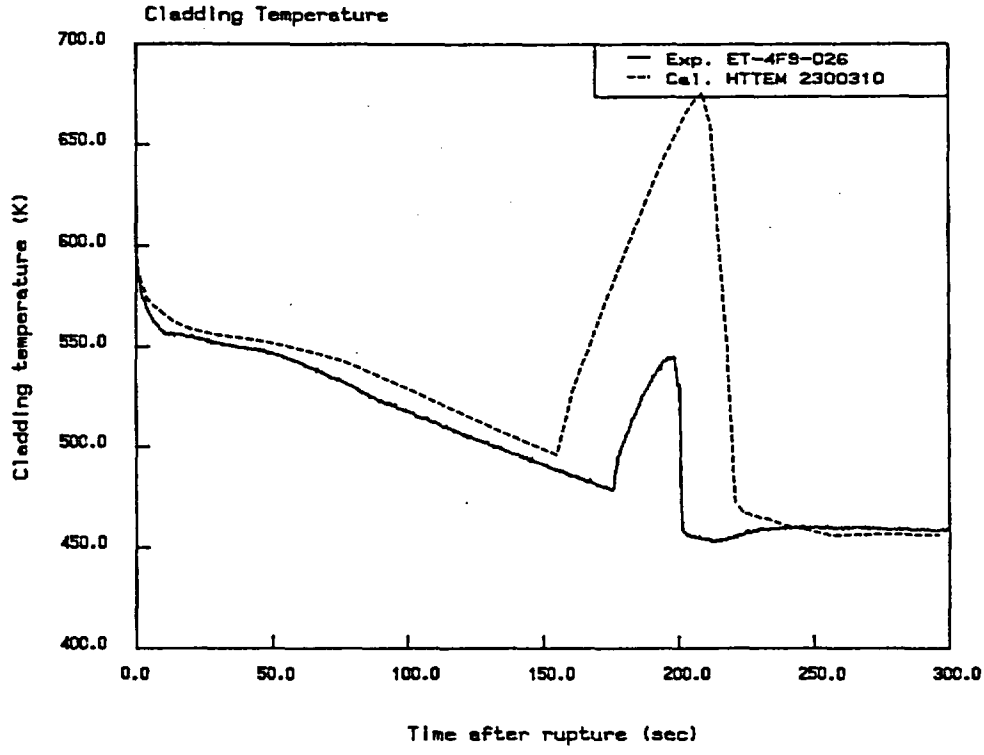

Figure 23. Cladding temperatures at peripheral 26 inch

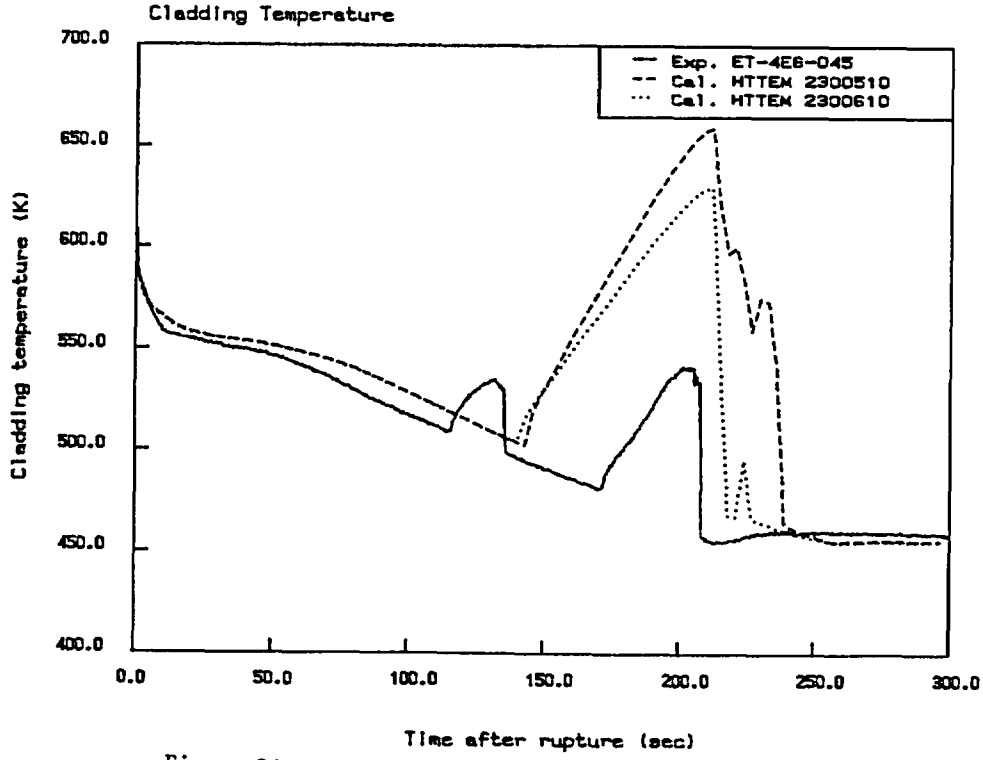

Figure 24. Cladding temperatures at peripheral 45 inch

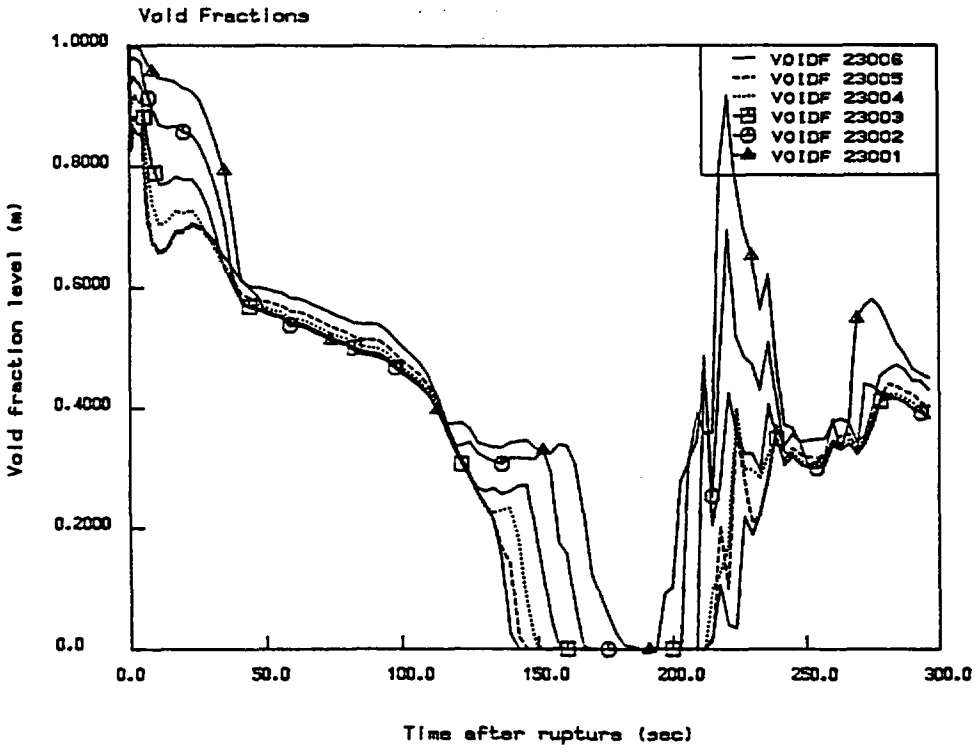

Figure 25. Liquid fractions along the core

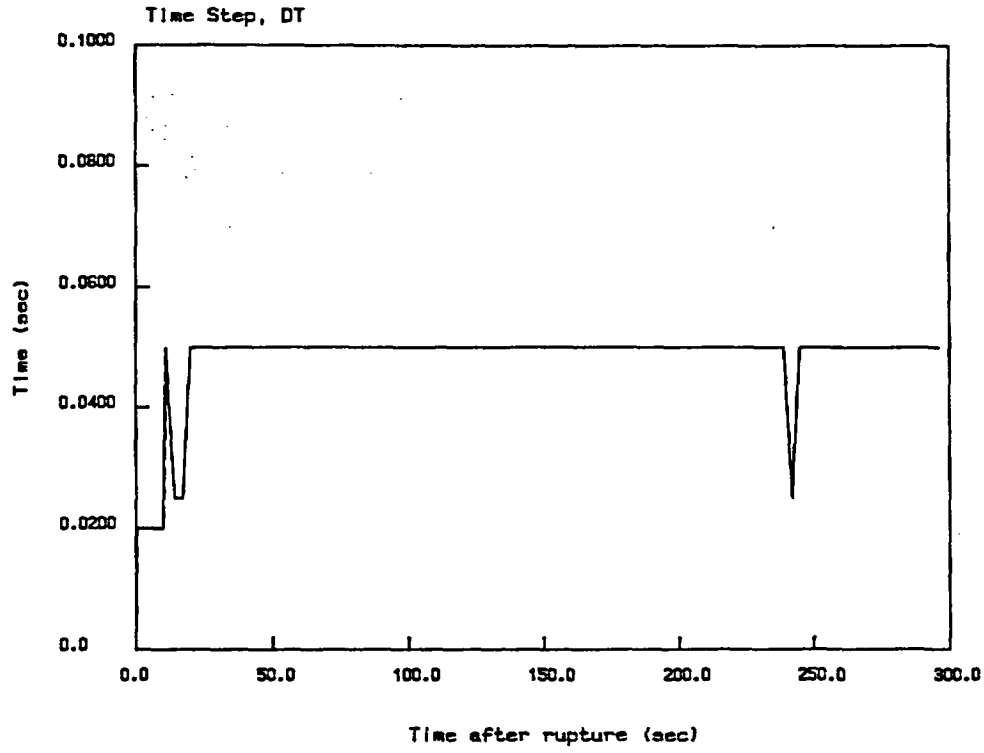

Figure 26. Time step size

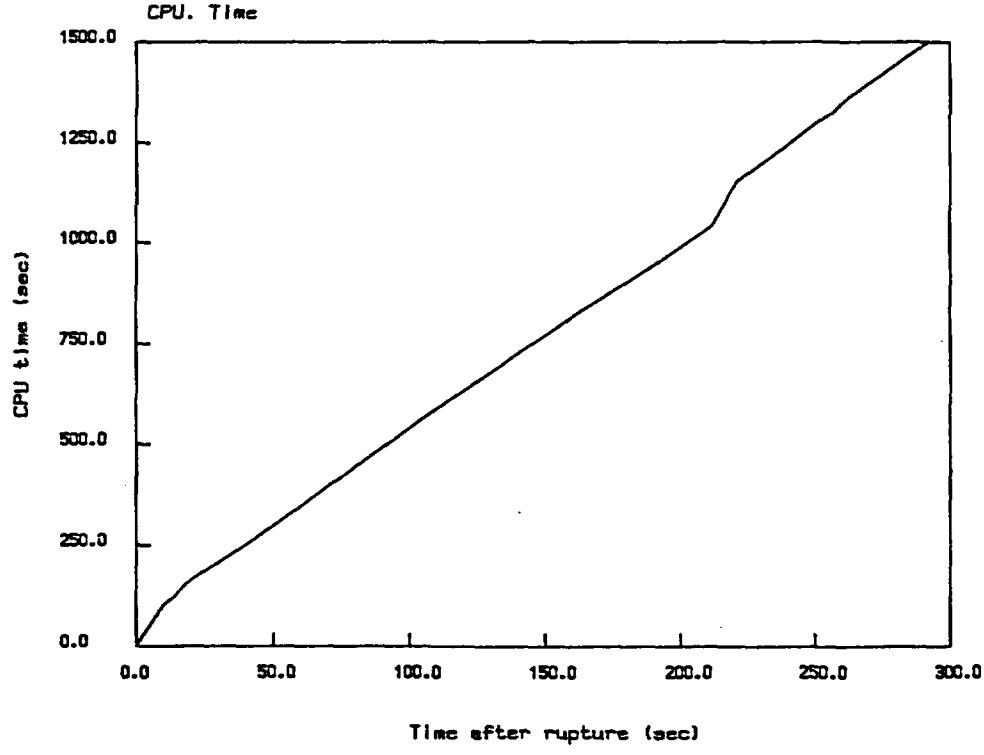

Figure 27. CPU time

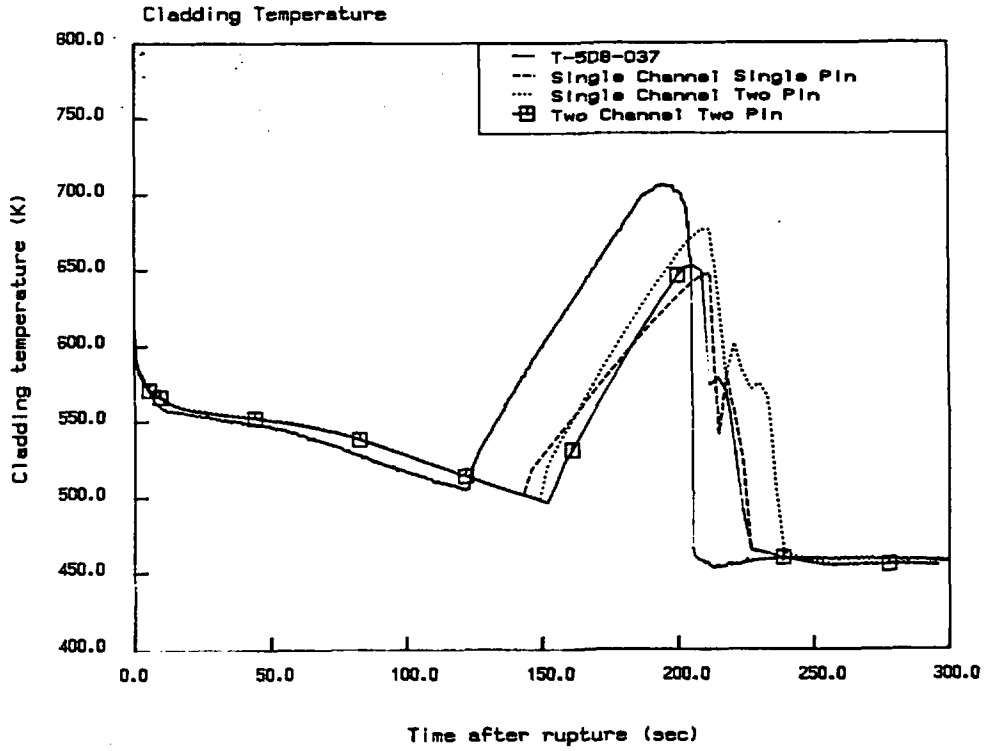

Figure 28. The effect of core nodalization sensitivity on PCT

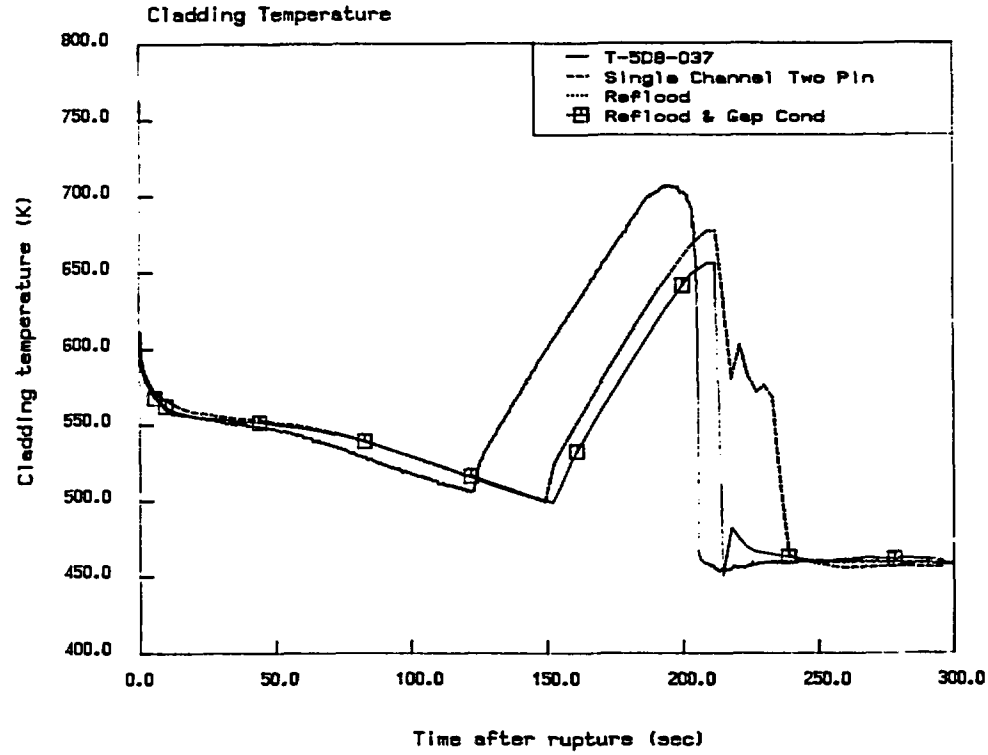

Figure 29. The effect of model option senstivity on PCT

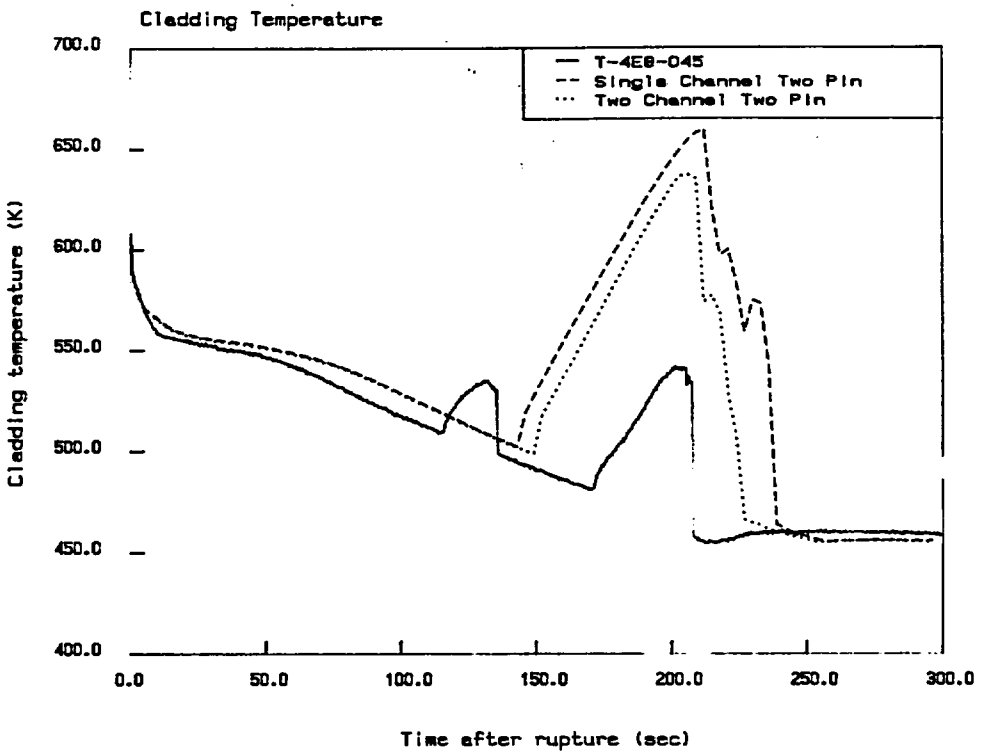

Figure 30. The effect of two flow channels on peripheral clad temperature

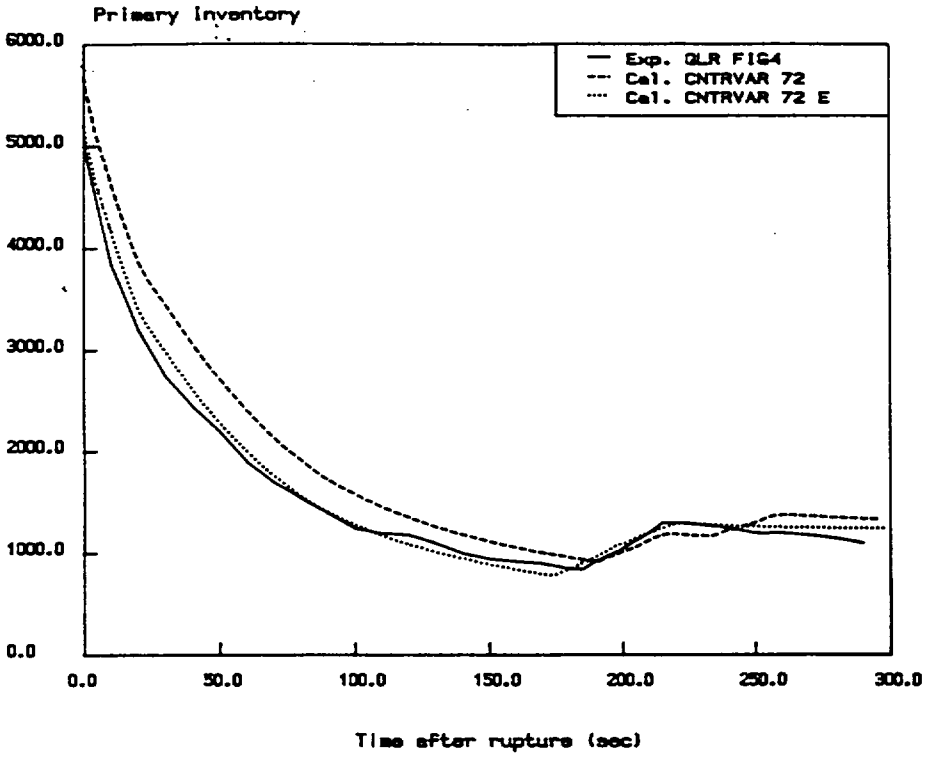

Figure 31. The changes of primary system inventory

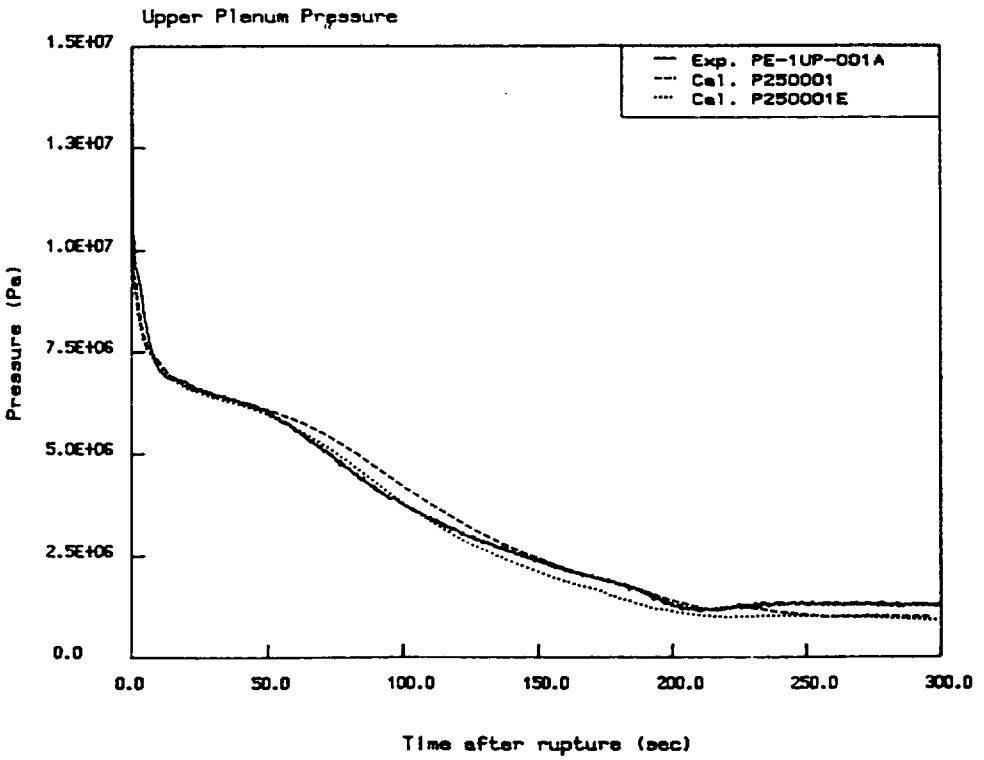

Figure 32. The effect of primary system inventory on primary system pressure

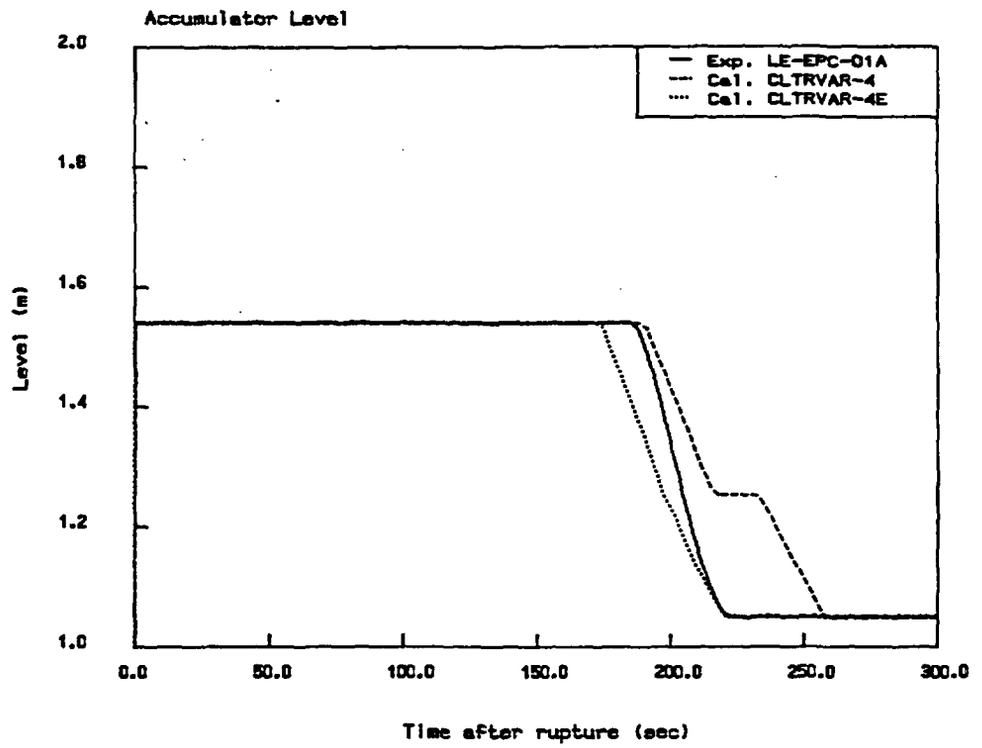

Figure 33. The effect of primary system inventory on accumulator liquid level

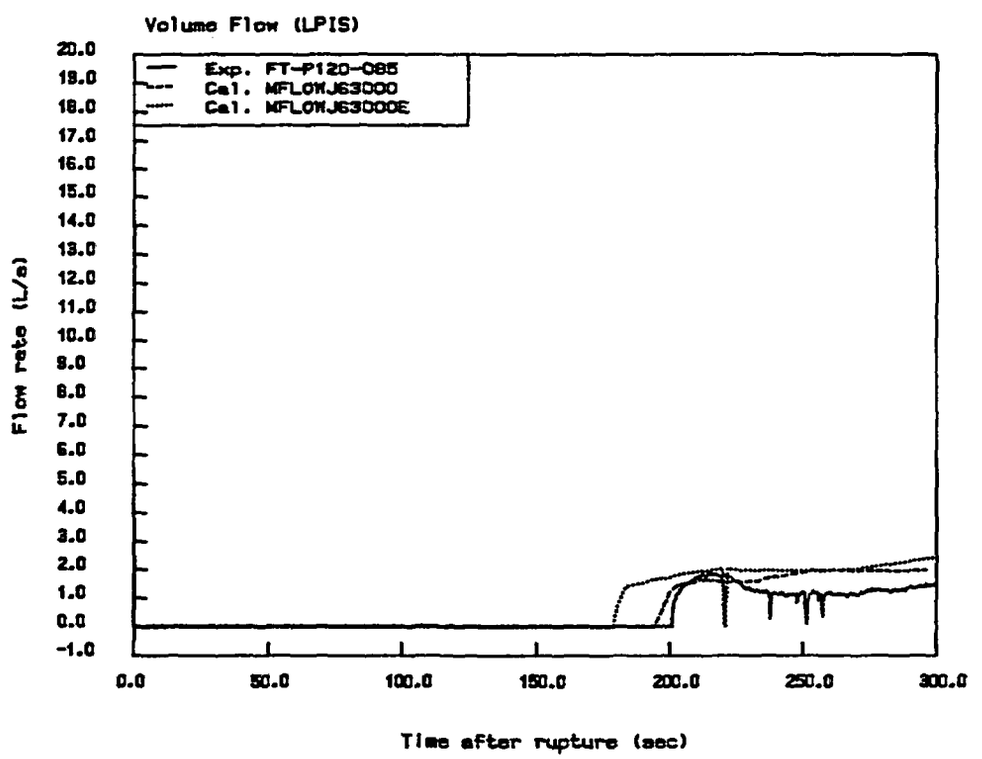

Figure 34. The effect of primary system inventory on LPSI flowrates

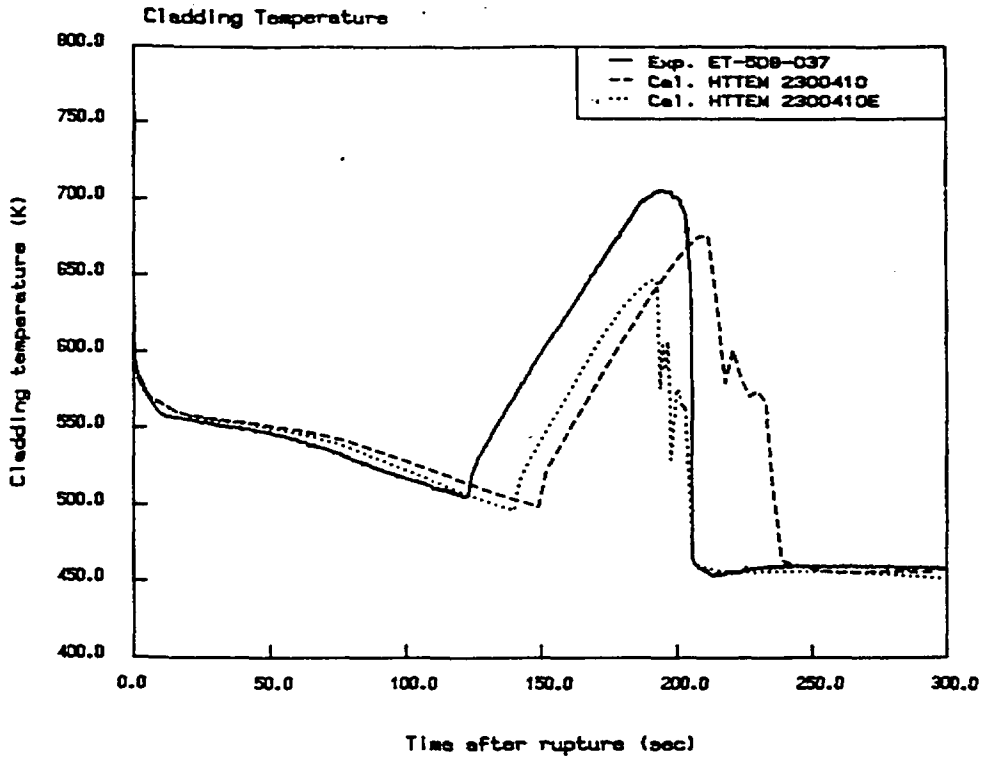

Figure 35. The effect of primary system inventory on PCT

Appendix: Input Listing

```
/JOB
L51S12,T6000.
/USER
ATTACH,STH2XT,RE364BX.
PURGE,L5SRP12/NA.
DEFINE,RSTPLT=L5SRP12.
FILE,RSTPLT,SBF=NO.
RFL,CM=350000,EC=200.
REDUCE(-)
RE364BX,,*PL=50000.
/EOR
=LOFT L5-1 POST TEST ANALYSIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*              INITIAL CONDITIONS
*
*              CORE POWER = 45.9 MW
*              PCS FLOW = 308.2 KG/S
*              THOT = 579.1 K
*              TCOLD = 552.3 K
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000100   NEW    STDY-ST
0000101   RUN
0000105   5.0     10.0
0000110   NITROGEN
*   TIME STEP CONTROL CARDS
*         END TIME  MIN DT    MAX DT    OPTN MNR  MJR  RST
0000201  500.0     1.E-6     0.25      11   8    200  200
*CARD ABOVE IS A REPLACEMENT CARD OF THE ONE BELOW
* 0000201   200.0     1.E-6     0.25      2    4    100  100
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   MINOR EDIT VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEADY STATE PLOT REQUESTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000301   P         250010000
0000302   P         530010000
0000303   TEMPF     250010000
0000304   TEMPF     185010000
0000305   TEMPF     515010000
0000306   MFLOWJ    540000000
0000307   MFLOWJ    985000000
0000308   MFLOWJ    995000000
0000309   CNTRLVAR  1
0000310   CNTRLVAR  2
0000311   MFLOWJ    566000000
0000312   CNTRLVAR  910
0000313   MFLOWJ    100010000
0000314   P         420010000
0000315   VOIDG     500010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TEMPERATURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000316   SATTEMP   345010000          * TE-BL-1A,1B,1C
0000317   SATTEMP   310010000          * TE-BL-2A,2B,2C
0000318   SATTEMP   100010000          * TE-PC-2A,2B,2C
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0000319   SATTEMP   180010000          * TE-PC-1
0000320   SATTEMP   114010000          * TE-SG-1
0000321   SATTEMP   116010000          * TE-SG-2
0000322   SATTEMP   510030000          * TE-SG-3
0000323   SATTEMP   415040000          * TE-139-19
0000324   SATTEMP   415030000          * TE-139-20
0000325   SATTEMP   205010000          * TE-1ST-1 / TE-2ST-1
0000326   SATTEMP   210010000          * TE-1ST-2 / TE-2ST-2
0000327   SATTEMP   210050000          * TE-1ST-6 / TE-2ST-6
0000328   SATTEMP   210060000          * TE-1ST-7 / TE-2ST-7
0000329   SATTEMP   215010000          * TE-1ST-10 / TE-2ST-10
0000330   SATTEMP   220010000          * TE-1ST-13 / TE-2ST-13
0000331   SATTEMP   250010000          * TE-1UP-6
0000332   SATTEMP   251010000          * TE-2UP-4
0000333   SATTEMP   255010000          * TE-1UP-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DENSITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000334   RHO       345010000          * DE-BL-1
0000335   RHO       310010000          * DE-BL-2
0000336   RHO       180010000          * DE-PC-1
0000337   RHO       100010000          * DE-PC-2
0000338   RHO       118020000          * DE-PC-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VELOCITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000339   VELF      345010000          * FE-BL-1
0000340   VELF      310010000          * FE-BL-2
0000341   VELF      180010000          * FE-PC-1
0000342   VELF      100010000          * FE-PC-2
0000343   VELG      345010000          * FE-BL-1
0000344   VELG      310010000          * FE-BL-2
0000345   VELG      180010000          * FE-PC-1
0000346   VELG      100010000          * FE-PC-2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MASS FLOW RATES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000347   MFLOWJ    350010000          * BREAK PLANE BLCL
0000348   MFLOWJ    315110000          * BREAK PLANE BLHL
0000349   MFLOWJ    345020000          * DTT-RAKE BLCL
0000350   MFLOWJ    310020000          * DTT-RAKE BLHL
0000351   MFLOWJ    180010000          * DTT-RAKE ILCL
0000352   MFLOWJ    100020000          * DTT-RAKE ILHL
0000353   MFLOWJ    400010000          * PRES. SURGE LINE FLOW
0000354   MFLOWJ    541010000          * FE-P4-12
0000355   MFLOWJ    566000000          * FE-P4-72-1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CLADDING TEMPERATURES CONTROL MODULE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000356   HTTEMP    230000110          *
0000357   HTTEMP    230000210          *
0000358   HTTEMP    230000310          *
0000359   HTTEMP    230000410          *
0000360   HTTEMP    230000510          *
0000361   HTTEMP    230000610          *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LIQUID FRACTIONS IN THE PRESSURIZER                              *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
```

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0000362   VOIDF     415010000
0000363   VOIDF     415020000
0000364   VOIDF     415030000
0000365   VOIDF     415040000
0000366   VOIDF     415050000
0000367   VOIDF     415060000
0000368   VOIDF     420010000
0000369   VOIDF     420020000
0000370   HTTEMP    231000110
0000371   HTTEMP    231000210
0000372   HTTEMP    231000310
0000373   HTTEMP    231000410
0000374   HTTEMP    231000510
0000375   HTTEMP    231000610
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*     TRIPS
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     501-509  GENERAL TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     ALWAYS TRUE
0000501   TIME      0         GE   NULL      0         -1.0      L
*     ALWAYS FALSE
0000502   TIME      0         LT   NULL      0         -1.0      N
*     PRESSURIZER LOW LEVEL ALARM
0000503   CNTRLVAR  002       LE   NULL      0         0.3810    L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     510-519  TEST SPECIFIC TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     SCRAM
0000510   P         100010000 LE   NULL      0         1.4193+7  L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LT  677  COLD LEG QOBV            CARD 3650301
0000511   TIME      0         LT   NULL      0         7302.     N
0000512   TIME      0         GE   NULL      0         0.0       L
0000677   511       AND       512       N
*---- ----1---- ----1---- ----1----
* LT  678  COLD LEG ISOL VALVE      CARD 3550301
0000678   501       OR        501       N
*---- ----1---- ----1---- ----1----
* LT  681  ECC CHECK VALVE          CARD 6000301
0000577   MFLOWJ     600000000 GE   NULL      0         0.0       N
0000578   P          605010000 GE   P         185010000 0.0       N
0000681   577       AND       578       N
*---- ----1---- ----1---- ----1----
* LT  682  ACCUMULATOR VALVE        CARD 6100301
0000579   TIME      0         GE   NULL      0         1.0+9     L
0000682   579       OR        579       L
*---- ----1---- ----1---- ----1----
* LT  683  HPIS JUNCTION            CARD 6400200
0000513   P         100010000 LE   NULL      0         13.159+6  L
0000514   TIME      0         LT   NULL      0         1800.     N
0000515   TIME      0         GT   NULL      0         5974.     L
0000610   514       OR        515       N
0000683   610       AND       513       N
*---- ----1---- ----1---- ----1----
* LT  684  LPIS JUNCTION            CARD 6350200
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0000684   510       AND       510       L
*---- ----1---- ----1---- ----1----
* LT  685-686  STEAM VALVE          CARD 5400301
* OPEN TRIP
0000589   P         530010000 GT   NULL      0          7.1125+6 N
0000590   P         530010000 LT   NULL      0          6.9747+6 N
0000670   685       OR        589       N
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----
* LT  687  STEAM BYPASS VALVE       CARD 5450301
0000516   TIME      0         GE   NULL      0          3574.     L
0000517   P         530010000 GT   P         546010000  0.        N
0000687   516       AND       517       N
*---- ----1---- ----1---- ----1----
* LT  688  FEED JUNCTION            CARD 5660200
0000688   510       AND       510       L
*---- ----1---- ----1---- ----1----
* LT  689  FEED VOLUME              CARD 5650200
0000689   510       AND       510       L
*---- ----1---- ----1---- ----1----
* LT  690  AUX FEED JUNCTION        CARD 5690200
0000690   516       AND       516       L
*---- ----1---- ----1---- ----1----
* LT  692  PZR SPRAY VALVE          CARD 4350301
0000583   P         420010000 GT   NULL      0        1.533874+7 N
0000584   P         420010000 LT   NULL      0        1.516637+7 N
0000665   583       OR        692       N
0000692   -584      AND       665       N
*---- ----1---- ----1---- ----1----
* LT  695  PCP 1 TRIP               CARD 1350301
0000695   510       AND       510       N
*---- ----1---- ----1---- ----1----
* LT  696  PCP 1 VELOCITY TABLE     CARD 1356100
0000696   502       AND       502       N
*---- ----1---- ----1---- ----1----
* LT  697  PCP 2 TRIP               CARD 1650301
0000697   510       AND       510       N
*---- ----1---- ----1---- ----1----
* LT  698  PCP 2 VELOCITY TABLE     CARD 1656100
0000698   502       AND       502       N
*---- ----1---- ----1---- ----1----
* LT  699  SCRAM                    CARD 20269900 OR 20290000
0000699   510       OR        510       L
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   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         14913500. 1328990.0 2461830.0 0.0
1001101  252010000 100000000 0.0634    0.1       0.1       0002
1002101  100010000 105000000 0.0       0.1       0.1       0000
1001201  10.523000 10.523000 0.0
1002201  10.517000 10.517000 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         14905700. 1328990.  2461990.  0.0
1051101  105010000 107000000 0.0       0.12      0.12      0000
1051201  10.757000 10.757000 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         14897600. 1328990.  2462160.  0.0
1071101  107010000 110000000 0.0       0.135     0.135     0000
1071201  11.009    11.009    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER CONNECTION TEE STEAM GENERATOR SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1100000  "PZR T SGS "       BRANCH
1100001  1         0
1100101  0.0606063 0.9207292 0.0       0.0       0.0       0.0
1100102  4.0E-5    0.0       00
1100200  0         14888500. 1328980.  2462350.  0.0
1101101  110010000 112000000 0.0       0.15      0.15      0000
1101201  11.628000 11.628000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1120000  "HOT LEG PP"       PIPE
1120001  2
1120101  0.0       2
1120201  0.0       1
1120301  1.38893   1
1120302  0.707687  2
1120401  0.0796973 1
1120402  0.0579614 2
1120501  0.0       2
1120601  0.0       1
1120602  90.0      2
1120701  0.0       1
1120702  0.246447  2
1120801  4.0E-5    0.0       2
1120901  0.20      0.20      1
1121001  00        2
```

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1121101   0000      1
1121201   0         14873600. 1328970.  2462670.  0.0  0.0  01
1121202   0         14885900. 1328970.  2462410.  0.0  0.0  02
1121300   0
1121301   11.628000 11.628000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG INLET PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1140000   "SG IN PLNM"        BRANCH
1140001   2         0
1140101   0.0       0.629795  0.33532   0.0       90.0      0.512756
1140102   4.E-5     0.0102    00
1140200   0         14801000. 1328950.  2464200.  0.0
1141101   112010000 114000000 0.0512    0.0       0.0       0100
1142101   114010000 115000000 0.0       0.0       0.0       0100
1141201   8.1466000 8.1466000 0.0
1142201   4.4143000 4.4143000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG U-TUBES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1150000   "SG TUBES  "        PIPE
1150001   8
1150101   0.0       8
1150201   0.151171  7
1150301   0.902     1
1150302   0.6096    3
1150303   0.462908  5
1150304   0.6096    7
1150305   0.902     8
1150401   0.136356  1
1150402   0.0921538 3
1150403   0.0699783 5
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         14781200. 1308850.  2464620.  0.0  0.0  01
1151202   0         14767100. 1292040.  2464910.  0.0  0.0  02
1151203   0         14755800. 1277830.  2465150.  0.0  0.0  03
1151204   0         14746400. 1267890.  2465350.  0.0  0.0  04
1151205   0         14741200. 1258740.  2465460.  0.0  0.0  05
1151206   0         14738500. 1247990.  2465520.  0.0  0.0  06
1151207   0         14736200. 1237950.  2465570.  0.0  0.0  07
1151208   0         14733400. 1228440.  2465630.  0.0  0.0  08
1151300   0
1151301   4.3678000 4.3678000 0.0       01
1151302   4.3300000 4.3300000 0.0       02
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1151303   4.2988000 4.2988000 0.0       03
1151304   4.2777000 4.2777000 0.0       04
1151305   4.2587000 4.2587000 0.0       05
1151306   4.2370000 4.2370000 0.0       06
1151307   4.2166000 4.2166000 0.0       07
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SG OUTLET PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1160000   "SG OUT PLN"        BRANCH
1160001   2         0
1160101   0.0       0.629795  0.33532   0.0       -90.0     -0.512756
1160102   4.E-5     0.0102    00
1160200   0         14735800. 1228440.  2465580.  0.0
1161101   115010000 116000000 0.0       0.0       0.0       0100
1162101   116010000 118000000 0.0512    0.0       0.0       0100
1161201   4.1997000 4.1997000 0.0
1162201   7.7841000 7.7841000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SUCTION PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1180000   "PMP SUC PP"        PIPE
1180001   3
1180101   0.0       3
1180201   0.0       2
1180301   0.546638  1
1180302   0.688596  2
1180303   0.558577  3
1180401   0.0445625 1
1180402   0.0445137 2
1180403   0.0354278 3
1180501   0.0       3
1180601   -90.0     3
1180701   -0.498052 1
1180702   -0.688596 2
1180703   -0.355604 3
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         14659900. 1228430.  2467190.  0.0  0.0  01
1181202   0         14646900. 1228430.  2467470.  0.0  0.0  02
1181203   0         14644400. 1228430.  2467520.  0.0  0.0  03
1181300   0
1181301   9.8172000 9.8172000 0.0       01
1181302   10.006000 10.006000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SUCTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1200000   "PMP SCT T "        BRANCH
1200001   3         0
1200101   0.0       0.759614  0.0487901 0.0       0.0       0.0
1200102   4.0E-5    0.0       00
1200200   0         14641700. 1228420.  2467580.  0.0
1201101   118010000 120000000 0.0       0.1       0.1       0000
1202101   120010000 125000000 0.0317    0.4       0.4       0100
1203101   120010000 155000000 0.0317    0.4       0.4       0100
1201201   10.006000 10.006000 0.0
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1202201   5.2047000 5.2047000 0.0
1203201   4.7736000 4.7736000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP1 SUCTION TEE OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1250000   "PMP1 SCT T"        BRANCH
1250001   1         0
1250101   0.0       1.00308   0.0640548 0.0       90.0      0.520704
1250102   4.0E-5    0.0       00
1250200   0         14619800. 1228410.  2468040.  0.0
1251101   125010000 130000000 0.0       0.13      0.13      0000
1251201   8.5638000 8.5638000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 1 INLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1300000   "PMP1 INLET"        SNGLVOL
1300101   0.0       0.457201  0.0177444 0.0       90.0      0.457201
1300102   4.0E-5    0.0       00
1300200   0         14594400. 1228410.  2468590.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1350000   "PCPUMP1   "        PUMP
1350101   0.0       0.4572    0.0991    0.0       90.0      0.317900
1350102   0
1350108   130010000 0.0       0.017     0.017     0000
1350109   140000000 0.0       0.05      0.05      0000
1350200   0         14870800. 1228670.  2462730.  0.0
1350201   0         8.5640000 8.5640000 0.0
1350202   0         9.0771000 9.0771000 0.0
1350301   0    0    0         -1        -1        695       0
1350302   369.00000 .91178862 .31550000 96.000000 500.60000 1.4310000
1350303   613.6     0.0       207.433   0.0444    19.5987   0.0
1350308   78.53982  0.0       -22.86511 27.16043  5.74589
1350310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 1 OUTLET PUMP SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1400000   "PMP1 OUT P"        SNGLVOL
1400101   0.0       0.502185  0.0183849 0.0       0.0       0.0
1400102   4.0E-5    0.0       00
1400200   0         15090400. 1228670.  2457720.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP1 OUTLET PIPE TEE SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1450000   "PMP1 OUT T"        BRANCH
1450001   2         0
1450101   0.0       1.4084    0.0633    0.0       0.0       0.0
1450102   4.0E-5    0.0       00
1450200   0         15099600. 1228660.  2457500.  0.0
1451101   140010000 145000000 0.0       0.0       0.0       0000
1452101   145010000 150000000 0.0       0.1       0.1       0100
1451201   9.0747000 9.0747000 0.0
1452201   7.3917000 7.3917000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP OUTLET TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1500000   "PMP OUT T "        BRANCH
```

```
1500001   2         0
1500101   0.0636463 0.3542995 0.0       0.0       0.0       0.0
1500102   4.0E-5    0.0       00
1500200   0         15079600. 1228680.  2457980.  0.0
1501101   170010000 150000000 0.0183    0.1       0.1       0100
1502101   150010000 172000000 0.0       0.0       0.0       0000
1501201   8.0488000 8.0488000 0.0
1502201   9.9847000 9.9847000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 SUCTION TEE OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1550000   "PMP2 SCT T"        BRANCH
1550001   1         0
1550101   0.0       1.00308   0.0640548 0.0       90.0      0.520704
1550102   4.0E-5    0.0       00
1550200   0         14629600. 1228410.  2467830.  0.0
1551101   155010000 160000000 0.0       0.13      0.13      0000
1551201   7.7885000 7.7885000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 INLET PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1600000   "PMP2 INLET"        SNGLVOL
1600101   0.0       0.457201  0.0177444 0.0       90.0      0.457201
1600102   4.0E-5    0.0       00
1600200   0         14608000. 1228410.  2468300.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1650000   "PCPUMP2   "        PUMP
1650101   0.0       0.514     0.0991    0.0       90.0      0.317900
1650102   0
1650108   160010000 0.0       0.017     0.017     0000
1650109   170000000 0.0       0.1       0.1       0000
1650200   0         14928600. 1228710.  2461510.  0.0
1650201   0         7.7887000 7.7887000 0.0
1650202   0         8.0515000 8.0515000 0.0
1650301   135  135  135       -1        -1        697       0
1650302   369.00000 .93018970 .31550000 96.000000 500.60000 1.4310000
1650303   613.6     0.0       207.433   0.0444    19.5987   0.0
1650308   78.53982  0.0       -22.86511 27.16403  5.74589
1650310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2 OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1700000   "PMP2 OUT T"        BRANCH
1700001   0         0
1700101   0.0       0.514071  0.0192958 0.0       0.0       0.0
1700102   4.0E-5    0.0       00
1700200   0         15203100. 1228710.  2454990.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SPRAY TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1720000   "PZR SPR T "        BRANCH
1720001   1         0
1720101   0.0635359 0.2844229 0.0       0.0       0.0       0.0
1720102   4.0E-5    0.0       00
1720200   0         15078900. 1228680.  2458000.  0.0
1721101   172010000 175000000 0.0       0.0       0.0       0000
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1721201   10.002    10.002    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INTACT LOOP COLD LEG PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1750000   "ILCL PIPE "        PIPE
1750001   2
1750101   0.0       2
1750201   0.0       1
1750301   0.4163655 1
1750302   0.613244  2
1750401   0.0264082 1
1750402   0.038895  2
1750501   0.0       2
1750601   0.0       2
1750701   0.0       2
1750801   4.0E-5    0.0       2
1750901   0.0       0.0       1
1751001   00        2
1751101   0000      1
1751201   0         15078200. 1228680.  2458020.  0.0  0.0  01
1751202   0         15077300. 1228680.  2458040.  0.0  0.0  02
1751300   0
1751301   10.002000 10.002000 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CONNECTION TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1800000   "ECC T     "        BRANCH
1800001   1         0
1800101   0.0       1.15189   0.0730598 0.0       0.0       0.0
1800102   4.0E-5    0.0       00
1800200   0         15075800. 1228670.  2458080.  0.0
1801101   175010000 180000000 0.0       0.0       0.0       0000
1801201   10.002000 10.002000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - INTACT LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1850000   "RVN ILCL  "        BRANCH
1850001   2         0
1850101   0.0       1.00965   0.0644920 0.0       0.0       0.0
1850102   4.0E-5    0.0       00
1850200   0         15075200. 1228670.  2458090.  0.0
1851101   185010000 202000000 0.0634    2.8       2.8       0101
1852101   180010000 185000000 0.0       0.0       0.0       0100
1851201   8.6438000 8.6438000 0.0
1852201   10.002000 10.002000 0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   REACTOR VESSEL
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2000000   "IN AN TOP "        BRANCH
2000001   1         0
2000101   0.2617061 0.1876129 0.0       0.0       90.0      0.1876129
2000102   3.81-6    0.178     00
2000200   0         15030000. 1232640.  2459190.  0.0
2001101   200000000 202000000 0.0       0.0       0.0       0000
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2001201   1.59691-7 1.59691-7 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2020000   "IN AN     "       BRANCH
2020001   2         0
2020101   0.2617061 0.2851822 0.0       0.0       -90.0     -0.2851822
2020102   3.81-6    0.175     00
2020200   0         15031700. 1228660.  2459150.  0.0
2021101   202010000 205000000 0.0       0.0       0.0       0000
2022101   202000000 252000000 0.0       4.5+4     4.5+4     0003
2021201   2.2804    2.2804    0.0
2022201   6.12444-2 6.12444-2 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2050000   "IN AN BOT "      BRANCH
2050001   1         0
2050101   0.2296374 0.2525361 0.0       0.0       -90.0     -0.2525361
2050102   3.81-6    0.172     00
2050200   0         15031700. 1228660.  2459150.  0.0
2051101   205010000 210000000 0.0       0.0       0.0       0000
2051201   3.5613000 3.5613000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2100000   "DOWNCOMER "      ANNULUS
2100001   6
2100101   0.0       6
2100201   0.0       5
2100301   1.0267313 1
2100302   0.4933248 2
2100303   0.7028265 3
2100304   0.5588068 4
2100305   0.6522799 5
2100306   0.4269792 6
2100401   0.1509710 1
2100402   0.0706690 2
2100403   0.1060015 3
2100404   0.0795138 4
2100405   0.0998947 5
2100406   0.06252   6
2100501   0.0       6
2100601   -90.0     6
2100801   3.81-6    0.102     6
2100901   0.0       0.0       5
2101001   00        6
2101101   0000      5
2101201   0         15033300. 1228660.  2459110.  0.0  0.0  01
2101202   0         15038200. 1228660.  2458990.  0.0  0.0  02
2101203   0         15042800. 1228660.  2458880.  0.0  0.0  03
2101204   0         15046500. 1228660.  2458790.  0.0  0.0  04
2101205   0         15051300. 1228660.  2458670.  0.0  0.0  05
2101206   0         15054600. 1228660.  2458590.  0.0  0.0  06
2101300   0
2101301   3.6556000 3.6556000 0.0       01
2101302   3.6555000 3.6555000 0.0       02
2101303   3.6801000 3.6801000 0.0       03
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2101304   3.6801000 3.6801000 0.0       04
2101305   3.5763000 3.5763000 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PLENUM TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2150000   "LWR PL TOP"        BRANCH
2150001   3         0
2150101   0.0       0.3533183 0.24520   0.0       -90.0     -0.3533183
2150102   3.81-6    0.0       00
2150200   0         15052500. 1228660.  2458640.  0.0
2151101   210010000 215000000 0.0       2.00      2.00      0000
2152101   215010000 220000000 0.0       0.005     0.005     0000
2153101   215000000 225000000 0.1499    1.5       1.5       0000
2151201   3.5762000 3.5762000 0.0
2152201   -.1243900 -.1243900 0.0
2153201   4.0692000 4.0692000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PLENUM BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2200000   "LWR PL BOT"        SNGLVOL
2200101   0.0       0.3741720 0.29656   0.0       -90.0     -0.3741720
2200102   4.0E-5    0.0       00
2200200   0         15055200. 1227510.  2458580.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION FROM COLD LEG TO FILLER GAP
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2220000   "CL-FLLRGAP"        SNGLJUN
2220101   185010000 223000000 0.0       15.000    15.000    0100
2220201   0         1.3659000 1.3659000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL FILLER GAP
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2230000   "FILLER GAP"        ANNULUS
2230001   4
2230101   0.0       4
2230201   0.0       3
2230301   1.4218585 1
2230302   1.1961513 2
2230303   1.2110867 3
2230304   0.7802975 4
2230401   0.0899085 1
2230402   0.0722790 2
2230403   0.0334096 3
2230404   0.0309800 4
2230501   0.0       4
2230601   -90.0     4
2230801   3.81-6    0.0       4
2230901   0.0       0.0       3
2231001   00        4
2231101   0000      3
2231201   0         15105600. 1228360.  2457350.  0.0  0.0  01
2231202   0         15115300. 1228100.  2457120.  0.0  0.0  02
2231203   0         15121100. 1227850.  2456970.  0.0  0.0  03
2231204   0         15130300. 1227690.  2456750.  0.0  0.0  04
2231300   0
2231301   1.4291000 1.4291000 0.0       01
2231302   1.3129900 1.3129900 0.0       02
2231303   3.1295000 3.1295000 0.0       03
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION FROM FILLER GAP TO LOWER PLENUM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2240000   "FLLRGAP-LP"        SNGLJUN
2240101   223010000 220000000 0.0        15.        15.        0000
2240101   223010000 220000000 0.0        45.        45.        0000
2240201   0         2.1743000 2.1743000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER CORE SUPPORT STRUCTURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2250000   "L CORE SUP"        BRANCH
2250001   2         0
2250101   0.0       0.6561928 0.12094   0.0        90.0       0.6561928
2250102   3.81-6    0.095     00
2250200   0         15038300. 1228490.  2458990.   0.0
2251101   225010000 230000000 0.1134    1.5        1.5        0100
2252101   225010000 235000000 0.0       12.        12.        0100
2251201   3.2020000 3.2020000 0.0
2252201   1.6570000 1.6570000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACTIVE CORE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2300000   "CORE      "        PIPE
2300001   6
2300101   0.0       6
2300201   0.1705    1
2300202   0.144     2
2300203   0.1705    3
2300204   0.144     4
2300205   0.1705    5
2300301   0.3728765 1  * 89/11/09  EQUAL LENGTH MODEL
2300302   0.2221000  5
2300303   0.4234231  6
2300401   0.0683340 1
2300402   0.0478582 2
2300403   0.0483329 3
2300404   0.0479138 4
2300405   0.0479052 5
2300406   0.0750459 6
2300501   0.0       6
2300601   90.0      6
2300801   1.27-7    0.012     6
2300901   0.0       0.0       1
2300902   0.66      0.66      2
2300903   0.0       0.0       3
2300904   0.66      0.66      4
2300905   0.0       0.0       5
2301001   00        6
2301101   0000      5
2301201   0         15017600. 1243280.  2459490.   0.0  0.0  01
2301202   0         15012600. 1267710.  2459620.   0.0  0.0  02
2301203   0         15004500. 1294130.  2459810.   0.0  0.0  03
2301204   0         15000500. 1317510.  2459910.   0.0  0.0  04
2301205   0         14992300. 1332930.  2460100.   0.0  0.0  05
2301206   0         14987800. 1337240.  2460200.   0.0  0.0  06
2301300   0
2301301   3.4659000 3.4659000 0.0        01
2301302   4.1523000 4.1523000 0.0        02
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2301303   3.5540000 3.5540000 0.0       03
2301304   4.2594000 4.2594000 0.0       04
2301305   3.6273000 3.6273000 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE BYPASS VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2350000   "CORE BYPSS"        PIPE
2350001   3
2350101   0.0       3
2350201   0.0       2
2350301   0.5758754 1
2350302   0.4824023 2
2350303   0.6264219 3
2350401   0.0091280 1
2350402   0.0072325 2
2350403   0.0088095 3
2350501   0.0       3
2350601   90.0      3
2350801   3.81-6    0.003     3
2350901   0.0       0.0       2
2351001   00        3
2351101   0000      2
2351201   0         15001900. 1228490.  2459460.  0.0  0.0  01
2351202   0         15007600. 1228490.  2459740.  0.0  0.0  02
2351203   0         14994900. 1228500.  2460040.  0.0  0.0  03
2351300   0
2351301   1.7916000 1.7916000 0.0       01
2351302   1.8500000 1.8500000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER END BOXES AND SUPPORT STRUCTURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2400000   "UPR END BX"        BRANCH
2400001   2         0
2400101   0.0       0.4933248 0.1195494 0.0       90.0      0.4933248
2400102   3.81-6    0.145     00
2400200   0         14969100. 1333110.  2460620.  0.0
2401101   230010000 240000000 0.1118    1.5       1.5       0100
2402101   235010000 240000000 0.0       12.       12.       0100
2401201   3.4977000 3.4977000 0.0
2402201   1.8501000 1.8501000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER CORE SUPPORT STRUCTURE - CROSS FLOW REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2450000   "UPR CR SUP"        BRANCH
2450001   2         0
2450101   0.0       0.4933248 0.1280806 0.0       90.0      0.4933248
2450102   3.81-6    0.145     00
2450200   0         15420100. 1407960.  2449770.  0.0
2451101   240010000 245000000 0.0       0.0       0.0       0000
2452101   245010000 251000000 0.0       0.0       0.0       0100
2451201   2.1756000 2.1756000 0.0
2452201   -.24832-4 -.24832-4 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER FLOW SKIRT REGION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2500000   "U FLW SKRT"        BRANCH
2500001   1         0
2500101   0.1547532 0.7850547 0.0       0.0       90.0      0.7850547
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2500102   3.81-6    0.131      00
2500200   0         14955900.  1333110.  2460920.  0.0
2501101   245010000 250000000  0.0       0.0       0.0       0100
2501201   4.1549000 4.1549000  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DEAD END OF FUEL MODULES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2510000   "DE FL MODS"        SNGLVOL
2510101   0.0       0.7844123  0.1154214 0.0       90.0      0.7844123
2510102   3.81-6    0.214      00
2510200   0         14963500.  1329710.  2460750.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER HEAD
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2520000   "UPR HEAD  "        BRANCH
2520001   1         0
2520101   0.2622585 0.2869580  0.0       0.0       90.0      0.2869580
2520102   3.81-6    0.0        00
2520200   0         14957200.  1329000.  2460890.  0.0
2521101   250010000 252000000  0.0       0.006     0.006     0000
2521201   4.1549000 4.1549000  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM BOTTOM VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2550000   "UPR PL BOT"        BRANCH
2550001   2         0
2550101   0.2622585 0.6312304  0.0       0.0       90.0      0.6312304
2550102   3.81-6    0.0        00
2550200   0         14954800.  1328590.  2460950.  0.0
2551101   252010000 255000000  0.0       0.006     0.006     0000
2552101   255010000 260000000  0.0       0.03      0.03      0000
2551201   3.56869-6 3.56869-6  0.0
2552201   4.52212-6 4.52212-6  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM TOP VOLUME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2600000   "UPR PL TOP"        SNGLVOL
2600101   0.0       0.7747094  0.1914909 0.0       90.0      0.7747094
2600102   3.81-6    0.0        00
2600200   0         14949800.  1326010.  2461060.  0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*    BROKEN LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3000000   "RVN BLHL  "        BRANCH
3000001   2         0
3000101   0.0       0.876303   0.0575410 0.0       0.0       0.0
3000102   4.0E-5    0.0        00
3000200   0         14957200.  1221360.  2460890.  0.0
3001101   252010000 300000000  0.067014  0.0       0.0       0002
3002101   300010000 305000000  0.063426  0.1       0.1       0000
3001201   -.1240600 -.1240600  0.0
3002201   -.1311000 -.1311000  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPE TO REFLOOD ASSIST BYPASS TEE
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3050000   "HLP-RABS T"        BRANCH
3050001   1         0
3050101   0.0       0.698336  0.0442927 0.0       0.0       0.0
3050102   4.0E-5    0.0       00
3050200   0         14957200. 1221770.  2460890.  0.0
3051101   305010000 310000000 0.0       0.1       0.1       0100
3051201   -.1838800 -.1838800 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG CONTRACTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3100000   "BLHL CONTR"        BRANCH
3100001   2         0
3100101   0.0       1.50013   0.0678467 0.0       0.0       0.0
3100102   4.0E-5    0.0       00
3100200   0         14957200. 1222120.  2460890.  0.0
3101101   380010000 310000000 0.0388    0.84      0.84      0100
3102101   310010000 315000000 0.0083647 0.0       0.0       0100
3101201   .21484000 .21484000 0.0
3102201   2.07725-3 2.07725-3 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR AND PUMP SIMULATIOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3150000   "SG+PMP SIM"        PIPE
3150001   12
3150101   0.0       12
3150201   0.0083647 2
3150202   0.032603  4
3150203   0.105626  5
3150204   0.032603  7
3150205   0.0083647 9
3150206   0.008364  10
3150207   0.0046398 11
3150301   0.367768  1
3150302   0.552201  2
3150303   0.993978  4
3150304   0.849744  6
3150305   0.993978  8
3150306   1.371350  9
3150307   1.365029  10
3150308   1.674812  11
3150309   0.545209  12
3150401   3.0767-3  1
3150402   4.67621-3 2
3150403   8.60554-2 4
3150404   8.97552-2 6
3150405   8.60554-2 8
3150406   1.82303-2 9
3150407   5.46687-2 10
3150408   1.82489-2 11
3150409   2.83241-2 12
3150601   90.0      5
3150602   -90.0     10
3150603   90.0      11
3150604   0.0       12
3150701   0.127000  1
3150702   0.552201  2
3150703   0.993978  4
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3150704   0.457202  5
3150705   -0.457202 6
3150706   -0.993978 8
3150707   -1.371350 9
3150708   -0.520701 10
3150709   1.212851  11
3150710   0.0       12
3150801   4.0E-5    0.0       3
3150802   4.0E-5    0.124     4
3150803   4.0E-5    0.0       6
3150804   4.0E-5    0.124     7
3150805   4.0E-5    0.0       12
3150901   0.2       0.2       1
3150902   0.0       0.0       2
3150903   93.9      93.9      4
3150904   0.4       0.4       5
3150905   93.9      93.9      7
3150906   0.0       0.0       8
3150907   0.2       0.2       9
3150908   4.1       4.1       10
3150909   0.4       0.4       11
3151001   00        12
3151101   0000      1
3151102   0100      2
3151103   0000      7
3151104   0100      8
3151105   0000      10
3151106   0100      11
3151201   0         14956800. 1204970.  2460900.  0.0  0.0  01
3151202   0         14954200. 1196960.  2460960.  0.0  0.0  02
3151203   0         14948400. 1216750.  2461090.  0.0  0.0  03
3151204   0         14941000. 1217220.  2461250.  0.0  0.0  04
3151205   0         14935500. 1219110.  2461370.  0.0  0.0  05
3151206   0         14935500. 1219140.  2461370.  0.0  0.0  06
3151207   0         14941000. 1217240.  2461250.  0.0  0.0  07
3151208   0         14948400. 1217200.  2461090.  0.0  0.0  08
3151209   0         14957300. 1206410.  2460890.  0.0  0.0  09
3151210   0         14964400. 1209760.  2460730.  0.0  0.0  10
3151211   0         14961800. 1196570.  2460790.  0.0  0.0  11
3151212   0         14957200. 1215100.  2460890.  0.0  0.0  12
3151300   0
3151301   -.14625-4 -.14625-4 0.0       01
3151302   -.35422-4 -.35422-4 0.0       02
3151303   -.13114-4 -.13114-4 0.0       03
3151304   -.72833-5 -.72833-5 0.0       04
3151305   -.24333-5 -.24333-5 0.0       05
3151306   -.88365-5 -.88365-5 0.0       06
3151307   -.29947-5 -.29947-5 0.0       07
3151308   -.19321-4 -.19321-4 0.0       08
3151309   -.16785-4 -.16785-4 0.0       09
3151310   -.16628-4 -.16628-4 0.0       10
3151311   -.12497-4 -.12497-4 0.0       11
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3350000   "RVN BLCL  "        BRANCH
3350001   2         0
3350101   0.0       0.749305  0.047979  0.0       0.0       0.0
```

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3350102   4.0E-5    0.0       00
3350200   0         15031700. 1228270.  2459150.  0.0
3351101   202000000 335000000 0.064130  1.0       1.0       0002
3352101   335010000 340000000 0.063426  0.1       0.1       0000
3351201   .13028000 .13028000 0.0
3352201   .13170000 .13170000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3400000   "CLP-RABS T"        BRANCH
3400001   1         0
3400101   0.0       0.698336  0.0443927 0.0       0.0       0.0
3400102   4.0E-5    0.0       00
3400200   0         15031700. 1227890.  2459150.  0.0
3401101   340010000 345000000 0.0       0.1       0.1       0100
3401201   .18613000 .18613000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG CONTRACTION TO BREAK PLANE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3450000   "BLCL CONTR"        BRANCH
3450001   2         0
3450101   0.0       1.50013   0.0673163 0.0       0.0       0.0
3450102   4.0E-5    0.0       00
3450200   0         15424700. 1228050.  2449660.  0.0
3451101   345000000 370000000 0.0388    0.84      0.84      0100
3452101   345010000 350000000 0.0046367 0.0       0.0       0100
3451201   .21516000 .21516000 0.0
3452201   6.55835-5 6.55835-5 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPOOL PIECE AND PIPE TO ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3500000   "BRK SP+PPE"        PIPE
3500001   2
3500101   0.0       2
3500201   0.023520  1
3500301   0.453394  1
3500302   1.074803  2
3500401   0.0106640 1
3500402   0.0407801 2
3500601   0.0       2
3500801   4.0E-5    0.0       1
3500802   4.0E-5    0.0       2
3500901   0.0       0.0       1
3501001   00        2
3501101   0100      1
3501201   0         15031700. 1218930.  2459150.  0.0  0.0  01
3501202   0         15031700. 1226360.  2459150.  0.0  0.0  02
3501300   0
3501301   4.59331-5 4.59331-5 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3550000   "CL ISO VLV"        VALVE
3550101   350010000 360000000 0.0       0.0       0.0       0100
3550201   0         -6.7943-7 -6.7943-7 0.0
3550300   TRPVLV
3550301   678
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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* COLD LEG PIPE BETWEEN ISOLATION VALVE AND QOBV
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3600000   "CL IS-QOBV"        SNGLVOL
3600101   0.0       0.569219  0.0297722 0.0       0.0       0.0
3600102   4.0E-5    0.0       00
3600200   0         15031700. 1241690.  2459150.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG QUICK OPENING BLOWDOWN VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3650000   "CL QOBV   "        VALVE
3650101   360010000 805000000 0.0466    0.0       0.0       0000
3650201   0         .00000000 .00000000 0.0
3650300   TRPVLV
3650301   677
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - COLD LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3700000   "RABS C L  "        PIPE
3700001   3
3700101   0.0388    2
3700102   0.0776    3
3700201   0.0388    2
3700301   0.0       3
3700401   0.0279    1
3700402   0.070     2
3700403   0.1165    3
3700601   90.0      1
3700602   0.0       3
3700701   0.64      1
3700702   0.0       3
3700801   4.0-5     0.0       3
3700901   0.28      0.28      1
3700902   0.84      0.84      2
3701001   00        3
3701101   0000      2
3701201   0         15029300. 1226830.  2459210.  0.0  0.0  01
3701202   0         15026900. 1226050.  2459270.  0.0  0.0  02
3701203   0         15026900. 1224760.  2459270.  0.0  0.0  03
3701300   0
3701301   .21514000 .21514000 0.0       01
3701302   .21508000 .21508000 0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3750000   "RABS VALVS"        SNGLJUN
3750101   370010000 380000000 0.0       1.55+4    1.55+4    0000
3750201   0         .10749000 .10749000 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - HOT LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3800000   "RABS H L  "        PIPE
3800001   3
3800101   0.0776    1
3800102   0.0388    3
3800201   0.0388    2
3800301   0.0       3
3800401   0.0915    1
3800402   0.048     2
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3800403   0.0489    3
3800601   0.0       1
3800602   -90.0     2
3800603   0.0       3
3800701   0.0       1
3800702   -0.64     2
3800703   0.0       3
3800801   4.0-5     0.0       3
3800901   0.84      0.84      1
3800902   0.28      0.28      2
3801001   00        3
3801101   0000      2
3801201   0         14952500. 1223750.  2469100.  0.0  0.0  01
3801202   0         14954900. 1223220.  2469090.  0.0  0.0  02
3801203   0         14957200. 1222740.  2460890.  0.0  0.0  03
3801300   0
3801301   .21492000 .21492000 0.0       01
3801302   .21488000 .21488000 0.0       02
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PRESSURIZER
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SURGE LINE PCS SIDE
*---- ----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         14895700. 1345680.  2462200.  0.0
4001101   107000000 400000000 1.44561-3 3.9       3.9       0002
4002101   400010000 405000000 1.44561-3 2.85      2.85      1000
4001201   1.16231-2 1.16231-2 0.0
4002201   1.16247-2 1.16247-2 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SURGE LINE
*---- ----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         14892800. 1383720.  2462200.  0.0  0.0  01
4051202   0         14890800. 1435980.  2462300.  0.0  0.0  02
4051300   0
4051301   1.16231-2 1.16231-2 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER SURGE LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4100000   "SRG LINE  "        SNGLJUN
4100101   405010000 415000000 1.44561-3 0.42      1.00      1000
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4100201   0         -.0608789 -.0608789 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4150000   "PZR VESSEL"        PIPE
4150001   6
4150101   0.0       2
4150102   0.5653    5
4150103   0.0       6
4150201   0.0       5
4150301   0.1815    1
4150302   0.1524    2
4150303   0.3967    3
4150304   0.5289    4
4150305   0.3967    5
4150306   0.1943    6
4150401   0.0684    1
4150402   0.0838    2
4150403   0.0       5
4150404   0.0732    6
4150501   0.0       6
4150601   90.0      6
4150801   4.0E-5    0.0       6
4151001   00        6
4151101   0000      5
4151201   0         14889200. 1551340.  2462340.  0.0         0.0  01
4151202   0         14888200. 1576890.  2462360.  0.0         0.0  02
4151203   0         14888600. 1578210.  2462390.  0.0         0.0  03
4151204   0         14884300. 1579040.  2463380.  .31381      0.0  04
4151205   0         14882900. 1581860.  2462380.  1.0         0.0  05
4151206   0         14882600. 1581850.  2462350.  1.0         0.0  06
4151300   0
4151301   4.13174-5 4.13174-5 0.0       01
4151302   2.75755-5 2.75755-5 0.0       02
4151303   2.50280-5  .50049   0.0       03
4151304   -.37026   5.25011-5 0.0       04
4151305   -.13472   1.81309-5 0.0       05
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER VESSEL TO TOP HAT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4170000   "VSSL-TPHAT"        SNGLJUN
4170101   415010000 420000000 0.0       0.0       0.0       0000
4170201   0         -.19776   3.46367-5 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER TOP HAT AND RELIEF CONNECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4200000   "PZR TOPHAT"        PIPE
4200001   2
4200101   0.0       2
4200201   0.0       1
4200301   0.1104915 2
4200401   0.0139870 2
4200601   90.0      2
4200801   4.E-5     0.346066  2
4201001   00        2
4201101   0000      1
4201201   0         14882500. 1581850.  2462380.  1.0  0.0  01
4201202   0         14882400. 1581840.  2462380.  1.0  0.0  02
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4201300   0
4201301   -.10996   2.21137-5 0.0       01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPRAY LINE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4300000   "SPRAY     "         BRANCH
4300001   1         0
4300101   0.0003363 6.322     0.0       0.0       90.0      2.9905
4300102   4.0-5     0.0       00
4300200   0         15067800. 1227770.  2458270.  0.0
4301101   172000000 430000000 0.0       0.0       0.0       0002
4301201   -5.3194-6 -5.3194-6 0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   STEAM GENERATOR SECONDARY SIDE
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY SEPARATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5000000   "SEPARATOR "        SEPARATR
5000001   3         0
5000101   0.0       0.4445    0.2425    0.0       90.0      0.4445
5000102   4.E-5     0.2840    00
5000200   0         5222780.0 1161490.  2595710.  .89049
5001101   500010000 520000000 0.087745  0.0       0.0       0100
5002101   500000000 505000000 0.087745  0.0       0.0       0100      0.3
5003101   515010000 500000000 0.29187   0.4       0.4       0100
5001201   1.3751    1.4411    0.0
5002201   .53770    .50887    0.0
5003201   2.7804    3.5935    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SEPARATOR BYPASS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5030000   "SEPBYPASS "        BRANCH
5030001   2         0
5030101   0.0       0.4445    0.4384    0.0       90.0      0.4445
5030102   4.E-5     0.3678    00
5030200   0         5222780.0 1611330.  2595720.  .99999
5031101   505000000 503000000 0.98627   0.0       0.0       0100
5032101   503010000 520000000 0.98627   0.8       0.0       0100
5031201   -.16063   .48006    0.0
5032201   2.38241-2 .17866    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         5222770.0 1161410.  2595720.  .37208
5051101   505010000 508000000 0.0       0.0       0.0       0100
5051201   .47026    -.47917   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
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5080102   4.E-5     0.163697  00
5080200   0         5228350.0 1094450.  2595690.  0.0
5081101   508010000 510000000 0.0       0.0       0.0       0100
5081201   .58694    .58694    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         5233030.0 1094480.  2595670.  0.0       0.0  01
5101202   0         5237770.0 1095280.  2595640.  0.0       0.0  02
5101203   0         5242510.0 1095650.  2595610.  0.0       0.0  03
5101300   0
5101301   .58704    .58704    0.0       01
5101302   .58714    .58714    0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* JUNCTION FROM 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         .58722    .83849    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         5241030.0 1154980.  2595580.  .49316    0.0  01
5151202   0         5237440.0 1161810.  2595610.  .71327    0.0  02
5151203   0         5233350.0 1162120.  2595650.  .80605    0.0  03
5151204   0         5232841.0 1161820.  2595680.  .85407    0.0  04
5151205   0         5237361.0 1161540.  2595700.  .87426    0.0  05
5151300   0
5151301    .94859   1.3289    0.0       01
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5151302   1.5589     2.3557     0.0        02
5151303   2.1266     3.3332     0.0        03
5151304   2.6440     4.0529     0.0        04
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER PORTION OF STEAM DOME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5200000   "LWR STM DM"         BRANCH
5200001   1          0
5200101   0.0        0.46956    0.705312   0.0        90.0       0.46956
5200102   4.E-5      1.383      00
5200200   0          5219990.0  1161320.   2595680.   1.0
5201101   520010000  525000000  0.0        0.0        0.0        0100
5201201    .50120     .64094    0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PORTION OF STEAM DOME
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5250000   "UPR STM DM"         BRANCH
5250001   1          0
5250101   0.0        0.46956    0.705312   0.0        90.0       0.46956
5250102   4.E-5      1.383      00
5250200   0          5219870.0  1161310.   2595700.   1.0
5251101   525010000  530000000  0.0        0.8        0.8        0100
5251201   15.687     20.771     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM PIPE FROM GENERATOR TO CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5300000   "STEAM PIPE"         SNGLVOL
5300101   0.04635    25.074     0.0        0.0        0.0        0.0
5300102   4.E-5      0.0        00
5300200   0          5203370.0  1160330.   2595740.   .99998
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM FLOW CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5400000   "CV-P4-10  "         VALVE
5400101   530010000  541000000  0.0047772  0.0        0.0        1100
5400201   0          16.933     36.097     0.0
5400300   MTRVLV
5400301   685        686        0.05       0.645229   540
20254000  NORMAREA
20254001  0.0        9.25-4
20254002  9.25-4     9.25-4
20254003  1.0        1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPE DOWNSTREAM OF STEAM CONTROL VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5410000   "COND INLET"         BRANCH
5410001   1          0
5410101   0.06557    54.44      0.0        0.0        0.0        0.0
5410102   4.E-5      0.0        00
5410200   0          2009650.0   907346.   2597920.    .99820
5411101   541010000  542000000  0.0        0.0        0.0        0100
5411201   16.933     36.097     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AIR COOLED CONDENSER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5420000   "CONDENSER "         TMDPVOL
5420101   0.21677    17.67      0.0        0.0        0.0        0.0
5420102   4.E-5      0.02       00
```

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5420200   2
5420207   0.0       2.00E6    1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM BYPASS VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5450000   "STM BYPSS "         VALVE
5450101   530010000 546000000 3.2-4     0.0       0.0       0100
5450201   0         .00000000 .00000000 0.0
5450300   TRPVLV
5450301   687
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AIR COOLED CONDENSER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5460000   "CONDENSER "         TMDPVOL
5460101   0.21677   17.67     0.0       0.0       0.0       0.0
5460102   4.E-5     0.02      00
5460200   1         516
5460201   0.0       554.8     0.999
5460202   18000.    332.5     0.999
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED STORAGE TANK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5650000   "FEED TANK "         TMDPVOL
5650101   29.81     3.048     0.0       0.0       0.0       0.0
5650102   4.E-5     0.0       00
5650200   1         689
5650201   -1.0      478.706   0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FEED WATER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5660000   "FEED      "         TMDPJUN
5660101   565000000 508000000 0.05
5660200   1         688
5660201   0.0       25.553    0.0       0.0
5660202   0.7       0.0       0.0       0.0
5660203   59.5      0.0       0.0       0.0
5660204   60.0      0.50364   0.0       0.0
5660205   1860.0    0.50364   0.0       0.0
5660206   1861.0    0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AUX FEED STORAGE TANK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5680000   "AUX FD TNK"         TMDPVOL
5680101   29.81     3.048     0.0       0.0       0.0       0.0
5680102   4.E-5     0.0       00
5680200   1
5680201   0.0       305.0     0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* AUX FEED WATER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
5690000   "AUX FEED  "         TMDPJUN
5690101   568000000 508000000 0.05
5690200   1         690
5690201   -1.0      0.00      0.0       0.0
5690202   0.0       0.50364   0.0       0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   ECC SYSTEM
```

```
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CHECK VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6000000   "ECC CHKVLV"        VALVE
6000101   605010000 185000000 5.9896-3  0.935     0.935     1120
6000201   0         .00000000 .00000000 0.0
6000300   TRPVLV
6000301   681
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"        SNGLVOL
6050101   5.9896-3  5.0148    0.0       0.0       90.0      3.3071202
6050102   4.0-5     0.0       01
6050200   0         13595900. 172410.   2489140.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6100000   "ACCUM VLV "        VALVE
6100101   615010000 605000000 5.9896-3  6.278     6.278     1000
6100201   0         0.0       0.0       0.0
6100300   TRPVLV
6100301   682
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "        SNGLVOL
6150101   0.0       25.997165 0.4074774 0.0       0.0       0.0
6150102   4.0-5     0.0       01
6150200   0         13580200. 112409.   2489450.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*6200000   "ACCUMULATR"         ACCUM
*6200101   0.0       1.8103    2.3422    0.0       90.0      1.8103
*6200102   4.0-5     0.0       01
*6200200   4.31+6    306.6
*6201101   615000000 8.2132-3  13.3      13.3      0
*6202200   0.0       1.0662    2.4509    1.6927    0.04445   0 0 0 0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BWST LPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6250000   "BWST LPIS "        TMDPVOL
6250101   20.44     5.0       0.0       0.0       90.0      5.0
6250102   4.0E-5    0.0       00
6250200   3
6250201   0.0       1.0+5     300.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOW PRESSURE INJECTION SYSTEM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6300000   "LPIS      "        TMDPJUN
6300101   625000000 605000000 5.9896-3
6300200   1         684       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
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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----
* BWST HPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6350000   "BWST HPIS "        TMDPVOL
6350101   20.44     5.0       0.0       0.0       90.0      5.0
6350102   4.0E-5    0.0       00
6350200   3
6350201   0.0       1.0+5     300.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HIGH PRESSURE INJECTION SYSTEM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6400000   "HPIS      "        TMDPJUN
6400101   635000000 185000000 5.9896-3
6400200   1         683       P         185010000
6400201   -1.0      0.0       0.0       0.0
6400202   0.0       .75687272 0.0       0.0
6400203   7.72514+6 .75687272 0.0       0.0
6400204   8.3597+6  .31536281 0.0       0.0
6400205   17.2436+6 .31536281 0.0       0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   CONTAINMENT
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CONTAINMENT BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
8050000   "CONT BLCL "        TMDPVOL
8050101   0.0       1.0       0.1       0.0       0.0       0.0
8050102   0.0       0.0       00
8050200   2
8050201   0.0       1.0+5     1.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   REACTOR VESSEL HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL WALL HEAT STRUCTURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* THE REACTOR VESSEL WALL IS NOT MODELLED ABOVE THE NOZZLES.
* THE VESSEL TO FILLER GAP IS ASSUMED TO INSULATE THE VESSEL
* FROM THE FILLERS.  THE VESSEL TO FILLER GAP IS NOT MODELLED
* AT THIS ELEVATION.
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL WALL ABOVE STATION 178 - 5.50 INCHES THICK
* STATION 178 TO 258
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12231000  2         5         2         1         0.7328
12231100  0         1
12231101  4         0.8725
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12231201  5         4
12231301  0.0       4
12231401  551.0     5
12231501  223010000 0         1         1         1.4218585  1
12231502  223020000 0         1         1         0.7621415  2
12231601  -939      0         3949      1         1.4218585  1
12231602  -939      0         3949      1         0.7621415  2
12231701  0         0.0       0.0       0.0       2
12231801  0         0.0127    0.1922    1.4218585 1
12231802  0         0.0127    0.1922    0.7621415 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL WALL BELOW STATION 178 - 3.62 INCHES THICK
* STATION 67.7 TO 178
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12232000  4         5         2         1         0.7328
12232100  0         1
12232101  4         0.8247
12232201  5         4
12232301  0.0       4
12232401  553.0     5
12232501  223020000 0         1         1         0.4340098  1
12232502  223030000 0         1         1         1.2110867  2
12232503  223040000 0         1         1         0.7802975  3
12232504  220010000 0         1         1         0.3741720  4
12232601  -939      0         3949      1         0.4340098  1
12232602  -939      0         3949      1         1.2110867  2
12232603  -939      0         3949      1         0.7802975  3
12232604  -939      0         3949      1         0.3741720  4
12232701  0         0.0       0.0       0.0       4
12232801  0         0.0127    0.1922    0.4340098 1
12232802  0         0.0127    0.1922    1.2110867 2
12232803  0         0.0127    0.1922    0.7802975 3
12232804  0         0.0127    0.1922    0.3741720 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL BOTTOM
* STATION 67.7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12200000  1         5         1         1         0.0
12200100  0         1
12200101  4         0.092
12200201  5         4
12200301  0.0       4
12200401  551.0     5
12200501  220010000 0         1         0         1.68       1
12200601  -939      0         3949      0         1.68       1
12200701  0         0.0       0.0       0.0       1
12200801  0         0.0       0.0       5.00      1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL FILLER BLOCKS HEAT STRUCTURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS TOP VOLUME
* STATION 264 TO 277
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12000000  2         5         2         1         0.508
12000100  0         1
12000101  4         0.7264
12000201  4         4
12000301  0.0       4
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12000401  556.0      5
12000501  200010000  0          1          1          0.1876129  1
12000502  202010000  0          1          1          0.2851823  2
12000601  0          0          0          1          0.1876129  1
12000602  0          0          0          1          0.2851823  2
12000701  0          0.0        0.0        0.0        2
12000801  0          0.1524     0.3245     0.1876129  1
12000802  0          0.1524     0.3245     0.2851823  2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET ANNULUS LOWER VOLUME
* STATION 247.3 TO 264.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12050000  1          5          2          1          0.501
12050100  0          1
12050101  4          0.7264
12050201  4          4
12050301  0.0        4
12050401  556.0      5
12050501  205010000  0          1          1          0.2525361  1
12050601  223010000  0          1          1          0.2525361  1
12050701  0          0.0        0.0        0.0        1
12050801  0          0.1524     0.3245     0.2525361  1
12050901  0          0.0127     0.0253     0.2525361  1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DOWNCOMER AND LOWER PLENUM
* STATION 67.7 TO 247.3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12100000  7          5          2          1          0.47
12100100  0          1
12100101  4          0.7264
12100201  4          4
12100301  0.0        4
12100401  556.0      5
12100501  210010000  0          1          1          1.0267313  1
12100502  210020000  0          1          1          0.4933248  2
12100503  210030000  0          1          1          0.7028265  3
12100504  210040000  0          1          1          0.5588068  4
12100505  210050000  0          1          1          0.6522799  5
12100506  210060000  0          1          1          0.4269792  6
12100507  215010000  0          1          1          0.3533183  7
12100601  223010000  0          1          1          1.0267313  1
12100602  223020000  0          1          1          0.4933248  2
12100603  223020000  0          1          1          0.7028265  3
12100604  223030000  0          1          1          0.5588068  4
12100605  223030000  0          1          1          0.6522799  5
12100606  223040000  0          1          1          0.4269792  6
12100607  223040000  0          1          1          0.3533183  7
12100701  0          0.0        0.0        0.0        7
12100801  0          0.1016     0.2155     1.0267313  1
12100802  0          0.1016     0.2155     0.4933248  2
12100803  0          0.1016     0.2155     0.7028265  3
12100804  0          0.1016     0.2155     0.5588068  4
12100805  0          0.1016     0.2155     0.6522799  5
12100806  0          0.1016     0.2155     0.4269792  6
12100807  0          0.1016     0.2155     0.3533183  7
12100901  0          0.0127     0.0253     1.0267313  1
12100902  0          0.0127     0.0253     0.4933248  2
12100903  0          0.0127     0.0253     0.7028265  3
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12100904  0          0.0127    0.0253    0.5588068 4
12100905  0          0.0127    0.0253    0.6522799 5
12100906  0          0.0127    0.0253    0.4269792 6
12100907  0          0.0127    0.0253    0.3533183 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE SUPPORT BARREL
* STATION 96.44 TO 277
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12001000  9          5         2         1         0.381
12001100  0          1
12001101  4          0.419
12001201  4          4
12001301  0.0        4
12001401  556.0      5
12001501  0          0         0         1         0.1876129 1
12001502  0          0         0         1         0.2851823 2
12001503  0          0         0         1         0.2525361 3
12001504  0          0         0         1         1.0267313 4
12001505  0          0         0         1         0.4933248 5
12001506  0          0         0         1         0.7028265 6
12001507  0          0         0         1         0.5588068 7
12001508  0          0         0         1         0.6522799 8
12001509  0          0         0         1         0.4269792 9
12001601  200010000  0         1         1         0.1876129 1
12001602  202010000  0         1         1         0.2851823 2
12001603  205010000  0         1         1         0.2525361 3
12001604  210010000  0         1         1         1.0267313 4
12001605  210020000  0         1         1         0.4933248 5
12001606  210030000  0         1         1         0.7028265 6
12001607  210040000  0         1         1         0.5588068 7
12001608  210050000  0         1         1         0.6522799 8
12001609  210060000  0         1         1         0.4269792 9
12001701  0          0.0       0.0       0.0       9
12001901  0          0.1016    0.2155    0.1876129 1
12001902  0          0.1016    0.2155    0.2851823 2
12001903  0          0.1016    0.2155    0.2525361 3
12001904  0          0.1016    0.2155    1.0267313 4
12001905  0          0.1016    0.2155    0.4933248 5
12001906  0          0.1016    0.2155    0.7028265 6
12001907  0          0.1016    0.2155    0.5588068 7
12001908  0          0.1016    0.2155    0.6522799 8
12001909  0          0.1016    0.2155    0.4369792 9
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FLOW SKIRT - CORE FILLER ASSEMBLY
* STATION 96.44 TO 261.13
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12250000  10         5         2         1         0.3
12250100  0          1
12250101  4          0.38
12250201  4          4
12250301  0.0        4
12250401  575.0      5
12250501  225010000  0         1         1         0.4269792 1
12250502  230010000  0         1         1         0.3728765 2
12250503  230020000  10000     1         1         0.2794034 6
12250504  230060000  0         1         1         0.4234231 7
12250505  240010000  5000000   1         1         0.4933248 9
12250506  250010000  0         1         1         0.7850547 10
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12250601  0          0          0          1          0.4269792 1
12250602  0          0          0          1          0.3728765 2
12250603  0          0          0          1          0.2794034 6
12250604  0          0          0          1          0.4234231 7
12250605  0          0          0          1          0.4933248 9
12250606  0          0          0          1          0.7850547 10
12250701  0          0.0        0.0        0.0        10
12250801  0          0.095      0.095      0.4269792 1
12250802  0          0.0124     0.5713     0.3728765 2
12250803  0          0.0124     0.5713     0.2794034 6
12250804  0          0.0124     0.5713     0.4234231 7
12250805  0          0.145      0.5713     0.4933248 9
12250806  0          0.131      0.5713     0.7850547 10
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LOWER CORE SUPPORT STRUCTURE
* STATION 96.44 TO 116.91
* INCLUDES CORE SUPPORT BARREL LIP , LOWER CORE SUPPORT
* STRUCTURE , AND FUEL MODULE LOWER END BOXES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12251000  1          5          2          1          0.282
12251100  0          1
12251101  4          0.3
12251201  4          4
12251301  0.0        4
12251401  556.0      5
12251501  225010000  0          1          1          0.4269792 1
12251601  0          0          0          1          0.4269792 1
12251701  0          0.0        0.0        0.0        1
12251801  0          0.095      0.095      0.4269792 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACTIVE CORE
* STATION 116.91 TO 182.94
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12300000  6          10         2          1          0.0
12300100  0          1
12300101  5          4.647E-3
12300102  1          4.742E-3
12300103  3          5.359E-3
12300201  1          5
12300202  -2         6
12300203  -3         9
12300301  1.0        5
12300302  0.0        9
12300401  575.0      10
12300501  0          0          0          1          57.000    6  * 1.68X204/6
12300601  230010000  10000      1          1          57.000    6  * 89/11/09
12300701  900        0.03695    0.0        0.0        1 * 100% POWER  * 89/11/06
12300702  900        0.03979    0.0        0.0        2 * 100% POWER
12300703  900        0.04153    0.0        0.0        3 * 100% POWER
12300704  900        0.03521    0.0        0.0        4 * 100% POWER
12300705  900        0.02802    0.0        0.0        5 * 100% POWER
12300706  900        0.02161    0.0        0.0        6 * 100% POWER
12300901  0          0.01240    0.01504    1.775      6
*
*  HEAT STRUCTURE MODEL FOR 1096 RODS IN PERIPERAL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACTIVE CORE (PERIPERAL 1096 RODS)
* STATION 116.91 TO 182.94
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12310000 6         10        2         1         0.0
12310100 0         1
12310101 5         4.647E-3
12310102 1         4.742E-3
12310103 3         5.359E-3
12310201 1         5
12310202 -2        6
12310203 -3        9
12310301 1.0       5
12310302 0.0       9
12310401 575.0     10
12310501 0         0         0         1         307.00    6 * 1.68X1096/6
12310601 230010000 10000     1         1         307.00    6  * 89/11/09
12310701 900       0.13896   0.0       0.0       1 * 100% POWER
12310702 900       0.15345   0.0       0.0       2 * 100% POWER
12310703 900       0.16486   0.0       0.0       3 * 100% POWER
12310704 900       0.13947   0.0       0.0       4 * 100% POWER
12310705 900       0.11431   0.0       0.0       5 * 100% POWER
12310706 900       0.08461   0.0       0.0       6 * 100% POWER
12310901 0         0.01240   0.01504   1.775     6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER CORE SUPPORT STRUCTURE
* STATION 190.5 TO 234.5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12400000 2         5         2         1         0.282
12400100 0         1
12400101 4         0.31
12400201 4         4
12400301 0.0       4
12400401 575.0     5
12400501 240010000 5000000   1         1         0.4933248 2
12400601 0         0         0         1         0.4933248 2
12400701 0         0.0       0.0       0.0       2
12400801 0         0.56      0.0       0.9866496 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* FUEL MODULES
* STATION 187.6 TO 258.4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12510000 1         5         1         1         0.0
12510100 0         1
12510101 4         0.01
12510201 4         4
12510301 0.0       4
12510401 575.0     5
12510501 250010000 0         1         1         1.8       1
12510601 251010000 0         1         1         1.8       1
12510701 0         0.0       0.0       1.8       1
12510801 0         0.0       0.0       1.8       1
12510901 0         0.0       0.0       1.8       1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER PLENUM INTERNALS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12551000 3         5         1         1         0.0
12551100 0         1
12551101 4         0.005
12551201 4         4
12551301 0.0       4
```

```
12551401  575.0     5
12551501  252010000 0         1         1         1.0       1
12551502  255010000 0         1         1         1.0       2
12551503  250010000 0         1         1         1.0       3
12551601  0         0         0         1         1.0       3
12551701  0         0.0       0.0       0.0       3
12551801  0         0.0       0.0       1.0       3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE SUPPORT BARREL - UPPER PLENUM LOWER VOLUME
* STATION 264 TO 297.6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12552000  2         5         2         1         0.381
12552100  0         1
12552101  4         0.474
12552201  5         4
12552301  0.0       4
12552401  575.0     5
12552501  255010000 0         1         1         0.6312304 1
12552502  252010000 0         1         1         0.2869580 2
12552601  0         0         0         1         0.6312304 1
12552602  0         0         0         1         0.2869580 2
12552701  0         0.0       0.0       0.0       2
12552801  0         0.762     0.0       0.6312304 1
12552802  0         0.762     0.0       0.2869580 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CORE SUPPORT BARREL - UPPER PLENUM TOP VOLUME
* STATION 297.6 TO 325
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12601000  1         5         2         1         0.381
12601100  0         1
12601101  4         0.728
12601201  5         4
12601301  0.0       4
12601401  575.0     5
12601501  260010000 0         1         1         0.7747094 1
12601601  0         0         0         1         0.7747094 1
12601701  0         0.0       0.0       0.0       1
12601801  0         0.762     0.0       0.7747094 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UPPER HEAD TOP PLATE
* STATION 325
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
12602000  1         5         1         1         0.0
12602100  0         1
12602101  4         0.474
12602201  5         4
12602301  0.0       4
12602401  560.0     5
12602501  260010000 0         1         1         0.712     1
12602601  -939      0         3949      1         0.712     1
12602701  0         0.0       0.0       0.0       1
12602801  0         0.0       0.0       0.712     1
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   STEAM GENERATOR HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TUBING
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
10060000  8         8         2         1         0.0051054
10060100  0         1
10060101  7         0.006348984
10060201  6         7
10060301  0.0       7
10060401  551.0     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
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SHROUD - UPPER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
15000000  2         4         2         1         0.3048
15000100  0         1
15000101  3         0.3143
15000201  5         3
15000301  0.0       3
15000401  539.0     4
15000501  500010000 0         1         0         0.85127   1
15000502  515050000 0         1         0         2.51199   2
15000601  503010000 0         1         0         0.87780   1
15000602  505010000 0         1         0         2.59028   2
15000701  0         0.0       0.0       0.0       2
15000801  0         0.0       0.0       0.0       2
15000901  0         0.0       0.0       0.0       2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SHROUD - LOWER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
15100000  4         4         2         1         0.6445
15100100  0         1
15100101  3         0.6572
15100201  5         3
15100301  0.0       3
15100401  533.0     4
15100501  515040000 0         1         1         0.646354  1
15100502  515030000 -10000    1         0         2.46858   4
15100601  508010000 0         1         1         0.646354  1
15100602  510010000 10000     1         0         2.51723   4
15100701  0         0.0       0.0       0.0       4
15100801  0         0.0       0.0       0.0       4
15100901  0         0.0       0.0       0.0       4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL WALL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
15250000  8         5         2         1         0.7112
15250100  0         1
15250101  4         0.76397
15250201  5         4
15250301  0.0       4
15250401  540.0     5
```

```
15250501  525010000 0         1         1         0.46956   1
15250502  520010000 0         1         1         0.46956   2
15250503  503010000 0         1         1         0.4445    3
15250504  505010000 0         1         1         1.2131    4
15250505  508010000 0         1         1         0.6096    5
15250506  510010000 10000     1         1         0.6096    8
15250601  -939      0         3959      1         0.46956   1
15250602  -939      0         3959      1         0.46956   2
15250603  -939      0         3959      1         0.4445    3
15250604  -939      0         3959      1         1.2131    4
15250605  -939      0         3959      1         0.6096    5
15250606  -939      0         3959      1         0.6096    8
15250701   0        0.0       0.0       0.0       8
15250801   0        0.0       0.0       0.0       8
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
* PIPING HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INTACT LOOP PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* .284 METER DIAMETER PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11001000  14        5         2         1         0.142
11001100  0         1
11001101  4         0.1780
11001201  4         4
11001301  0.0       4
11001401  560.0     5
11001501  100010000 0         1         1         1.58878   1
11001502  105010000 0         1         1         1.0531192 2
11001503  107010000 0         1         1         0.2810215 3
11001504  110010000 0         1         1         0.9207292 4
11001505  112010000 0         1         1         1.38893   5
11001506  118020000 0         1         1         0.688596  6
11001507  118030000 0         1         1         0.558577  7
11001508  120010000 0         1         1         0.759614  8
11001509  150010000 0         1         1         0.3542995 9
11001510  172010000 0         1         1         0.2844229 10
11001511  175010000 0         1         1         0.4163655 11
11001512  175020000 0         1         1         0.613244  12
11001513  180010000 0         1         1         1.15189   13
11001514  185010000 0         1         1         1.00965   14
11001601  -939      0         3949      1         1.58878   1
11001602  -939      0         3949      1         1.0531192 2
11001603  -939      0         3949      1         0.2810215 3
11001604  -939      0         3949      1         0.9207292 4
11001605  -939      0         3949      1         1.38893   5
11001606  -939      0         3949      1         0.688596  6
11001607  -939      0         3949      1         0.558577  7
11001608  -939      0         3949      1         0.759614  8
11001609  -939      0         3949      1         0.3542995 9
11001610  -939      0         3949      1         0.2844229 10
11001611  -939      0         3949      1         0.4163655 11
11001612  -939      0         3949      1         0.613244  12
11001613  -939      0         3949      1         1.15189   13
11001614  -939      0         3949      1         1.00965   14
11001701  0         0         0         0         14
```

```
11001801  0          0          0          1.58878    1
11001802  0          0          0          1.0531192  2
11001803  0          0          0          0.2810215  3
11001804  0          0          0          0.9207292  4
11001805  0          0          0          1.38893    5
11001806  0          0          0          0.688596   6
11001807  0          0          0          0.558577   7
11001808  0          0          0          0.759614   8
11001809  0          0          0          0.3542995  9
11001810  0          0          0          0.2844229  10
11001811  0          0          0          0.4163655  11
11001812  0          0          0          0.613244   12
11001813  0          0          0          1.15189    13
11001814  0          0          0          1.00965    14
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR CONNECTIONS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11002000  2          5          2          1          0.1625
11002100  0          1
11002101  4          0.203
11002201  4          4
11002301  0.0        4
11002401  560.0      5
11002501  112020000  0          1          1          0.707687   1
11002502  118010000  0          1          1          0.546638   2
11002601  -939       0          3949       1          0.707687   1
11002602  -939       0          3949       1          0.546638   2
11002701  0          0          0          0          2
11002801  0          0          0          0.707687   1
11002802  0          0          0          0.546638   2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* .216 METER DIAMETER PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11003000  7          5          2          1          0.108
11003100  0          1
11003101  4          0.1365
11003201  4          4
11003301  0.0        4
11003401  560.0      5
11003501  125010000  0          1          1          1.00308    1
11003502  130010000  0          1          1          0.457201   2
11003503  140010000  0          1          1          0.502185   3
11003504  145010000  0          1          1          1.40843    4
11003505  155010000  0          1          1          1.00308    5
11003506  160010000  0          1          1          0.457201   6
11003507  170010000  0          1          1          0.514071   7
11003601  -939       0          3949       1          1.00308    1
11003602  -939       0          3949       1          0.457201   2
11003603  -939       0          3949       1          0.502185   3
11003604  -939       0          3949       1          1.40843    4
11003605  -939       0          3949       1          1.00308    5
11003606  -939       0          3949       1          0.457201   6
11003607  -939       0          3949       1          0.514071   7
11003701  0          0          0          0          7
11003801  0          0          0          1.00308    1
11003802  0          0          0          0.457201   2
11003803  0          0          0          0.502185   3
11003804  0          0          0          1.40843    4
```

```
11003805  0          0          0          1.00308    5
11003806  0          0          0          0.457201   6
11003807  0          0          0          0.514071   7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR PLENA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
11004000  2          5          3          1          0.6858
11004100  0          1
11004101  4          0.7747
11004201  5          4
11004301  0.0        4
11004401  560.0      5
11004501  114010000  0          1          1          0.25       1
11004502  116010000  0          1          1          0.25       2
11004601  -939       0          3949       1          0.25       1
11004602  -939       0          3949       1          0.25       2
11004701  0          0          0          0          2
11004801  0          0          0          0.630      1
11004802  0          0          0          0.630      2
11004901  0          0          0          0.630      2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* NOZZLE PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13000000  3          5          2          1          0.1420
13000100  0          1
13000101  4          0.1780
13000201  4          4
13000301  0.0        4
13000401  560.0      5
13000501  300010000  0          1          1          0.876303   1
13000502  305010000  0          1          1          0.698336   2
13000503  310010000  0          1          1          0.974349   3
13000601  -939       0          3949       1          0.876303   1
13000602  -939       0          3949       1          0.698336   2
13000603  -939       0          3949       1          0.974349   3
13000701  0          0          0          0          3
13000801  0          0          0          0.876303   1
13000802  0          0          0          0.698336   2
13000803  0          0          0          0.974349   3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INLET TO STM GEN SIMULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13151000  3          5          2          1          0.0515
13151100  0          1
13151101  4          0.0705
13151201  4          4
13151301  0.0        4
13151401  545.0      5
13151501  310010000  0          1          1          0.525781   1
13151502  315010000  0          1          1          0.367768   2
13151503  315020000  0          1          1          0.552201   3
13151601  -939       0          3949       1          0.525781   1
13151602  -939       0          3949       1          0.367768   2
13151603  -939       0          3949       1          0.552201   3
13151701  0          0          0          0          3
13151801  0          0          0          0.525781   1
```

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13151802  0          0          0          0.36768    2
13151803  0          0          0          0.552201   3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR SIMULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13152000  6          5          2          1          0.1835
13152100  0          1
13152101  4          0.2285
13152201  4          4
13152301  0.0        4
13152401  545.0      5
13152501  315030000  10000      1          1          0.993978   2
13152502  315050000  10000      1          1          0.849744   4
13152503  315070000  10000      1          1          0.993978   6
13152601  -939       0          3949       1          0.993978   2
13152602  -939       0          3949       1          0.849744   4
13152603  -939       0          3949       1          0.993978   6
13152701  0          0          0          0          6
13152801  0          0          0          0.993978   2
13152802  0          0          0          0.849744   4
13152803  0          0          0          0.993978   6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STM GEN SIMULATOR OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13153000  1          5          2          1          0.0550
13153100  0          1
13153101  4          0.0705
13153201  4          4
13153301  0.0        4
13153401  545.0      5
13153501  315090000  0          1          1          1.371350   1
13153601  -939       0          3949       1          1.371350   1
13153701  0          0          0          0          1
13153801  0          0          0          1.371350   1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SIMULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13154000  1          5          2          1          0.1420
13154100  0          1
13154101  4          0.1780
13154201  4          4
13154301  0.0        4
13154401  545.0      5
13154501  315100000  0          1          1          1.365029   1
13154601  -939       0          3949       1          1.365029   1
13154701  0          0          0          0          1
13154801  0          0          0          1.365029   1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP SIMULATOR OUTLET
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13155000  1          5          2          1          0.0660
13155100  0          1
13155101  4          0.0840
13155201  4          4
13155301  0.0        4
13155401  545.0      5
13155501  315110000  0          1          1          1.674812    1
13155601  -939       0          3949       1          1.674812    1
```

```
13155701  0          0          0          0          1
13155801  0          0          0          1.674812   1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPING BETWEEN BREAK AND ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13156000  1          5          2          1          0.1285
13156100  0          1
13156101  4          0.1620
13156201  4          4
13156301  0.0        4
13156401  545.0      5
13156501  315120000  0          1          1          0.545209   1
13156601  -939       0          3949       1          0.545209   1
13156701  0          0          0          0          1
13156801  0          0          0          0.545209   1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* NOZZLE PIPING
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13350000  3          5          2          1          0.1420
13350100  0          1
13350101  4          0.1780
13350201  4          4
13350301  0.0        4
13350401  550.0      5
13350501  335010000  0          1          1          0.749305   1
13350502  340010000  0          1          1          0.698336   2
13350503  345010000  0          1          1          0.974349   3
13350601  -939       0          3949       1          0.749305   1
13350602  -939       0          3949       1          0.698336   2
13350603  -939       0          3949       1          0.974349   3
13350701  0          0          0          0          3
13350801  0          0          0          0.749305   1
13350802  0          0          0          0.698336   2
13350803  0          0          0          0.974349   3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SMALL PIPING NEAR BREAK
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13501000  1          5          2          1          0.0550
13501100  0          1
13501101  4          0.1780
13501201  4          4
13501301  0.0        4
13501401  545.0      5
13501501  345010000  0          1          1          0.525781   1
13501601  -939       0          3949       1          0.525781   1
13501701  0          0          0          0          1
13501801  0          0          0          0.525781   1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPING BETWEEN BREAK AND ISOLATION VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13502000  2          5          2          1          0.0865
13502100  0          1
13502101  4          0.1095
13502201  4          4
13502301  0.0        4
13502401  545.0      5
```

```
13502501  350010000 0         1         1         0.453394  1
13502502  350020000 0         1         1         1.074803  2
13502601  -939      0         3949      1         0.453394  1
13502602  -939      0         3949      1         1.074803  2
13502701  0         0         0         0         2
13502801  0         0         0         0.453394  1
13502802  0         0         0         1.074803  2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST PIPING AND VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13700000  6         5         2         1         0.111
13700100  0         1
13700101  4         0.1365
13700201  4         4
13700301  0.0       4
13700401  550.0     5
13700501  370010000 0         1         1         0.7251    1
13700502  370020000 0         1         1         1.8200    2
13700503  370030000 0         1         1         2.9055    3
13700504  380010000 0         1         1         2.2898    4
13700505  380020000 0         1         1         1.2231    5
13700506  380030000 0         1         1         1.1065    6
13700601  -939      0         3949      1         0.7251    1
13700602  -939      0         3949      1         1.8200    2
13700603  -939      0         3949      1         2.9055    3
13700604  -939      0         3949      1         2.2898    4
13700605  -939      0         3949      1         1.2231    5
13700606  -939      0         3949      1         1.1065    6
13700701  0         0         0         0         6
13700801  0         0         0         0.7246    1
13700802  0         0         0         1.820     2
13700803  0         0         0         1.7230    3
13700804  0         0         0         1.144     4
13700805  0         0         0         1.181     5
13700806  0         0         0         1.2586    6
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
* PRESSURIZER HEAT STRUCTURES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL BOTTOM
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14151000  1         5         1         1         0.0
14151100  0         1
14151101  4         0.0762
14151201  5         4
14151301  0.0       4
14151401  613.0     5
14151501  415010000 0         1         1         0.362     1
14151601  -939      0         3969      1         0.362     1
14151701  0         0         0         0         1
14151801  0         0.0       0.0       0.0       1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL SIDES - LARGE DIAMETER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14152000  6         5         2         1         0.42291
14152100  0         1
14152101  4         0.49911
```

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14152201  5          4
14152301  0.0        4
14152401  613.0      5
14152501  415010000  0          1          1          0.1815     1
14152502  415020000  0          1          1          0.1524     2
14152503  415030000  0          1          1          0.3967     3
14152504  415040000  0          1          1          0.5289     4
14152505  415050000  0          1          1          0.3967     5
14152506  415060000  0          1          1          0.1943     6
14152601  -939       0          3969       1          0.1815     1
14152602  -939       0          3969       1          0.1524     2
14152603  -939       0          3969       1          0.3967     3
14152604  -939       0          3969       1          0.5289     4
14152605  -939       0          3969       1          0.3967     5
14152606  -939       0          3969       1          0.1943     6
14152701  0          0          0          0          6
14152801  0          0.0        0.0        0.0        6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL SIDES - SMALL DIAMETER SECTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14153000  2          5          2          1          0.2032
14153100  0          1
14153101  4          0.3683
14153201  5          4
14153301  0.0        4
14153401  613.0      5
14153501  420010000  10000      1          1          0.1029     2
14153601  -939       0          3969       1          0.1029     2
14153701  0          0          0          0          2
14153801  0          0.0        0.0        0.0        2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VESSEL TOP
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
14201000  1          5          1          1          0.0
14201100  0          1
14201101  4          0.18415
14201201  5          4
14201301  0.0        4
14201401  613.0      5
14201501  420020000  0          1          1          0.13       1
14201601  -939       0          3969       1          0.13       1
14201701  0          0          0          0          1
14201801  0          0.0        0.0        0.0        1
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   HEAT STRUCTURE THERMAL PROPERTY DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100100  TBL/FCTN  1          1          * UO2
20100200  TBL/FCTN  1          1          * GAP
20100300  TBL/FCTN  1          1          * ZR
20100400  TBL/FCTN  1          1          * S-STEEL
20100500  C-STEEL
20100600  TBL/FCTN  1          1          * INCONEL 600
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* UO2 - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100101  2.7315E2  8.44
```

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20100102  4.1667E2  6.46
20100103  5.3315E2  5.782385
20100104  6.99817E2 4.633177
20100105  8.66483E2 3.880307
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----
* UO2 - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100151  2.73150E2 2.310427E6
20100152  3.23150E2 2.571985E6
20100153  3.73150E2 2.746357E6
20100154  6.7315E2  3.138694E6
20100155  1.37315E3 3.443844E6
20100156  1.77315E3 3.531030E6
20100157  1.97315E3 3.792588E6
20100158  2.17315E3 4.228518E6
20100159  2.37315E3 4.882412E6
20100160  2.67315E3 6.015829E6
20100161  2.77315E3 6.320980E6
20100162  2.87315E3 6.582538E6
20100163  2.97315E3 6.713317E6
20100164  3.11315E3 6.800503E6
20100165  4.69982E3 6.800503E6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* GAP - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100201  273.15    0.14
20100202  590.0     0.24
20100203  810.0     0.29
20100204  1090.0    0.36
20100205  1370.0    0.42
20100206  3260.0    0.75
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* GAP - VOLUMETRIC HEAT CAPACITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100251  273.15    5.4
20100252  3260.0    5.4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - THERMAL CONDUCTIVITY          FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100301  380.4     13.6
20100302  469.3     14.6
20100303  577.6     15.8
20100304  685.9     17.3
20100305  774.8     18.4
20100306  872.0     19.8
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20100307  973.2     21.8
20100308  1073.2    23.2
20100309  1123.2    25.4
20100310  1152.3    24.2
20100311  1232.2    25.5
20100312  1331.2    26.6
20100313  1404.2    28.2
20100314  1576.2    33.0
20100315  1625.2    36.7
20100316  1755.2    41.2
20100317  2273.2    55.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ZIRCALOY-4 - VOLUMETRIC HEAT CAPACITY      FROM MATPRO
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100351  300.0     1.841E6
20100352  400.0     1.978E6
20100353  640.0     2.168E6
20100354  1090.0    2.456E6
20100355  1093.0    3.288E6
20100356  1113.0    3.865E6
20100357  1133.0    4.028E6
20100358  1153.0    4.709E6
20100359  1173.0    5.345E6
20100360  1193.0    5.044E6
20100361  1213.0    4.054E6
20100362  1233.0    3.072E6
20100363  1243.0    2.332E6
20100364  1477.0    2.332E6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* S-STEEL - THERMAL CONDUCTIVITY
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20100401  273.15    12.98
20100402  1199.82   25.1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* S-STEEL - VOLUMETRIC HEAT CAPACITY
*---- ----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----
* INCONEL-600 - THERMAL CONDUCTIVITY
*---- ----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
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* INCONEL-600 - VOLUMETRIC HEAT CAPACITY
*---- ----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
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*         CONTROL VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  001-006  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
* 004 ACCUMULATOR LEVEL
*20500400  ACCMLVL   INTEGRAL  -6.3480-3 2.0447    0
*20500401  VELFJ     620010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  061-072  PRIMARY SYSTEM MASS CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 061 INTACT LOOP HOT LEG MASS
20506100  ILHLMASS  SUM       1.0       0.0       1
20506101  0.0       0.102752  RHO       100010000
20506102            7.57291-2 RHO       105010000
20506103            6.43178-2 RHO       110010000
20506104            7.96973-2 RHO       112010000
20506105            5.79614-2 RHO       112020000
* 062 STEAM GENERATOR PRIMARY MASS
20506200  SGPRIMASS SUM       1.0       0.0       1
20506201  0.0       0.335320  RHO       114010000
20506202            0.136356  RHO       115010000
20506203            9.21538-2 RHO       115020000
20506204            9.21538-2 RHO       115030000
20506205            6.99783-2 RHO       115040000
20506206            6.99783-2 RHO       115050000
20506207            9.21538-2 RHO       115060000
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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       0.0864164 RHO       200010000
20506502            0.0907360 RHO       205010000
20506503            0.1509710 RHO       210010000
20506504            0.0706690 RHO       210020000
20506505            0.1060015 RHO       210030000
20506506            0.0795138 RHO       210040000
20506507            0.0998947 RHO       210050000
20506508            0.06252   RHO       210060000
20506509            0.24520   RHO       215010000
20506510            0.29656   RHO       220010000
* 066 REACTOR VESSEL FILLER GAP MASS
20506600  FGAPMASS  SUM       1.0       0.0       1
20506601  0.0       0.0899085 RHO       223010000
20506602            0.0722790 RHO       223020000
20506603            0.0334096 RHO       223030000
20506604            0.03098   RHO       223040000
* 067 CORE/UPPER PLENUM MASS
20506700  CRUPMASS  SUM       1.0       0.0       1
20506701  0.0       0.12094   RHO       225010000
20506702            0.0683340 RHO       230010000
20506703            0.0478582 RHO       230020000
20506704            0.0483329 RHO       230030000
20506705            0.0479138 RHO       230040000
20506706            0.0479052 RHO       230050000
20506707            0.0750459 RHO       230060000
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
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20506714            0.1154214 RHO       251010000
20506715            0.2031741 RHO       255010000
20506716            0.1914909 RHO       260010000
* 068 BROKEN LOOP HOT LEG MASS
20506800  BLHLMASS  SUM       1.0       0.0       1
20506801  0.0       5.75410-2 RHO       300010000
20506802            4.42927-2 RHO       305010000
20506803            6.78467-2 RHO       310010000
20506804            3.07670-3 RHO       315010000
20506805            4.67621-3 RHO       315020000
20506806            8.60554-2 RHO       315030000
20506807            8.60554-2 RHO       315040000
20506808            8.97552-2 RHO       315050000
20506809            8.97552-2 RHO       315060000
20506810            8.60554-2 RHO       315070000
20506811            8.60554-2 RHO       315080000
20506812            1.82303-2 RHO       315090000
20506813            5.46687-2 RHO       315100000
20506814            1.82489-2 RHO       315110000
20506815            2.83241-2 RHO       315120000
20506816            9.15000-2 RHO       380010000
20506817            4.80000-2 RHO       380020000
20506818            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            6.73163-2 RHO       345010000
20506904            1.06640-2 RHO       350010000
20506905            4.07801-2 RHO       350020000
20506906            2.97722-2 RHO       360010000
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
20507009            7.32000-2 RHO       415060000
20507010            1.42000-2 RHO       420010000
20507011            1.42000-2 RHO       420020000
20507012            2.12609-3 RHO       430010000
* 071 REACTOR VESSEL TOTAL MASS
20507100  RVMASS    SUM       1.0       0.0       1
20507101  0.0       1.0       CNTRLVAR  65
20507102            1.0       CNTRLVAR  66
20507103            1.0       CNTRLVAR  67
* 072 PCS TOTAL MASS
20507200  PCSMASS   SUM       1.0       0.0       1
20507201  0.0       1.0       CNTRLVAR  61
20507202            1.0       CNTRLVAR  62
20507203            1.0       CNTRLVAR  63
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20507204            1.0       CNTRLVAR  64
20507205            1.0       CNTRLVAR  68
20507206            1.0       CNTRLVAR  69
20507207            1.0       CNTRLVAR  70
20507208            1.0       CNTRLVAR  71
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*  073-076  STEAM GENERATOR MASS CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 073 STEAM GENERATOR DOWNCOMER MASS
20507300  SGDCMASS  SUM       1.0       0.0       1
20507301  0.0       0.4384    RHO       503010000
20507302            1.4850    RHO       505010000
20507303            2.21070-1 RHO       508010000
20507304            1.41427-1 RHO       510010000
20507305            1.41427-1 RHO       510020000
20507306            1.41427-1 RHO       510030000
* 074 STEAM GENERATOR BOILER MASS
20507400  SGBLRMASS SUM       1.0       0.0       1
20507401  0.0       5.07675-1 RHO       515010000
20507402            5.07675-1 RHO       515020000
20507403            5.07675-1 RHO       515030000
20507404            5.07675-1 RHO       515040000
20507405            3.71565-1 RHO       515050000
20507406            0.2425    RHO       500010000
* 075 STEAM GENERATOR DOME AND PIPE MASS
20507500  SGDMMASS  SUM       1.0       0.0       1
20507501  0.0       0.705312  RHO       520010000
20507502            0.705312  RHO       525010000
20507503            1.162180  RHO       530010000
* 076 STEAM GENERATOR TOTAL MASS
20507600  SGMASS    SUM       1.0       0.0       1
20507601  0.0       1.0       CNTRLVAR  73
20507602            1.0       CNTRLVAR  74
20507603            1.0       CNTRLVAR  75
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   GENERAL TABLE DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*      TABLE
*      NUMBER       DESCRIPTION
*      ------       -----------
*
*       900         REACTOR POWER VS TIME AFTER SCRAM
*       939         ENVIRONMENTAL HEAT LOSS BOUNDARY TEMPERATURE
*       949         PRIMARY SYSTEM ENVR LOSS HEAT XFER COEFFICIENT
*       959         STEAM GENERATOR ENVR LOSS HEAT XFER COEFFICIENT
*       969         PRESSURIZER ENVR LOSS HEAT XFER COEFFICIENT
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER     699       1.0       45.9+6
20290001  0.0       1.0       * FROM F3S-20&F2-2 OF EDR L5-1
20290002  0.50      0.55374
20290003  1.00      0.18625
20290004  1.50      0.10259
20290005  2.00      0.08423
20290006  2.50      0.080020
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20290007  3.0       0.07603
20290008  3.5       0.072700
20290009  5.0       0.064940
20290010 10.0       0.055882
20290011  25.0      0.046738
20290012  65.       0.035
20290013  100.      0.031546
20290014  250.      0.025210
20290015  650.      0.0188
20290016  1000.     0.0164
20290017  1500.     0.0140
20290018  3000.     0.0110
20290019  5000.     0.0092
20290020  1.+5      0.001460  * CHANGED 89/11/06 BASED ON EDR F2-2   F3S-20
*-1-- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ENVIRONMENTAL HEAT LOSS BOUNDARY TEMPERATURE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20293900  TEMP
20293901  0.0       311.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY SYSTEM ENVIRONMENTAL LOSS HEAT XFER COEFFICIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20294900  HTC-T
20294901  0.0       10.76     * 174 KW FROM PCS (EXCEPT PZR)
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR ENVIRONMENTAL LOSS HEAT XFER COEFFICIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20295900  HTC-T
20295901  0.0       3.385     *  20 KW FROM STEAM GENERATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER ENVIRONMENTAL LOSS HEAT XFER COEFFICIENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20296900  HTC-T
20296901  0.0       3.019     *   6 KW FROM PRESSURIZER
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   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
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1351205   7.443200E-01        2.583000E-01
1351206   7.734800E-01        3.778000E-01
1351207   8.631300E-01        6.326000E-01
1351208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351300   1                   3
1351301   -1.000000E+00       2.472200E+00
1351302   -8.057400E-01       2.047400E+00
1351303   -6.069000E-01       1.831000E+00
1351304   -4.068300E-01       1.624000E+00
1351305   -2.001710E-01       1.470500E+00
1351306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351400   1                   4
1351401   -1.000000E+00       2.472200E+00
1351402   -8.229700E-01       1.996800E+00
1351403   -6.333200E-01       1.589700E+00
1351404   -4.553400E-01       1.327900E+00
1351405   -2.710900E-01       1.194900E+00
1351406   -1.771600E-01       1.060500E+00
1351407   -9.073000E-02       1.015600E+00
1351408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351500   1                   5
1351501   0.000000E+00        2.500000E-01
1351502   2.000000E-01        2.800000E-01
1351503   4.000000E-01        3.400000E-01
1351504   4.118000E-01        2.768000E-01
1351505   5.976300E-01        4.584000E-01
1351506   7.934670E-01        6.992000E-01
1351507   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351600   1                   6
1351601   0.000000E+00        9.342790E-01
1351602   9.109900E-02        9.229000E-01
1351603   1.865090E-01        8.963000E-01
1351604   2.717620E-01        8.750000E-01
1351605   4.558720E-01        8.433000E-01
1351606   5.744060E-01        8.355000E-01
1351607   7.405760E-01        8.466000E-01
1351608   7.666190E-01        8.469000E-01
1351609   8.714710E-01        8.838000E-01
1351610   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351700   1                   7
1351701   -1.000000E+00       -1.000000E+00
1351702   -8.000000E-01       -6.300000E-01
1351703   -6.000000E-01       -3.000000E-01
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1351704   -4.000000E-01       -5.000000E-02
1351705   -2.000000E-01       1.500000E-01
1351706   0.000000E+00        2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351800   1                   8
1351801   -1.000000E+00       -1.000000E+00
1351802   -8.000000E-01       -9.700000E-01
1351803   -6.000000E-01       -9.500000E-01
1351804   -4.000000E-01       -8.800000E-01
1351805   -2.000000E-01       -8.000000E-01
1351806   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351900   2                   1
1351901   0.000000E+00        6.032000E-01
1351902   1.930000E-01        6.325000E-01
1351903   3.930000E-01        7.369000E-01
1351904   5.955200E-01        8.331000E-01
1351905   7.978200E-01        9.229000E-01
1351906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352000   2                   2
1352001   0.000000E+00        -6.700000E-01
1352002   4.000000E-01        -2.500000E-01
1352003   5.000000E-01        1.500000E-01
1352004   7.372550E-01        5.265860E-01
1352005   7.680490E-01        6.065940E-01
1352006   8.672300E-01        7.436600E-01
1352007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352100   2                   3
1352101   -1.000000E+00       1.984300E+00
1352102   -8.009600E-01       1.394000E+00
1352103   -6.063800E-01       1.097500E+00
1352104   -4.068600E-01       8.220000E-01
1352105   -1.992800E-01       6.648000E-01
1352106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352200   2                   4
1352201   -1.000000E+00       1.984300E+00
1352202   -8.223400E-01       1.830800E+00
1352203   -6.337100E-01       1.682400E+00
1352204   -4.585300E-01       1.557000E+00
1352205   -2.670230E-01       1.436200E+00
1352206   -1.761070E-01       1.387900E+00
1352207   -8.931000E-02       1.348100E+00
1352208   0.000000E+00        1.233610E+00
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352300   2                   5
1352301   0.000000E+00        -4.500000E-01
1352302   4.000000E-01        -2.500000E-01
1352303   5.000000E-01        0.000000E+00
1352304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352400   2                   6
1352401   0.000000E+00        1.233610E+00
1352402   9.064300E-02        1.196500E+00
1352403   1.885690E-01        1.109600E+00
1352404   2.734700E-01        1.041600E+00
1352405   4.586690E-01        8.958000E-01
1352406   5.744800E-01        7.807000E-01
1352407   7.381600E-01        6.134000E-01
1352408   7.685200E-01        5.849000E-01
1352409   8.700570E-01        4.877000E-01
1352410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352500   2                   7
1352501   -1.000000E+00       -1.000000E+00
1352502   -3.000000E-01       -9.000000E-01
1352503   -1.000000E-01       -5.000000E-01
1352504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352600   2                   8
1352601   -1.000000E+00       -1.000000E+00
1352602   -2.500000E-01       -9.000000E-01
1352603   -8.000000E-02       -8.000000E-01
1352604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L5-1 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353000   0
1353001   0.000000E+00        0.000000E+00
1353002   1.000000E-01        0.000000E+00
1353003   2.000000E-01        1.000000E-01
1353004   3.000000E-01        2.000000E-01
1353005   3.500000E-01        3.000000E-01
1353006   4.000000E-01        6.000000E-01
1353007   5.000000E-01        6.000000E-01
1353008   6.000000E-01        6.000000E-01
1353009   7.000000E-01        6.000000E-01
1353010   8.000000E-01        5.000000E-01
1353011   9.000000E-01        3.000000E-01
1353012   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1353100   0
1353101   0.000000E+00        0.000000E+00
1353102   1.000000E-01        0.000000E+00
1353103   2.000000E-01        1.000000E-01
1353104   3.000000E-01        3.000000E-01
1353105   3.500000E-01        5.000000E-01
1353106   4.000000E-01        7.500000E-01
1353107   5.000000E-01        7.500000E-01
1353108   6.000000E-01        7.500000E-01
1353109   7.000000E-01        7.500000E-01
1353110   8.000000E-01        7.500000E-01
1353111   9.000000E-01        5.000000E-01
1353112   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354100   1                   1
1354101   0.000000E+00        1.000000E+00
1354102   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354200   1                   2
1354201   0.000000E+00        1.000000E+00
1354202   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354300   1                   3
1354301   -1.000000E+00       -1.160000E+00
1354302   -9.000000E-01       -1.240000E+00
1354303   -8.000000E-01       -1.770000E+00
1354304   -7.000000E-01       -2.360000E+00
1354305   -6.000000E-01       -2.790000E+00
1354306   -5.000000E-01       -2.910000E+00
1354307   -4.000000E-01       -2.670000E+00
1354308   -2.500000E-01       -1.690000E+00
1354309   -1.000000E-01       -5.000000E-01
1354310   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354400   1                   4
1354401   -1.000000E+00       -1.160000E+00
1354402   -9.000000E-01       -7.800000E-01
1354403   -8.000000E-01       -5.000000E-01
1354404   -7.000000E-01       -3.100000E-01
1354405   -6.000000E-01       -1.700000E-01
1354406   -5.000000E-01       -8.000000E-02
1354407   -3.500000E-01       0.000000E+00
1354408   -2.000000E-01       5.000000E-02
1354409   -1.000000E-01       8.000000E-02
1354410   0.000000E+00        1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354500   1                   5
1354501   0.000000E+00        0.000000E+00
1354502   2.000000E-01        -3.400000E-01
1354503   4.000000E-01        -6.500000E-01
1354504   6.000000E-01        -9.300000E-01
1354505   8.000000E-01        -1.190000E+00
1354506   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354600   1                   6
1354601   0.000000E+00        1.100000E-01
1354602   1.000000E-01        1.300000E-01
1354603   2.500000E-01        1.500000E-01
1354604   4.000000E-01        1.300000E-01
1354605   5.000000E-01        7.000000E-02
1354606   6.000000E-01        -4.000000E-02
1354607   7.000000E-01        -2.300000E-01
1354608   8.000000E-01        -5.100000E-01
1354609   9.000000E-01        -9.100000E-01
1354610   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354700   1                   7
1354701   -1.000000E+00       0.000000E+00
1354702   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354800   1                   8
1354801   -1.000000E+00       0.000000E+00
1354802   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354900   2                   1
1354901   0.000000E+00        1.000000E+00
1354906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355000   2                   2
1355001   0.000000E+00        1.000000E+00
1355007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355100   2                   3
1355101   -1.000000E+00       1.984300E+00
1355102   -8.009600E-01       1.394000E+00
1355103   -6.063800E-01       1.097500E+00
1355104   -4.068600E-01       8.220000E-01
1355105   -1.992800E-01       6.648000E-01
1355106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355200   2                   4
1355201   -1.000000E+00       1.984300E+00
1355202   -8.223400E-01       1.830800E+00
1355203   -6.337100E-01       1.682400E+00
1355204   -4.585300E-01       1.557000E+00
1355205   -2.670230E-01       1.436200E+00
1355206   -1.761070E-01       1.387900E+00
1355207   -8.931000E-02       1.348100E+00
1355208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355300   2                   5
1355301   0.000000E+00        -4.500000E-01
1355302   4.000000E-01        -2.500000E-01
1355303   5.000000E-01        0.000000E+00
1355304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355400   2                   6
1355401   0.000000E+00        1.233610E+00
1355402   9.064300E-02        1.196500E+00
1355403   1.885690E-01        1.109600E+00
1355404   2.734700E-01        1.041600E+00
1355405   4.586690E-01        8.958000E-01
1355406   5.744800E-01        7.807000E-01
1355407   7.381600E-01        6.134000E-01
1355408   7.685200E-01        5.849000E-01
1355409   8.700570E-01        4.877000E-01
1355410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355500   2                   7
1355501   -1.000000E+00       -1.000000E+00
1355502   -3.000000E-01       -9.000000E-01
1355503   -1.000000E-01       -5.000000E-01
1355504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355600   2                   8
1355601   -1.000000E+00       -1.000000E+00
1355602   -2.500000E-01       -9.000000E-01
1355603   -8.000000E-02       -8.000000E-01
1355604   0.000000E+00        -6.700000E-01
* $$$ REMOVE ALL REMAINING DATA CARDS AFTER ACHIEVING STEADY STATE
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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1651100   1                   1
1651101   0.000000E+00        1.403600E+00
1651102   1.906100E-01        1.363600E+00
1651103   3.896300E-01        1.318600E+00
1651104   5.939600E-01        1.232800E+00
1651105   7.902000E-01        1.133600E+00
1651106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651200   1                   2
1651201   0.000000E+00        -6.700000E-01
1651202   2.000000E-01        -5.000000E-01
1651203   4.000000E-01        -2.500000E-01
1651204   5.755400E-01        0.000000E+00
1651205   7.443200E-01        2.583000E-01
1651206   7.734800E-01        3.778000E-01
1651207   8.631300E-01        6.326000E-01
1651208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651300   1                   3
1651301   -1.000000E+00       2.472200E+00
1651302   -8.057400E-01       2.047400E+00
1651303   -6.069000E-01       1.831000E+00
1651304   -4.068300E-01       1.624000E+00
1651305   -2.001710E-01       1.470500E+00
1651306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651400   1                   4
1651401   -1.000000E+00       2.472200E+00
1651402   -8.229700E-01       1.996800E+00
1651403   -6.333200E-01       1.589700E+00
1651404   -4.553400E-01       1.327900E+00
1651405   -2.710900E-01       1.194900E+00
1651406   -1.771600E-01       1.060500E+00
1651407   -9.073000E-02       1.015600E+00
1651408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1651500   1                   5
1651501   0.000000E+00        2.500000E-01
1651502   2.000000E-01        2.800000E-01
1651503   4.000000E-01        3.400000E-01
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
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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---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652100   2                   3
1652101   -1.000000E+00       1.984300E+00
1652102   -8.009600E-01       1.394000E+00
1652103   -6.063800E-01       1.097500E+00
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1652104   -4.068600E-01       8.220000E-01
1652105   -1.992800E-01       6.648000E-01
1652106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652200   2                   4
1652201   -1.000000E+00       1.984300E+00
1652202   -8.223400E-01       1.830800E+00
1652203   -6.337100E-01       1.682400E+00
1652204   -4.585300E-01       1.557000E+00
1652205   -2.670230E-01       1.436200E+00
1652206   -1.761070E-01       1.387900E+00
1652207   -8.931000E-02       1.348100E+00
1652208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652300   2                   5
1652301   0.000000E+00        -4.500000E-01
1652302   4.000000E-01        -2.500000E-01
1652303   5.000000E-01        0.000000E+00
1652304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652400   2                   6
1652401   0.000000E+00        1.233610E+00
1652402   9.064300E-02        1.196500E+00
1652403   1.885690E-01        1.109600E+00
1652404   2.734700E-01        1.041600E+00
1652405   4.586690E-01        8.958000E-01
1652406   5.744800E-01        7.807000E-01
1652407   7.381600E-01        6.134000E-01
1652408   7.685200E-01        5.849000E-01
1652409   8.700570E-01        4.877000E-01
1652410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652500   2                   7
1652501   -1.000000E+00       -1.000000E+00
1652502   -3.000000E-01       -9.000000E-01
1652503   -1.000000E-01       -5.000000E-01
1652504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1652600   2                   8
1652601   -1.000000E+00       -1.000000E+00
1652602   -2.500000E-01       -9.000000E-01
1652603   -8.000000E-02       -8.000000E-01
1652604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L5-1 TEST DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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1653000   0
1653001   0.000000E+00        0.000000E+00
1653002   1.000000E-01        0.000000E+00
1653003   2.000000E-01        1.000000E-01
1653004   3.000000E-01        2.000000E-01
1653005   3.500000E-01        3.000000E-01
1653006   4.000000E-01        6.000000E-01
1653007   5.000000E-01        6.000000E-01
1653008   6.000000E-01        6.000000E-01
1653009   7.000000E-01        6.000000E-01
1653010   8.000000E-01        5.000000E-01
1653011   9.000000E-01        3.000000E-01
1653012   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1653100   0
1653101   0.000000E+00        0.000000E+00
1653102   1.000000E-01        0.000000E+00
1653103   2.000000E-01        1.000000E-01
1653104   3.000000E-01        3.000000E-01
1653105   3.500000E-01        5.000000E-01
1653106   4.000000E-01        7.500000E-01
1653107   5.000000E-01        7.500000E-01
1653108   6.000000E-01        7.500000E-01
1653109   7.000000E-01        7.500000E-01
1653110   8.000000E-01        7.500000E-01
1653111   9.000000E-01        5.000000E-01
1653112   1.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PUMP 2-PHASE DIFFERENCE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654100   1                   1
1654101   0.000000E+00        1.000000E+00
1654102   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654200   1                   2
1654201   0.000000E+00        1.000000E+00
1654202   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654300   1                   3
1654301   -1.000000E+00       -1.160000E+00
1654302   -9.000000E-01       -1.240000E+00
1654303   -8.000000E-01       -1.770000E+00
1654304   -7.000000E-01       -2.360000E+00
1654305   -6.000000E-01       -2.790000E+00
1654306   -5.000000E-01       -2.910000E+00
1654307   -4.000000E-01       -2.670000E+00
1654308   -2.500000E-01       -1.690000E+00
1654309   -1.000000E-01       -5.000000E-01
1654310   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654400   1                  4
1654401   -1.000000E+00      -1.160000E+00
1654402   -9.000000E-01      -7.800000E-01
1654403   -8.000000E-01      -5.000000E-01
1654404   -7.000000E-01      -3.100000E-01
1654405   -6.000000E-01      -1.700000E-01
1654406   -5.000000E-01      -8.000000E-02
1654407   -3.500000E-01      0.000000E+00
1654408   -2.000000E-01      5.000000E-02
1654409   -1.000000E-01      8.000000E-02
1654410   0.000000E+00       1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654500   1                  5
1654501   0.000000E+00       0.000000E+00
1654502   2.000000E-01       -3.400000E-01
1654503   4.000000E-01       -6.500000E-01
1654504   6.000000E-01       -9.300000E-01
1654505   8.000000E-01       -1.190000E+00
1654506   1.000000E+00       -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654600   1                  6
1654601   0.000000E+00       1.100000E-01
1654602   1.000000E-01       1.300000E-01
1654603   2.500000E-01       1.500000E-01
1654604   4.000000E-01       1.300000E-01
1654605   5.000000E-01       7.000000E-02
1654606   6.000000E-01       -4.000000E-02
1654607   7.000000E-01       -2.300000E-01
1654608   8.000000E-01       -5.100000E-01
1654609   9.000000E-01       -9.100000E-01
1654610   1.000000E+00       -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654700   1                  7
1654701   -1.000000E+00      0.000000E+00
1654702   0.000000E+00       0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654800   1                  8
1654801   -1.000000E+00      0.000000E+00
1654802   0.000000E+00       0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1654900   2                  1
1654901   0.000000E+00       1.000000E+00
1654906   1.000000E+00       1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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1655000   2                   2
1655001   0.000000E+00        1.000000E+00
1655007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655100   2                   3
1655101   -1.000000E+00       1.984300E+00
1655102   -8.009600E-01       1.394000E+00
1655103   -6.063800E-01       1.097500E+00
1655104   -4.068600E-01       8.220000E-01
1655105   -1.992800E-01       6.648000E-01
1655106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655200   2                   4
1655201   -1.000000E+00       1.984300E+00
1655202   -8.223400E-01       1.830800E+00
1655203   -6.337100E-01       1.682400E+00
1655204   -4.585300E-01       1.557000E+00
1655205   -2.670230E-01       1.436200E+00
1655206   -1.761070E-01       1.387900E+00
1655207   -8.931000E-02       1.348100E+00
1655208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655300   2                   5
1655301   0.000000E+00        -4.500000E-01
1655302   4.000000E-01        -2.500000E-01
1655303   5.000000E-01        0.000000E+00
1655304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655400   2                   6
1655401   0.000000E+00        1.233610E+00
1655402   9.064300E-02        1.196500E+00
1655403   1.885690E-01        1.109600E+00
1655404   2.734700E-01        1.041600E+00
1655405   4.586690E-01        8.958000E-01
1655406   5.744800E-01        7.807000E-01
1655407   7.381600E-01        6.134000E-01
1655408   7.685200E-01        5.849000E-01
1655409   8.700570E-01        4.877000E-01
1655410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1655500   2                   7
1655501   -1.000000E+00       -1.000000E+00
1655502   -3.000000E-01       -9.000000E-01
1655503   -1.000000E-01       -5.000000E-01
1655504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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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
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*     STEADY STATE CONTROL SYSTEM
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRIMARY COOLANT PUMP SPEED CONTROLLERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CALCULATE MASS FLOW ERROR
*---- ----1---- ----1---- ----1----
20590100  MSSERR    SUM       1.0       0.0       1
20590101  308.20    -1.0      MFLOWJ    100010000 * EJL 89/9/23
* SP       XXXXXX
* SP - HOT LEG MASS FLOW SETPOINT
*---- ----1---- ----1---- ----1----
* PUMP 1 SPEED
*---- ----1---- ----1---- ----1----
20590200  PCP1SPD   INTEGRAL  0.34482   321.95    1
20590201  CNTRLVAR  901
*---- ----1---- ----1---- ----1----
* PCP1 PUMP VELOCITY TABLE
*---- ----1---- ----1---- ----1----
1356100   501       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   328.74    1
20590301  CNTRLVAR  901
*---- ----1---- ----1---- ----1----
* PCP2 PUMP VELOCITY TABLE
*---- ----1---- ----1---- ----1----
1656100   501       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----
* PRESSURIZER SPRAY VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPRAY VALVE
*---- ----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
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*---- ----1---- ----1---- ----1----
* SPRAY VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590400  SPRAY     SUM       -1.0      0.0       1         * CONTIN
+         3         0.0       1.0
20590401  14.90+6   -1.0      P         420010000
* SP       XXXXXXX
* SP - TOP END OF PRESSURE CONTROL BAND ; SPRAY TURNS ON
*---- ----1---- ----1---- ----1----
* POSITION VS AREA TABLE
*---- ----1---- ----1---- ----1----
20299900  NORMAREA
20299901  0.0       0.0
20299902  0.0001    0.0
20299903  1.0       1.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER HEATERS IN INITIALIZATION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TRIP SETPOINTS
*---- ----1---- ----1---- ----1----
* LT  693  CYLCING HEATERS          CARD 20241700
0000585   P         100010000 GT    NULL      0       14.85+6    N
* SP                                                  XXXXXXX
* SP - BOTTOM END OF PRESSURE CONTROL BAND ; HEATERS TURN OFF
0000586   P         100010000 LT    NULL      0       14.8499+6  N
* SP                                                  XXXXXXXXX
* SP - (BOTTOM END . . .) - DELTA ; HEATERS TURN ON
0000666   586       OR        693       N
0000667   -585      AND       666       N
0000693   -503      AND       667       N
*---- ----1---- ----1---- ----1----
* LT  694  BACKUP HEATERS           CARD 20241800
0000587   P         420010000 GT    NULL      0       14.85+6    N
* SP                                                  XXXXXXX
* SP - BACKUP HEATERS TURN OFF
0000588   P         420010000 LT    NULL      0       14.84+6    N
* SP                                                  XXXXXXX
* SP - BACKUP HEATERS TURN ON
0000668   588       OR        694       N
0000669   -587      AND       668       N
0000694   -503      AND       669       N
*---- ----1---- ----1---- ----1----
* PRESSURIZER HEATERS
*---- ----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.      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----
* PRESSURIZER CYCLING HEATERS
*---- ----1---- ----1---- ----1----
20241700  POWER     693
20241701  -1.0      0.0
20241702  0.0       0.0
20241703  1.0       3.6+4
*---- ----1---- ----1---- ----1----
* PRESSURIZER BACKUP HEATERS
*---- ----1---- ----1---- ----1----
20241800  POWER     694
20241801  -1.0      0.0
20241802  0.0       0.0
20241803  1.0       3.6+4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PRESSURIZER LEVEL CONTROL USING CHARGING AND LETDOWN COMPONENTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MODIFY PZR LEVEL CONTROL VARIABLE
*---- ----1---- ----1---- ----1----
20500206            0.1249    VOIDF     415060000
20500207            0.02477   VOIDF     420010000
20500208            0.02447   VOIDF     420020000
*---- ----1---- ----1---- ----1----
* CHARGING RESERVIOR
*---- ----1---- ----1---- ----1----
9800000   "CHRG RESRV"        TMDPVOL
9800101   1.0       1.0       0.0       0.0       0.0       0.0
9800102   4.0-5     0.0       00
9800200   3
9800201   0.0       2.07+07   559.2
*---- ----1---- ----1---- ----1----
* CHARGING VALVE
*---- ----1---- ----1---- ----1----
9850000   "CHRG VALVE"        VALVE
9850101   980000000 185000000 3.8E-05   0.0       0.0       0100
9850201   0         .00000000 .00000000 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  1.09      -1.0      CNTRLVAR  2
* SP       XXXXX
* SP - BOTTOM END OF LEVEL CONTROL BAND ; CHARGING TURNS ON
*---- ----1---- ----1---- ----1----
* LETDOWN SINK
*---- ----1---- ----1---- ----1----
9900000   "LTDWN SINK"        TMDPVOL
9900101   1.0       1.0       0.0       0.0       0.0       0.0
9900102   4.0-5     0.0       00
9900200   3
9900201   0.0       1.4+7     559.2
*---- ----1---- ----1---- ----1----
* LETDOWN VALVE
*---- ----1---- ----1---- ----1----
9950000   "LTDWN VLV "        VALVE
```

```
9950101   185000000 990000000  2.5-5    0.0       0.0       0100
9950201   0         .00000000 .00000000 0.0
9950300   SRVVLV
9950301   906       999
*---- ----1---- ----1---- ----1----
* LETDOWN VALVE POSITION CALCULATOR
*---- ----1---- ----1---- ----1----
20590600  LETDOWN   SUM       -7.7     0.0       1         *CONTIN
+         3         0.0       1.0
20590601  1.11      -1.0      CNTRLVAR  2
* SP       XXXXX
* SP - TOP END OF LEVEL CONTROL BAND ; LETDOWN TURNS ON
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM VALVE CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CHANGES TO STEAM VALVE
*---- ----1---- ----1---- ----1----
5400201   0         16.946000 20.832000 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  552.30    -1.       TEMPF    185010000
* SP       XXXXXX
* SP - COLD LEG TEMPERATURE SETPOINT
*---- ----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  -0.25     -0.25
20290803  -0.25     0.0
20290804  0.25      0.0
20290805  0.25      0.25
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      0.645229  0         *CONTI
+         3         0.6       0.90
* SP                                   XXXXXXX
* SP - STEAM VALVE INITIAL POSTION
20591001  0.645229  -0.07126  CNTRLVAR  908
* SP       XXXXXXX
* SP - STEAM VALVE INITIAL POSITION
```

```
20591002            -0.01492  CNTRLVAR  909
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SIMPLIFIED FEED SYSTEM CONTROLLER
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20591100  SGLVLERR  SUM       1.0       0.0       1
20591101  3.20      -1.0      CNTRLVAR  001
* SP       XXXXXX
* SP - STEAM GENERATOR LEVEL SETPOINT
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    25.553    0.0       0.0
* SP                XXXXXX
* SP - INITIAL FEED FLOW RATE
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
5660208
5660209
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CONSTANT REACTOR POWER TABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER
20290001  0.0       45.9+6
20290002  100.      45.9+6
20290003  200.      45.9+6
20290004  1.E+3     45.9+6
20290005
20290006
20290007
20290008
20290009
20290010
20290011
20290012
20290013
20290014
20290015
20290016
20290017
20290018
20290019
20290020
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE TRIPS FOR STEADY STATE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     SCRAM
0000510   TIME      0         GE   NULL      0         1.+9      L
*     BREAK OPENS
0000511   TIME      0         GE   NULL      0         1.+9      L
*     HPIS ON
```

```
0000513   TIME      0         GE   NULL      0         1.+9      L
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
. . . . . RELAP5 END CARD
```

```
/JOB
L51T12,T6000.
/USER
ATTACH,RE364BX.
ATTACH,STH2XT.
*PURGE,L51TRP1/NA.
*DEFINE,RSTPLT=L51TRP1.
PURGE,L51PF12/NA.
DEFINE,PLOTFL=L51PF12.
ATTACH,RSTIN=L5SRP12.
FILE,RSTIN,SBF=NO.
FILE,RSTPLT,SBF=NO.
RFL,CM=350000,EC=200.
REDUCE(-)
RE364BX,,*PL=50000.
/EOR
= LOFT L5-1 ASSESSMENT CALCULATION (1-FLOW AND 2-PIN MODEL)
0000100   RESTART   TRANSNT
0000101   RUN
0000103   1845    * 89/11/10
0000105   5.0       10.0
0000201   10.0   1.0-6     0.02      3    5  2500 1000
0000202  300.0   1.0-6    0.05      3   20  2000  1000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE S. S.  PUMP SPEED CONTROLLERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20590100  MSSERR    DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590200  PCP1SPD   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
20590300  PCP2SPD   DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*****
*  CV 51 FOR INTEGRATED BREAK FLOW
****
20505100   INTBFLW    INTEGRAL    1.0   0.0   0
20505101   MFLOWJ     365000000
****
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PUMP1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1350000   "PCPUMP1   "        PUMP
1350101   0.0       0.4572    0.0991    0.0       90.0      0.317900
1350102   0
1350108   130010000 0.0       0.017     0.017     0000
1350109   140000000 0.0       0.05      0.05      0000
1350200   0         1.48280+7 1.22765+6 2.46363+6 0.
1350201   0         8.5604    8.5604    0.0
1350202   0         9.0732    9.0732    0.0
1350301     0    0    0        -1        -1       695         0
1350302   369.00000 .91140921 .31550000 96.000000 500.60000 1.4310000
1350303   613.6     0.0       207.433   .0444     19.5987   0.0
1350308   0.212845  0.0       -22.86511 27.16043  5.74589
1350310   0.0       0.0       0.0
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   PUMP DATA
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE HEAD CURVES
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351100   1                   1
1351101   0.000000E+00        1.403600E+00
1351102   1.906100E-01        1.363600E+00
1351103   3.896300E-01        1.318600E+00
1351104   5.939600E-01        1.232800E+00
1351105   7.902000E-01        1.133600E+00
1351106   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351200   1                   2
1351201   0.000000E+00        -6.700000E-01
1351202   2.000000E-01        -5.000000E-01
1351203   4.000000E-01        -2.500000E-01
1351204   5.755400E-01        0.000000E+00
1351205   7.443200E-01        2.583000E-01
1351206   7.734800E-01        3.778000E-01
1351207   8.631300E-01        6.326000E-01
1351208   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351300   1                   3
1351301   -1.000000E+00       2.472200E+00
1351302   -8.057400E-01       2.047400E+00
1351303   -6.069000E-01       1.831000E+00
1351304   -4.068300E-01       1.624000E+00
1351305   -2.001710E-01       1.470500E+00
1351306   0.000000E+00        1.403600E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351400   1                   4
1351401   -1.000000E+00       2.472200E+00
1351402   -8.229700E-01       1.996800E+00
1351403   -6.333200E-01       1.589700E+00
1351404   -4.553400E-01       1.327900E+00
1351405   -2.710900E-01       1.194900E+00
1351406   -1.771600E-01       1.060500E+00
1351407   -9.073000E-02       1.015600E+00
1351408   0.000000E+00        9.342790E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351500   1                   5
1351501   0.000000E+00        2.500000E-01
1351502   2.000000E-01        2.800000E-01
1351503   4.000000E-01        3.400000E-01
1351504   4.118000E-01        2.768000E-01
1351505   5.976300E-01        4.584000E-01
1351506   7.934670E-01        6.992000E-01
1351507   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
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1351600   1                   6
1351601   0.000000E+00        9.342790E-01
1351602   9.109900E-02        9.229000E-01
1351603   1.865090E-01        8.963000E-01
1351604   2.717620E-01        8.750000E-01
1351605   4.558720E-01        8.433000E-01
1351606   5.744060E-01        8.355000E-01
1351607   7.405760E-01        8.466000E-01
1351608   7.666190E-01        8.469000E-01
1351609   8.714710E-01        8.838000E-01
1351610   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351700   1                   7
1351701   -1.000000E+00       -1.000000E+00
1351702   -8.000000E-01       -6.300000E-01
1351703   -6.000000E-01       -3.000000E-01
1351704   -4.000000E-01       -5.000000E-02
1351705   -2.000000E-01       1.500000E-01
1351706   0.000000E+00        2.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351800   1                   8
1351801   -1.000000E+00       -1.000000E+00
1351802   -8.000000E-01       -9.700000E-01
1351803   -6.000000E-01       -9.500000E-01
1351804   -4.000000E-01       -8.800000E-01
1351805   -2.000000E-01       -8.000000E-01
1351806   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SINGLE PHASE TORQUE DATA
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1351900   2                   1
1351901   0.000000E+00        6.032000E-01
1351902   1.930000E-01        6.325000E-01
1351903   3.930000E-01        7.369000E-01
1351904   5.955200E-01        8.331000E-01
1351905   7.978200E-01        9.229000E-01
1351906   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352000   2                   2
1352001   0.000000E+00        -6.700000E-01
1352002   4.000000E-01        -2.500000E-01
1352003   5.000000E-01        1.500000E-01
1352004   7.372550E-01        5.265860E-01
1352005   7.680490E-01        6.065940E-01
1352006   8.672300E-01        7.436600E-01
1352007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352100   2                   3
```

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1352101   -1.000000E+00       1.984300E+00
1352102   -8.009600E-01       1.394000E+00
1352103   -6.063800E-01       1.097500E+00
1352104   -4.068600E-01       8.220000E-01
1352105   -1.992800E-01       6.648000E-01
1352106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352200   2                   4
1352201   -1.000000E+00       1.984300E+00
1352202   -8.223400E-01       1.830800E+00
1352203   -6.337100E-01       1.682400E+00
1352204   -4.585300E-01       1.557000E+00
1352205   -2.670230E-01       1.436200E+00
1352206   -1.761070E-01       1.387900E+00
1352207   -8.931000E-02       1.348100E+00
1352208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352300   2                   5
1352301   0.000000E+00        -4.500000E-01
1352302   4.000000E-01        -2.500000E-01
1352303   5.000000E-01        0.000000E+00
1352304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352400   2                   6
1352401   0.000000E+00        1.233610E+00
1352402   9.064300E-02        1.196500E+00
1352403   1.885690E-01        1.109600E+00
1352404   2.734700E-01        1.041600E+00
1352405   4.586690E-01        8.958000E-01
1352406   5.744800E-01        7.807000E-01
1352407   7.381600E-01        6.134000E-01
1352408   7.685200E-01        5.849000E-01
1352409   8.700570E-01        4.877000E-01
1352410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352500   2                   7
1352501   -1.000000E+00       -1.000000E+00
1352502   -3.000000E-01       -9.000000E-01
1352503   -1.000000E-01       -5.000000E-01
1352504   0.000000E+00        -4.500000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1352600   2                   8
1352601   -1.000000E+00       -1.000000E+00
1352602   -2.500000E-01       -9.000000E-01
1352603   -8.000000E-02       -8.000000E-01
1352604   0.000000E+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TWO - PHASE MULTIPLIER DATA FROM L3-6 TEST DATA
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----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
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1354309   -1.000000E-01       -5.000000E-01
1354310   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354400   1                   4
1354401   -1.000000E+00       -1.160000E+00
1354402   -9.000000E-01       -7.800000E-01
1354403   -8.000000E-01       -5.000000E-01
1354404   -7.000000E-01       -3.100000E-01
1354405   -6.000000E-01       -1.700000E-01
1354406   -5.000000E-01       -8.000000E-02
1354407   -3.500000E-01       0.000000E+00
1354408   -2.000000E-01       5.000000E-02
1354409   -1.000000E-01       8.000000E-02
1354410   0.000000E+00        1.100000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354500   1                   5
1354501   0.000000E+00        0.000000E+00
1354502   2.000000E-01        -3.400000E-01
1354503   4.000000E-01        -6.500000E-01
1354504   6.000000E-01        -9.300000E-01
1354505   8.000000E-01        -1.190000E+00
1354506   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354600   1                   6
1354601   0.000000E+00        1.100000E-01
1354602   1.000000E-01        1.300000E-01
1354603   2.500000E-01        1.500000E-01
1354604   4.000000E-01        1.300000E-01
1354605   5.000000E-01        7.000000E-02
1354606   6.000000E-01        -4.000000E-02
1354607   7.000000E-01        -2.300000E-01
1354608   8.000000E-01        -5.100000E-01
1354609   9.000000E-01        -9.100000E-01
1354610   1.000000E+00        -1.470000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354700   1                   7
1354701   -1.000000E+00       0.000000E+00
1354702   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HEAD CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354800   1                   8
1354801   -1.000000E+00       0.000000E+00
1354802   0.000000E+00        0.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1354900   2                   1
1354901   0.000000E+00        1.000000E+00
1354906   1.000000E+00        1.000000E+00
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355000   2                   2
1355001   0.000000E+00        1.000000E+00
1355007   1.000000E+00        1.000000E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355100   2                   3
1355101   -1.000000E+00       1.984300E+00
1355102   -8.009600E-01       1.394000E+00
1355103   -6.063800E-01       1.097500E+00
1355104   -4.068600E-01       8.220000E-01
1355105   -1.992800E-01       6.648000E-01
1355106   0.000000E+00        6.032000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 4
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355200   2                   4
1355201   -1.000000E+00       1.984300E+00
1355202   -8.223400E-01       1.830800E+00
1355203   -6.337100E-01       1.682400E+00
1355204   -4.585300E-01       1.557000E+00
1355205   -2.670230E-01       1.436200E+00
1355206   -1.761070E-01       1.387900E+00
1355207   -8.931000E-02       1.348100E+00
1355208   0.000000E+00        1.233610E+00
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 5
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355300   2                   5
1355301   0.000000E+00        -4.500000E-01
1355302   4.000000E-01        -2.500000E-01
1355303   5.000000E-01        0.000000E+00
1355304   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 6
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355400   2                   6
1355401   0.000000E+00        1.233610E+00
1355402   9.064300E-02        1.196500E+00
1355403   1.885690E-01        1.109600E+00
1355404   2.734700E-01        1.041600E+00
1355405   4.586690E-01        8.958000E-01
1355406   5.744800E-01        7.807000E-01
1355407   7.381600E-01        6.134000E-01
1355408   7.685200E-01        5.849000E-01
1355409   8.700570E-01        4.877000E-01
1355410   1.000000E+00        3.569000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 7
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355500   2                   7
1355501   -1.000000E+00       -1.000000E+00
1355502   -3.000000E-01       -9.000000E-01
1355503   -1.000000E-01       -5.000000E-01
1355504   0.000000E+00        -4.500000E-01
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TORQUE CURVE NO. 8
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1355600   2                   8
1355601   -1.000000E+00       -1.000000E+00
1355602   -2.500000E-01       -9.000000E-01
1355603   -8.000000E-02       -8.000000E-01
1355604   0.00000CE+00        -6.700000E-01
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* RENODALIZE PUMP 2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
1650000   "PCPUMP2   "        PUMP
1650101   0.0       0.514     0.0991    0.0       90.0      0.317900
1650102   0
1650108   160010000 0.0       0.017     0.017     0000
1650109   170000000 0.0       0.1       0.1       0000
1650200   0         1.48858+7 1.22768+6 2.46241+6 0.
1650201   0         7.7855    7.7855    0.0
1650202   0         8.0481    8.0481    0.0
1650301   135  135  135        -1        -1        697         0
1650302   369.00000 .92981030 .31550000 96.000000 500.60000 1.4310000
1650303   613.60000 .00000000 207.43300 .04440000 19.598700 .00000000
1650308   0.212845  0.0       -22.86511 27.16043  5.74589
1650310   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE  SPRAY VALVE AND CALCULATOR
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
4350000   SPRVLV    DELETE
20590400  SPRAY     DELETE    0.0  0.0  0.0  0.0  0.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE PRESSURIZER TRIPS AND HEATERS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000585   DISCARD
0000586   DISCARD
0000666   510       DISCARD
0000667   510       DISCARD
0000693   510       DISCARD
0000587   DISCARD
0000588   DISCARD
0000668   510       DISCARD
0000669   510       DISCARD
0000694   510       DISCARD
14172000  DELETE
20241700  DELETE
20241800  DELETE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE PRESSURIZER LEVEL CONTROLLERS, CHARGING COMPONENT, AND
* LETDOWN COMPONENT
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20500200  PZRLVL    SUM       1.0       0.0       1
20500201  0.0       0.1815    VOIDF     415010000
20500202            0.1524    VOIDF     415020000
20500203            0.3967    VOIDF     415030000
20500204            0.5289    VOIDF     415040000
20500205            0.3967    VOIDF     415050000
20500206            0.1943    VOIDF     415060000
20500207            0.1029    VOIDF     420010000
20500208            0.1029    VOIDF     420020000
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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       1100
5400201   0         16.963    20.945    0.0
5400300   MTRVLV
5400301   685       686       0.05      .649345   540
20254000  NORMAREA
20254001  0.0       7.066-3
20254002  7.066-3   7.066-3
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         688
5660201   0.0       25.593    0.0       0.0
5660202   0.7       0.0       0.0       0.0
5660203   59.5      0.0       0.0       0.0
5660204   60.0      0.50364   0.0       0.0
5660205   1860.0    0.50364   0.0       0.0
5660206   1861.0    0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE REACTOR POWER TABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20290000  POWER     699       1.0       45.9+6
20290001  0.0       1.0       * FROM F3S-20&F2-2 OF EDR L5-1  89/11/09
20290002  0.50      0.55374
20290003  1.00      0.18625
20290004  1.50      0.10259
20290005  2.00      0.08423
20290006  2.50      0.080020
20290007  3.0       0.07603
20290008  3.5       0.072700
20290009  5.0       0.064940
20290010  10.0      0.055882
20290011  25.0      0.046738
20290012  65.       0.035
20290013  100.      0.031546
20290014  250.      0.025210
20290015  650.      0.0188
20290016  1000.     0.0164
20290017  1500.     0.0140
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20290018  3000.      0.0110
20290019  5000.      0.0092
20290020  1.+5       0.001460  * CHANGED 89/11/06 BASED ON EDR F2-2   F3S-20
*-1-- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REPLACE TRIPS 510,511,513
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*     SCRAM
0000510   P         100010000 LT   NULL      0         1.4190+7 L
*     BREAK ISOLATION
0000511   TIME      0         LT   NULL      0         7302.    N
*     HPIS ON
0000513   P         100010000 LE   NULL      0         10.600+6 L
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*    RENODALIZE DEAD END OF FUEL MODULES AND BROKEN LOOP
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DEAD END OF FUEL MODULES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
2510000   "DE FL MODS"        SNGLVOL
2510101   0.0       0.7844123 0.1154214 0.0       90.0      0.7844123
2510102   3.81-6    0.214     00
2510200   0         1.49207+7 1.33213+6 2.46168+6 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP HOT LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3000000   "RVN BLHL  "        BRANCH
3000001   2         0
3000101   0.0       0.876303  0.0575410 0.0       0.0       0.0
3000102   4.0E-5    0.0       00
3000200   0         1.49144+7 1.25750+6 2.46181+6 0.0
3001101   252010000 300000000 0.067014  0.0       0.0       0002
3002101   300010000 305000000 0.063426  0.1       0.1       0000
3001201   0.0       0.0       0.0
3002201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* HOT LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3050000   "HLP-RABS T"        BRANCH
3050001   1         0
3050101   0.0       0.698336  0.0442927 0.0       0.0       0.0
3050102   4.0E-5    0.0       00
3050200   0         1.49144+7 1.25750+6 2.46181+6 0.0
3051101   305010000 310000000 0.0       0.1       0.1       0100
3051201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP HOT LEG CONTRACTION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3100000   "BLHL CONTR"        BRANCH
3100001   2         0
3100101   0.0       1.50013   0.0678467 0.0       0.0       0.0
3100102   4.0E-5    0.0       00
3100200   0         1.49144+7 1.25750+6 2.46181+6 0.0
3101101   380010000 310000000 0.0388    0.84      0.84      0100
3102101   310010000 315000000 0.0083647 0.0       0.0       0100
3101201   0.0       0.0       0.0
3102201   0.0       0.0       0.0
```

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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEAM GENERATOR AND PUMP SIMULATION
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3150000   "SG+PMP SIM"        PIPE
3150001   12
3150101   0.0        12
3150201   0.0083647  2
3150202   0.032603   4
3150203   0.105626   5
3150204   0.032603   7
3150205   0.0083647  9
3150206   0.008364   10
3150207   0.0046398  11
3150301   0.367768   1
3150302   0.552201   2
3150303   0.993978   4
3150304   0.849744   6
3150305   0.993978   8
3150306   1.371350   9
3150307   1.365029   10
3150308   1.674812   11
3150309   0.545209   12
3150401   3.0767-3   1
3150402   4.67621-3  2
3150403   8.60554-2  4
3150404   8.97552-2  6
3150405   8.60554-2  8
3150406   1.82303-2  9
3150407   5.46687-2  10
3150408   1.82489-2  11
3150409   2.83241-2  12
3150601   90.0       5
3150602   -90.0      10
3150603   90.0       11
3150604   0.0        12
3150701   0.127000   1
3150702   0.552201   2
3150703   0.993978   4
3150704   0.457202   5
3150705   -0.457202  6
3150706   -0.993978  8
3150707   -1.371350  9
3150708   -0.520701  10
3150709   1.212851   11
3150710   0.0        12
3150801   4.0E-5     0.0        3
3150802   4.0E-5     0.124      4
3150803   4.0E-5     0.0        6
3150804   4.0E-5     0.124      7
3150805   4.0E-5     0.0        12
3150901   0.2        0.2        1
3150902   0.0        0.0        2
3150903   93.9       93.9       4
3150904   0.4        0.4        5
3150905   93.9       93.9       7
3150906   0.0        0.0        8
3150907   0.2        0.2        9
3150908   4.1        4.1        10
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3150909   0.4       0.4       11
3151001   00        12
3151101   0000      1
3151102   0100      2
3151103   0000      7
3151104   0100      8
3151105   0000      10
3151106   0100      11
3151201   0         14914000. 1257500.  2461820.  0.0  0.0  01
3151202   0         14911400. 1257500.  2461870.  0.0  0.0  02
3151203   0         14905500. 1257500.  2461990.  0.0  0.0  03
3151204   0         14998100. 1257500.  2462150.  0.0  0.0  04
3151205   0         14992600. 1257500.  2462270.  0.0  0.0  05
3151206   0         14992600. 1257500.  2462270.  0.0  0.0  06
3151207   0         14998100. 1257500.  2462150.  0.0  0.0  07
3151208   0         14905500. 1257500.  2461990.  0.0  0.0  08
3151209   0         14914500. 1257500.  2461810.  0.0  0.0  09
3151210   0         14921600. 1257500.  2461660.  0.0  0.0  10
3151211   0         14919000. 1257500.  2461710.  0.0  0.0  11
3151212   0         14914300. 1257500.  2461810.  0.0  0.0  12
3151300   0
3151301   0.0       0.0       0.0       11
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REACTOR VESSEL NOZZLE - BROKEN LOOP COLD LEG
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3350000   "RVN BLCL  "        BRANCH
3350001   2         0
3350101   0.0       0.749305  0.047979  0.0       0.0       0.0
3350102   4.0E-5    0.0       00
3350200   0         1.49889+7 1.23500+6 2.46018+6 0.0
3351101   202000000 335000000 0.064130  1.0       1.0       0002
3352101   335010000 340000000 0.0       0.1       0.1       0000
3351201   0.0       0.0       0.0
3352201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG PIPE TO REFLOOD ASSIST BYPASS TEE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3400000   "CLP-RABS T"        BRANCH
3400001   1         0
3400101   0.0       0.698336  0.0443927 0.0       0.0       0.0
3400102   4.0E-5    0.0       00
3400200   0         1.49889+7 1.23500+6 2.46018+6 0.0
3401101   340010000 345000000 0.0       0.1       0.1       0100
3401201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* BROKEN LOOP COLD LEG CONTRACTION TO BREAK PLANE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3450000   "BLCL CONTR"        BRANCH
3450001   2         0
3450101   0.0634    0.974     0.0       0.0       0.0       0.0
3450102   4.0E-5    0.0       00
3450200   0         1.49889+7 1.23500+6 2.46018+6 0.0
3451101   345000000 370000000 0.0388    0.84      0.84      0100
3452101   345010000 350000000 0.0       0.0       0.0       0100
3451201   0.0       0.0       0.0
3452201   0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* SPOOL PIECE AND PIPE TO ISOLATION VALVE
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*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3500000   "BRK SP+PPE"        SNGLVOL
3500101   0.0525    0.823     0.0       0.0       0.0       0.0
3500102   4.0E-5    0.0       00
3500200   0         1.49889+7 1.23500+6 2.46018+6 0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REMOVE COLD LEG ISOLATION VALVE AND COLD LEG PIPE BETWEEN
* ISOLATION VALVE AND QOBV
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3550000   "CL ISO VLV"        DELETE
3600000   "CL IS-QOBV"        DELETE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* COLD LEG QUICK OPENING BLOWDOWN VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3650000   "CO QOBV   "        VALVE
3650101   350010000 805000000 1.729E-3  0.0       0.0       0100 1.0 1.0
3650201   0         0.0       0.0       0.0
3650300   MTRVLV
3650301   677 502  14.0  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - COLD LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3700000   "RABS C L  "        PIPE
3700001   3
3700101   0.0388    2
3700102   0.0776    3
3700201   0.0388    2
3700301   0.0       3
3700401   0.0279    1
3700402   0.070     2
3700403   0.1165    3
3700601   90.0      1
3700602   0.0       3
3700701   0.64      1
3700702   0.0       3
3700801   4.0-5     0.0       3
3700901   0.28      0.28      1
3700902   0.84      0.84      2
3701001   00        3
3701101   0000      2
3701201   0         1.49865+7 1.23500+6 2.46023+6 0.0  0.0  01
3701202   0         1.49841+7 1.23500+6 2.46028+6 0.0  0.0  02
3701203   0         1.49841+7 1.23500+6 2.46028+6 0.0  0.0  03
3701300   0
3701301   0.0       0.0       0.0       01
3701302   0.0       0.0       0.0       02
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS VALVES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3750000   "RABS VALVS"        SNGLJUN
3750101   370010000 380000000 0.0       1.55+2    1.55+2    0000
3750201   0         0.0       0.0       0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* REFLOOD ASSIST BYPASS PIPING - HOT LEG SIDE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
3800000   "RABS H L  "        PIPE
3800001   3
3800101   0.0776    1
```

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3800102   0.0388    3
3800201   0.0388    2
3800301   0.0       3
3800401   0.0915    1
3800402   0.048     2
3800403   0.0489    3
3800601   0.0       1
3800602   -90.0     2
3800603   0.0       3
3800701   0.0       1
3800702   -0.64     2
3800703   0.0       3
3800801   4.0-5     0.0       3
3800901   0.84      0.84      1
3800902   0.28      0.28      2
3801001   00        3
3801101   0000      2
3801201   0         1.49097+7 1.25750+6 2.46191+6 0.0  0.0  01
3801202   0         1.49121+7 1.25750+6 2.46186+6 0.0  0.0  02
3801203   0         1.49144+7 1.25750+6 2.46181+6 0.0  0.0  03
3801300   0
3801301   0.0       0.0       0.0       01
3801302   0.0       0.0       0.0       02
*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*$*
*
*   MINOR EDIT VARIABLES
*
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* STEADY STATE AND TRANSIENT PLOT REQUESTS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000301   P         250010000
0000302   P         530010000
0000303   TEMPF     250010000
0000304   TEMPF     185010000
0000305   TEMPF     515010000
0000306   MFLOWJ    540000000
0000309   CNTRLVAR  1
0000310   CNTRLVAR  2
0000311   MFLOWJ    566000000
0000313   MFLOWJ    100010000
0000314   P         420010000
0000315   VOIDG     500010000
0000316   VELFJ     112010000
0000317   VELGJ     112010000
0000318   TEMPF     215010000
0000319   MFLOWJ    365000000
0000320   RHO       100010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* TEMPERATURES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000321   SATTEMP   345010000           * TE-BL-1A,1B,1C
0000322   SATTEMP   310010000           * TE-BL-2A,2B,2C
0000323   SATTEMP   100010000           * TE-PC-2A,2B,2C
0000324   SATTEMP   180010000           * TE-PC-1
0000325   SATTEMP   114010000           * TE-SG-1
0000326   SATTEMP   116010000           * TE-SG-2
0000327   SATTEMP   510030000           * TE-SG-3
0000328   SATTEMP   415040000           * TE-139-19
```

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0000329   SATTEMP   415030000          * TE-139-20
0000330   SATTEMP   205010000          * TE-1ST-1 / TE-2ST-1
0000331   SATTEMP   210010000          * TE-1ST-2 / TE-2ST-2
0000332   SATTEMP   210050000          * TE-1ST-6 / TE-2ST-6
0000333   SATTEMP   210060000          * TE-1ST-7 / TE-2ST-7
0000334   SATTEMP   215010000          * TE-1ST-10 / TE-2ST-10
0000335   SATTEMP   220010000          * TE-1ST-13 / TE-2ST-13
0000336   SATTEMP   250010000          * TE-1UP-6
0000337   SATTEMP   251010000          * TE-2UP-4
0000338   SATTEMP   255010000          * TE-1UP-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* DENSITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000341   RHO       345010000          * DE-BL-1
0000342   RHO       310010000          * DE-BL-2
0000343   RHO       180010000          * DE-PC-1
0000344   RHO       100010000          * DE-PC-2
0000345   RHO       118020000          * DE-PC-3
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* VELOCITIES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000351   VELF      345010000          * FE-BL-1
0000352   MFLOWJ    630000000          * LPISL-2
0000353   VELF      180010000          * FE-PC-1
0000354   VELF      100010000          * FE-PC-2
0000355   VELG      345010000          * FE-BL-1
0000356   VELG      310010000          * FE-BL-2
0000357   VELG      180010000          * FE-PC-1
0000358   VELG      100010000          * FE-PC-2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* MASS FLOW RATES
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000361   MFLOWJ    345020000          * BREAK PLANE BLCL
0000362   MFLOWJ    315110000          * BREAK PLANE BLHL
0000363   MFLOWJ    345020000          * DTT-RAKE BLCL
0000364   MFLOWJ    310020000          * DTT-RAKE BLHL
0000365   MFLOWJ    180010000          * DTT-RAKE ILCL
0000366   MFLOWJ    100020000          * DTT-RAKE ILHL
0000367   MFLOWJ    400010000          * PRES. SURGE LINE FLOW
0000369   MFLOWJ    541010000          * FE-P4-12
0000370   MFLOWJ    566000000          * FE-P4-72-1
0000371    MFLOWJ    230010000       * REFLOODING FLOW
0000372    CNTRLVAR   51        *  INT BRK FLOW
0000373   HTTEMP    231000110
0000374   HTTEMP    231000210
0000375   HTTEMP    231000310
0000376   HTTEMP    231000410
0000377   HTTEMP    231000510
0000378   HTTEMP    231000610
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* CLADDING TEMPERATURES CONTROL MODULE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000381   HTTEMP    230000110          *
0000382   HTTEMP    230000210          *
0000383   HTTEMP    230000310          *
0000384   HTTEMP    230000410          *
0000385   HTTEMP    230000510          *
0000386   HTTEMP    230000610          *
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* LIQUID FRACTIONS IN THE PRESSURIZER                          *
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000391   VOIDF     415010000
0000392   VOIDF     415020000
0000393   VOIDF     415030000
0000394   VOIDF     415040000
0000395   VOIDF     415050000
0000396   VOIDF     415060000
0000397   VOIDF     420010000
0000398   VOIDF     420020000
0000309  CNTRLVAR  4  * ACC LEVEL -.32 M STAND PIPE
0000340  CNTRLVAR 10  * RX LEVEL
0000346  CNTRLVAR 71  * RX WATER INVENTORY
0000347  CNTRLVAR 72  * PRIMARY WATER INVENTORY
0000348  CNTRLVAR 73  * SECONDARY WATER INVENTORY
0000349  CNTRLVAR 81  * TIME STEP SIZE
0000350  MFLOWJ  600000000  * ECC TO CL
0000351  MFLOWJ  610000000  * ACCUMULATOR
0000352  MFLOWJ  640000000  * HPIS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"        SNGLVOL
6050101   5.9896-3  5.0148    0.0       0.0       90.0      3.3071202
6050102   4.0-5     0.0       00
6050200   0         13595900. 172410.   2489140.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "       SNGLVOL
6150101   0.0       25.997165 0.4074774 0.0       0.0       0.0
6150102   4.0-5     0.0       00
6150200   0         13580200. 112409.   2489450.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* PIPING BETWEEN BREAK AND VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
13502000  1         5         2         1         0.0865
13502100  0         1
13502101  4         0.1095
13502201  4         4
13502301  0.0       4
13502401  551.0     5
13502501  350010000 0         1         1         0.823     1
13502601  -939      0         3949      1         0.823     1
13502701  0         0         0         0         1
13502801  0         0         0         0.823     1
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* 069 BROKEN LOOP COLD LEG MASS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20506900  BLCLMASS  SUM       1.0       0.0       1
20506901  0.0       4.79790-2 RHO       335010000
20506902            4.43927-2 RHO       340010000
20506903            6.73163-2 RHO       345010000
20506904            4.32075-2 RHO       350010000
20506905            2.79000-2 RHO       370010000
20506906            7.00000-2 RHO       370020000
20506907            1.16500-1 RHO       370030000
```

```
*
*  REACTOR VESSEL LIQUID LEVEL CONTROL VARIABLE
*
20501000    RVLVL   SUM   0.2794034   0.0  1
20501001    0.0   1.0   VOIDF  230010000
20501002          1.0   VOIDF  230020000
20501003          1.0   VOIDF  230030000
20501004          1.0   VOIDF  230040000
20501005          1.0   VOIDF  230050000
20501006          1.0   VOIDF  230060000
*---
*
*  REPLACE HPIS 89.2.13
*---
*  DELAYED HPIS INJECTION
0000583    TIME,0   GE  TIMEOF,513   2.48   L   -1.0  *  89/11/08
0000683    583  AND  583   L
6400000   "HP1S"       TMDPJUN
6400101   635000000  185000000  5.9896-3
6400200   1          683        P        185010000   * 89/11/08
6400201  -1.0        0.0        0.0      0.0
6400202   0.0        0.700      0.0      0.0
6400203   3.5+6      0.575      0.0      0.0
6400204   6.6+6      0.460      0.0      0.0
6400205  17.0+6      0.100      0.0      0.0
*
*  LPIS CAPACITY CORRECTED BASED ON EXPERIMENT DATA TAPE
*
6300000   "LPIS "  TMDPJUN
6300101    625000000  605000000   5.9896-3
6300200    1   684    P    605010000
6300201    0.0   5.5  0.0  0.0
6300202    0.2+6 5.0  0.0  0.0
6300203    0.6+6 4.0  0.0  0.0
6300204    0.8+6 3.0  0.0  0.0
6300205    1.0+6 2.0  0.0  0.0
6300206    1.2+6 1.6  0.0  0.0
6300207    1.3+6 1.5  0.0  0.0
6300208    1.4+6 1.4  0.0  0.0
6300209    1.5+6 0.0  0.0  0.0
*
*---
*  IMPROVE ACCUMULATOR (E J LEE 89.2.28)
*---
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE TRIPS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
0000579   MFLOWJ    610000000 GE        NULL      0    0.0     N
0000580   CNTRLVAR  4         LT        NULL      0    1.050   L * EJL 89/10/23
*  MODIFIED THE LIMIT OF ACCUM EMPTY CASE INTO 1.52 FROM 0.939 (P160 EDR, 89.5.15) EJL
0000682   579       AND       -580      N
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR LEVEL CONTROL VARIABLE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
20500400  ACCMLVL   INTEGRAL  -6.549E-3 1.54      0
20500401  VELFJ     620010000
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECC CHECK VALVE
```

```
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6000000   "ECC CHKVLV"        VALVE
6000101   605010000 185000000 0.0       1.3869    1.3869    0100
6000201   0         0.0       0.0       0.0
6000300   TRPVLV
6000301   681
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ECCS HEADER TO PCS
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6050000   "ECCS HEADR"        SNGLVOL
6050101   5.989E-3  4.8247    0.0       0.0       90.0      2.2061
6050102   1.0165-5  0.0       10
6050200   0         1.66E+6    125472.   2600290.  0.0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VALVE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6100000   "ACCUM VLV "        VALVE
6100101   615010000 605000000 0.0       8.1009    8.1009    0000
6100201   0         0.0       0.0       0.0
6100300   TRPVLV
6100301   682
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR PIPE
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
6150000   "ACC PIPE  "        SNGLVOL
6150101   0.01608   24.5486   0.0       0.0       0.0       0.0
6150102   1.0165-5  0.0       10
6150200   3         1.66E+6   308.2
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
* ACCUMULATOR VESSEL
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*
*  MOVE TO S/S COMPONENT BY B. D. CHUNG
*
*
6200000   "ACCUMULATR"        ACCUM
6200101   1.254     1.8261563 0.0       0.0       -90.0     -1.8261563
6200102   2.286-5   0.0       10
6200200   1.66E+6   308.2
6201101   615000000 8.213E-3  6.7582    8.3202    0
6202200   1.10      0.0       4.0251    0.67056   0.04445   0 0 0 0
*---- ----1---- ----1---- ----1---- ----1---- ----1---- ----1----
*****************************************************************
***  TRIP CHANGE FOR L5-1
0000518   TIME  0  GE  NULL  0  4.0  N
0000695    518  AND   518    N
0000697    518  AND   518    N
*
*  LPIS
0000520   P  100010000   LT   NULL  0  1.08+6  N
*
*  RUN STATISTICS
*
20507800   OLDTIME SUM  1.   0.  0
20507801   0.   1.      CNTRLVAR 79
*
20507900   NEWTIME SUM  1.   0.  0
20507901   0.   1.      TIME 0.
```

```
*
20508100   TSTEP   SUM  1.   0.  0
20508101   0.      -1.  CNTRLVAR 78
20508102            1.  CNTRLVAR 79
*
*
*00   PLOT REQUEST VARIALES  *
*
20300100   P          250010000    * UPPLENUM PRESSURE(PE-1UP-1A1)
20300200   P          530010000    * STEAMDOME PRESSURE(PE-SGS-1)
20300300   HTTEMP     230000110
20300400   HTTEMP     230000210
20300500   HTTEMP     230000310
20300600   HTTEMP     230000410
20300700   HTTEMP     230000510
20300800   HTTEMP     230000610
20300900   HTTEMP    231000110  * PERIPHERAL 89/11/10
20301000   HTTEMP    231000210
20301100   HTTEMP    231000310
20301200   HTTEMP    231000410
20301300   HTTEMP    231000510
20301400   HTTEMP    231000610
20301600   VELFJ      112010000    * IL HL LIQUID VEL
20301700   VELGJ      112010000    * IL HL VAPOR VEL
20301800   RHO   100010000      * IL HL DENSITY(DE-PC-2)
20301900   RHO   345010000      * BL CL DENSITY(DE-BL-1)
20302000   MFLOWJ    365000000    *BREAK FLOW(FR-BL-111)
20302100   MFLOWJ    640000000    *HPIS FLOW
20302200   MFLOWJ    230010000    * REFLOODING  RATE
20302300   CPUTIME     0          *CPU TIME
*20302400    ACVLIQ      620000000  *ACCUMU VOL
20302500    MFLOWJ    545000000    * STEAM MASS OUT
20302600    MFLOWJ    540000000    * STAEM MASS OUT
20302700    MFLOWJ    569000000    * STEAM MASS IN
20302800    MFLOWJ    566000000    * STAEM MASS IN (AUX)
20302900   VOIDF    515010000    * SG2
20303000   VOIDF    515020000    *
20303100   VOIDF    515030000
20303200   VOIDF    515040000
20303300   VOIDF    515050000
20303400   VOIDG    250010000    * UPPER PLENUM
20303500   VOIDF    250010000
20303600   VOIDF    245010000
20303700   VOIDF    240010000
20303800   VOIDF    230060000
20303900   VOIDF    230050000
20304000   VOIDF    230040000
20304100   VOIDF    230030000
20304200   VOIDF    230020000
20304300   VOIDF    230010000
20304400   VOIDF    225010000
20304500   VOIDF    215010000
20304600   MFLOWJ   610000000
20304700   MFLOWJ   630000000    *LPIS
20304800   RHO    345010000     *DENSITY BEFORE BREAK
20304900   VOIDG 345010000
20305000   VELFJ    180010000    * LIQ VELOCITY AT ILCL (FE-PC-001B)
20305100  CNTRLVAR   1
```

```
20305200  CNTRLVAR   2
20305300  CNTRLVAR   4
20305400  CNTRLVAR   10
20305500  CNTRLVAR   71
20305600   CNTRLVAR   81   * TIME STEP DT FROM CV 81
20305700   MFLOWJ  100010000
20305800    CNTRLVAR  72
20305900    CNTRLVAR  51    * INT BRK FLOW
*
.  * END OF INPUT DATA
```

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10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

The LOFT intermediate break experiment L5-1, which simulates 12 inch diameter ECC line break in a typical PWR, has been analyzed using the reactor thermal/hydraulic analysis code RELAP/MOD2, Cycle 36.05. The base calculation, which modeled the core with single flow channel and two heat structures without using the options of reflood and gap conductance model has been successfully completed and compared with experimental data. Sensitivity studies were carried out to investigate the effects of nodalization at reactor vessel and core modeling on major thermal hydraulic parameters, especially on peak cladding temperature (PCT). These sensitivity items are: single flow channel and single heat structure (Case A), two flow channel and two heat structures (Case B), reflood options added (Case C) and both reflood and gap conductance options added (Case D). The code, RELAP/MOD2 Cycle 36.04 with the base modeling, predicted the key parameters of LOFT IBLOCA Test L5-1 better than Cases A, B, C and D. Thus, it is concluded that the single flow channel modeling for core is better than the two flow channel modeling and two heat structure is also better than a single heat structure modeling to predict PCT at the central fuel rods. It is recommended to use the reflood option and not to use gap conductance option for this L5-1 type IBLOCA.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*
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