



International Agreement Report

RELAP5/MOD3 Assessment Using the Semiscale 50% Feed Line Break Test S-FS-11

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Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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Prepared as part of
The Agreement on Research Participation and Technical Exchange
under the International Thermal-Hydraulic Code Assessment
and Application Program (ICAP)

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RELAP5/MOD3 ASSESSMENT USING THE SEMISCALE

50 % FEED LINE BREAK TEST S-FS-11

Abstract

The RELAP5/MOD3 5m5 code was assessed using the 1/1705 volume scaled Semiscale 50 % Feed Line Break (FLB) test S-FS-11. Test S-FS-11 was designed in three different phases: (a) blowdown phase, (b) stabilization phase, and (c) refill phase. The first objective was to assess the code applicability to 50 % FLB situation, the second was to evaluate FSAR conservatisms regarding SG heat transfer degradation, steam line check valve failure, break flow state, and peak primary system pressure, and the third was to validate the EOP effectiveness. The code was able to simulate the major T/H parameters except for the two-phase break flow and the secondary convective heat transfer rate. The two-phase break flow had still deficiencies. Correlations for the current boiling heat transfer coefficient were developed from the data for flow inside a heated tube, not for flow around heated tubes in a tube bundle. Results indicated that the assumption of 100 % heat transfer upto the liquid inventory depletion was not conservative, the failed affected steam generator main steam line check valve assumption was not conservative. The measured break flow experienced all types of flow conditions. The relative value to the 110 % design pressure limit was conservative. The automatic actions during the blowdown phase were effective in mitigating the consequences. The stabilization operation performed by operator actions was effective permitting natural circulation cooldown and depressurization. The voided secondary refill operations also verified the effectiveness of the operations while recovering the inventory in a voided steam generator.

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Executive Summary

This report presents RELAP5/MOD3 code assessment calculation using the Semiscale 50 % feed line break (FLB) test S-FS-11 data. The Semiscale test facility was scaled to be 1/1705 in volume and 1/1 in elevation scaled. The code and the experiment data were released from INEL under the auspices of USNRC. Test S-FS-11 was designed in three parts: (a) blowdown phase in which only automatically functioning plant protection systems (0-600 s), followed by (b) an operator controlled stabilization period including pressurizer warm-up heater operation, and a controlled intact loop(IL) steam generator(SG) feed operation (600-4000 s). Test S-FS-11 was concluded with (c) refill phase including break isolation and affected loop(AL) steam generator(SG) refill (4000-8000 s). The first objective was to provide the data base and the code applicability to 50 % FLB, the second was to evaluate the conservatisms used in FSAR such as the assumption of 100 % heat transfer reduction with liquid inventory depletion, the assumption of main steam line check valve failure, the assumption of break flow saturation state until the inventory depletion, and 110 % of the design peak primary pressure value. The third was to validate the EOP effectiveness. The code was able to simulate the major T/H parameters except for the secondary side convective heat transfer rate and pressure. The current convective boiling heat transfer correlations were developed from data for flow inside of a heated tube, not for flow around heated tube in a tube bundle. The AL SG auxiliary feedwater was injected earlier due to a rapid depressurization rate of the secondary pressure. The faster decrease in secondary pressure was attributable to the excessive steam exhaust. The secondary side convective heat transfer rate is a function of void and liquid inventory. The liquid

inventory and velocity affect the heat transfer rate significantly. The code overestimated the blowdown peak heat transfer rate probably due to the overestimated steam flowrate. AL SG heat transfer rate was underestimated during the refill phase so that the pressure was underestimated. Based on results it was found that the assumption of the 100 % heat transfer upto the liquid inventory depletion followed by a step change reduction in the heat transfer to 0 % was not conservative but it was estimated closely by the experiment and the code. The failed AL SG main steam line check valve assumption utilized for the C-E Systyem 80 FSAR Appendix 15 B bottom main feed line break calculations was not conservative based on the results of the experiment and the code. The intersecondary communication, due to the failure, produces increased steam flow from the intact SG, which increases or maintains its primary energy removal, thereby reducing the effect of losing the AL SG heat sink. The assumption regarding the break flow state(i.e., that saturated liquid was discharged until no liquid remained at which time saturated steam was discharged) was not appropriate because the measured break flow did not consist of only saturated liquid and saturated steam flow but exhibited a transition through the full range of condition(i.e.,subcooled liquid, to saturated liquid, to two-phase fluid, to saturated steam), and the code underpredicted the maximum flowrate. The estimated peak primary pressure represented a pressure near, but not quite at, 110 % of the design pressure limit. The relative value of 110 % design pressure limit motivated the need to perform best-estimate calculations with a thermal-hydraulic computer code. The major concern with regard to the system recovery from a bottom main feedwater line break accident was the effectiveness of the recovery operations specified in the plant Emergency Operating Procedures in recovering and maintaining control of the plant. The automatic actions

performed by the plant safety systems (SCRAM, SI initiation, MSIV closure) were effective in mitigating the consequence. The stabilization operation performed by operator actions (PZR internal heater operation, normal charging/letdown operation, and IL SG feed operation) was effective in stabilizing the system at conditions that would permit natural circulation cooldown and depressurization. The voided secondary refill operations verified the effectiveness of the operations for maintaining stable condition while recovering the inventory in a voided SG. The EOP-specified operation was very effective in maintaining control of the Semiscale Mod-2C system during these experiments.

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1. Introduction

The RELAP5/MOD3 code [1] has been developed by the Idaho National Engineering Laboratory (INEL) under the sponsorship of US Nuclear Regulatory Commission (USNRC) and its frozen version 5m5 was release at the end of 1990. The code has been assessed against various experimental data to provide input to code improvement and user guideline enhancement [2][3]. However, no assessment has been made against the steam generator (SG) bottom main feed line break (FLB) due to the limited data base and the recent release of the code.

One of the objectives from this assessment using the bottom main feed water line break test is to provide data to assist the USNRC in addressing the various concerns regarding this kind of events. The major concerns are the code applicability, conservatisms or assumptions used in FASR calculation, and the effectiveness of Emergency Operating Procedure (EOP) specified for recovering and cooling down the plant [4]. Specific objectives of this study are:

- to provide data base and applicable range of RELAP5/MOD3 5m5 for simulating 50 % feed line bottom break test, S-FS-11
- to evaluate the accuracy and the discrepancy of the code in predicting the TH behavior of the PCS (Primary Coolnat System) and SCS (Secondary Coolant System) during the test, especially focusing on
 - * Two phase break flow
 - * SG secondary pressure and heat transfer rate
 - * PCS pressurization/depressurization and cooldown

- to evaluate conservatisms used in the C-E System 80 FSAR App 15 B FLB calculations such as:
 - * SG 100 % heat transfer degradation with 100 % inventory depletion
 - * Failed main steam isolation valve (MSIV) check valve assumption
 - * Saturation state of the break flow
 - * 110 % of design primary pressure
- to validate the effectiveness of EOP during
 - * blowdown phase (0-600 s)
 - * stabilization phase (600-4000 s)
 - * refill phase (4000-8000 s)

This report was prepared to address the above questions. Descriptions of the Semiscale Mod-2C system and test S-FS-11 are given in Chapter 2. The code description, the input modelling and initial and boundary conditions are given in Chapter 3. The results of calculation are discussed in Chapter 4 and the run statistics given in Chapter 5. The conclusions obtained from the present assessment are summarized in Chapter 6.

2. Facility and Test Description

2.1 Facility Description

The Semiscale Mod-2C system configuration is illustrated in Fig. 1. The system is scaled from a reference four-loop PWR system based on the core power ratio, 2 MW/3411 MW [4]. Component elevations, dynamic pressure heads, and liquid distribution were maintained as similar as practical. The two-loop test configuration consisted of the vessel with a 25-rod electrically heated core with external downcomer, tube-and-shell steam generators and associated loop piping with circulation pumps. The affected loop (the loop in which the feed line break occurs) is scaled to represent one loop of a four-loop PWR. The Semiscale feedwater and feed line break Experiment Operating Specification contains more detailed information about specific components.

The facility configuration required for the FS Test Series is the Semiscale Mod-2C system. The Mod-2C system consists of the Mod-2B system with several modifications. A new "Type III" AL SG, new main steam line and feedwater line break assemblies, break effluent catch tank, and refined SG control systems have been incorporated into the system for this test series. A letdown line has been added to provide better control of primary system inventory. Scaling criteria specific to Test S-FS-11 are contained in the EOS Appendix [6]. The Type III AL SG design incorporates a downcomer which is external to the tube bundle and riser section (Fig. 2).

The bottom feedwater line break assembly for the AL SG consists of a break

flow nozzle and instrumentation to measure single-phase and two-phase break mass flows as well as fluid density, pressure and temperature. The break nozzle is interchangeable to allow simulation of a wide range of break sizes. For S-FS-11 a nozzle size of 0.609 cm was used to simulate the 50 % break size. Simulation of the MSIV closure will be realized by closing a valve in the connecting "crossoverline" between the SG's. Letdown simulation consists of a valve line connected to the AL cold leg, in which the flow rate is 0.01081 kg/s. Heat loss makeup is accomplished by using external heaters distributed fairly uniformly throughout the Semiscale system. Pressurizer internal heater simulation for Test S-FS-11 consisted of the system warmup heaters supplying 7.10 kW to maintain a primary system subcooling.

2.2 Test Description

Test S-FS-11 simulated a pressurized water reactor transient initiated by a 50 % break in a steam generator bottom feedwater line [5]. The accuracy of the measured parameters was summarized in the Appendix S-FS-11 of the experiment operating specification for the Semiscale Mod-2C feedwater and steam line break experiment series [6]. With the exception of primary pressure, the initial conditions represented those used for the C-E System 80 [7]. The reactor and turbine trip signals (SCRAM) were assumed to be generated by a high pressure signal. Loss-of-offsite power (LOP) was simulated to occur concurrently with SCRAM. The safety injection (SIS) and MSIV closure signals were assumed to be generated by a low steam generator pressure signal. SIS initiated the high pressure injection system (HPIS) and

auxiliary feedwater injection signals. The test was designed in three parts: (1) blowdown phase (0-600 s), (2) stabilization phase (600-4000 s), and (3) refill phase (4000-8000 s).

The test was initiated at $t=0$ s by opening the valve in the break assembly in the affected loop (AL) steam generator (SG). The simulated bottom feedwater line break (FLB), in conjunction with the simulated AL SG main steam line check valve failure, produced pressure drops and inventory losses in both SG secondary sides. Table 3 contains a sequence of events listing for S-FS-11. The first 600 s of the transient consisted of automatically occurring events such as main feedwater termination, core power decay initiation, normal steam flow control valve closure initiation, and HPIS flow initiation. The main feedwater was terminated at break initiation. The initiating event for the core power decay, normal steam flow control valve closure, and main coolant pump trip actions was a reactor and turbine trip (SCRAM) signal, due to a high pressurizer pressure of 15.86 MPa (2300.00 psia), compounded by a simulated LOP concurrent with the SCRAM signal. The initiating event for the MSIV closure action, and the auxiliary feedwater and HPIS initiation (SIS) actions was a low AL SG steam dome pressure of 4.47 MPa (648 psia). The recovery procedures for Test S-FS-11 consisted of: a) stabilization of the plant at the specified pressures, temperatures, and levels, using normal charging/letdown operations, pressurizer heater operation, and intact loop (IL) SG feed operation, and b) AL SG refill with auxiliary feedwater, while maintaining pressurizer level.

The plant stabilization procedure started at 600 s, the simulated time required for operator identification of the feed water line break event. The

AL SG auxiliary feedwater flow was terminated at 600 s. The pressurizer warm-up heaters, supplying 7.10 kw were cycled for 322 s at 120 s after the AL SG auxiliary feedwater termination to reestablish and maintain the primary system subcooling between 27.8 and 33.3 K. Safety injection (HPIS) flow termination criteria were satisfied at about 900 s with the primary system subcooled margin at 27.8 K and the pressurizer level at 250 cm. Since the primary system pressure remained above the 12.32 MPa HPIS shutoff head prior to HPIS flow termination, no HPIS flow injection occurred during the test. Charging flow was cycled, beginning at about 1062 s, to maintain the pressurizer level at 245 cm. Auxiliary feedwater flow was used to re-establish and maintain the IL SG secondary level between 910 and 1000 cm. The IL SG simulated atmospheric dump valve (ADV) was available to maintain the secondary pressure at < 6.98 MPa but was not needed. The plant was considered to be stabilized at 4055 s when the IL SG level reached 910 cm with all other stabilization criteria satisfied. No primary system voiding was produced during the stabilization phase of the test and all external heaters remained at full power throughout this part of the transient.

Following plant stabilization (4055 s) the AL SG refill was initiated by isolating the feedwater line break (4100 s) and commencing AL auxiliary feedwater (4100 s). The AL primary coolant pump was run at minimum speed starting at 4450 s to provide measurable primary tube flow rates for use in evaluating primary-to-secondary heat transfer during the refill phase. IL auxiliary feedwater was terminated at 5038 s when the IL SG secondary level had increased to 1000 cm. Normal charging flow was cycled throughout the refill phase to maintain the pressurizer level. AL auxiliary feedwater was

terminated upon meeting the refill criterion of 1036 cm at 7675 s. The test was terminated at 7700 s.

3. Code and Modelling Description

3.1 Code Description

RELAP5/MOD3 Version 5m5 [1], released by USNRC, was used in the present assessment calculation with Test S-FS-11. The features changed from the RELAP5/MOD2 were described in Reference [2].

3.2 Input Modelling

A standard input deck of Semiscale SBLOCA Test S-LH-1 for RELAP5/MOD2 was received from INEL in January 1991. The deck was modified for RELAP5/MOD3 to simulate the Semiscale SBLOCA Test S-NH-1 [8]. The conversion principle was based on the philosophy applied to model ROSA SBLOCA Test SB-CL-18 in Japan[9]. Some modifications were made as follows:

- Modeling options related to volume, junction, heat structure were properly modified to work with RELAP5/MOD3 [1].
- For steady state run, the following set points were changed:
 - * IL feed/steam flowrate control to keep the inventory (103 kg) constant
 - * BL feed/steam flowrate control to keep the inventory (26 kg) constant
 - * PZR inlet/outlet flowrate control to keep the level (484 cm) constant
 - * RCP speed control to keep flowrate (9.4 kg/s for IL and 3.3 kg/s for AL)
- For steady state run, the test specific trips were deleted out.
- A restart transient input data was developed by deleting steady state controllers and changing the test specific trips to be activated.

As in the nodalization diagram of Fig. 3, the Semiscale system was nodalized by 181 volumes, 174 junctions and 256 heat structures after implementing the items stated above. A steady state input deck and a transient input deck were provided in Appendice A and B of this report.

3.2.1 Primary Coolant System Modelling

The PCS composed of an intact loop and a broken loop, the former included a hot leg, a loop seal, a pump suction tee, two PCs and a cold leg. The intact loop was modelled by 13 hydrodynamic volumes. All piping metal structures exposed to environmental atmosphere were simulated by the heat structure to consider the associated heat loss. The detailed information can be found in Fig. 3. The volume and junction modelling options were set with default options.

3.2.2 Reactor Vessel Modelling

The Semiscale vessel was modelled by a downcomer annulus, a lower plenum, an active core, a core-bypass flow path, an upper plenum, an upper head. The active core and the downcomer were modeled by 6 volumes and 10 volumes stacked vertically, respectively. The rod bundle interphase friction model option was selected for the active core volumes. The axial power shape was described according to the reference [8]. The ANS-79 model was used for a decay heat simulation, which was changed from ANS-73 model in the posttest calculation.

3.2.3 Pressurizer Modelling

The pressurizer system was modelled by a surgeline, a pressurizer vessel, a spray line from the cold leg, a spray valve and an experiment PORV. Three volumes for the surge line, eight volumes for the vessel and one volume for the spray line were used, respectively. The spray valve and the PORV were simulated by the trip valves. The associated trip logics were prepared according to the experimental specification [5]. To consider the environmental heat loss from the pressurizer vessel wall, the vessel wall was modelled by nine heat structures.

3.2.4 Steam Generator Modelling

The steam generator consisted of a SG inlet plenum, U-tubes, an outlet plenum, a main feedwater tank and feed line, auxiliary feedwater tank and feed line, a feedwater inlet annulus, a SG secondary side downcomer, a boiler section, a separator inlet annulus, a separator, a steam dome, a steamline, a MSIV, MSCV, a MSCV downstream piping and a air-cooled condenser. The number of volumes used for each flow path is given in Fig. 3. The separator section in SG was modelled by a branch component with dead end in outlet side and a SEPARATOR component with inlet junction from the adjacent branch component.

The heat transfer area of U-tube heat structure in the intact loop SG generally affects the initial conditions in the SG secondary side. According to the previous Semiscale calculations using RELAP5/MOD2 [8], the predicted

pressure in SG secondary side were generally underpredicted by 0.4 MPa. This discrepancy may be due to the underestimation of heat transfer area in the SG U-tube.

3.2.5 Others

The emergency core cooling system (ECCS) in Semiscale was also modeled. Fig 3 and Appendix A provide a detailed information of ECCS. The containment was also modeled by a time-dependent volume with a constant pressure.

3.3 Initial and Boundary conditions

To obtain all initial conditions of the whole system prior to the transient, a steady state run was made with three steady state controllers as stated above. The result obtained from the steady state run was compared with the measured initial conditions in Table 1. The agreement between the measured and the predicted values for initial conditions is fairly good.

4. Calculation and Discussion

A transient calculation using the input modellings, initial conditions and boundary conditions stated in Chapter 3 was made with the RELAP5/MOD3 5m5 code. This chapter presents the results obtained from the transient calculation and compare the results with the measured data to assess the code applicability. Table 2 shows the predicted sequence of event along with the measured values. The detailed discussion of the comparison is provided for the following three phases:

- 1) blowdown phase (0-600 s)
- 2) stabilization phase (600-4000 s)
- 3) refill phase (4000-8000 s)

4.1 Blowdown Phase (0-600 s)

The blowdown phase is defined as the time interval between break initiation to a time when all automatic actions are completed and operator action is prepared. The measured and calculated break flow rates are compared in Fig. 4. The code underestimates the break flow rate for the first 20 s following the break initiation and also underestimates the maximum break flow rate. The code, however, overestimates the break flow rate from 20 s to 250 s because of the overestimated AL SG liquid inventory. The subcooled break flow rate is quite underestimated but the two-phase break flow rate is overestimated with this modeling. Fig. 5 shows the transient of the density

before break in the AL SG. The density decreases rapidly and increases again as the auxiliary feeding flow is injected. The code predicts the trends of the density properly so that the deficiency of the two-phase break flow model is not related to the poor prediction of the density. The crossover line valve is closed at 240 s, which simulates the failed MSIV failure allowing the intersecondary communicating flow rates between the SG's. The closure of the valve causes the AL SG steam dome pressure to decrease to zero (Fig. 9) and the IL SG steam dome pressure to increase again to its initial value (Fig. 19). The outgoing flow from the AL SG is increased by this flow in the crossover line. Fig. 6 shows the AL SG feed flow rate, which is terminated at 30 s and the trend is predicted fairly well. Fig. 7 shows the AL SG auxiliary feed flow rate, which is actuated by the AL SG secondary low pressure (4.47 MPa). The code predicts an earlier initiation time due to an overestimation of the AL SG steam flow rate (Fig. 8) and the rapid decrease of the AL SG secondary pressure (Fig. 9). Fig. 10 shows the AL SG secondary liquid mass inventory. The code predicts it closely during the first 20 s but overpredicts afterwards because of the early injected auxiliary feed flow rate and earlier closure of the steam valve. Fig. 11 shows the trend of the AL SG downcomer liquid level and the code underestimates the level as the pressure does. Fig. 12 shows that the AL SG heat transfer rate predicted by the code is fairly good. Fig. 13 shows the IL SG heat transfer rate, which is overpredicted due to the overestimated steam flow rate during the first 20 s. The AL SG secondary pressure decreases more quickly due to the steam flow rate. The lower decay power (Fig. 14) also caused not to repressurize and the crossoverline valve

closure affects the AL SG pressure to approach zero. Fig. 18 shows the trend of the IL SG secondary downcomer level. The code follows the trends of the measured values except for the timing due to the auxiliary feed initiation. Fig. 19 also shows the trend of the IL SG secondary pressure, which is underestimated by 1 MPa due to the earlier injection of the IL auxfeed flow (Fig. 16). The pressure, however, becomes stable after the crossoverline valve is closed at 200 s. The code underestimates, during the first 20 s, the IL SG secondary pressure probably due to the overestimated steam flow (Fig. 17). The overestimated steam flow causes to increase the IL SG heat transfer rate during the first 20 s. The failed main steam control line check valve assumption is not conservative since the communicating flow between the SG's increases the cooling capability. Also, the assumption of saturated state in break flow is not appropriate since the actual break flow experiences all types of the conditions. The value of 110 % primary pressure is found to be quite overestimated resulted from the improper assumptions. Fig. 21 shows the PZR liquid level and the level rises during the first 40 s because the heat sink capability is lost. Again, the level decreases after SCRAM and stays at 235 cm when auxiliary feeding starts. The normal charging set point of the PZR is 235 cm and the normal letdown set point is 255 cm. Fig. 22 shows the PZR pressure and the code predicts them fairly well except for the timing, which is related again to the rapid depressurization of the secondary pressure. The code also underpredicts the pressure due to the earlier injected auxiliary feed water flow rate. The charging contributes to repressurize, around 700 s, and the rate of the repressurization increases due to the internal heater operation

(Fig. 23). Fig. 26 shows the PZR saturation temperature and the code predicts fairly well. Fig. 27 shows the ILHL liquid temperature and the code underpredicts due to the earlier injection of the auxiliary feeding flow rate. The magnitude of the underestimation is about 20 K at around 100 s, which influences the subcooled margin to diverge as shown in Fig. 28. Fig. 29 shows the trend of upper plenum pressure. The trend is almost same as the one of the PZR pressure (Fig. 22). A SI signal is actuated by the SG low pressure but no flow is introduced into the system because the HPIS pump produces no flow at that pressure range. Fig. 30 and 31 show the trend of the AL and IL flow rate and the code predicts the RCP coastdown fairly well as can be seen in Fig. 32 and 33. The upper plenum temperature (Fig. 34) and the lower plenum temperature (Fig. 35) are underestimated by 20 K at around 600 s. Fig. 38 shows the trend of the IL SG secondary liquid void fraction and the upper part still has some liquid which enhances the heat transfer. However, Fig. 39 shows the trend of AL SG liquid void fraction, which decreases rapidly.

4.2 Stabilization Phase (600-4000 s)

The stabilization phase of Test S-FS-11 is defined to extend from 600 s to when criteria for a pressurizer liquid level (235-255 cm), primary subcooling (>27.8 K) and IL SG secondary pressure (<6.98 MPa) and liquid level (910-1000 cm) are met. These criteria are met at 4055 s in the test and predicted at 4000 s by the code.

Fig. 48 shows the PZR liquid level staying at 245 cm and the code predicts

the depressurization and the cooldown as in the trend of the PZR pressure (Fig. 49) and the ILHL liquid temperature (Fig 50). The calculated PZR pressure from 1000 s to 2000 s is overpredicted due to the earlier injection of the charging flow (Fig. 24 and 25). During the stabilization phase, the AL SG auxfeed is not operated so that the AL liquid mass inventory and SG downcomer level stays at zero level. Fig. 41 shows the AL SG secondary pressure staying at 0.1 MPa prior to the following refill phase. Fig. 45 shows the trend of IL SG auxiliary feed water flow rate feeding until 4500 s. Fig. 46 shows the IL SG secondary downcomer level. The level increases to 955 cm due to the feeding. Fig. 47 shows the IL SG secondary pressure approaching 6.98 MPa. The trend of the IL SG secondary downcomer level and the IL SG secondary pressure justifies the effectiveness of the EOP, indicating a safe operation with depressurization and cooldown as in Fig. 49 and 50.

4.3 Refill Phase

The refill phase of Test S-FS-11 is defined as the time interval from 4000 s to the end of the test at 8000 s. The refill phase starts with the initiation of the AL SG auxiliary feed water flow rate. This phase ends with the increased AL SG secondary pressure and the liquid level. The liquid level increases rapidly because the calculated aux feed is instated once but not cycled as in the measured. The final primary system pressure (Fig. 49) is underestimated because the secondary heat removal period is presumably extended longer than the measured (Fig. 40). The overestimated heat sink

contributed to the underestimation of the AL SG pressure. The IL SG secondary pressure ,however, is overestimated because the calculated IL SG aux feed is terminated earlier, the level is lower, and vapor is generated as in Fig. 47.

The code underestimates the AL SG secondary pressure (Fig. 41) due to the underestimated AL SG heat transfer rate (Fig. 42). The heat transfer rate is generally function of liquid inventory and void fraction. The IL SG secondary heat transfer rate is well predicted as the void varies (Fig. 57). The code predicts the heat transfer rate to decrease as the void decreases and the liquid inventory increases. This result is contrary to the one in the blowdown phase. The reason for this comes from the fact that the convective heat transfer correlation was developed for a flow inside tube not for a flow around heated tubes in a tube bundle [4]. EOP with the AL SG auxiliary feed water flow operation is validated with a voided SG refill because primary coolant system stably depressurizes and cools down. The trend of primary subcooled margin is properly predicted considering the scale of the plotting and the underestimation of the ILHL liquid temperature (Fig. 50).

5. Run Statistics

The main frame computer used in the present calculation was a CRAY-2S in System Engineering Research Institute (SERI), Korea under UNICOS as a operating system. Fig. 36 and 37 present the plots of the time step size and the CPU time for the transient time in the calculation from 0 to 1000 s. And Fig. 55 and 56 show the time step size and the CPU time used from 1000 s to 8000 s. The grind time can be calculated as follows:

Computer time, CPU = 1754+ 5059 = 6814

Number of time step, DT = 12250+28307 = 40557

Number of volume, C = 181

Transient real time, RT = 8000 (sec)

Grind time = CPU x 1000 / (C * DT) = 0.9080 CPU m sec/vol/step

6. Conclusions

The RELAP5/MOD3 5m5 code was assessed using the Semiscale test S-FS-11 for simulating the 50 % FLB. The assessment was performed in three different phases: (1) blowdown phase, (2) stabilization phase, and (3) refill phase. The calculated results were compared with the measured data to address the following questions:

- Code applicability to Semiscale FLB Test S-FS-11
- Code/Modeling deficiency
- FSAR conservatism evaluation
 - 100 % SG heat transfer degradation
 - failed MSIV
 - saturation state of break flow
 - 110 % of primary peak pressure
- EOP effectiveness

Main conclusions obtained from this assessment are:

- RELAP5/MOD3 5m5 can simulate Test S-FS-11 and the code can predict full scale PWR plant system response.
- The code underestimated the subcooled break flow rate and the maximum break flow rate. The two-phase break flow rate model still has some deficiency
- The SG secondary pressure and heat transfer rate were underestimated due to the fact that the initial phase steam flow was quite overestimated and

the boiling heat transfer correlation was developed for a flow inside tube not for a flow around heated tubes in a tube bundle.

- The modeling technique regarding the IL steam valve and recycled charging/letdown should be improved to match the measured data more closely.
- The assumptions and simplifications made for FSAR accident calculations were evaluated.

First, the assumption made for the bottom main feed water line break calculations regarding the reduction of heat transfer with liquid inventory (i.e., 100 % heat transfer until the liquid inventory is depleted followed by a step change reduction in the heat transfer to 0 %) is not conservative at all for the Semiscale Type III SG FLB case. The assumed heat transfer degradation actually closely simulated the heat transfer rate according to the inventory loss.

Second, the failed affected SG MSIV assumption utilized for the C-E System 80 FSAR was not a conservative assumption because the intersecondary communication, that occurs due to the failure, produces increased steam flow from the IL SG, thereby increasing heat sink capability.

Third, the assumptions regarding the break flow state (i.e., that saturated liquid was discharged until no liquid remained at which time saturated steam was discharged) was not appropriate because the measured break flow did not consist of only saturated liquid and saturated steam flow, but exhibited a transition through the full range of conditions (i.e., subcooled liquid, to saturated liquid, to two-phase liquid, to saturated steam).

Four, the estimated peak primary pressure represent pressures near, but not quite at, 110 % of the design pressure limit. So the need for performing

this best estimate calculation is justified.

- The effectiveness of EOP-specified operation was validated in three phases:

First, the automatic action performed by the plant safety systems (i.e., SCRAM, SI termination, and MSIV closure) was effective in mitigating the consequences.

Second, the stabilization operation performed following operator identification of the transient (i.e., SI termination, PZR internal heater operations, normal charging/letdown operations, and IL SG feed operation) was effective in stabilizing the system at conditions that would permit a natural circulation cooldown and depressurization.

Third, the voided secondary refill operations performed following the stabilization phase were verified to be the effectiveness of the operations for maintaining stable conditions while recovering the inventory in a voided SG with the AL SG auxiliary feed water flow rate

References

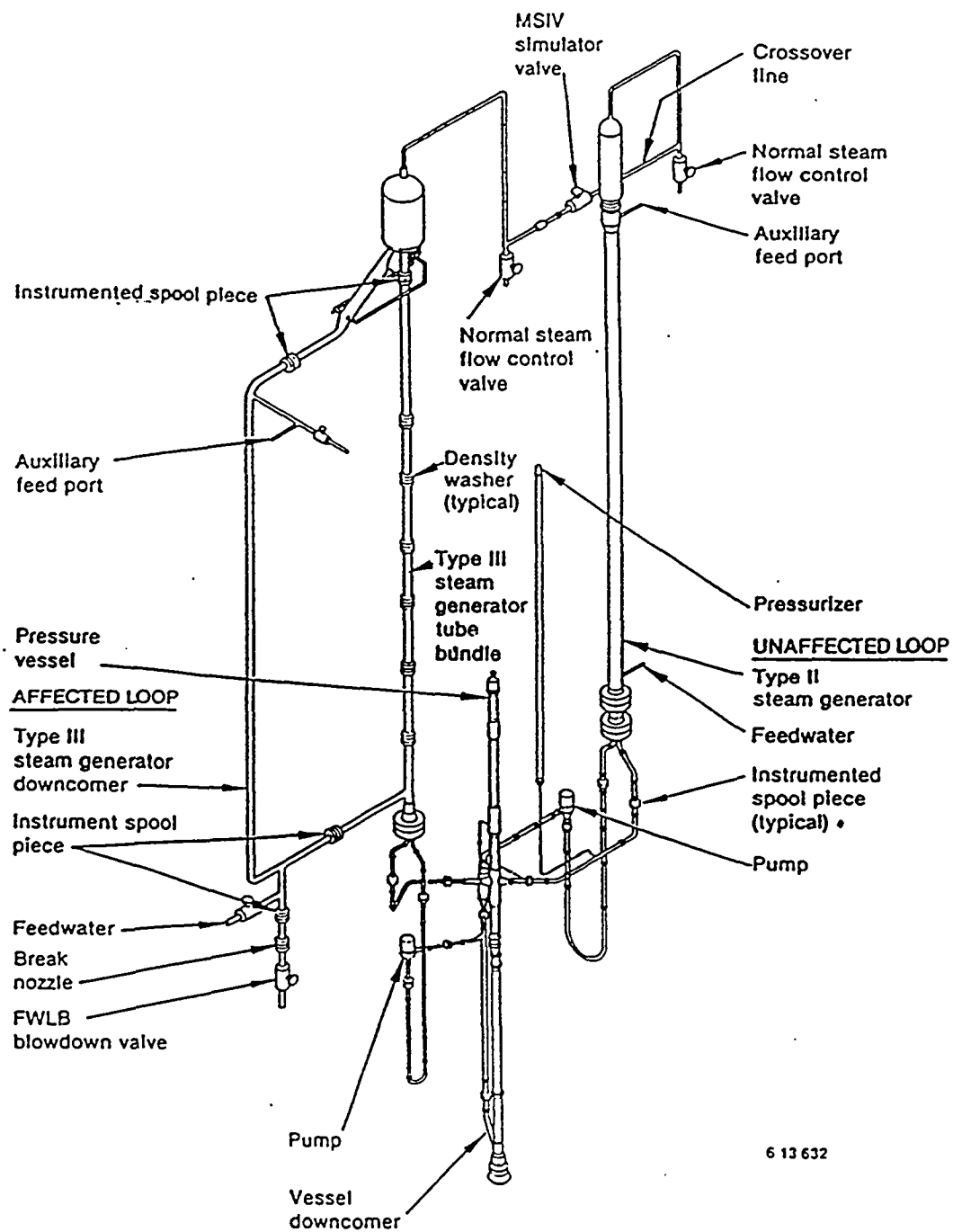
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2. W. Weaver, Improvement to the RELAP5/MOD3 Choking Model, EGG-EAST-8822, December 1989.
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4. T. J. Boucher, Results of Semiscale mod-2C Feedwater and Steam Line Break (S-FS) Experiment Series: Bottom Main Feedwater Line Break Accident Experiments, NUREG/CR-4898, EGG-2503, Feb 1988.
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6. T. J. Boucher, W. A. Owca, Appendix S-FS-11 of the Experiment Operating Specification for the Semiscale mod-2C Feedwater and Steam Line Break Experiment Series, EGG-SEMI-6909, June 1985.
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8. E. J. Lee et al, RELAP5 Assessment Using Semiscale SBLOCA Test S-NH-1, Submitted to INEL and USNRC, Mar 1991.
9. S. H. Lee et al, RELAP5 Assessment Using LSTF SB-CL-18, Submitted to INEL and USNRC, Feb 1991.

Table 1. Initial conditions for Test S-FS-11

<u>Parameter</u>	<u>Measured</u>	<u>RELAP5/MOD3</u>
Pressurizer pressure (MPa)	15.03	15.02
Core power (MW)	2.18	2.18
Core DT (K)	36.7	36.8
PZR liquid level (cm)	484.0	484.0
CL loop temperature difference (K)	4.5	3.8
CL fluid temperature (K)	568	572
IL primary flow rate (L/s)	9.4	9.4
AL primary flow rate (L/s)	3.3	3.3
IL SG secondary pressure (MPa)	6.27	6.24
AL SG secondary pressure (MPa)	6.23	6.22
IL SG secondary inventory (kg)	103	103
AL SG secondary inventory (kg)	26.0	26.3
IL SG feed flow rate (kg/s)	0.86	0.82
AL SG feed flow rate (kg/s)	0.24	0.25
IL SG feed temperature (K)	485.0	485.0
AL SG feed temperature (K)	481.0	481.0

Table 2. Sequence of events for Test S-FS-11

<u>Event</u>	<u>Description</u>	<u>Measured</u> (sec)	<u>Calculated</u> (sec)
Transient initiation		0.0	0.0
PZR pressure = 15.8 MPa	T=Tscram	23.0	24.0
RCP coastdown		25.0	26.0
Power decay		26.5	24.0
MSCV close		26.5	24.0
AL SG steam pressure = 4.47 MPa	T=Tsis	209.0	165.0
Aux feed initiation		211.0	165.0
HPIS initiation		211.0	165.0
Crossover line valve close		214.0	214.0
PZR heater (on/off)		(731/1053)	(731/1053)
AL SG aux feed restart		4100.0	4100.0
AL RCP restart		4450.0	4450.0
IL aux feed termination		5038.0	4500.0
Test termination		7600.0	7600.0



6 13 632

Fig.1 Axonometric configuration of Semiscale Mod-2C

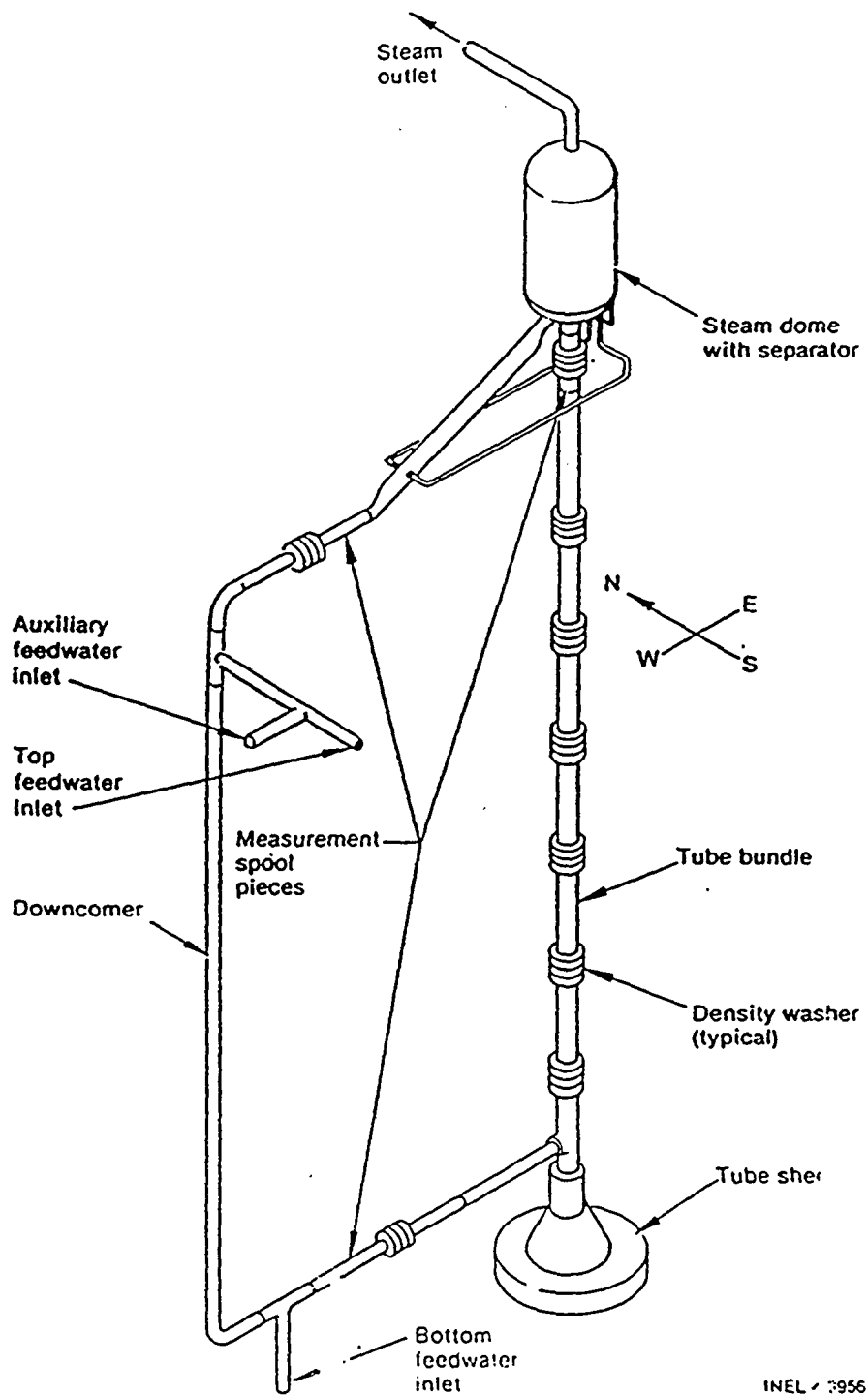


Fig.2 Semiscale Type III Affected Loop (AL) SG Configuration

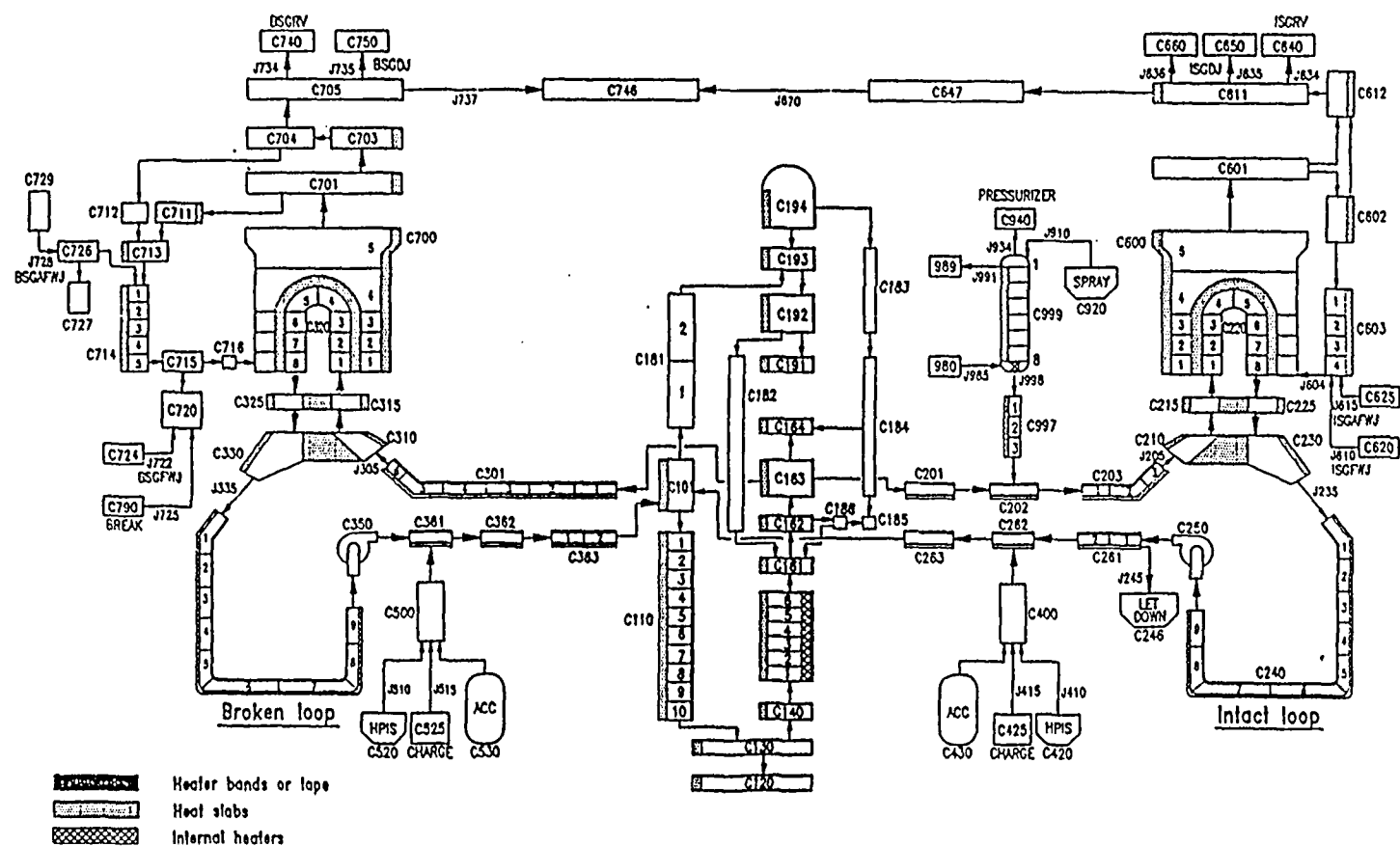


Fig.3 RELAP5 Nodalization for Semiscale Test S-FS-11

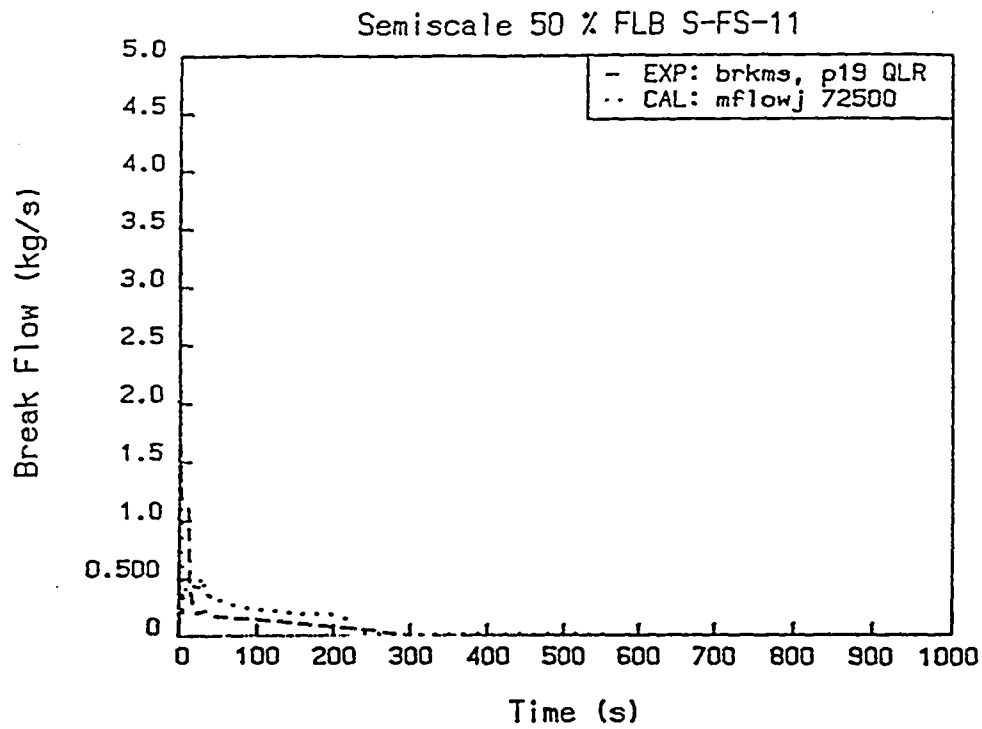


Fig.4 Affected Loop (AL) SG feedline break mass flowrate(0-1000s)

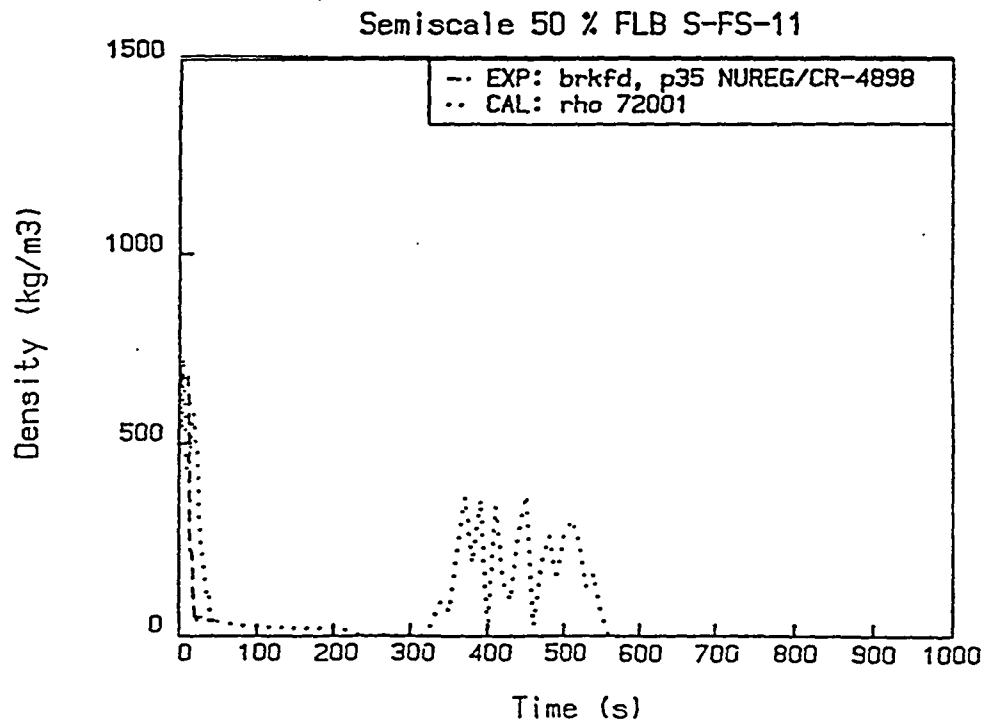


Fig.5 AL SG density before break

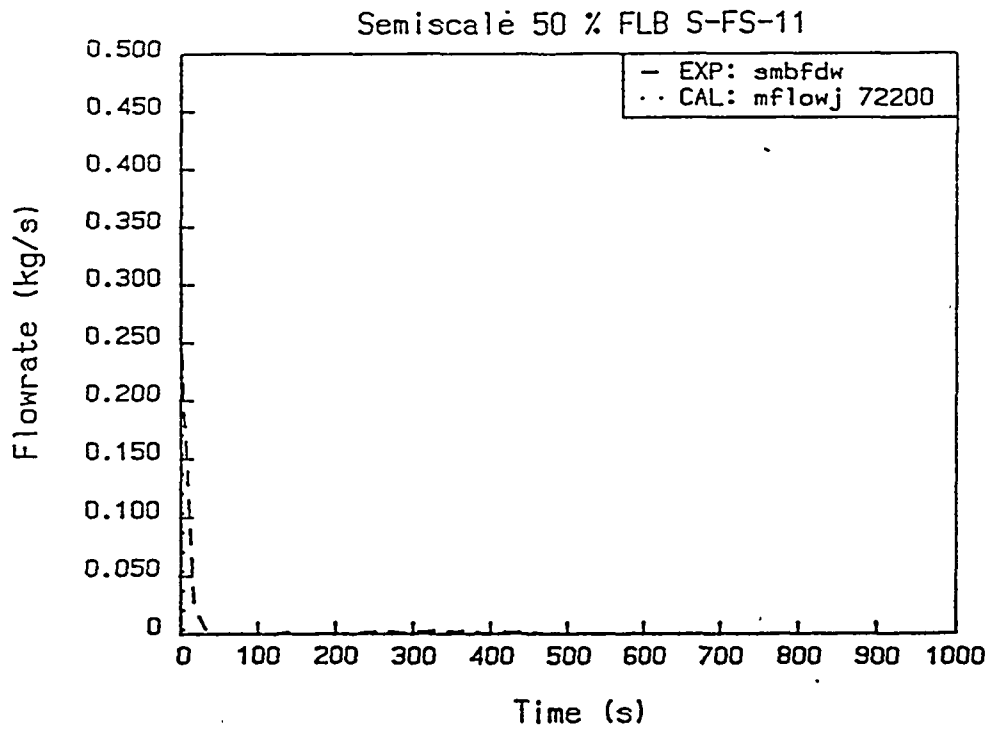


Fig.6 AL SG feed flowrate

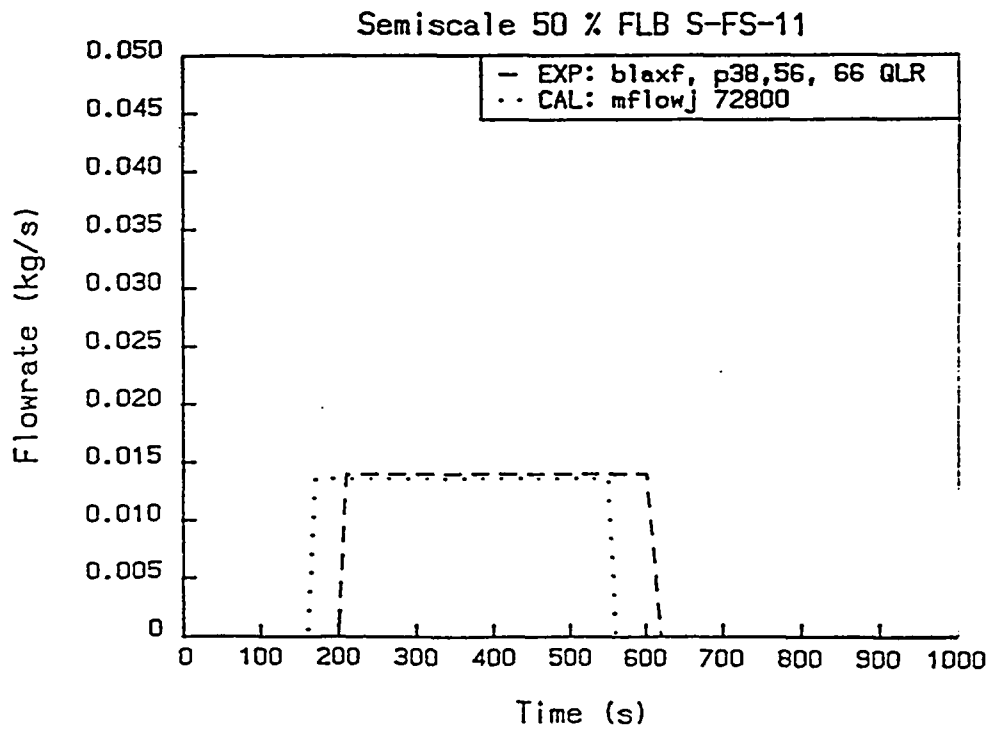


Fig.7 AL SG auxfeed flowrate

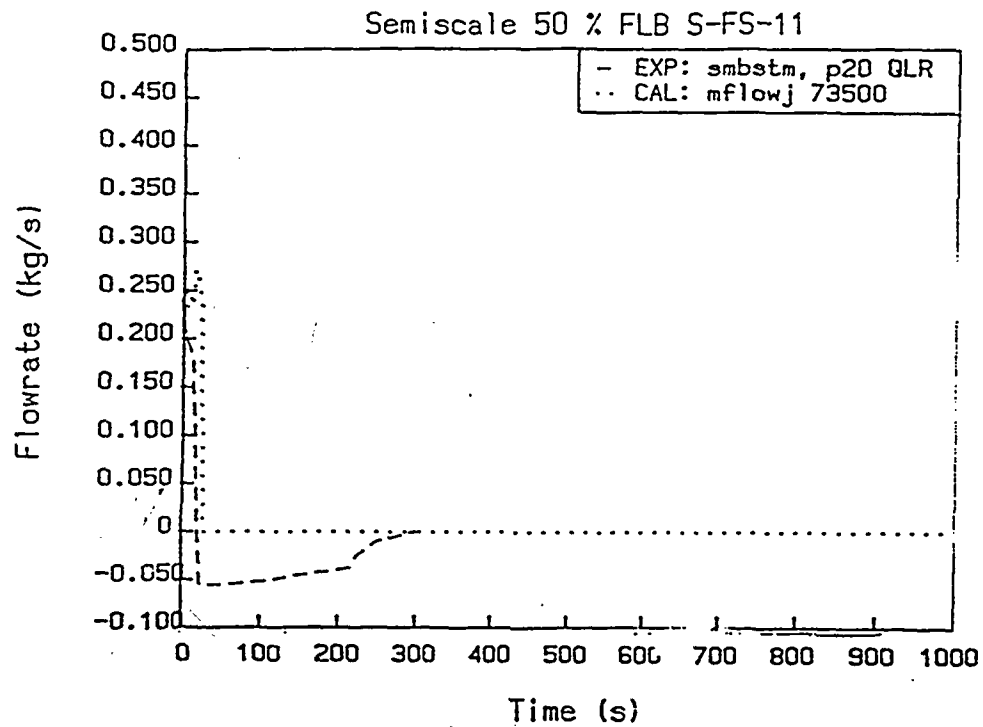


Fig.8 AL SG steam flowrate

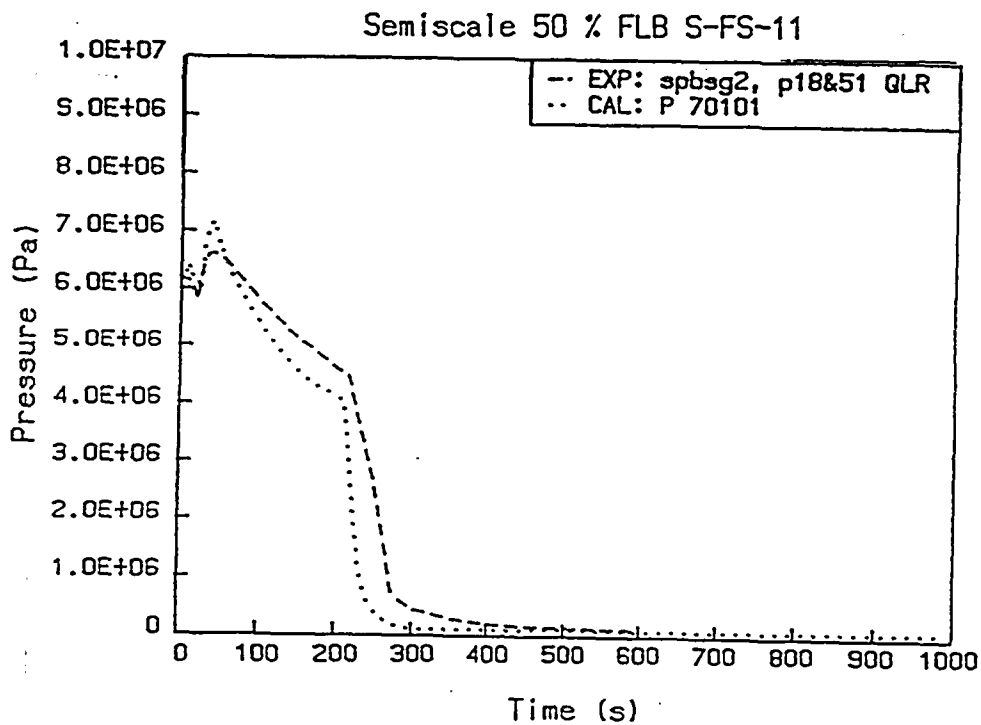


Fig.9 AL SG secondary pressure

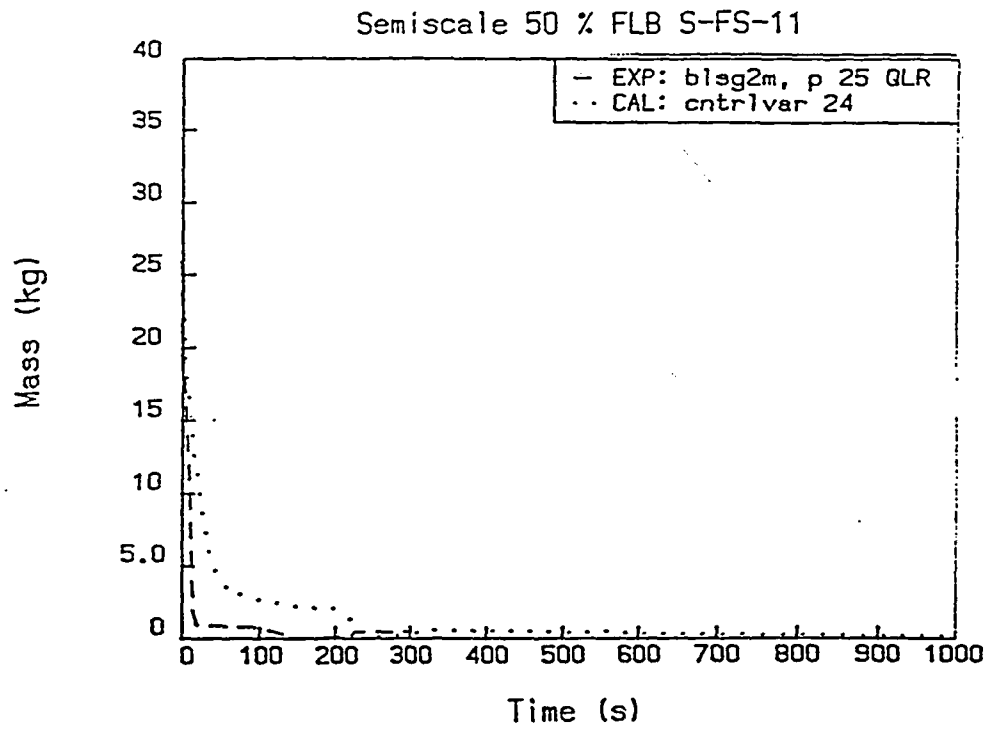


Fig.10 AL SG liquid mass inventory

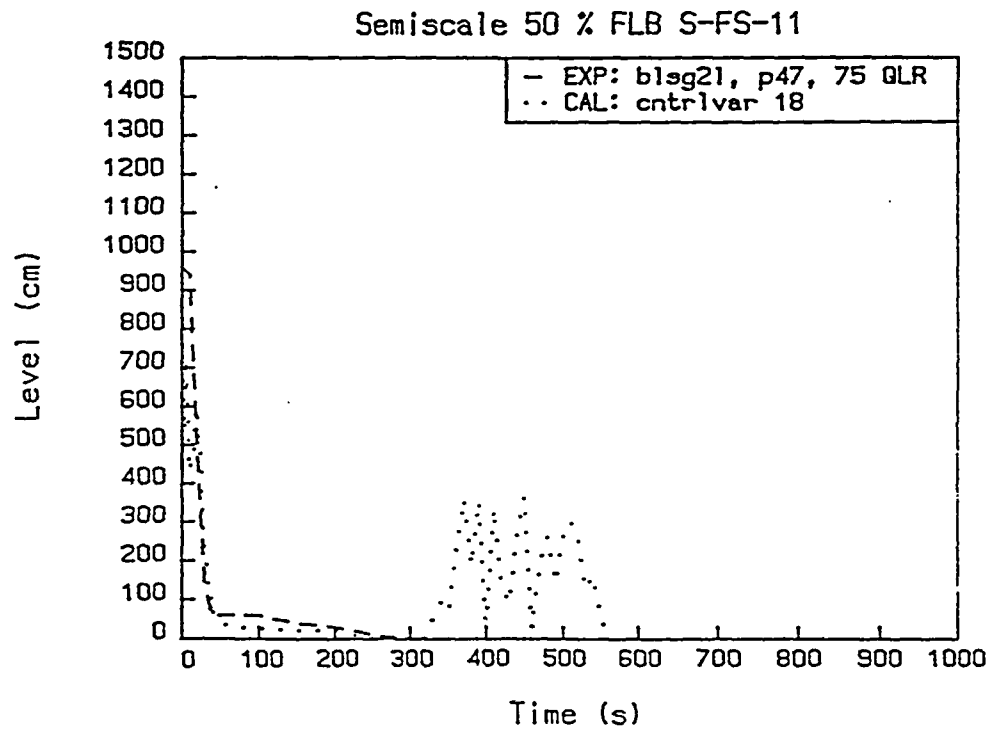


Fig.11 AL SG downcomer liquid level

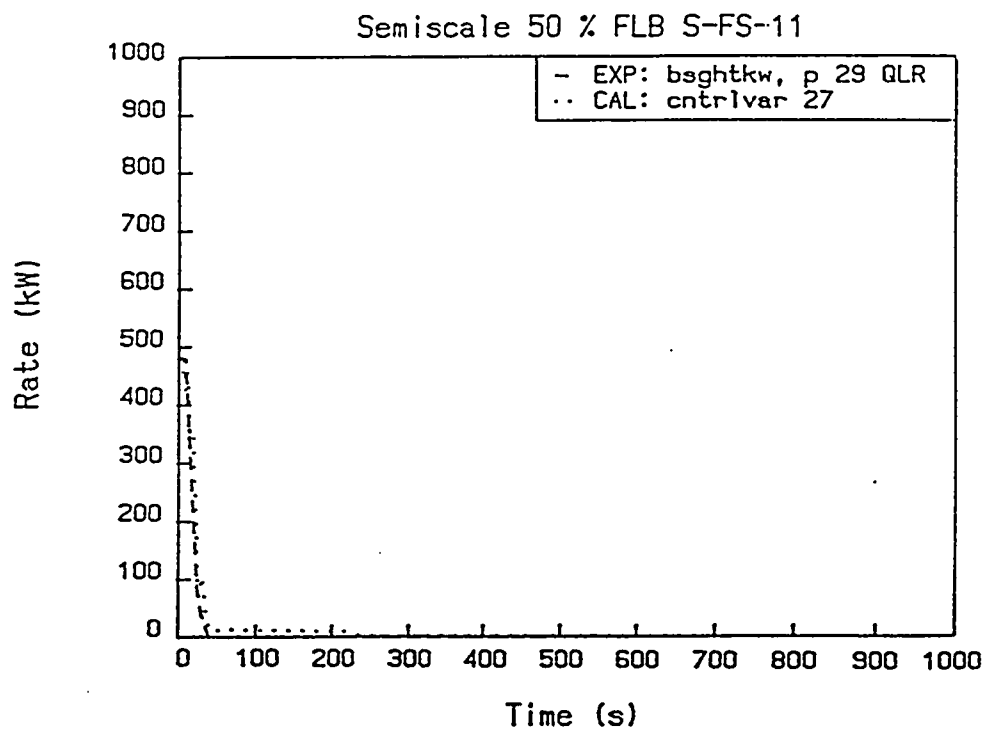


Fig.12 AL SG heat transfer rate

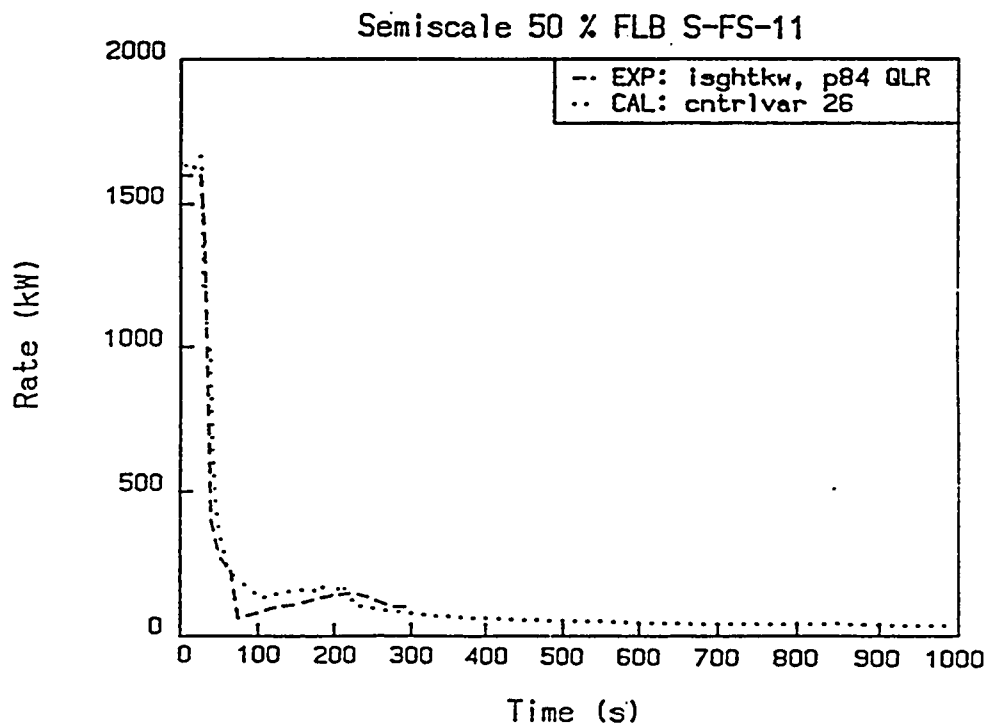


Fig.13 IL SG heat transfer rate

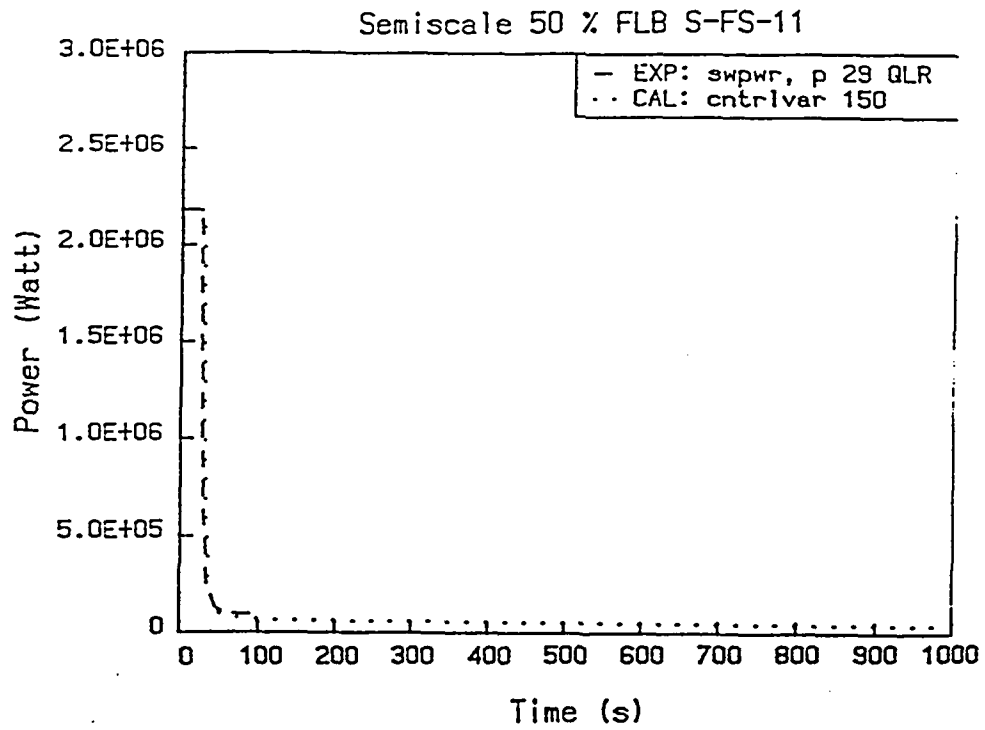


Fig.14 Decay heat power

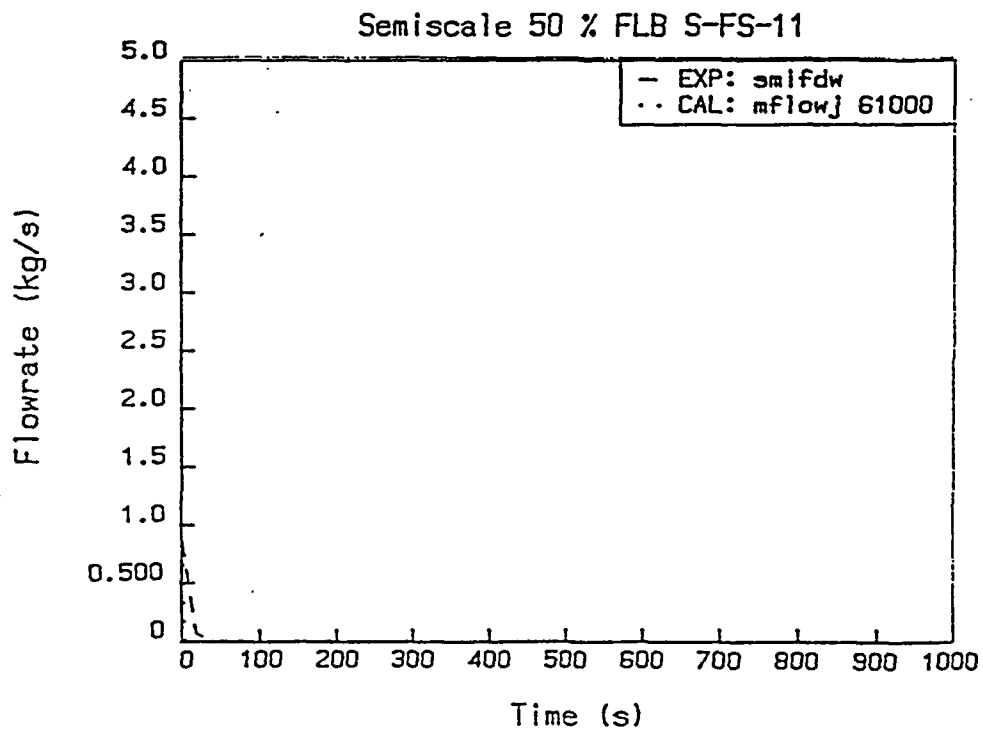


Fig.15 IL SG feed flowrate

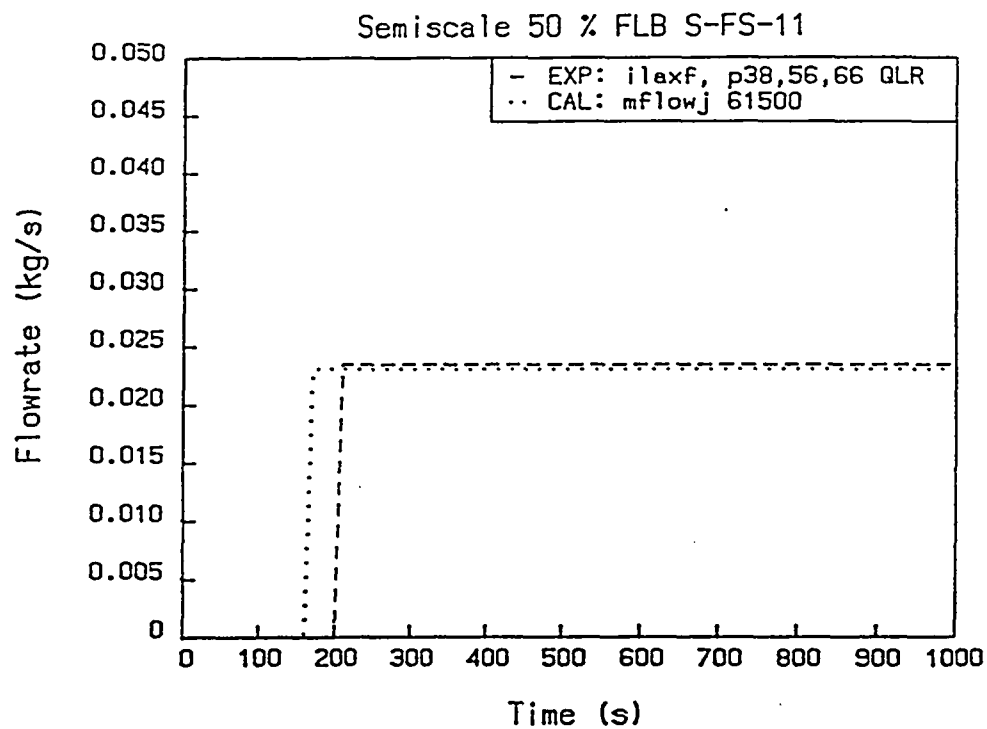


Fig.16 IL SG auxfeed flowrate

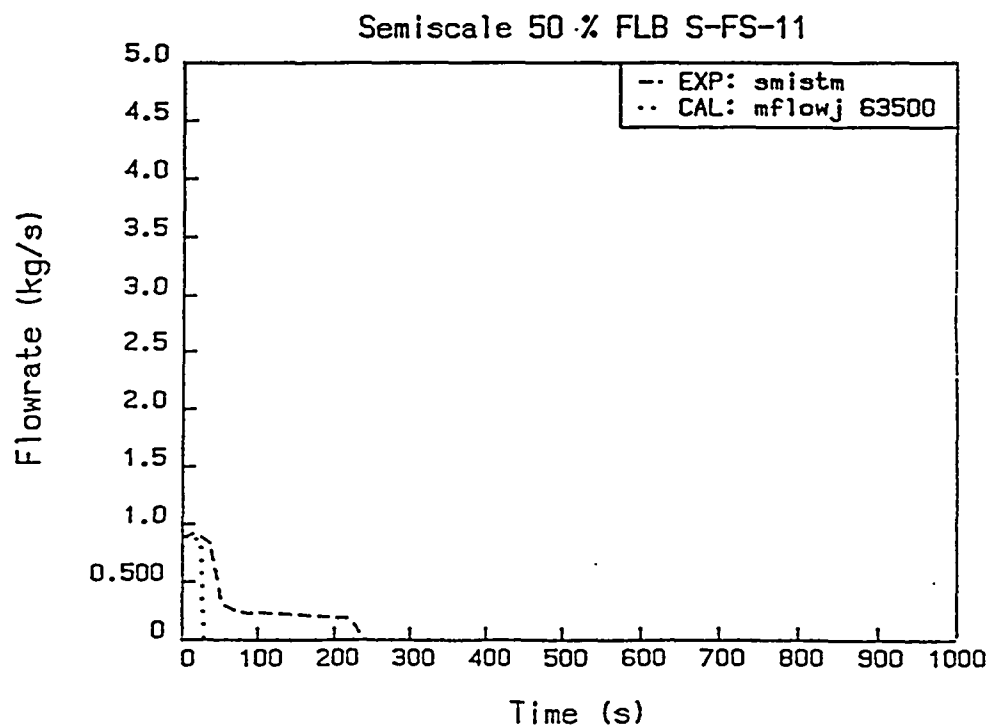


Fig.17 IL SG steam flowrate

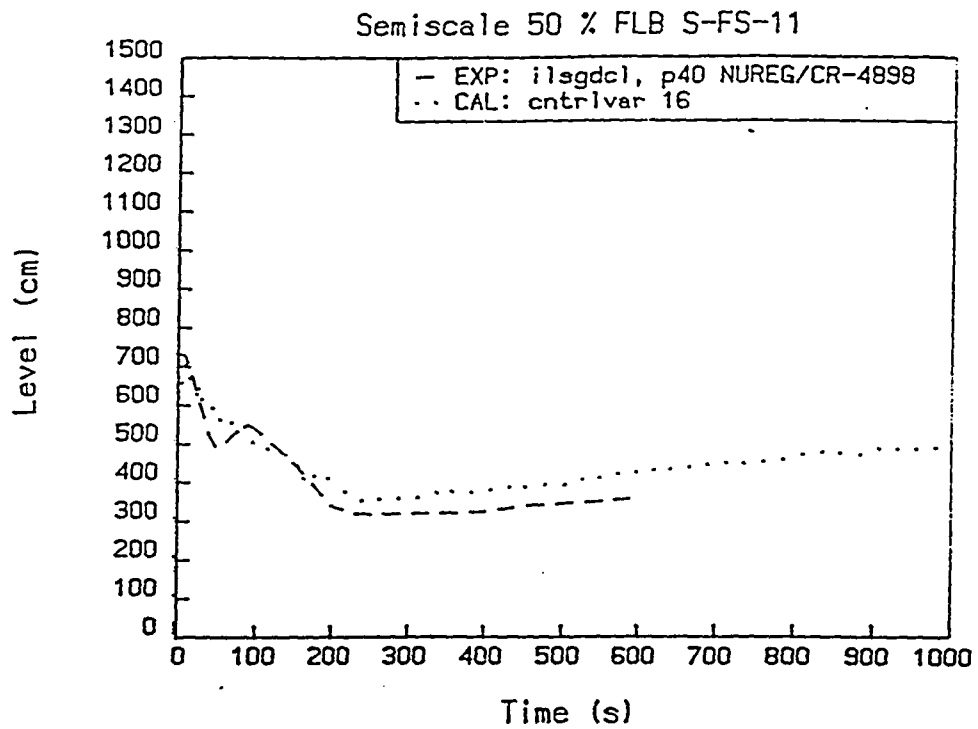


Fig.18 IL SG downcomer liquid level

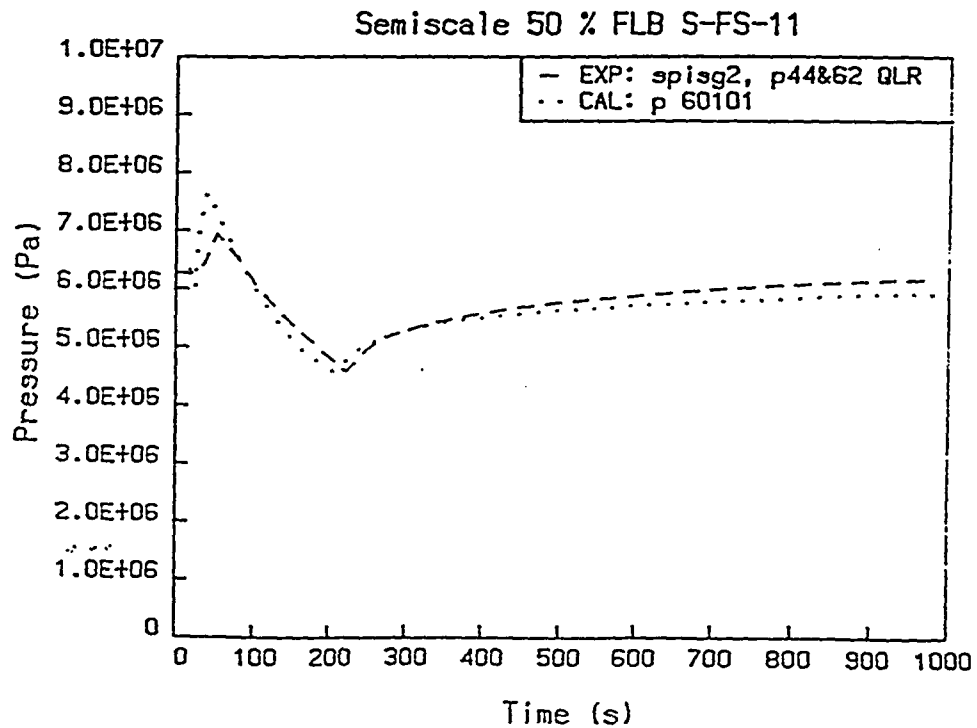


Fig.19 IL SG secondary pressure

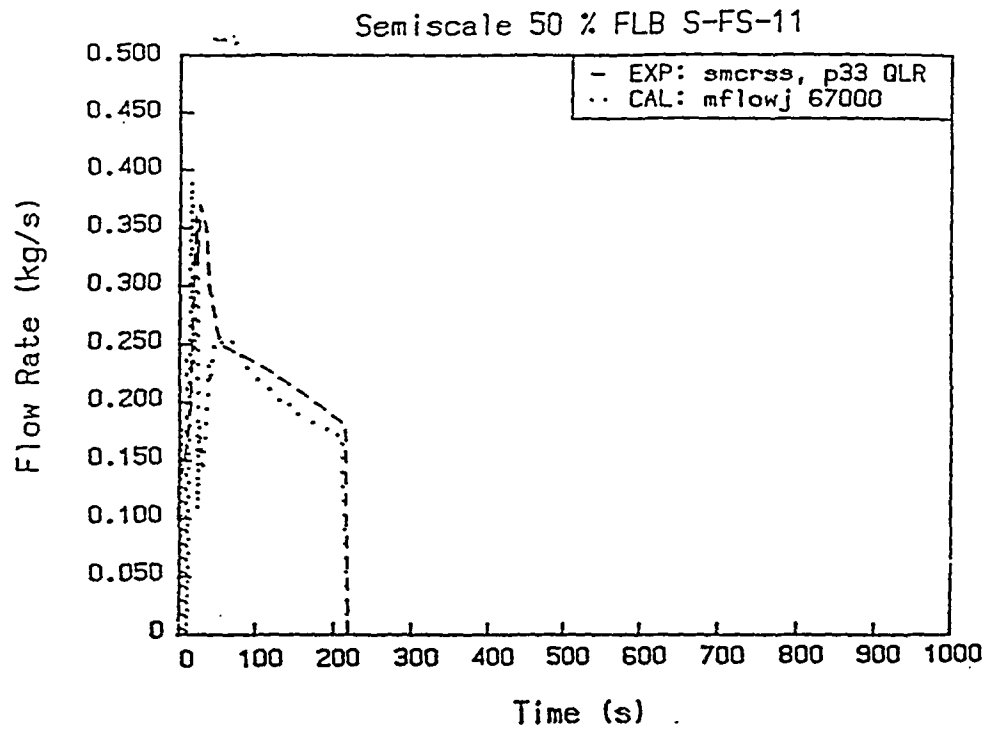


Fig.20 SG crossover line flowrate

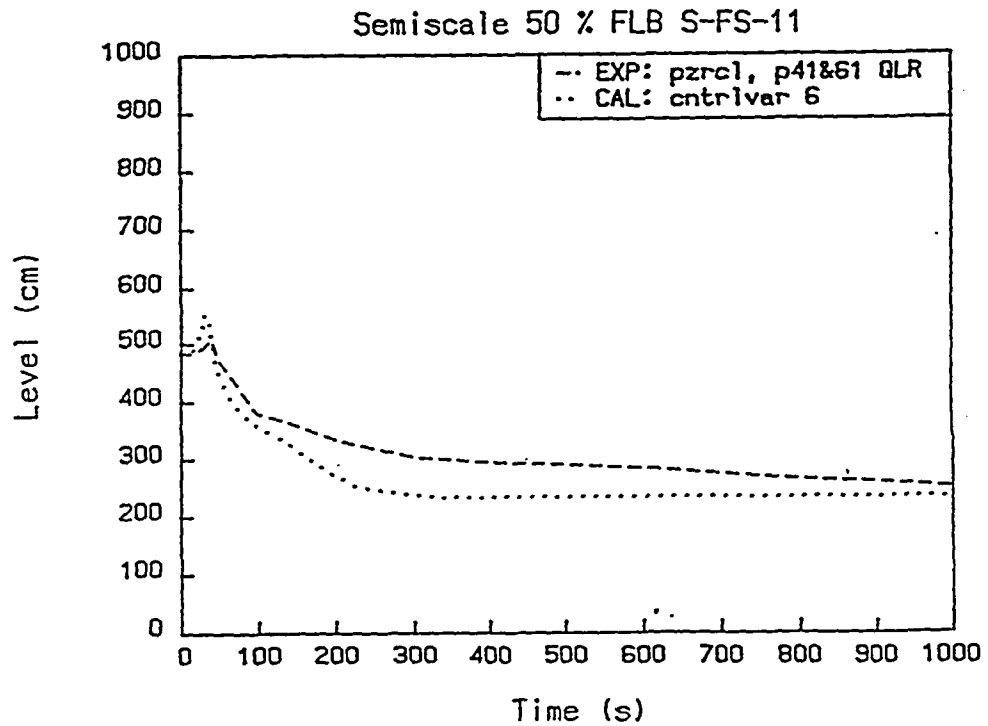


Fig.21 PZR liquid level

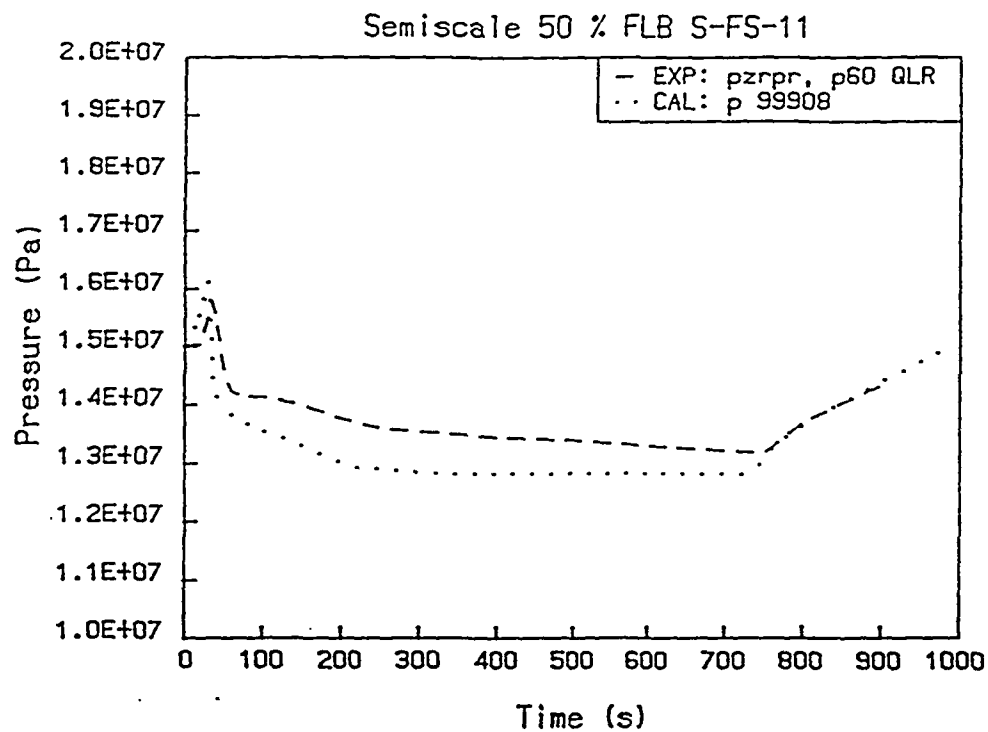


Fig.22 PZR pressure

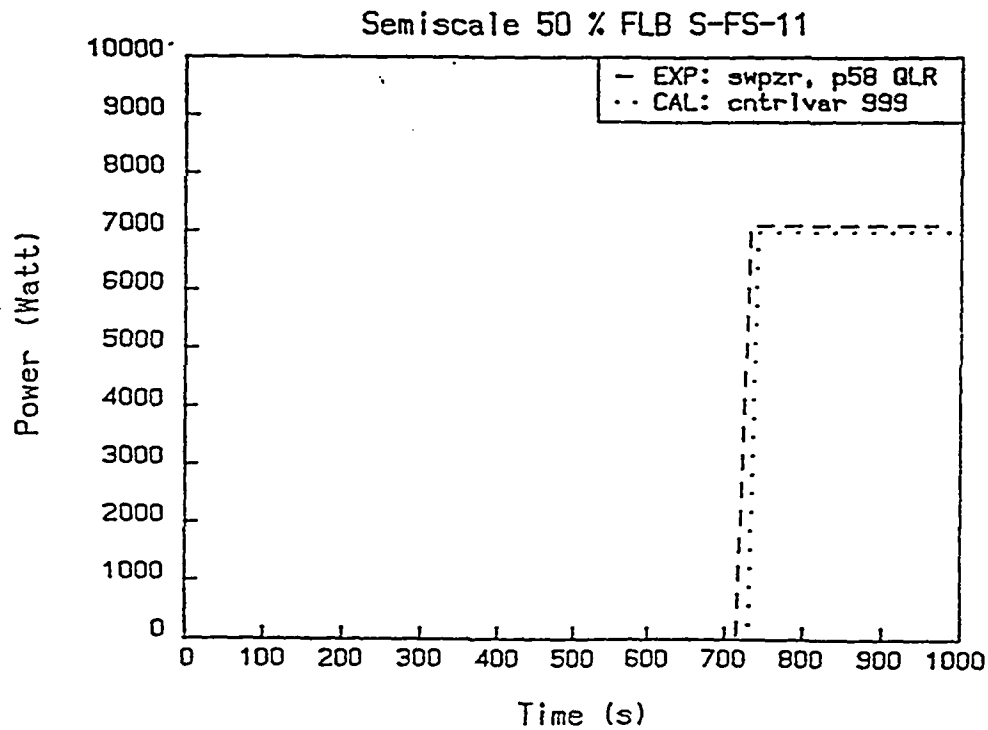


Fig.23 PZR heater power

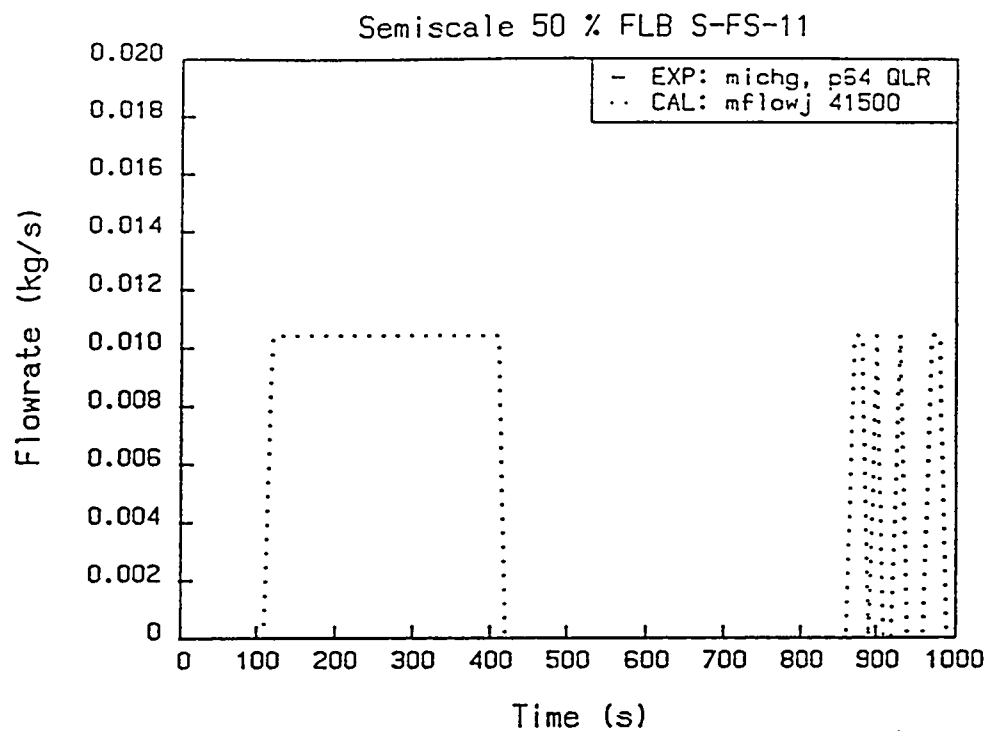


Fig.24 IL charging flowrate

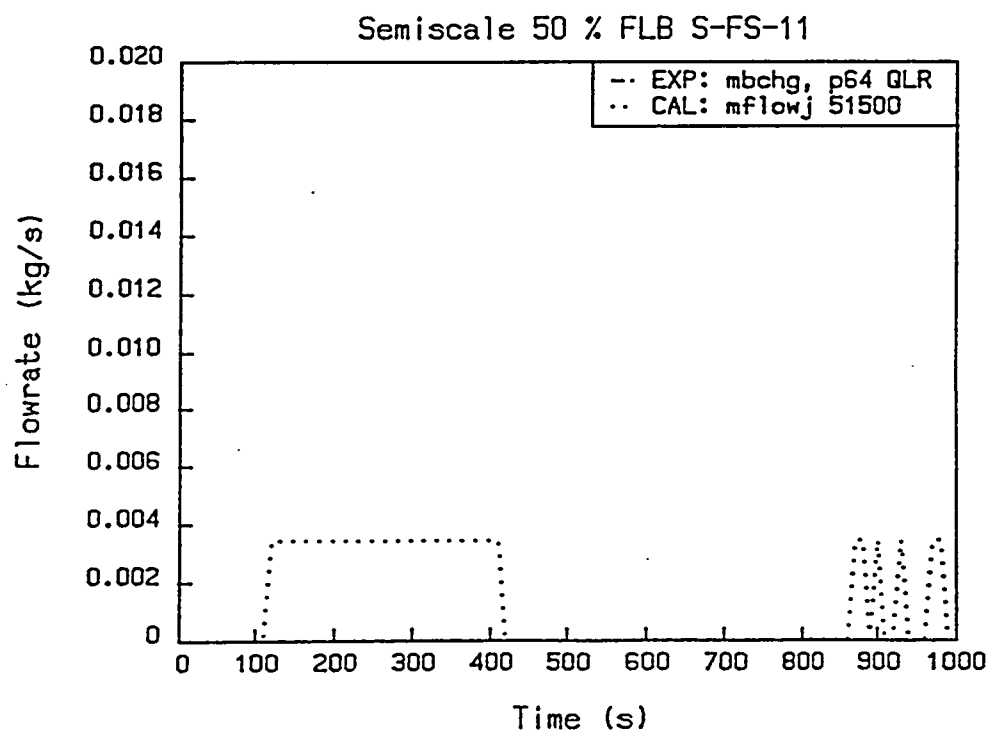


Fig.25 AL charging flowrate

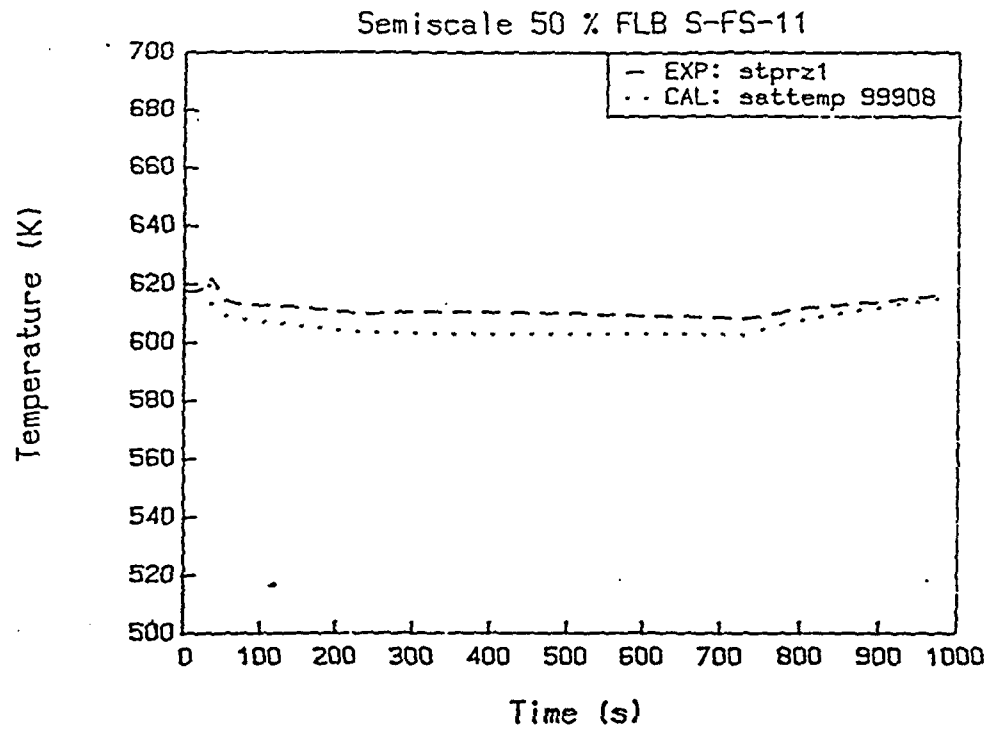


Fig.26 PZR Saturation Temperature

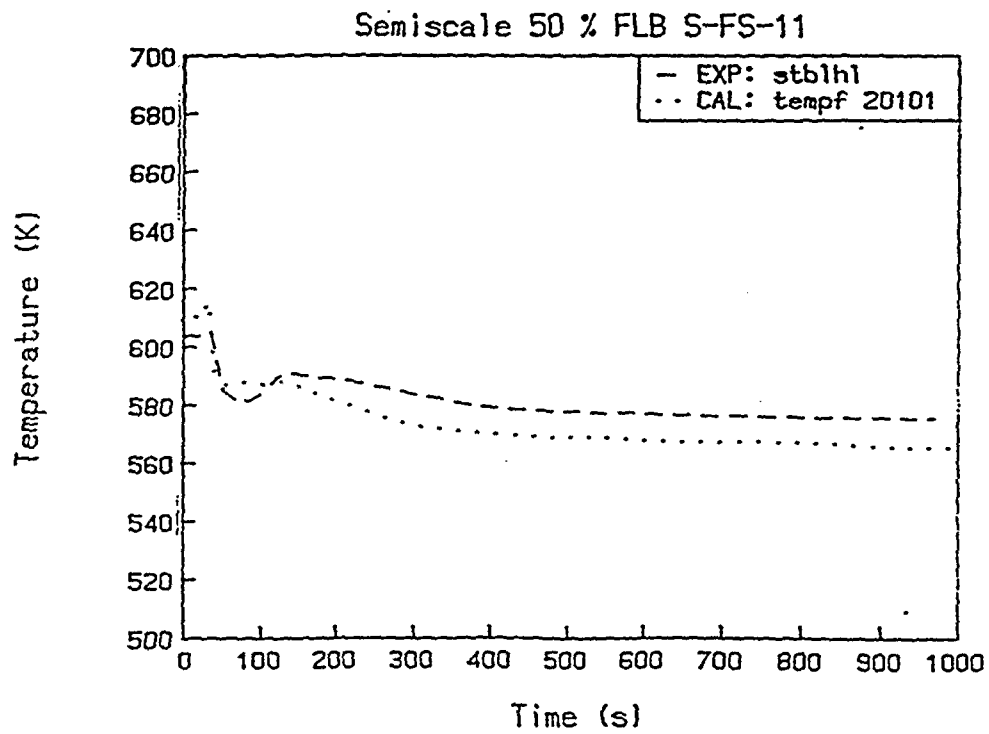


Fig.27 ILHL liquid temperature

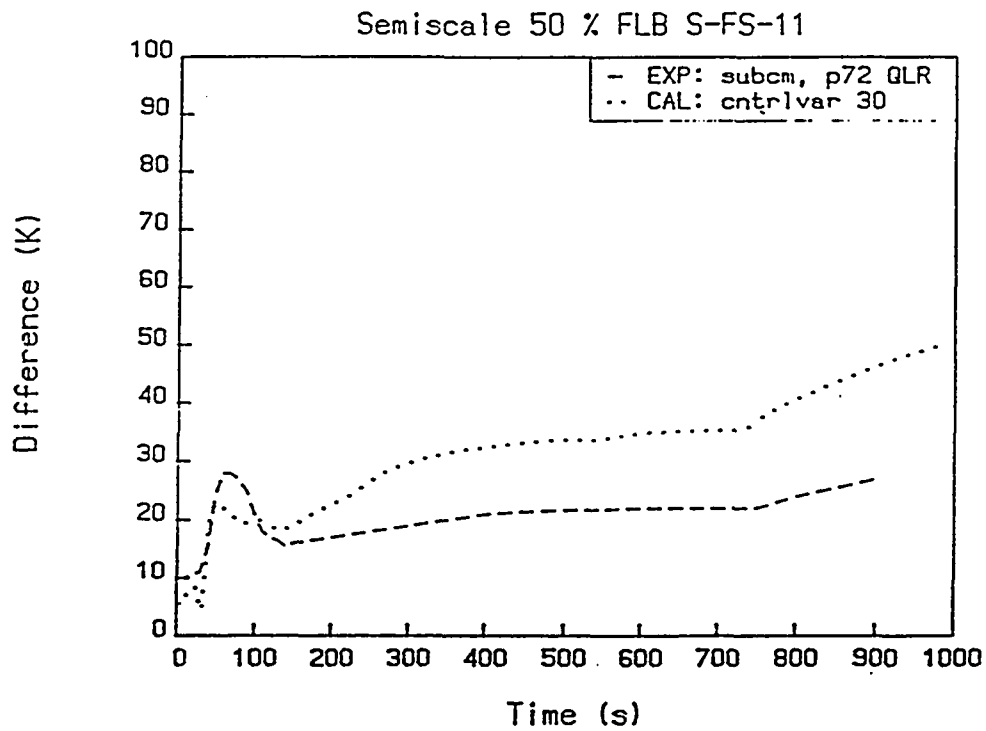


Fig.28 Primary subcooled margin

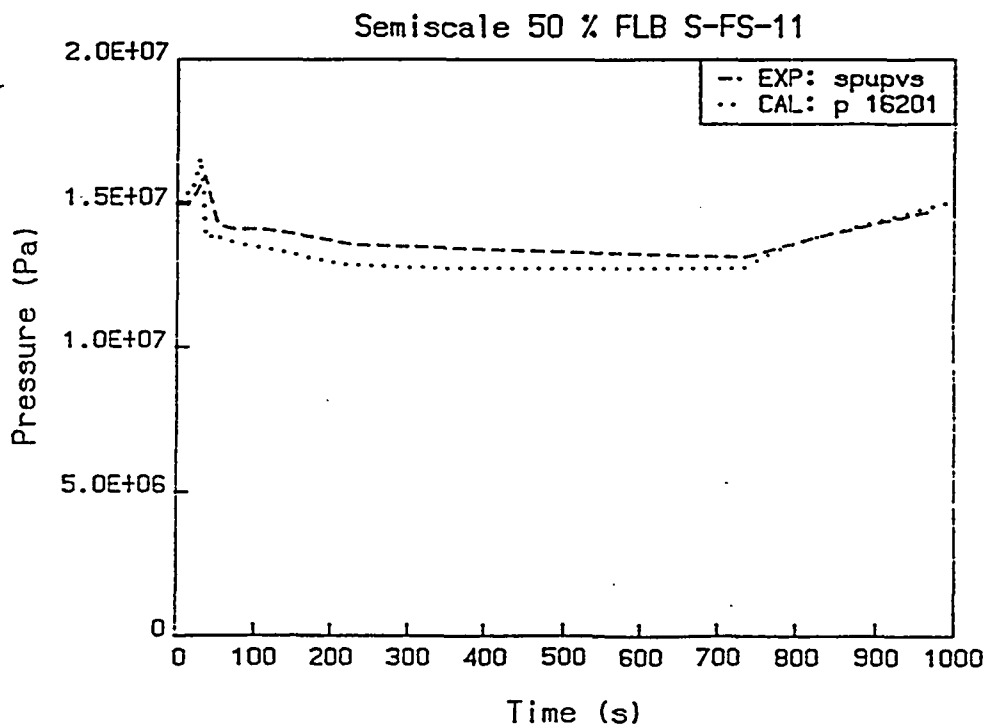


Fig.29 Upper plenum pressure

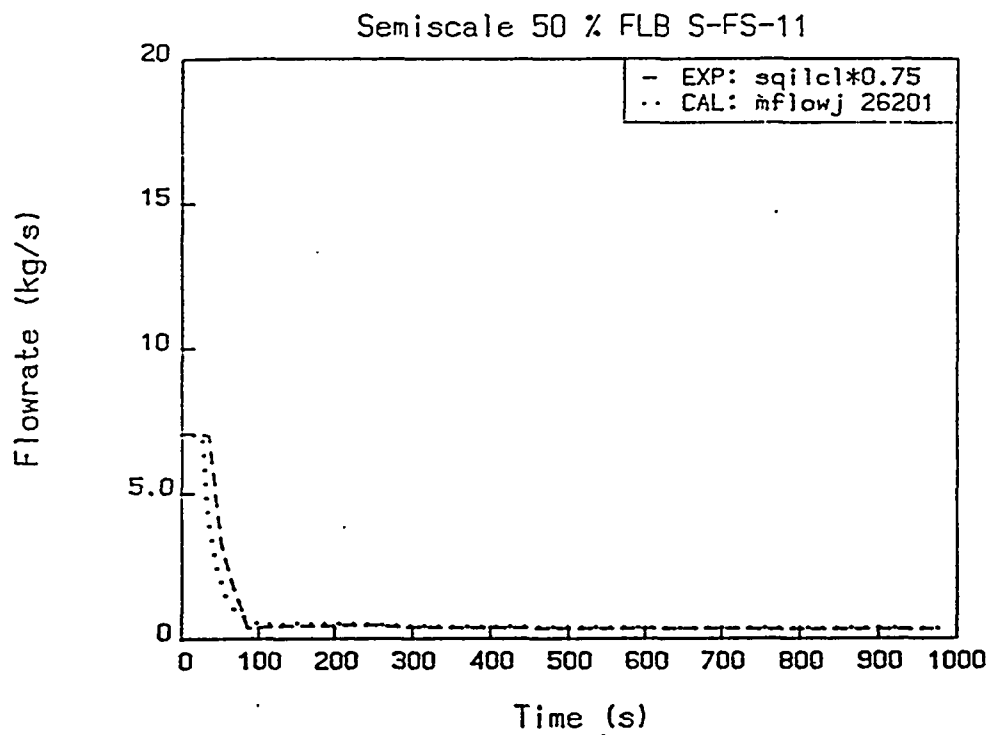


Fig.30 IL flowrate

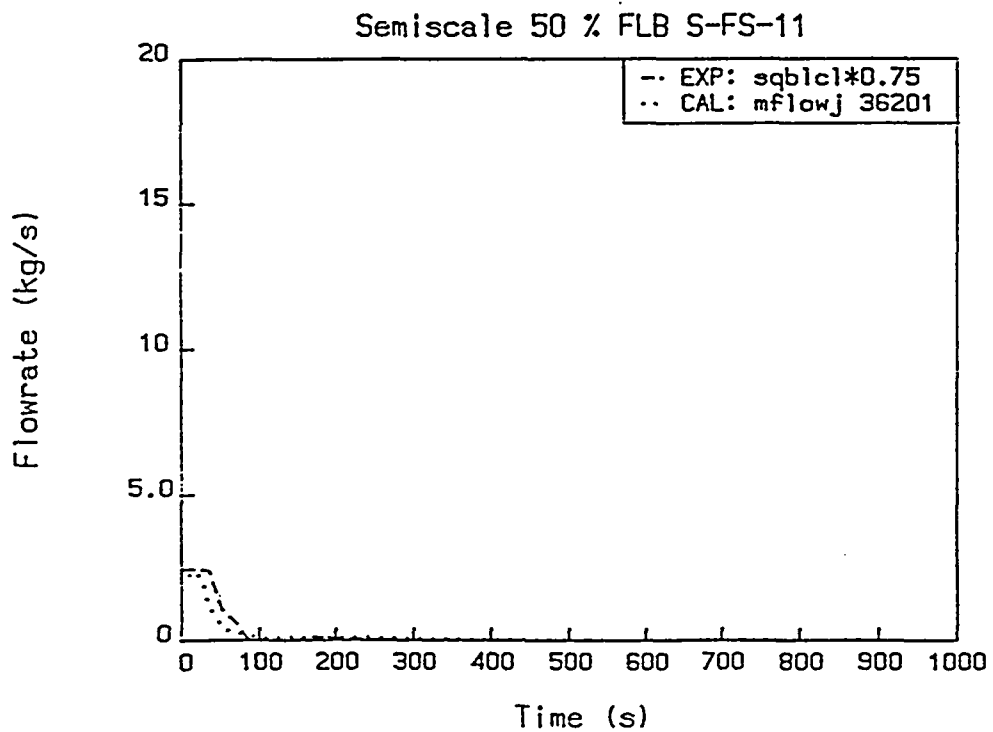


Fig.31 AL flowrate

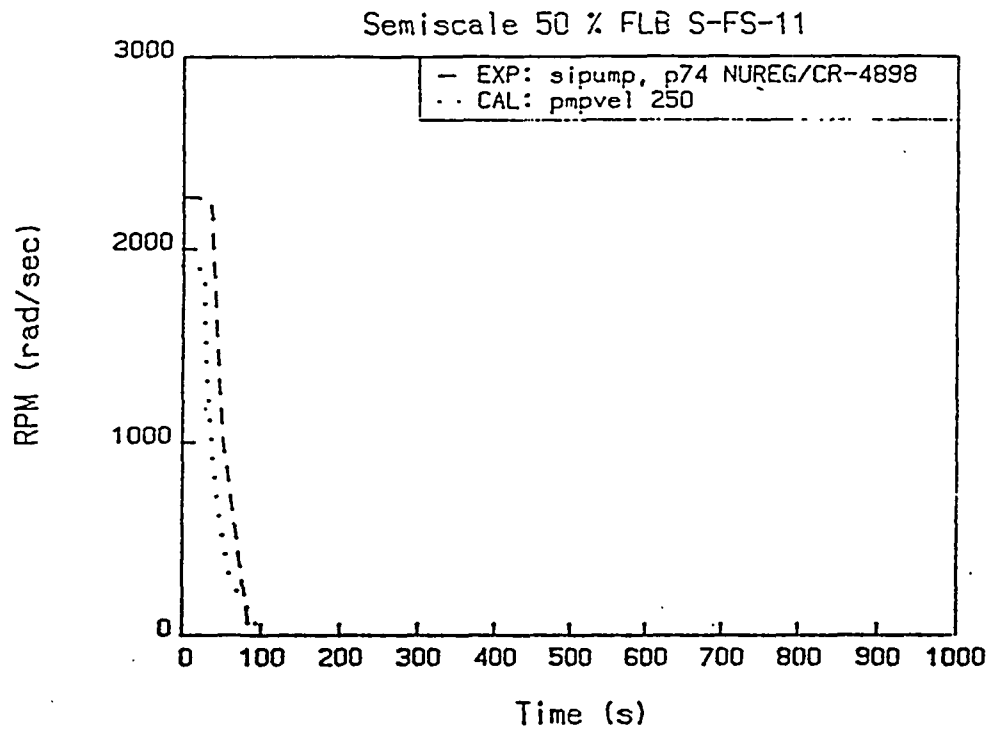


Fig.32 IL pump velocity

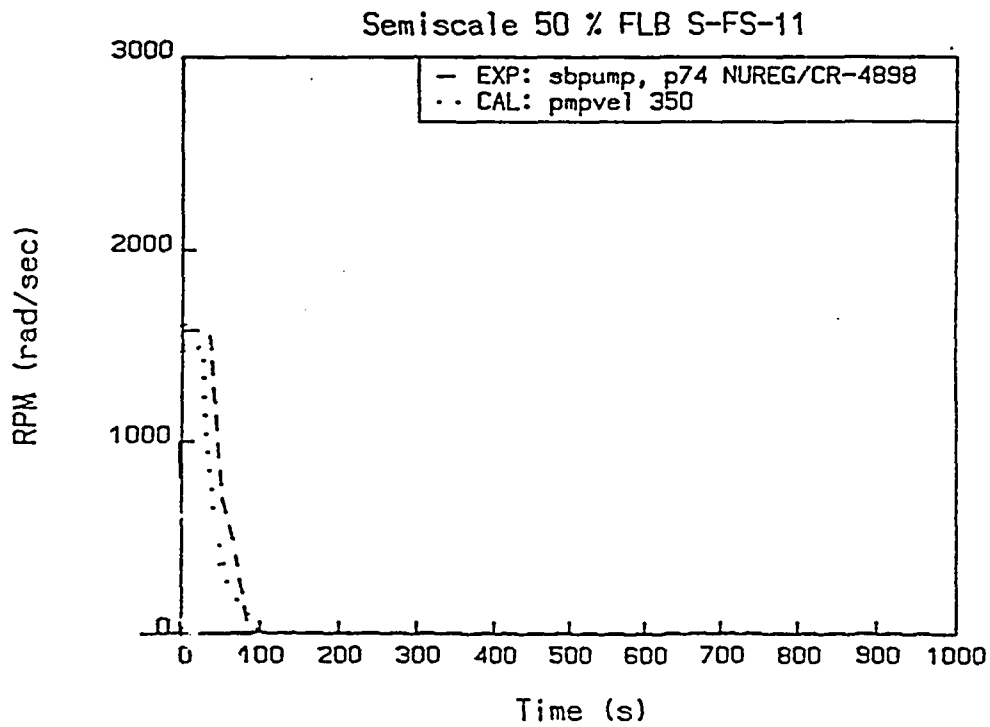


Fig.33 AL pump velocity

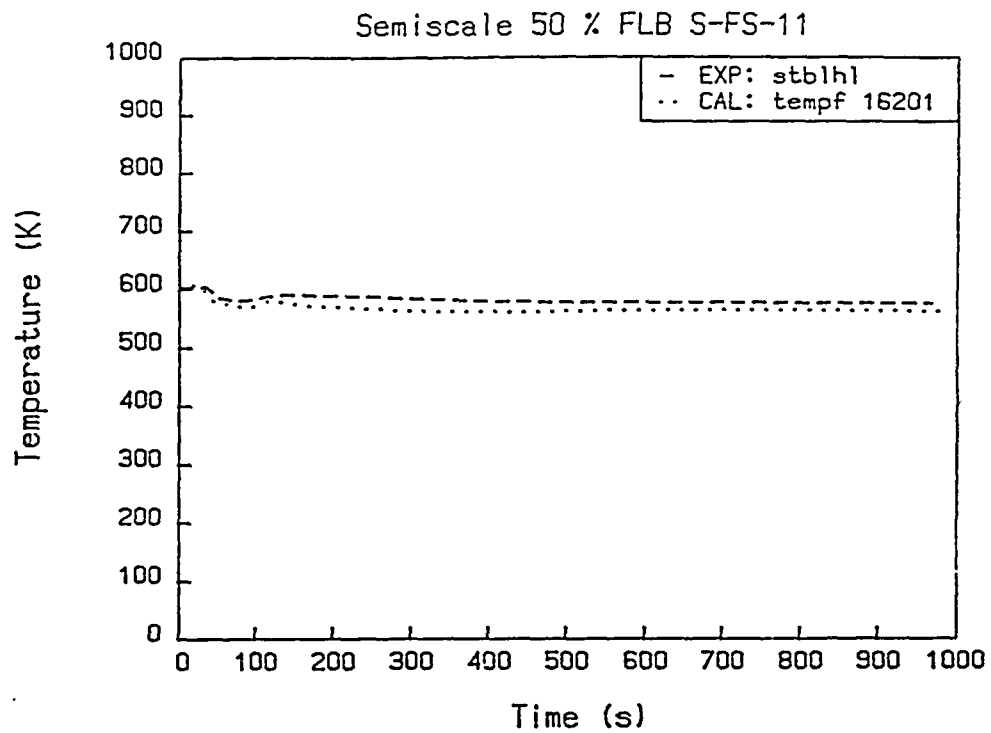


Fig.34 Upper plenum temperature

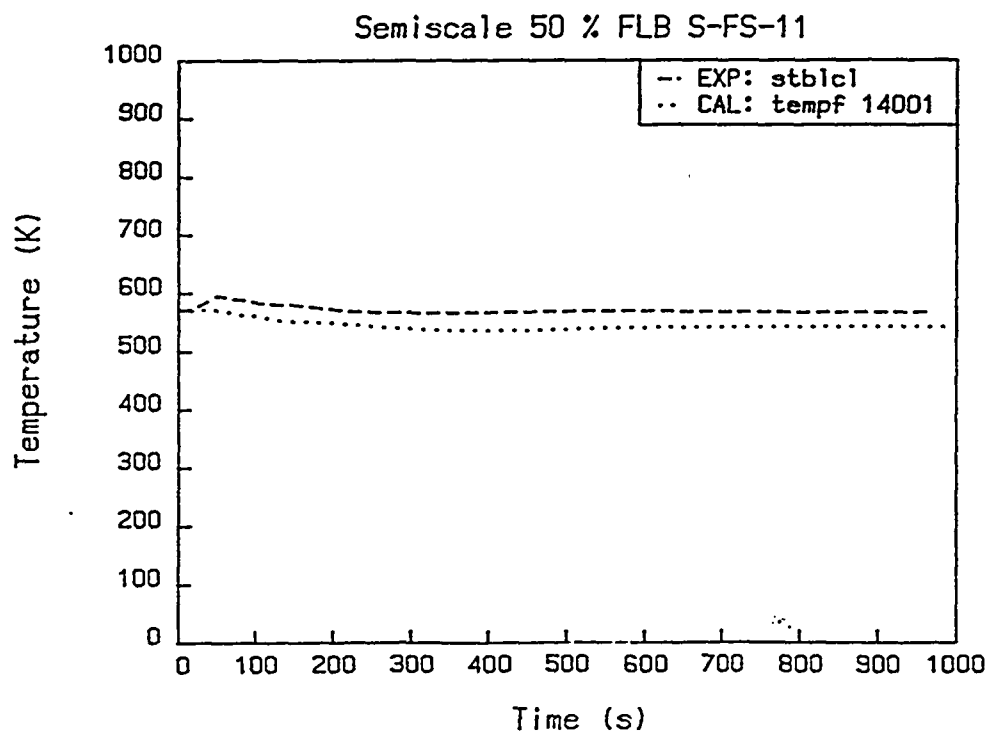


Fig.35 Lower plenum temperature

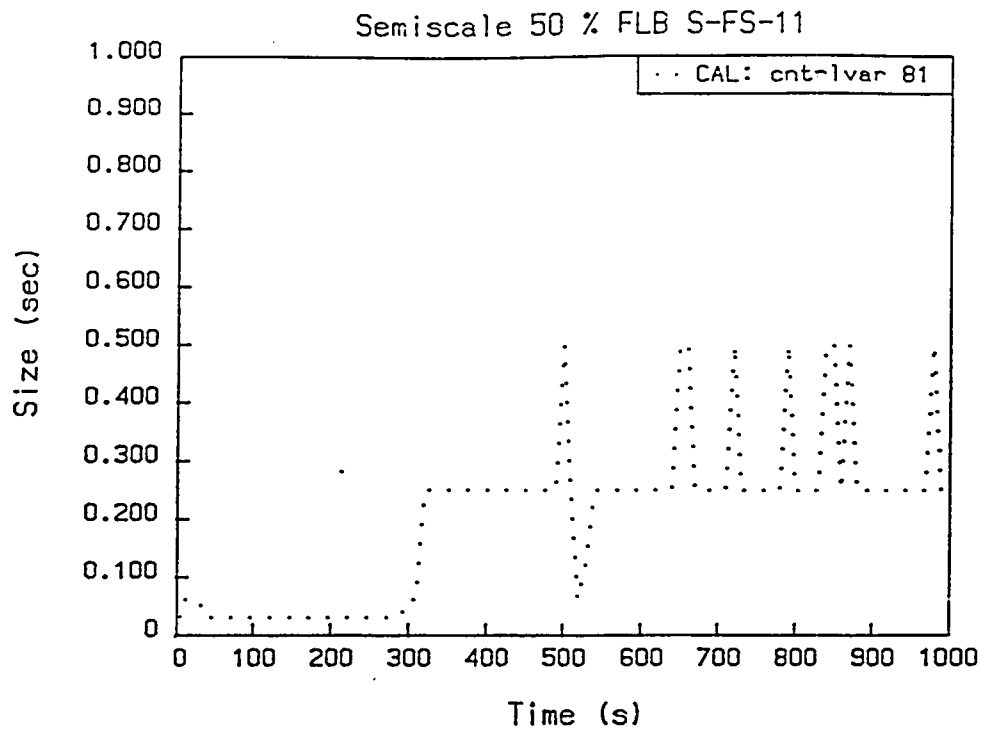


Fig.36 Time step size(0-1000s)

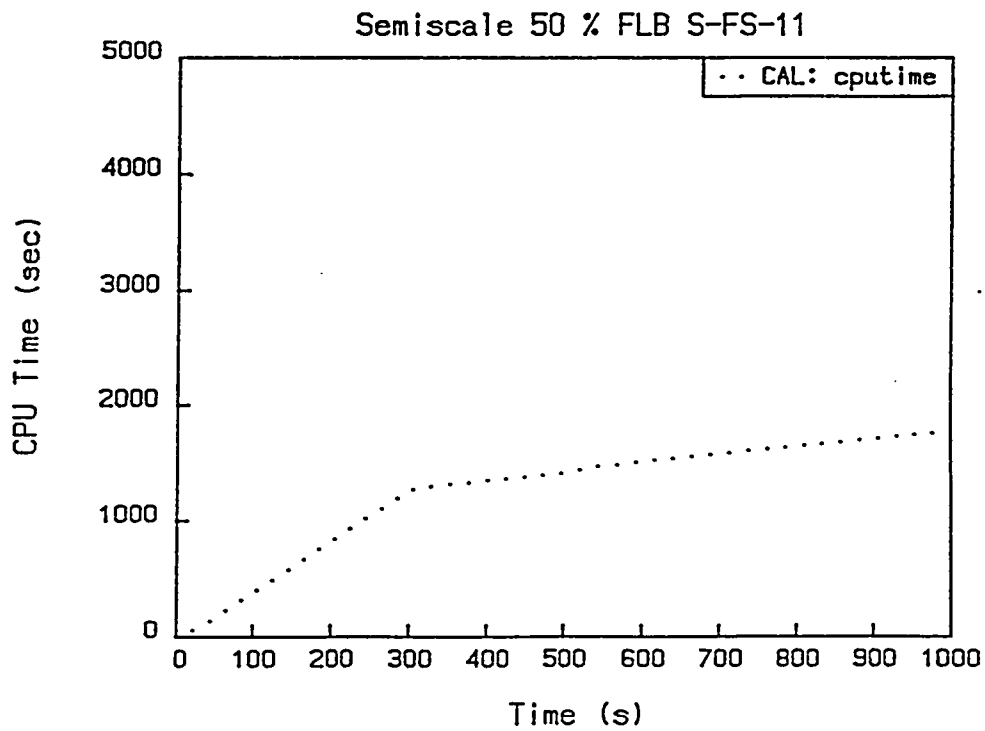


Fig.37 CPU time (0-1000s)

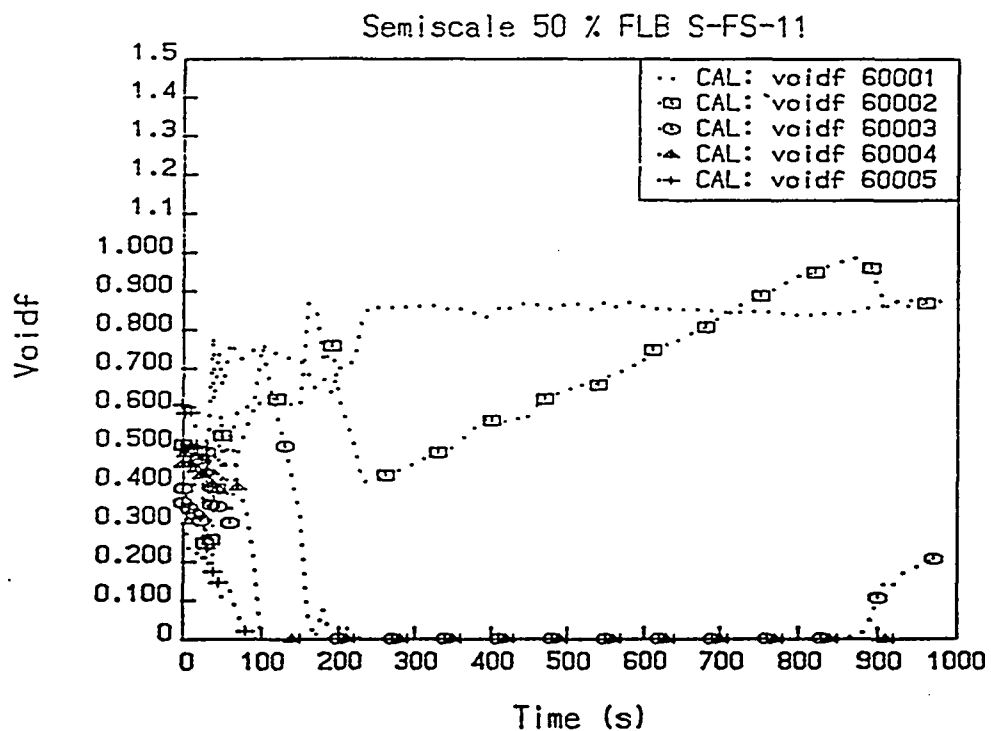


Fig.38 IL SG secondary voidf

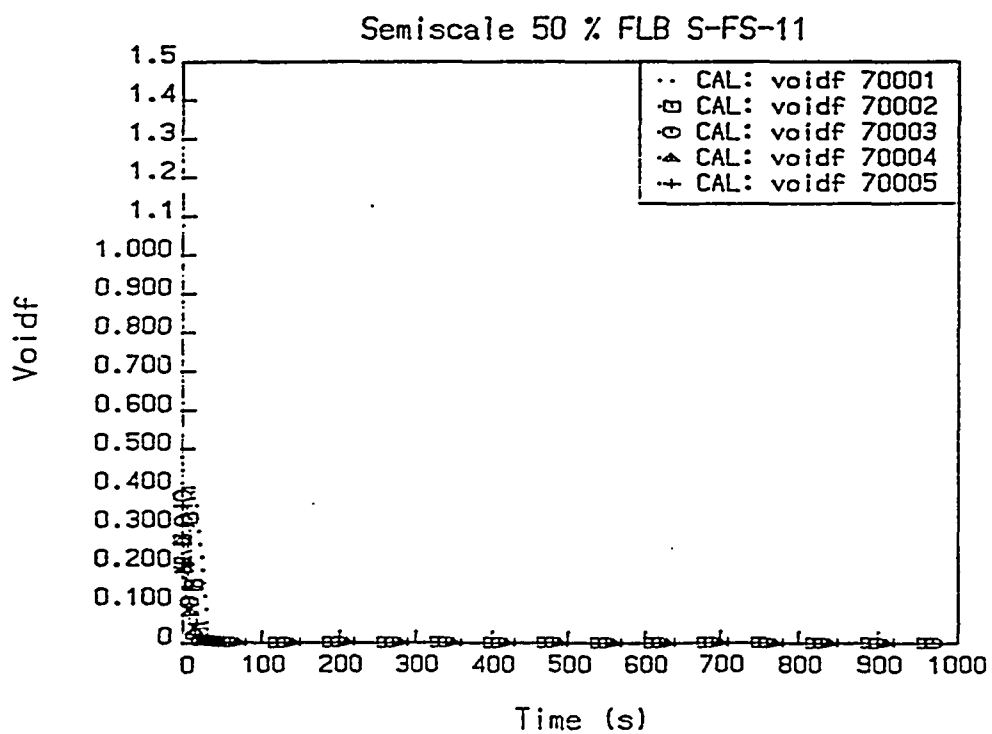


Fig.39 AL SG secondary voidf

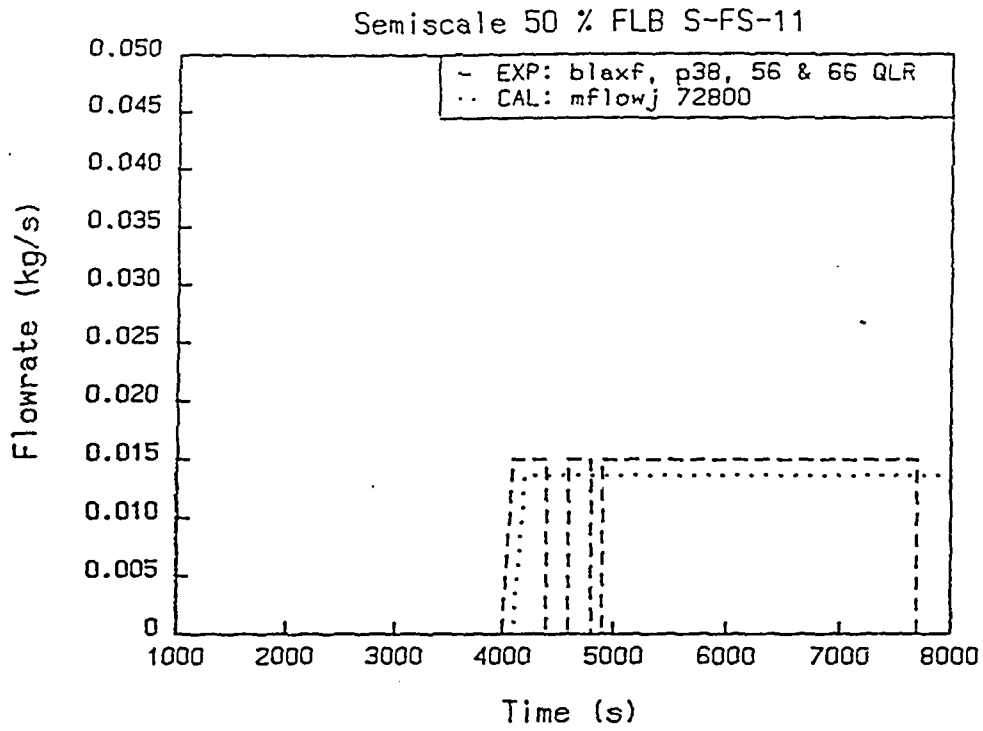


Fig.40 AL SG auxfeed flowrate (1000-8000 s)

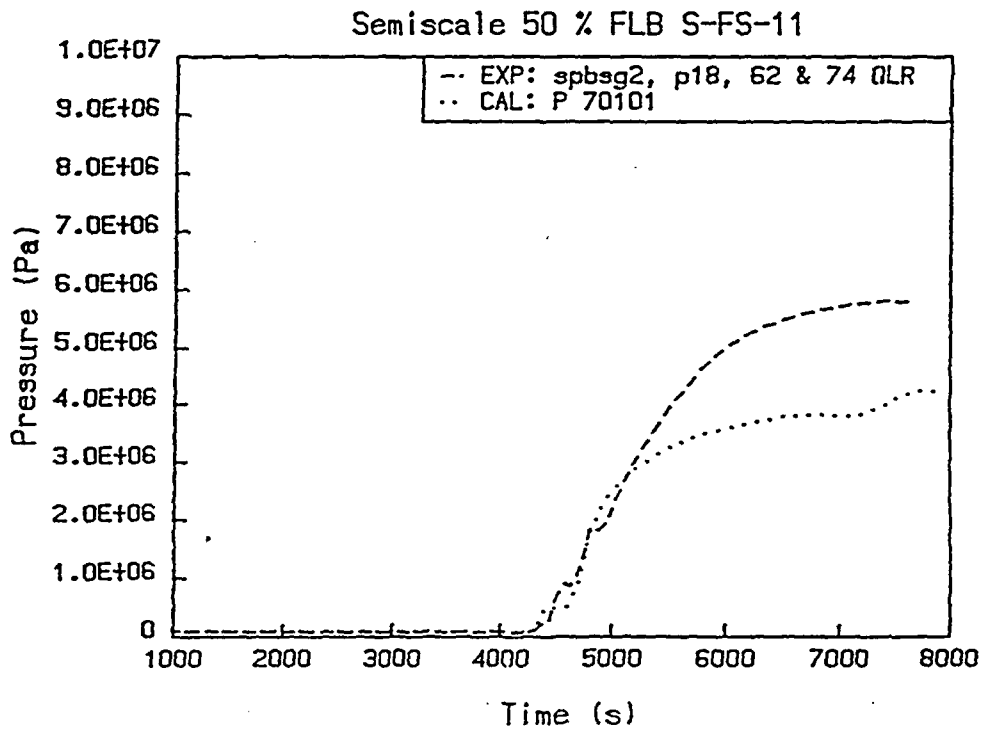


Fig.41 AL SG secondary pressure

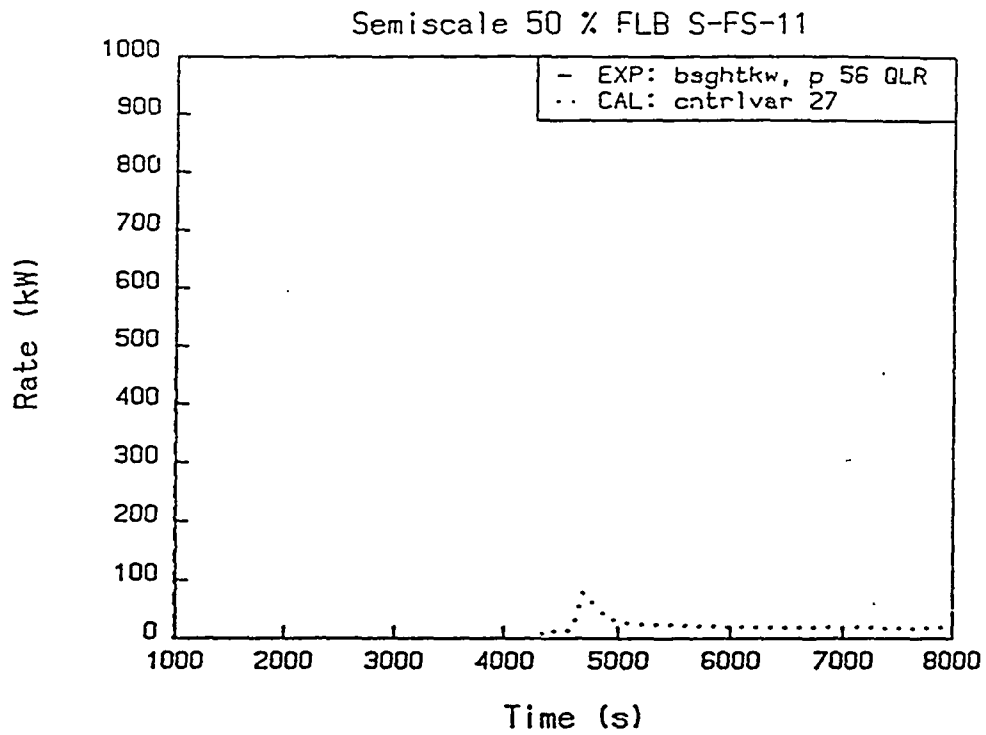


Fig.42 AL SG heat transfer rate

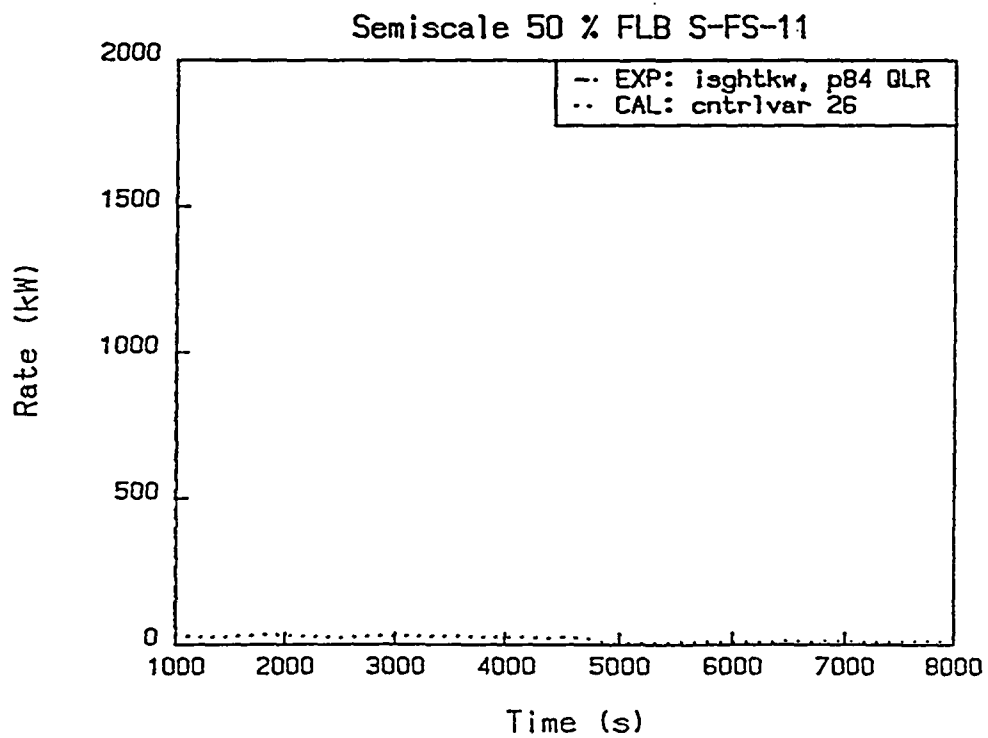


Fig.43 IL SG heat transfer rate

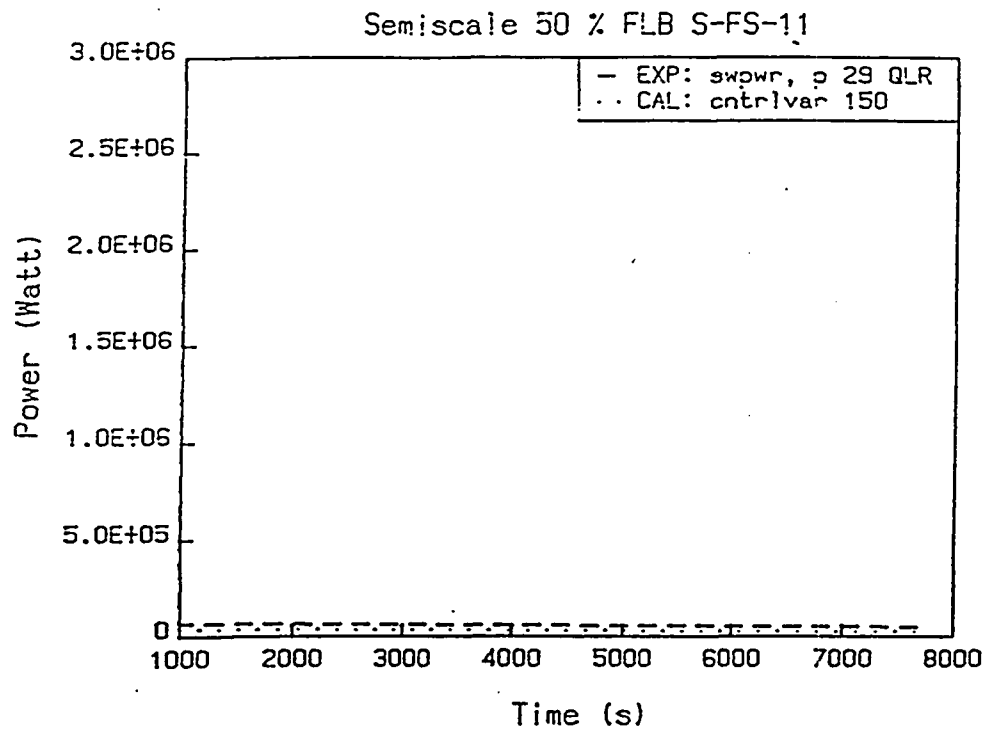


Fig.44 Decay heat power

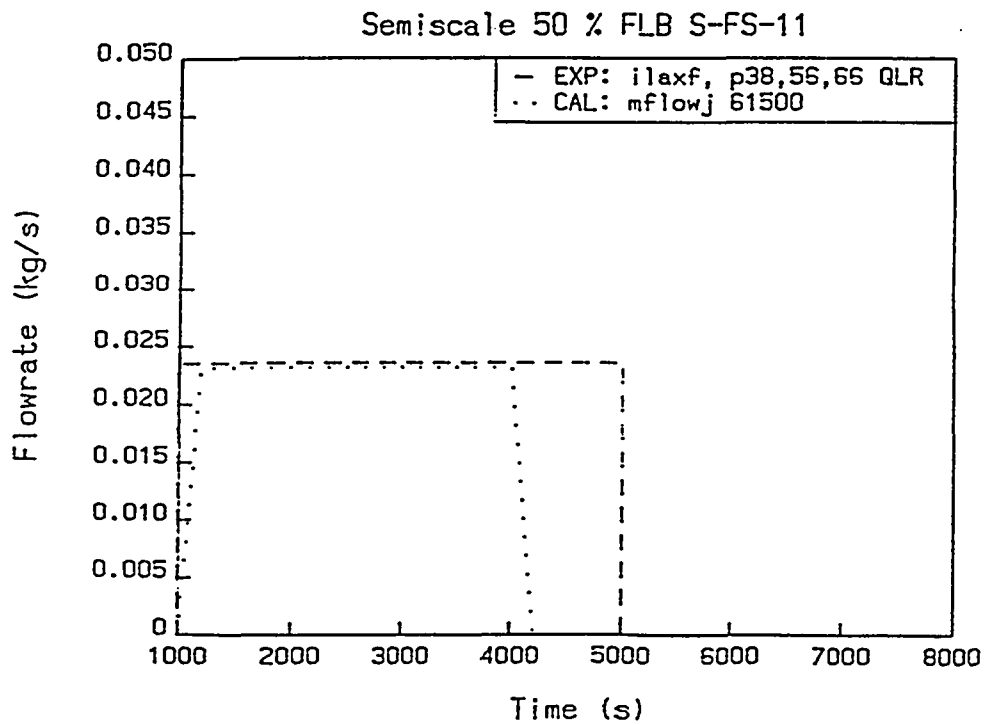


Fig.45 IL SG auxfeed flowrate

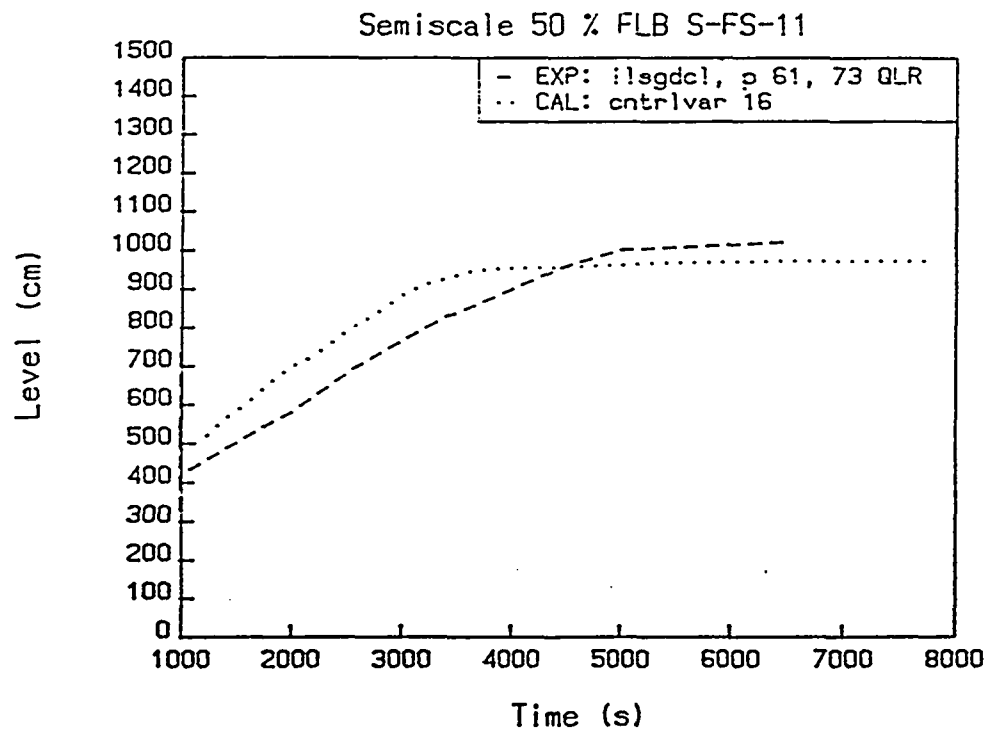


Fig.46 IL SG downcomer liquid level

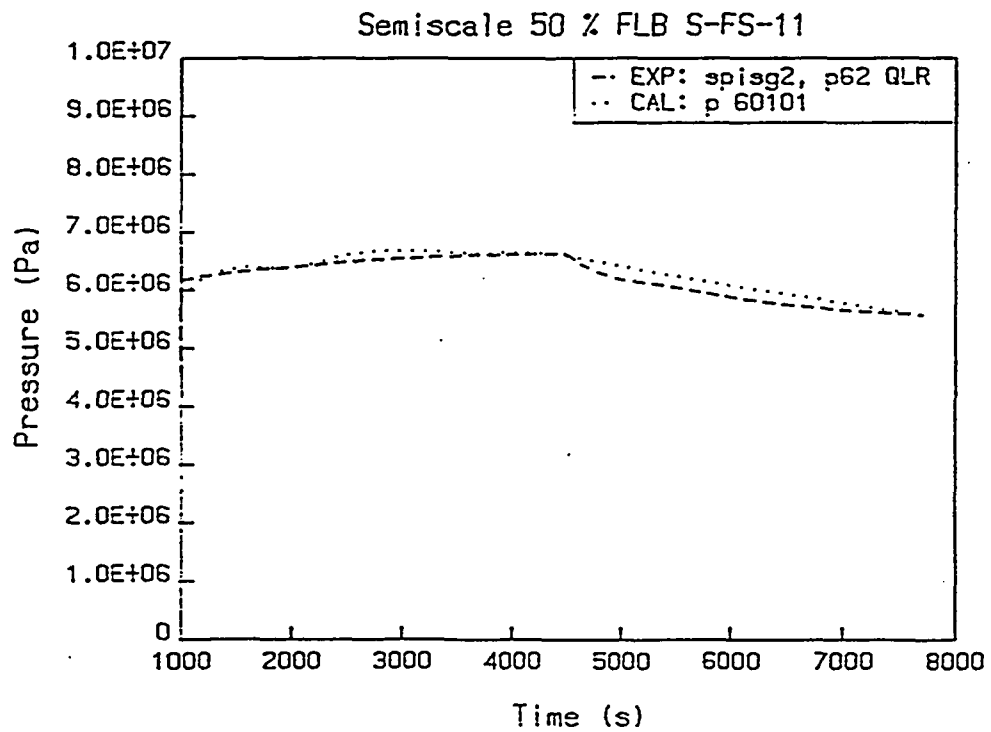


Fig.47 IL SG secondary pressure

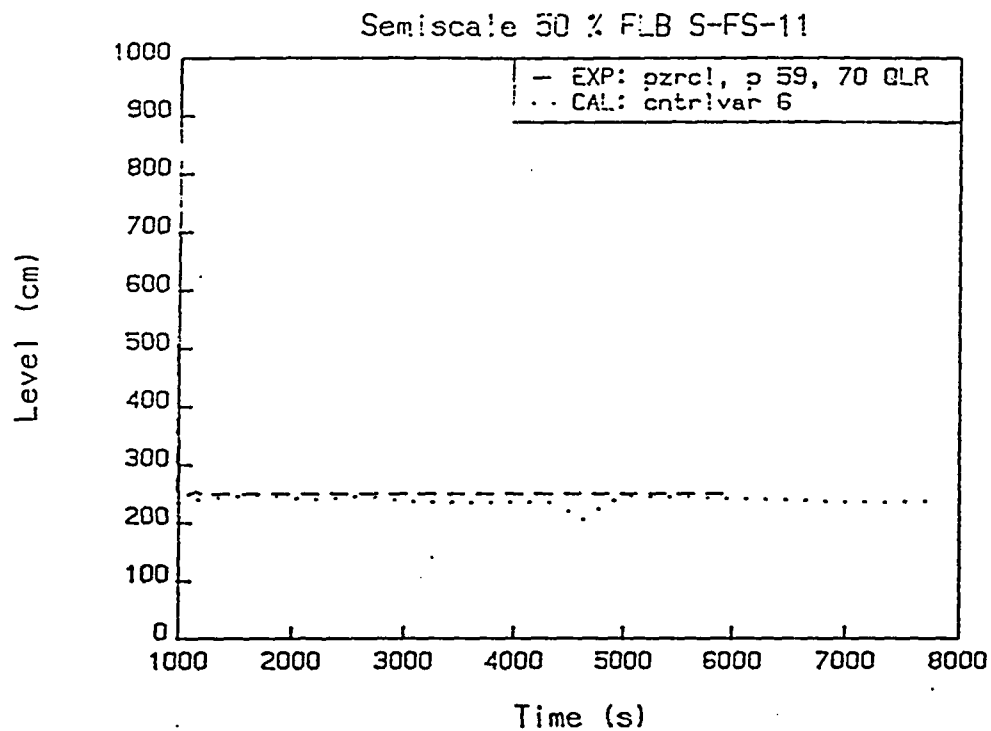


Fig.48 PZR liquid level

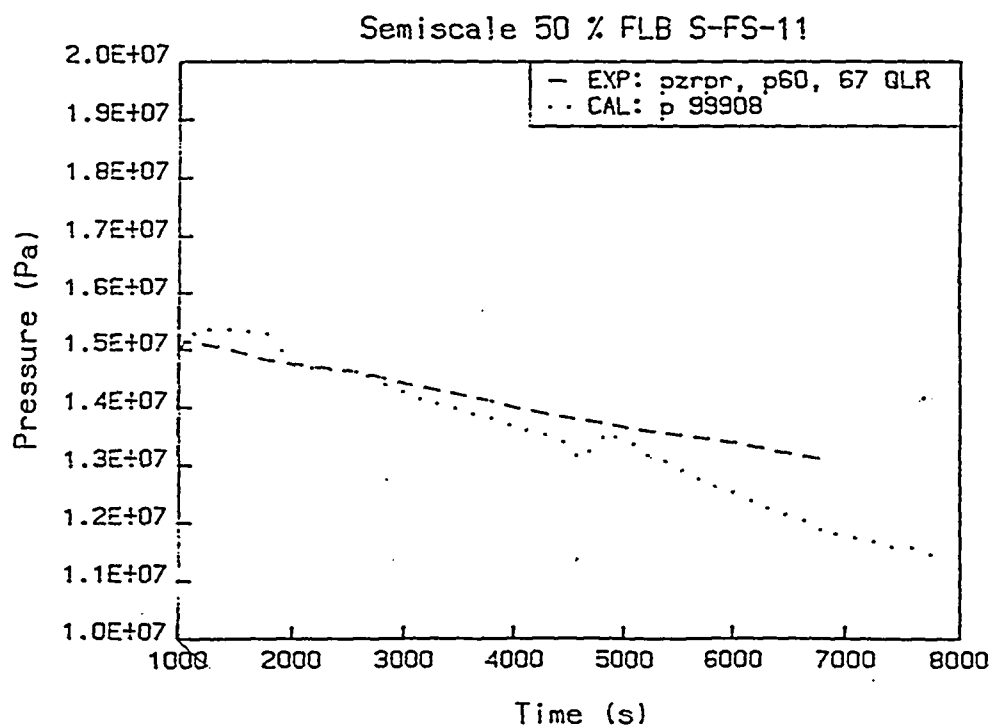


Fig.49 PZR pressure

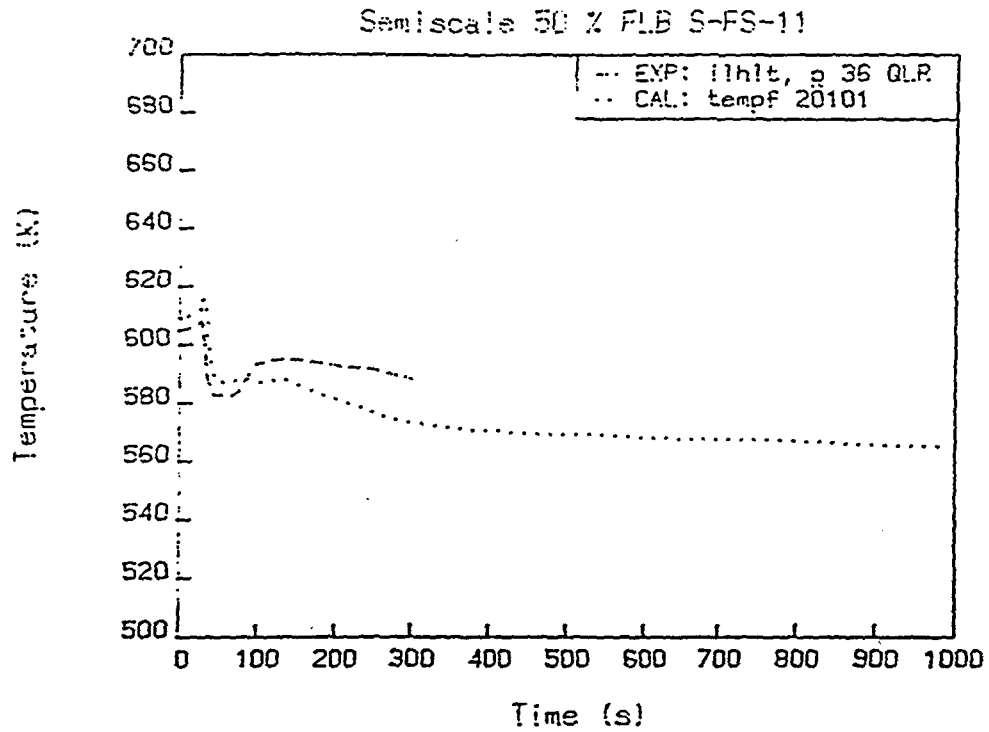


Fig.50 ILHL liquid temperature

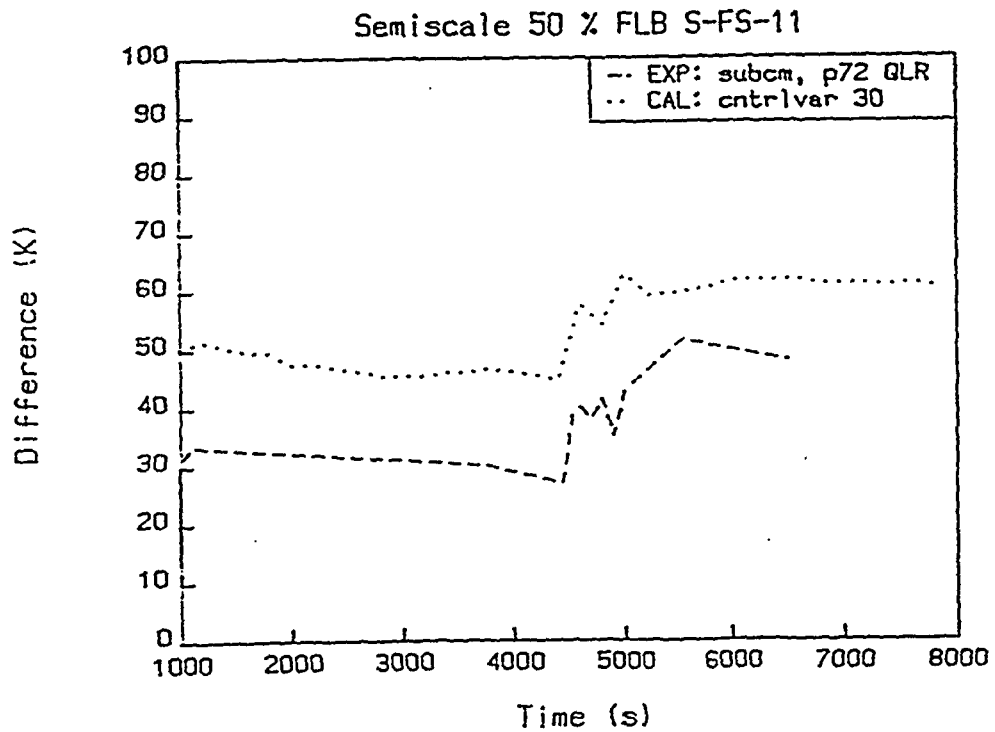


Fig.51 Primary subcooled margin

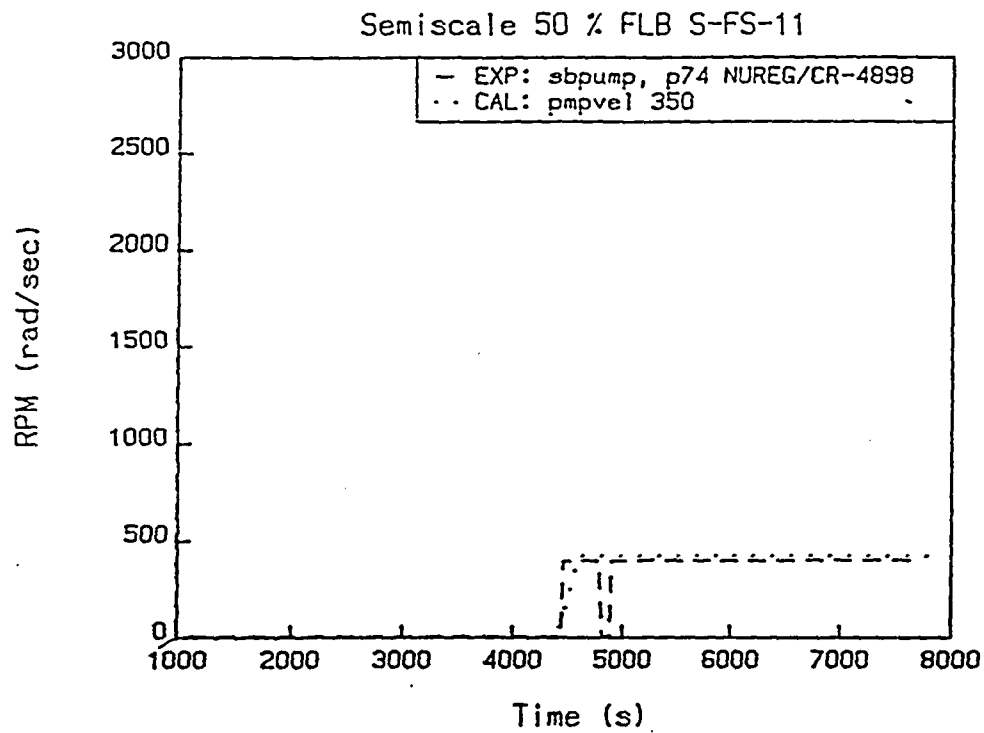


Fig.52 AL pump velocity

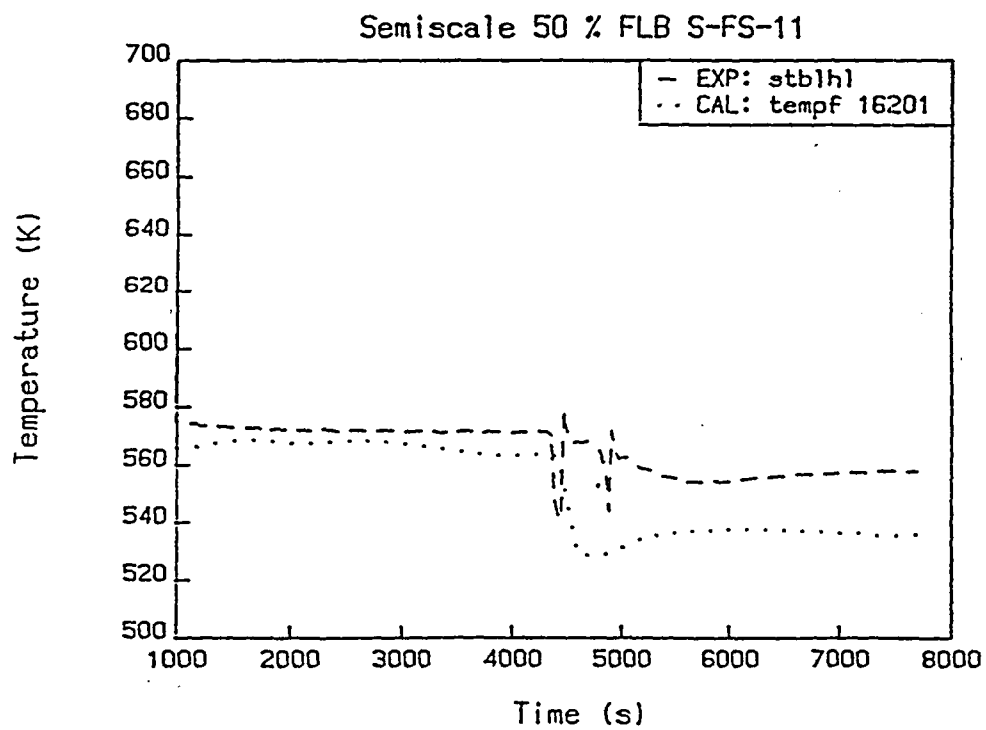


Fig.53 Upper plenum temperature

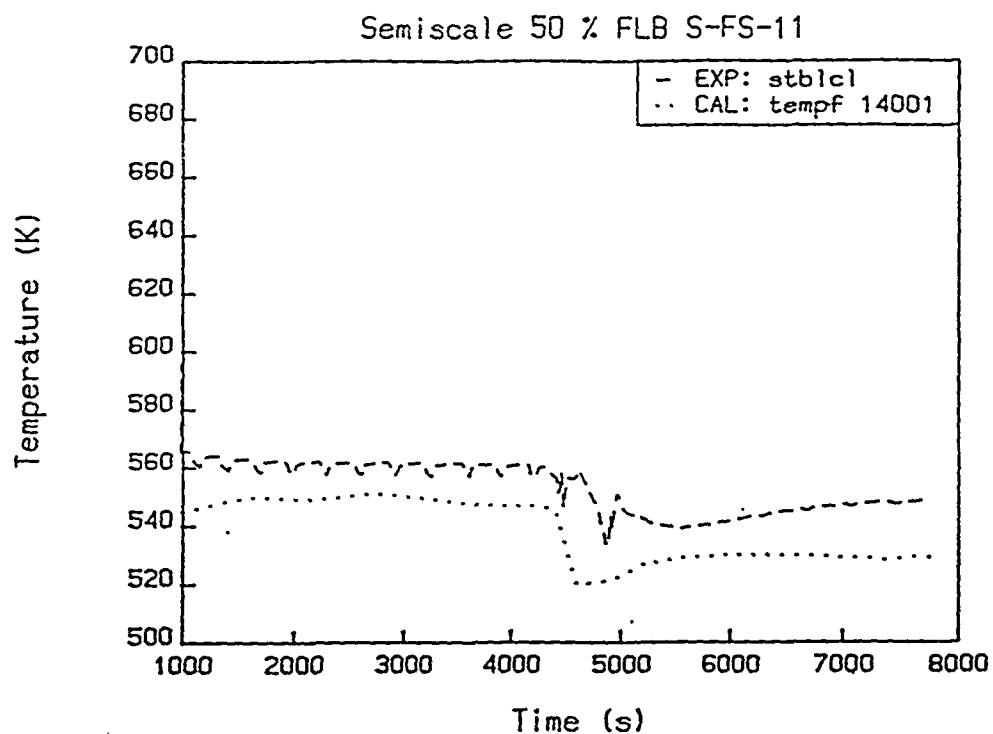


Fig.54 Lower plenum temperature

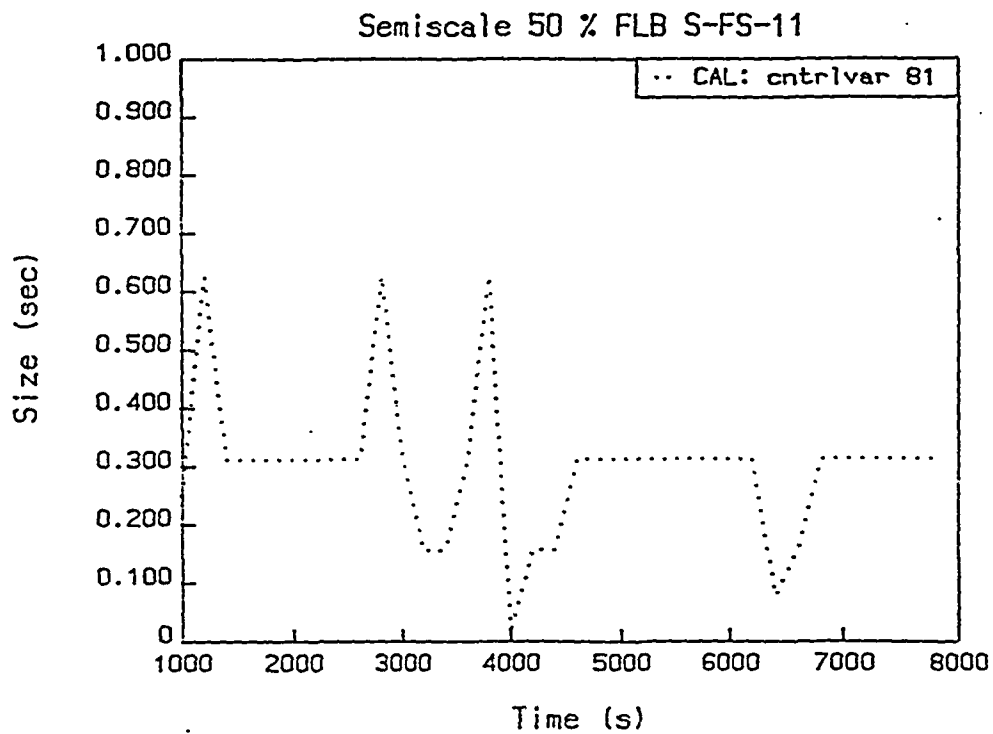


Fig.55 Time step size (1000-8000 s)

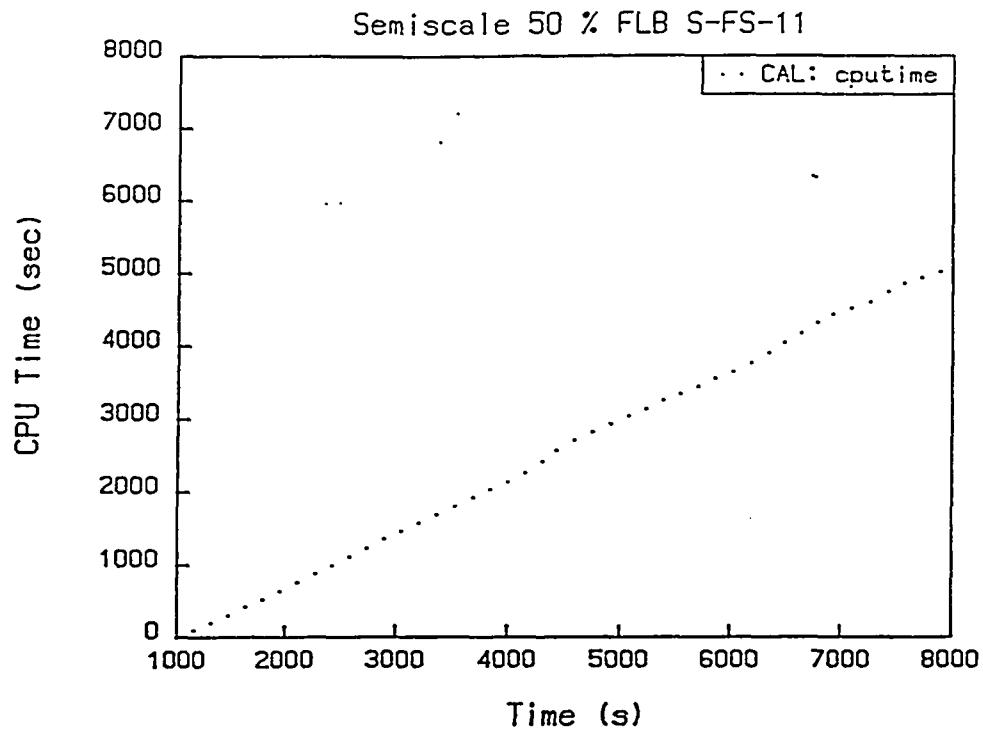


Fig.56 CPU time (1000-8000 s)

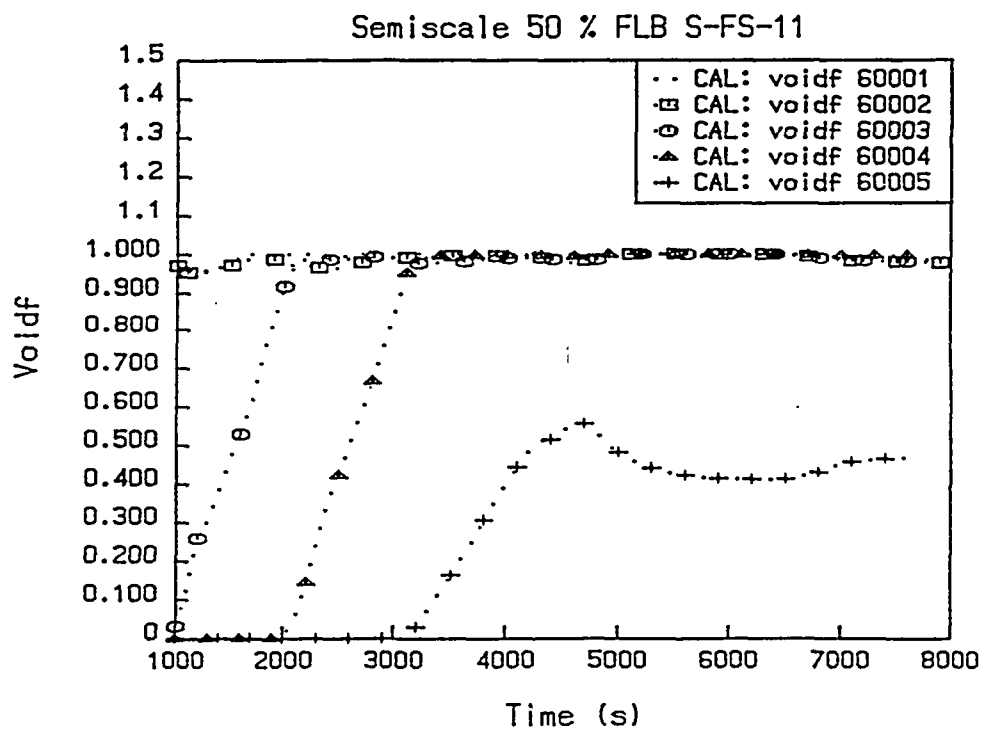


Fig.57 IL SG secondary voidf

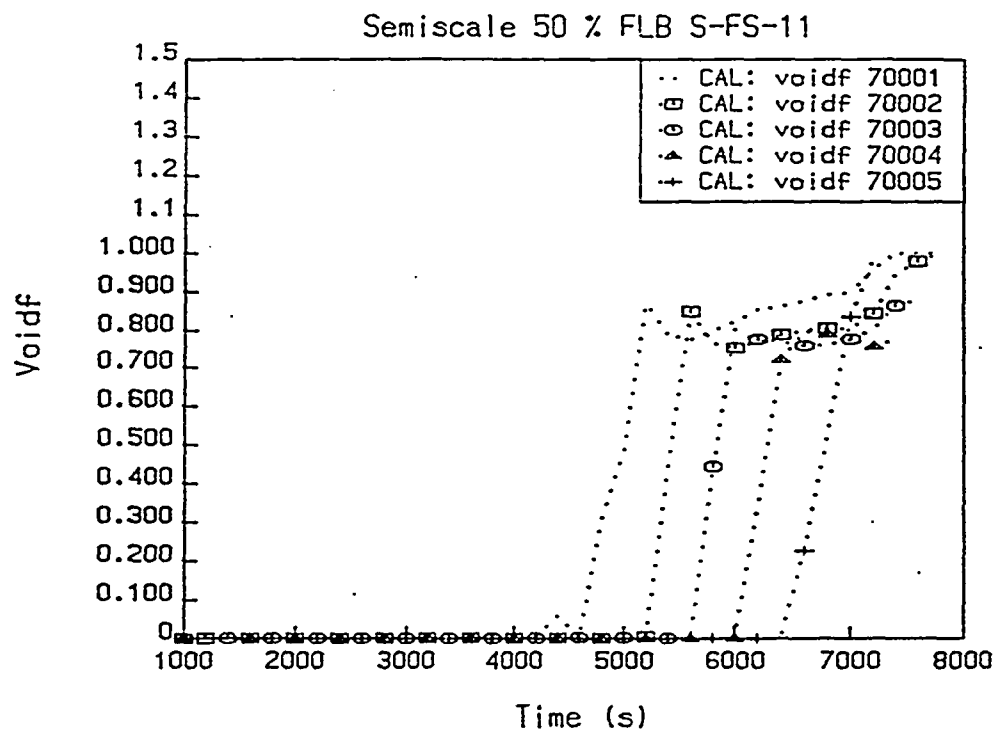


Fig.58 AL SG secondary voidf

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*****
*****
***** semiscale mod-2c *****
*****
*****
***** standard transient *****
***** input deck *****
***** for relap5/mod2 *****
*****
*****
*****notes-*****
*****
***** 1. this model is based on the standard mod-2a model *****
***** documented in reference 2 below. *****
*****
***** 2. steady state runs are made either with the provided *****
***** control systems package or with additional components *****
***** for single condition steady state calculations. *****
*****
***** 3. vessel heater tape to offset vessel heat loss is *****
***** included with this model. a control system to shut off *****
***** the vessel heaters and redistribute the power among *****
***** the remaining heaters is also included in this model. *****
*****
***** 4. the thermal conductivity of the insulation on the *****
***** vessel and piping has been modified to give 56 kw *****
***** heat loss. the thermal conductivity of the insulation *****
***** on the steam generators has been modified to give *****
***** 14 kw heat loss. an additional 35 kw is lost due to *****
***** pump seal cooling when pumps are running at full speed. *****
***** the heater tape is wrapped in the "no break" *****
***** configuration from drawing 414220. *****
*****
***** 5. the system configuration incorporated in this model is *****
***** the communicative cold leg break configuration. *****
***** all bhi system components are removed and upper head *****
***** internals are modeled as modified to reflect non-bhi *****
***** plant configuration. *****
*****
***** 6. steam generator components have been renodolized to *****
***** reflect the ppcc guidelines as established by caap *****
***** letter from c. davis. *****
*****
***** 7. steam separator components reflect recommended model *****
***** changes from j. trapp. (no junctions are abrupt, and *****
***** inlet is homogeneous) *****
*****
***** 8. primary coolant pump discharge junction is homogeneous *****
*****
***** 9. the pressurizer is the 20 foot long pressurizer with *****
***** heat structure to model the walls and with heater *****
***** tape and insulation on the outside. *****
*****
***** 10. a leak between the upper head to the upper plenum *****
***** through the support columns around the plugs is *****
***** included in this model. *****
*****
***** 11. the pressurizer spray and associated thermal shock *****

```

```

***** shield are included in this model. normal spray goes *****
***** from the intact loop cold leg to the pressurizer via *****
***** time dependent volumes and junctions, matching temp. *****
***** if auxiliary spray is also used the spray temp will not *****
***** match the cold leg temp. if the thermal shock shield *****
***** was not included in the test both the hydraulics and *****
***** heat structure of the pressurizer must be modified. *****
*****
*****
*****

```

```

*****
***** references *****
*****
***** 1. v. h. ranson et al., relap5/mod2 code manual, volume 1 and 2, *****
***** egg-saam-6377, september 1983. *****
*****
***** 2. m. t. leonard, "relap5 standard model for the semiscale mod-2a *****
***** *****
*****
***** 3. system design description for the mod-3 semiscale system, *****
***** revision b, december 1980. *****
*****
*****

```

```

*****
***** = relap5 model for the semiscale fs-11 posttest - steady state *****
*****
*****
***** for control system steady state runs, make appropriate changes *****
***** in components - *****
***** 610, 635, 710, 735, 980, 989, 991, trips, and control systems *****
*****

```

```

*problem type option
0000100 new std-st
*
* inp-chk or run
0000101 run
*

```

```

*units input output (si or british)
0000102 british si
*

```

```

*time out min max
*0000105 5.0 6.0
*0000105 125.0 150.0
* noncondensable gas type
0000110 nitrogen
* mass fraction
0000115 1.0
*

```

```

** vol no elev fluid name
*0000120 101010000 1.0 water primary
*0000121 600010000 0.0 water ilsg
*0000122 700010000 0.0 water blsg
**

```

```

* t end min st max st st cl nr nj wt
*0000201 2. 1.0-7 0.05 3 20 40 40
*0000202 10. 1.0-7 0.05 3 20 150 150
*0000203 25. 1.0-7 0.05 3 40 300 300
*0000204 100. 1.0-7 0.05 3 40 1500 1500
*0000205 200. 1.0-7 0.05 3 40 1000 1000
*0000206 1005. 1.0-7 0.05 3 40 2000 2000
*

```

```

*0000201 35.0 1.0-7 0.5 3 20 200 200
*0000202 40.0 1.0-7 0.01 3 500 5000 5000
0000201 300.0 1.0-7 1.0 3 50 500 500
*****
** trips - trip cancellation card 400 variable trip cards 401-599 **
** - trip stop card 600 logical trip cards 601-699 **
*****
**
** 401 terminate calculation **
** 402 open break **
** 403 always false - used in motor valves that only close, etc **
** 406 begin transient **
** 407 hpis pressure setpoint **
** 408 begin hpis **
** 409 begin core decay - scram **
** 410 close main intact loop steam generator steam valve **
** 411 close main broken loop steam generator steam valve **
** 412 begin intact loop primary coolant pump coastdown **
** 413 begin broken loop primary coolant pump coastdown **
** 414 close main intact loop steam generator feedwater valve **
** 415 close main broken loop steam generator feedwater valve **
** 416 open auxiliary intact loop steam generator feedwater valve **
** 417 open auxiliary broken loop steam generator feedwater valve **
** 418 open pressurizer spray valve **
** 419 turn off steam generator mass controller **
** 420 always true **
** 421 open pressurizer relief valve **
** 423 valve out time dependent volume pressurizer for steady state **
** 424 open steam generator cross-over line valve **
** 425 close steam generator cross-over line valve **
** 426 monitor maximum heater rod temp - may want to stop calculation **
** 429 turn off pressurizer level controller **
** 430 begin using test power for guard heater bank 110 (hot legs) **
** 431 begin using test power for guard heater bank 111 (bl pump suc) **
** 432 begin using test power for guard heater bank 112 (cold legs) **
** 433 begin using test power for guard heater bank 113 (il pump suc) **
** 436 begin using test power for vessel external heaters (bank 116) **
** 437 begin using test power for pressurizer ext heaters (bank 117) **
** 439 turn on pressurizer heater rods **
** 440 turn off power to upper head heaters **
** 441 turn off power to upper vessel heaters **
** 442 turn off power to middle vessel heaters **
** 443 turn off power to vessel and downcomer heaters **
** 450 pressure to open intact loop steam generator relief valve **
** 451 pressure to close intact loop steam generator relief valve **
** 452 upper limit on intact loop secondary pressure for steady state **
** 453 lower limit on intact loop secondary pressure for steady state **
** 454 rate to close main intact loop steam valve for steady state **
** 455 rate to open main intact loop steam valve for steady state **
** 470 pressure to open broken loop steam generator relief valve **
** 471 pressure to close broken loop steam generator relief valve **
** 472 upper limit on broken loop secondary pressure for steady state **
** 473 lower limit on broken loop secondary pressure for steady state **
** 474 rate to close main broken loop steam valve for steady state **
** 475 rate to open main broken loop steam valve for steady state **
** 600 stop calculation **
** 624 open steam generator cross-over line valve **
** 640 turn off power to upper head heaters **

** 641 turn off power to upper vessel heaters **
** 642 turn off power to middle vessel heaters **
** 643 turn off power to vessel and downcomer heaters **
** 660 reset intact loop steam relief valve for hysteresis effects **
** 661 open intact loop steam generator relief valve **
** 662 used in steady state control to open intact loop steam valve **
** 663 used in steady state control to close intact loop steam valve **
** 670 reset broken loop steam relief valve for hysteresis effects **
** 671 open broken loop steam generator relief valve **
** 672 used in steady state control to open broken loop steam valve **
** 673 used in steady state control to close broken loop steam valve **
**
*****
*
* trip vr co para rela va co para add indx timeof
0000401 time 0 ge null 0 1000.0 1 -1.
0000402 time 0 ge null 0 9999.0 1 -1.
0000403 time 0 lt null 0 0. 1 -1.
0000406 time 0 ge null 0 9999.0 1 -1.
0000407 p 999010000 le null 0 1827.5 1 -1.
0000408 time 0 ge timeof 407 26.3 1 -1.
0000409 time 0 ge timeof 407 4.6 1 -1.
0000410 time 0 ge timeof 407 7.3 1 -1.
0000411 time 0 ge timeof 407 7.3 1 -1.
0000412 time 0 ge timeof 407 4.7 1 -1.
0000413 time 0 ge timeof 407 4.35 1 -1.
0000414 time 0 ge timeof 407 0.0 1 -1.
0000415 time 0 ge timeof 407 0.0 1 -1.
0000416 time 0 lt null 0 0.0 1 -1.
0000417 time 0 lt null 0 0.0 1 -1.
0000418 time 0 lt null 0 0. 1 -1.
0000419 time 0 le null 0 500. n -1. *ejl
0000420 time 0 ge null 0 0. 1 0.
0000421 p 999010000 ge null 0 2305. n -1.
0000422 time 0 ge timeof 412 64. 1 -1.
0000423 time 0 ge null 0 9988. 1 -1.
0000424 time 0 lt null 0 0. 1 -1.
0000425 time 0 lt null 0 0. 1 -1.
0000426 ctrlrvar 29 ge null 0 922.0 n -1.
0000429 time 0 le null 0 340. n -1.
0000430 time 0 ge timeof 406 0. 1 -1.
0000431 time 0 ge timeof 406 0. 1 -1.
0000432 time 0 ge timeof 406 0. 1 -1.
0000433 time 0 ge timeof 406 0. 1 -1.
0000436 time 0 ge timeof 406 0. 1 -1.
0000437 time 0 ge timeof 406 0. 1 -1.
0000439 time 0 lt null 0 0. 1 -1.
0000440 ctrlrvar 565 lt null 0 +184.0 n -1.
0000441 ctrlrvar 564 lt null 0 +90.0 n -1.
0000442 ctrlrvar 561 lt null 0 -62.0 n -1.
0000443 ctrlrvar 561 lt null 0 -423.0 n -1.
* sfll
*0000600 401 426
0000624 424 and -425 n -1.
0000640 422 and 440 1 -1.
0000641 422 and 441 1 -1.
0000642 422 and 442 1 -1.
0000643 422 and 443 n -1.

```

*
* steam generator relief valve trips, including hysteresis effects

*
0000460 p 611010000 gt null 0 1048.0 n -1.
0000461 p 611010000 gt null 0 1045.0 n -1.
0000470 p 705010000 gt null 0 1048.0 n -1.
0000471 p 705010000 gt null 0 1045.0 n -1.

*
* steam generator relief valve logic

*
0000660 461 and 661 n -1.
0000661 460 or 660 n -1.
0000670 471 and 671 n -1.
0000671 470 or 670 n -1.

*

* trips used for controlling steam generator pressures in steady-state *
* acceptable pressure bands - trips 462 & 463 (il) and 472 & 473 (bl) *
* max and min pressure rate changes - trips 464, 465(il), 474, 475(bl) *
* open or close steam valves - trips 662 & 663 (il) and 672 & 673 (bl) *

*
* intact loop
0000462 p 611010000 ge null 0 906.0 n -1.
0000463 p 611010000 le null 0 902.0 n -1.
0000464 ctrlvar 631 gt null 0 -2500. n -1.
0000465 ctrlvar 631 lt null 0 2500. n -1.
0000662 462 and 464 n -1.
0000663 463 and 465 n -1.

*
* broken loop
0000472 p 705010000 ge null 0 906.0 n -1.
0000473 p 705010000 le null 0 902.0 n -1.
0000474 ctrlvar 731 gt null 0 -2500. n -1.
0000475 ctrlvar 731 lt null 0 2500. n -1.
0000672 472 and 474 n -1.
0000673 473 and 475 n -1.

*

* intact *
* loop *

* hot leg, vessel outlet to pressurizer surge line tee *

*
* ref drawings: hot leg nozzle - 407986
* 3 pc-lb (sp-1) - 414684
* 2.5pc-18 (sp-2) - 407346
* 2.5pc-2 (sp-3) - 415155

*
* inlet elev = outlet elev = + 8.500 in.

*
* name type
2010000 c201 pipe

*
* no vol

2010001 2

*
* area vol no
2010101 .0395502 1 * hot vessel nozzle (id = 2.880 in)
2010102 .0314314 2 * 3 in sch 160

*
* length vol no
2010301 2.6425000 1
2010302 2.4716667 2 * spool pieces 1 and 2

*
* bz ang vol no
2010501 -45.0 1
2010502 -45.0 2

*
* vr ang vol no
2010601 0.0 2

*
* elv ch vol no
2010701 0.0 2

*
* rough by dia vol no
2010801 6.667e-5 0.0 2

*
* f loss r loss jun no
2010901 0.05 0.05 1

*
* ctl flg vol no
2011001 0 2

*
* vrabs jun no
2011101 0 1

*
* ctl press temp zero zero air flg vol no
2011201 3 2258.30 592.30 0.0 0.0 0 1
2011202 3 2258.30 592.30 0.0 0.0 0 2

*
* ctl flg
2011300 1

*
* flow-f flow-g velj jun no
2011301 17.450 0.0 0.0 1

* hot leg - pressurizer surge line tee *

*
* ref drawings: 2.5pc-2 (sp-3) - 415155
* 2.5pc-6 (sp-4) - 414431

*
* pressurizer connection is horizontal to the hot leg center line.

*
* inlet elev = outlet elev = + 8.500 in.

*
* name type
2020000 c202 branch

*
* no jun ctl
2020001 3 1

```

*
*      area  length  volume  hz ang  vr ang  elv ch
2020101  .0246289  2.7433333  0.0    0.0    0.0    0.0
*
*      rough  hy dia  ctl
2020102  6.667e-5  0.0    0
*
*      ctl  press  temp
2020200  3  2258.30  592.30
*
*      from  to  jun area  f loss  r loss  vchgs
2021101  201010000  202000000  .0246289  0.075  0.075  0
2022101  202010000  203000000  .0246289  0.075  0.075  0
2023101  997010000  202000000  7.4667e-4  0.0    0.0    101
*
*      flow-f  flow-g  velj
2021201  17.450  0.0  0.0
2022201  17.450  0.0  0.0
2023201  0.000  0.0  0.0
*
*****
* pressurizer time dependent volume (for steady state calculations) *
*****
*
* elev = +326.875 in.
*
*      name  type
9890000  c889  tmpdvol
*
*      area  length  volume  hz ang  vr ang  elv ch
9890101  .06926263  10.00  0.0    0.0    0.0    0.0
*
*      rough  hy dia  ctl
9890102  0.0    0.0    0
*
*      ctl flg
9890200  2
*
*      time pressure  quale
9890201  0.0  2243.73  1.0
*
*****
* time dependent pressurizer junction *
*****
*
* elev = +326.875 in.
*
*      name  type
9910000  tmp-prz  valve
*
*      from  to  jun area  f loss  r loss  vchgs
9910101  989000000  999000000  .06926263  0.0    0.0    100
*
*      ctl flow-f  flow-g  velj
9910201  1  0.0  0.0  0.0
*
*      vlv type
9910300  mtrvlv

```

```

*
*      op trip  cl trip  slope  init pos  table
9910301  403  423  0.20  1.0  0
*
*****
* pressurizer desired level time dependent junction *
*****
*
* for steady state - input for getting and maintaining desired level
* elev = 87.000 in.
*
*      name  type
9850000  prtrvlj  tmpjrm
*
*      from  to  jun area
9850101  980000000  999010000  .012
*
*      ctl flg  trip  search variable
9850200  1  0  cntrlvar 985
*
*      table takes into account conversion of kg to lb
*      kg  lb
9850201  -10.0  -22.0462  0.0  0.0
9850202  0.0  0.0  0.0  0.0
9850203  10.0  22.0462  0.0  0.0
*
*****
* pressurizer desired level time dep volume - temp from bottom per *
*****
*
* for steady state - input for getting and maintaining desired level
* elev = 87.000 in.
*
*      name  type
9800000  prtrvlv  tmpdvol
*
*      area  length  volume  hz ang  vr ang  elv ch
9800101  .012  10.00  0.0    0.0    0.0    0.0
*
*      rough  hy dia  ctl
9800102  0.0    0.0    0
*
*      ctl flg  trip  search variable
9800200  1  0  tempf 999070000
*
*      temp (f)  temp (f)  quale
9800201  80.0  80.0  0.0
9800202  575.0  575.0  0.0
9800203  1340.0  1340.0  0.0
9800204  17540.0  17540.0  0.0
*
*****
* pressurizer spray time dependent junction *
*****
*
* elev = +326.875 in.
*
*      name  type

```

```

9100000 prspry tadpjm
*
*      from      to jua area
9100101 92000000 999000000 .012
*
*      ctl flg    trip
9100200      1      418
*
* check flows for 260 - same if normal spray only
*      time flow-f flow-g velj
9100201 -1.0 0.0 0.0 0.0
9100202 0.0 0.0 0.0 0.0
9100203 2000.0 0.0 0.0 0.0
*
*****
* pressurizer spray time dep volume - temp from intact loop cold leg *
*****
*
* elev = +326.875 in.
*
*      name      type
9200000 prsprv tadpvol
*
*      area length volume hz ang vr ang elv ch
9200101 .012 10.00 0.0 0.0 0.0 0.0
*
*      rough by dia ctl
9200102 0.0 0.0 0
*
***** normal spray *****
**      ctl flg    trip search variable
+9200200      1      0 tempf 261010000
**
**      temp (f) temp (f) quale
+9200201 80.0 80.0 0.0
+9200202 575.0 575.0 0.0
+9200203 1340.0 1340.0 0.0
+9200204 17540.0 17540.0 0.0
**
***** auxiliary spray or combination *****
*      ctl flg
9200200      3
*
*      time pressure temp
9200201 0.0 12.3 80.0
*
*****
* pressurizer pressure relief valve *
*****
*
* elev = +326.875 in.
*
*      name      type * simulate
9340000 prscr valve * srvc
*
*      from      to jua area f loss r loss vchgs
9340101 999000000 940000000 1.4748e-5 0.0 0.0 100
*

```

```

*      cd1 cd2
9340102 0.7 0.84
*
*      ctl flow-f flow-g velj
9340201 1 0.0 0.0 0.0
*
*      vlv type
9340300 trpvlv
*
*      trip
9340301 421
*
*****
* pressurizer relief valve - time dep discharge volume *
*****
*
* elev = +326.875 in.
*
*      name      type
9400000 prscr tadpvol
*
*      area length volume hz ang vr ang elv ch
9400101 10.00 10.00 0.0 0.0 0.0 0.0
*
*      rough by dia ctl
9400102 0.0 0.0 0
*
*      ctl flg
9400200      2
*
*      time pressure quale
9400201 0.0 12.3 1.0
*
*****
* long pressurizer *
*****
*
* ref drawings: 416200 - pr assembly
*                416199 - prz installation
*                418126 - pr thermal shock shield for spray, no liner
*
* vessel id = 3.631 in, total interior height = 239.875 in
* bottom of pressurizer model is top of heater rod retainer
* which is 5.2 inches below the lower pressure tap
* includes 6 heater rods 0.75 inches dia.
*
* total volume = 2417.26 in3 without thermal shield
*
* inlet elev = top = +326.875 in.
* outlet elev = bottom = + 87.000 in.
*
*      name      type
9990000 c999 pipe
*
*      no vol
9990001 8
*
*      area vol no

```

```

9990101 0.07190844 1
9990102 0.07190844 7
9990103 0.05350067 8 * includes 6 htr rods, grid plate.
*
*      area    jun no
9990201 0.07190844 1
9990202 0.07190844 6
9990203 0.05350067 7
*
*      length   vol no
9990301 2.500000 1
9990302 2.562500 6
9990303 2.583333 7
9990304 2.037500 8
*
*      vr ang   vol no
9990601 -90.0 8
*
*      elv ch   vol no
9990701 -2.500000 1
9990702 -2.562500 6
9990703 -2.583333 7
9990704 -2.037500 8
*
*      rough   by dia   vol no
9990801 6.667e-5 .2858333 1
9990802 6.667e-5 .3025833 7
9990803 6.667e-5 .1005325 8
*
*      f loss   r loss   jun no
9990901 0.0 0.0 7
*
*      ctl flg   vol no
9991001 0 8
*
*      vcabs     jun no
9991103 0 7
*
*      ctl press   quals   zero   zero   air flg   vol no
9991201 2 2258.30 1.00 0.0 0.0 0 2
9991202 2 2258.30 0.0777 0.0 0.0 0 3
9991203 2 2258.30 0.00 0.0 0.0 0 8
*
*      ctl flg
9991300 1
*
*      flow-f   flow-g   velj   jun no
9991301 0.0 0.0 0.0 7
*
*****
* pressurizer vessel outlet
*****
*
* ref drawings: 416204 & 416205
* outlet 6 holes + annulus around grid plate
* elev = +87.000 in.
*
*      name    type

```

```

9990000 j+998 sugljm
*
*      from    to    jun area   f loss   r loss   vcabs
9990101 999010000 997000000 6.1762e-3 0.0 0.0 100
*
*      ctl flow-f   flow-g   velj
9990201 1 0.0 0.0 0.0
*
*****
* pressurizer surge line
*****
*
* ref drawings: 416119 & 416204
*
* inlet elev = top = + 87.000 in.
* outlet elev = bottom = + 8.500 in.
*
*      name    type
9970000 c+997 pipe
*
*      no vol
9970001 3
*
*      area    vol no
9970101 6.1762e-3 1 * includes heater rod retainer
9970102 7.4657e-4 2
9970103 7.4657e-4 3
*
*      length   vol no
9970301 0.5416667 1
9970302 5.6458333 2
9970303 4.0625000 3
*
*      vr ang   vol no
9970601 -90.0 1
9970602 -90.0 2
9970603 -5.46 3
*
*      elv ch   vol no
9970701 -0.5416667 1
9970702 -5.6458333 2
9970703 -0.3541667 3
*
*      rough   by dia   vol no
9970801 6.667e-5 .0479447 1
9970802 6.667e-5 .0308333 3
*
*      f loss   r loss   jun no
9970901 7.8434 7.8434 1 * total r' = 1.63e9 m+4
9970902 7.8434 7.8434 2 * divided equally among
* the two junctions
* k = (r')(2a+2)
*
*      ctl flg   vol no
9971001 0 3
*
*      vcabs     jun no
9971101 0 2
*

```

```

*      ctl press temp zero zero air flg vol no
9971201 3 2258.30 592.30 0.0 0.0 0 3
*
*      ctl flg
9971300 1
*      flow-f flow-g velj jun no
9971301 0.0 0.0 0.0 2
*
*****
* hot leg pressurizer surge line tee to steam generator inlet *
*****
*
* ref drawings: 2.5pc-6 (sp-4) - 414431
*                2.5pc-7 (sp-5) - 414425
*                2.5pc-8 (sp-6) - 414426
*                2.5pc-9 (sp-7) - 414427
*                inlet plenum - 414271
*
* inlet elev = + 8.500 in. (hot leg centerline)
* outlet elev = + 73.969 in. (bottom of inlet plenum)
*
*      name type
2030000 c203 pipe
*
*      no vol
2030001 3
*
*      area vol no
2030101 .0245289 3 * 2.5 in sch-160
*
*      length vol no
2030301 2.6542072 1 * spool pieces 4,5,6
2030302 2.3329157 2
2030303 2.1884513 3 * spool piece 7 & inlet plenum connect
*
*      vr ang vol no
2030601 +45.0 1
2030602 +90.0 2
2030603 +45.0 3
*
*      elv ch vol no
2030701 1.3941666 1
2030702 2.3329157 2
2030703 1.7286602 3
*
*      rough by dia vol no
2030801 6.667e-5 0.0 3
*
*      f loss r loss jun no
2030901 0.075 0.075 1
2030902 0.050 0.050 2
*
*      ctl flg vol no
2031001 0 3
*
*      vcabs jun no
* kkt
2031101 100000 2

```

```

*
*      ctl press temp zero zero air flg vol no
2031201 3 2258.30 592.30 0.0 0.0 0 1
2031202 3 2258.30 592.30 0.0 0.0 0 2
2031203 3 2258.30 592.30 0.0 0.0 0 3
*
*      ctl flg
2031300 1
*
*      flow-f flow-g velj jun no
2031301 17.450 0.0 0.0 2
* kkt
2031401 0.0 0.0 0.55 0.785 2
*
*
*****
*      intact loop *
*      type-ii *
*      steam generator *
*****
* steam generator inlet *
*****
*
* ref drawing: 414271
*
* elev = +73.969 in.
*
*      name type
2050000 j205 sagljun
*
*      from to jun area f loss r loss vcabs
2050101 203010000 210000000 0.024529 6.0 0.0 000
*
*      ctl flow-f flow-g velj
2050201 1 17.450 0.0 0.0
*
*****
* steam generator inlet plenum *
*****
*
* reference - type-ii (intact loop) steam generator pant-leg drwg,
*                and plenum drwg. 414271 (1,2)
* note - inlet plenum entrance is circular (dia=2.125 in),
*        plenum tapers outward, nonuniformly, with rise to
*        tube sheet inlet (inlet plenum outlet).
*        outlet is rectangular with radiused corners.
*
* inlet elev = bottom = + 73.969 in.
* outlet elev = top = + 81.594 in.
*
*      name type
2100000 c210 saglvol
*
*      area length volume hz ang vr ang elv ch
2100101 0.0 0.6354157 0.0478580 +90.0 +90.0 0.6354157
*
*      rough by dia ctl
2100102 6.667e-5 0.2805910 0

```

```

*
*      ctl  press   temp   zero
2100200  3  2258.30  592.30  0.0
*
*****
* intact loop steam generator tube sheet inlet
*****
*
* ref drawing: 406416
*
* inlet elev = bottom = + 81.594 in. (bottom of tube sheet)
* outlet elev = top   = +102.594 in. (top of tube sheet)
*
*      name      type
2150000  ilts-in  branch
*
*      no jum   in  ctl
2150001      2      1
*
*      area  length  volume  hz ang  vr ang  elv ch
2150101  0.019757  1.7500  0.0  0.0  90.0  1.7500
*
*      rough  hy dia  ctl
2150102  5.000e-6  .06475  0
*
*      ctl  press   temp
2150200  3  2258.30  592.30
*
*      from      to  jun area  f loss  r loss  vcrabs
2151101  210010000 215000000 0.019757  1.0  0.0  100
2152101  215010000 220000000 0.019757  0.0  0.0  000
*
*      flow-f  flow-g  velj
2151201  17.450  0.0  0.0
2152201  17.450  0.0  0.0
* kkt
2170000  ilsgin  snljun
2170101  215010000 220000000 0.019757  0.0  0.0  100100
2170110  0.0  0.0  0.725  1.0
2170201  0.0  0.855  0.855  0.0
*
*****
* steam generator tube bundle
*****
*
* ref drawings: 413415 & 414271
*
* inlet elev = outlet elev = +102.594 in. (top of tube sheet)
*
* elev long tube = 391.24 in. above top of tube sheet
* elev middle tube = 364.86 in. above top of tube sheet
* elev short tube = 336.99 in. above top of tube sheet
*
* elev model tube = 364.490 in. above top of tube sheet
*
*      name      type
2200000  isgtub  pipe
*

```

```

*      no vol
2200001      8
*
*      area  vol no
2200101  0.019757  8  * 6 tubes, id = 0.777 in
*
*      length  vol no
2200301  7.9525000  1  * 8 volumes around u-tubes: 4 up and
2200302  7.9108334  3  * 4 down. lengths are equivalent
2200303  6.6920292  5  * to secondary side lengths (c600)
2200304  7.9108334  7
2200305  7.9525000  8
*
*      vr ang  vol no
2200601  +90.0  3
2200602  +88.6  4
2200603  -88.6  5
2200604  -90.0  8
*
*      elv ch  vol no
2200701  +7.9525000  1
2200702  +7.9108334  3
2200703  +6.5999883  4
2200704  -6.5999883  5
2200705  -7.9108334  7
2200706  -7.9525000  8
*
*      rough  hy dia  vol no
2200801  5.000e-6  .06475  8
*
*      f loss  r loss  jun no
2200901  0.0  0.0  3
2200902  0.0  0.0  4
2200903  0.0  0.0  7
*
*      ctl flg  vol no
2201001  0  8
*
*      ctl flg  jun no
2201101  0  7
*
*      ctl  press   temp  zero  zero  air flg  vol no
2201201  3  2258.30  592.30  0.0  0.0  0  1
2201202  3  2258.30  592.30  0.0  0.0  0  2
2201203  3  2258.30  592.30  0.0  0.0  0  3
2201204  3  2258.30  592.30  0.0  0.0  0  4
2201215  3  2258.30  531.30  0.0  0.0  0  5
2201216  3  2258.30  531.30  0.0  0.0  0  6
2201217  3  2258.30  531.30  0.0  0.0  0  7
2201218  3  2258.30  531.30  0.0  0.0  0  8
*
*      ctl flg
2201300  1
*
*      flow-f  flow-g  velj  jun no
2201301  17.450  0.0  0.0  7
*
*****

```

```

* steam generator secondary volume
*****
*
* ref drawings: 413463 - assembly 406419 - separator
*               413357 - fillers 413415 - baffle plates
*
* inlet elev = 0.000 in. above top of tube sheet
* outlet elev = 436.875 in. above top of tube sheet
*
*      name      type
6000000  isgsec   pipe
*
*      no vol
6000001      5
*
*      area      vol no
6000101      0.0      5
*
*      area      jcn no
6000201 .0583799      3 * single baffle plate along flow path
6000202 .0917866      4 * baffle plate which supports tc-tube
*
*      length      vol no
6000301 7.9525000      1 * vol begins above top of tube sheet.
6000302 7.9108334      3 * volumes are separated by junctions
6000303 7.4762500      4 * at baffle plates. (not all plates are
6000304 5.1558333      5 * considered - some are within volumes)
*
*      volume      vol no
6000401 1.0038417      1
6000402 0.9402046      2
6000403 0.8926058      3
6000404 1.0017945      4
6000405 2.2709806      5
*
*      vr ang      vol no
6000601 490.0      5
*
*      elv ch      vol no
6000701 7.9525000      1
6000702 7.9108334      3
6000703 7.4762500      4
6000704 5.1558333      5
*
*      rough      by dia      vol no
6000801 6.667e-5 .0884737      3
6000802 6.667e-5 .1058911      4
6000803 6.667e-5 .6378870      5
*
*      ctl flg      vol no
6001001      0      5
*
*      vcabs      jcn no
6001101      100      4 * baffle plates
*
*      ctl press      quals      zero      zero      air flg      vol no
6001201 2 829.600 0.02054      0.0      0.0      0      1
6001202 2 829.600 0.04054      0.0      0.0      0      2

```

```

6001203 2 829.600 0.06054      0.0      0.0      0      3
6001204 2 829.600 0.06054      0.0      0.0      0      4
6001205 2 829.600 0.10000      0.0      0.0      0      5
*
*      ctl flg
6001300      0
*
*      vel-f      vel-g      vel-j      jcn no
6001301 2.800      4.500      0.0      1
6001302 4.700      7.400      0.0      2
6001303 5.200      10.500      0.0      3
6001304 4.000      11.700      0.0      4
* kkt
6001401 0.0 1.0 1.0 1.0 3
6001402 0.0 1.0 1.0 1.0 4
*
*****
* intact loop steam generator secondary separator
*****
*
* ref drawing: 413463
*
* inlet elev = 436.875 in. above top of tube sheet
* outlet elev = 446.375 in. above top of tube sheet
*
*      name      type
6010000  isgsec   separatr
*
*      no jcn      ctl
6010001      3      0
*
*      area      length      volume      hz ang      vr ang      elv ch
6010101      0.0      .7916667      .4508175      0.0      90.0      .7916667
*
*      rough      by dia      ctl
6010102 6.667e-5      0.0      0
*
*      ctl press      quals
6010200 2 829.600      0.30
*
*      from      to      jcn area      f loss      r loss      cabs      voidgf
6011101 601010000 612000000 .4690572      0.0      0.0      1002      0.50
6011201 601000000 602000000 .4690572      0.0      0.0      1002      0.15
6011301 600010000 601000000 .5353713      0.0      0.0      1000
*
*      vel-f      vel-g      vel-j
6011201 -2.500      1.600      0.0
6012201 1.000      0.0      0.0
6013201 1.600      1.600      0.0
*
*****
* intact loop steam generator secondary steam dome
*****
*
* ref drawing: 413795
*
* inlet elev = 446.375 in. above top of tube sheet
* outlet elev = 455.360 in. above top of tube sheet

```

```

*
*      name      type
* 6110000      isgsd      snglvol
*
*
*      area      length      volume      hz ang      vr ang      elv ch
* 6110101      0.0      .748750      .4249623      0.0      90.0      .748750
*
*
*      rough      hy dia      ctl
* 6110102      6.667e-5      .5664365      0
*
*
*      ctl press      quals      zero
* 6110200      2 829.600      1.00      0.0
*
*
*****
* intact loop steam generator secondary downcomer (top) *
*****
*
* ref drawing: 413463
*
* inlet elev = 441.625 in. above top of tube sheet
* outlet elev = 375.005 in. above top of tube sheet
*
*
*      name      type
* 6020000      isgsd      branch
*
*
*      no jun      ctl
* 6020001      1      0
*
*
*      area      length      volume      hz ang      vr ang      elv ch
* 6020101      0.0      5.5516667      3.0085308      0.0      -90.0      -5.5516667
*
*
*      rough      hy dia      ctl
* 6020102      6.667e-5      .3369291      0
*
*
*      ctl press      quals
* 6020200      2 829.600      0.00
*
*
*      from      to jun area      f loss      r loss      vchgs
* 6021101      602010000      603000000      .0819387      0.0      0.0      0
*
*
*      vel-f      vel-g      vel-j
* 6021201      0.4300      -0.3400      0.0
*
*
*****
* intact loop steam generator secondary separator bypass *
*****
*
* ref drawing: 413463
*
* inlet elev = 441.625 in. above top of tube sheet
* outlet elev = 460.110 in. above top of tube sheet
*
*
*      name      type
* 6120000      isgby      branch
*
*
*      no jun      ctl
* 6120001      2      0
*
*

```

```

*
*      area      length      volume      hz ang      vr ang      elv ch
* 6120101      0.0      1.5494167      .7816260      0.0      90.0      1.5494167
*
*
*      rough      hy dia      ctl
* 6120102      6.667e-5      .6533449      0
*
*
*      ctl press      quals
* 6120200      2 829.600      1.00      -
*
*
*      from      to jun area      f loss      r loss      vchgs
* 6121101      612010000      611000000      0.3139546      0.0      0.0      3
* 6122101      602000000      612000000      0.7880455      0.0      0.0      0
*
*
*      vel-f      vel-g      vel-j
* 6121201      0.0      0.0      0.0
* 6122201      0.0      0.0      0.0
*
*
*****
* intact loop steam generator secondary downcomer (bottom) *
*****
*
* ref drawings: 413363 - assembly
*               414048 - fillers
*
* inlet elev = 375.005 in. above top of tube sheet
* outlet elev = 0.000 in. above top of tube sheet
*
*
*      name      type
* 6030000      isgich      pipe
*
*
*      no wpl
* 6030001      4
*
*
*      area      vol no
* 6030101      0.0      4
*
*
*      area      jun no
* 6030201      0.0292836      3
*
*
*      length      vol no
* 6030301      7.4762500      1
* 6030302      7.9108334      3
* 6030303      7.9525000      4
*
*
*      volume      vol no
* 6030401      .2211171      1
* 6030402      .2316581      2
* 6030403      .2316581      3
* 6030404      .3322701      4
*
*
*      vr ang      vol no
* 6030601      -90.0      4
*
*
*      elv ch      vol no
* 6030701      -7.4762500      1
* 6030702      -7.9108334      3
* 6030703      -7.9525000      4
*
*

```

```

*      rough  by dia  vol no
6030801  6.667e-5 .0128227  1
6030802  6.667e-5 .0126381  3
6030803  6.667e-5 .0201639  4
*
*      ctl flg  vol no
6031001  0 4
*
*      vcabs  jun no
6031101  0 3
*
*      ctl  press  quals  zero  zero  air flg  vol no
6031201  2 829.600  0.0  0.0  0.0  0  1
6031202  2 829.600  0.0  0.0  0.0  0  2
6031203  2 829.600  0.0  0.0  0.0  0  3
6031204  2 829.600  0.0  0.0  0.0  0  4
*
*      ctl flg
6031300  0
*
*      vel-f  vel-g  vel-j  jun no
6031301  6.450  6.100  0.0  3
*
*****
* downcomer - riser junction (thru flow divider) *
*****
*
* ref drawing: 413979, flow restrictor, adjustable area
*
* elev = 0.0 in. above top of tube sheet
*
*      name  type
6040000  isgfs  sugljun
*
*      from  to  jun area  f loss  r loss  vcabs
6040101  603010000 600000000 .0417818  0.0  0.0  100
*
*      ctl  vel-f  vel-g  vel-j
6040201  0 7.500  7.200  0.0
*
*****
* steam generator secondary - time dep feedwater junction *
*****
*
* elev = 0.0 in. above top of tube sheet
*
*      name  type
6100000  isgfvi  tmdpjun
*
*      from  to  jun area
6100101  620000000 603010000 .012
*
*      ctl flg  trip
*6100200  1 414
*
*      time  flow-f  flow-g  vel-j
*6100201  -1.0  5.6034  0.0  0.0
*6100202  0.0  5.6034  0.0  0.0

```

```

*6100203  24.0  5.6034  0.0  0.0
*6100204  26.0  0.0  0.0  0.0
*
* for steady state - input for keeping steam generator mass constant,
* put in what goes out steam valve - (comment out cards 61002xx above)
*
6100200  1 420  ctrlivar 610
*
table takes into account conversion of kg to lb
6100201  -10.0  0.0  0.0  0.0  * eji
*6100201  -10.0  -22.0462  0.0  0.0
6100202  0.0  0.0  0.0  0.0
6100203  0.1  0.22046  0.0  0.0
6100204  10.0  22.0462  0.0  0.0
*
*****
* steam generator secondary - time dep feedwater volume *
*****
*
* elev = 0.0 in. above top of tube sheet
*
*      name  type
6200000  isgfvi  tmdpvol
*
*      area  length  volume  hr ang  vr ang  elv ch
6200101  .012  10.00  0.0  0.0  0.0  0.0
*
*      rough  by dia  ctl
6200102  0.0  0.0  0
*
*      ctl flg
6200200  3
*
*      time  pressure  temp
6200201  0.0  1250.0  405.0  * eji
*
*****
* steam generator secondary - time dep aux feedwater junction *
*****
*
* elev = 0.0 in. above top of tube sheet
*
*      name  type
6150000  isgafvi  tmdpjun
*
*      from  to  jun area
6150101  625000000 603010000 .012
*
*      ctl flg  trip
6150200  1 416
*
*      time  flow-f  flow-g  vel-j
6150201  -1.0  0.0  0.0  0.0
6150202  0.0  0.0  0.0  0.0
6150203  2000.0  0.0  0.0  0.0
*
*****
* steam generator secondary - time dep aux feedwater volume *
*****

```

```

*
* elev = 0.0 in. above top of tube sheet
*
*      name      type
6250000  isgrfv  tadpvol
*
*      area  length  volume  hz ang  vr ang  elv ch
6250101  .012    10.00    0.0    0.0    0.0    0.0
*
*      rough  hy dia  ctl
6250102  0.0     0.0     0
*
*      ctl flg
6250200  3
*
*      time pressure  temp
6250201  0.0    900.0  80.0
*
*****
* steam generator secondary - relief valve
*****
*
* elev = 455.360 in. above top of tube sheet
*
*      name      type
6340000  isgrv  valve * simulate adv
*
*      from  to  jnn area  f loss  r loss  vchls
6340101  611010000  640000000 .0002592  0.0  0.0  100
*
*      ctl flow-f  flow-g  velj
6340201  1  0.0  0.0  0.0
*
*      vlv type
6340300  trpvlv
*
*      trip
6340301  661
*
*****
* steam generator secondary - time dep relief discharge volume
*****
*
* elev = 455.360 in. above top of tube sheet
*
*      name      type
6400000  isgrdv  tadpvol
*
*      area  length  volume  hz ang  vr ang  elv ch
6400101  .70584  10.0  0.0  0.0  0.0  0.0
*
*      rough  hy dia  ctl
6400102  0.0  0.0  0
*
*      ctl flg
6400200  2
*
*      time pressure  quale

```

```

6400201  0.0  12.3  1.0
*
*****
* steam generator secondary - discharge junction valve
*****
*
* elev = 455.360 in. above top of tube sheet
*
*      name      type
6350000  isglj  valve
*
*      from  to  jnn area  f loss  r loss  vchls
6350101  611010000  650000000 .007  204.67  204.67  100
*
*      ctl flow-f  flow-g  velj
6350201  1  0.0  5.6034  0.0
*
*      vlv type
*6350300  mrvlv
*
*      op trip  cl trip  slope  init pos  table
*6350301  403  410  .33333  0.29488  0
*
*input for steady state control systems (comment out cards 63503xxx)
6350300  srvvlv
6350301  637
*
*****
* steam generator secondary - time dep discharge volume
*****
*
* elev = 455.360 in. above top of tube sheet
*
*      name      type
6500000  isgrdv  tadpvol
*
*      area  length  volume  hz ang  vr ang  elv ch
6500101  .70584  10.0  0.0  0.0  0.0  0.0
*
*      rough  hy dia  ctl
6500102  0.0  0.0  0
*
*      ctl flg
6500200  2
*
*      time pressure  quale
6500201  0.0  12.3  1.0
*
*****
* cross connection - junction from il steam dome to connection pipe
*****
*
* elev = 455.360 in. above top of tube sheet
*
**      name      type
*6370000  ilcaj  sngljnn
**
**      from  to  jnn area  f loss  r loss  vchls

```

```

*6370101 611010000 647000000 0.003003 0.0 0.0 000
**
**      ctl vel-f   vel-g   velj
*6370201 0 0.0 0.0 0.0
**
*****
* intact loop steam dome cross connection pipe to b1 steam dome *
*****
*
* inlet elev = 455.360 in. above top of tube sheet
* outlet elev = 476.125 in. above top of tube sheet
*
* note - cross-over pipe snakes around:
* vertically down 18.000 ft
* horizontally over 8.000 ft
* horizontally back 6.000 ft
* vertically up 19.730 ft
* horizontally over 5.000 ft, part of 746
* horizontally forward 2.000 ft, part of 746
*
**      name      type
*6470000      ilcnp      pipe
**
**      no vol
*6470001      3
**
**      area      vol no
*6470101      .003003      3
**
**      length      vol no
*6470301      18.0      1
*6470302      14.0      2
*6470303      19.7304167      3
**
**      vr ang      vol no
*6470601      -90.0      1
*6470602      0.0      2
*6470603      +90.0      3
**
**      elv ch      vol no
*6470701      -18.0      1
*6470702      0.0      2
*6470703      19.7304167      3
**
**      rough      hy dia      vol no
*6470801      6.667e-5      0.0      3
**
**      ctl flg      vol no
*6471001      0      3
**
**      vcabs      jun no
*6471101      0      2
**
**      ctl press      quals      zero      zero      air flg      vol no
*6471201      2 829.600      0.0      0.0      0.0      0      1
*6471202      2 829.600      0.0      0.0      0.0      0      2
*6471203      2 829.600      0.0      0.0      0.0      0      3
**

```

```

**      ctl flg
*6471300      0
**
**      vel-f   vel-g   velj   jun no
*6471301      0.0      0.0      0.0      2
**
*****
* steam generator secondary - connection valve to broken loop secondary*
*****
*
* elev = 455.360 in. above top of tube sheet
*
**      name      type
*6700000      ilb1c      valve
**
**      from      to      jun area      f loss      r loss      vcabs
*6700101      647010000      746010000      0.000661      0.0      0.0      100
**
**      ctl flow-f      flow-g      velj
*6700201      1 0.0      0.0      0.0
**
**      vlv type
*6700300      mtrvlv
**
**      op trip      cl trip      slope      init pos      table
*6700301      624      425      1.0      0.0      0
**
*
* *****
*      * end of *
*      * steam generator *
*      * secondary *
* *****
* intact loop steam generator tube sheet outlet *
*****
*
* ref drawings: 406416 & 414271
*
* inlet elev = +102.594 in. (top of tube sheet)
* outlet elev = + 81.594 in. (bottom of tube sheet)
*
**      name      type
2250000      ills-ot      branch
*
*      no jun      ctl
2250001      2      1
*
*      area      length      volume      ht ang      vr ang      elv ch
2250101      0.019757      1.7500      0.0      0.0      -90.0      -1.7500
*
*      rough      hy dia      ctl
2250102      5.000e-6      .06475      0
*
*      ctl press      temp
2250200      3 2258.30      531.30
*
*      from      to      jun area      f loss      r loss      vcabs
2251101      220010000      225000000      0.019757      0.0      0.0      000
2252101      225010000      230000000      0.019757      0.0      1.0      100

```

```

*
*      flow-f  flow-g  velj
2251201    17.450    0.0    0.0
2252201    17.450    0.0    0.0
*
*****
* steam generator outlet plenum
*****
*
* ref drawing: 414271
*
* see note for steam generator inlet plenum (c210)
*
* inlet elev = top = + 81.594 in.
* outlet elev = bottom = + 73.969 in.
*
*      name      type
2300000      c230  seglvol
*
*      area  length  volume  hz ang  vr ang  elv ch
2300101      0.0  0.6354167  0.0478680  +90.0  -90.0  -0.6354167
*
*      rough  hy dia  ctl
2300102  6.667e-5  .2805910  0
*
*      ctl  press  temp  zero
2300200  3  2258.30  531.30  0.0
*
*****
* steam generator outlet
*****
*
* elev = +73.969 in.
*
*      name      type
2350000      j8  segljum
*
*      from  to  jum area  f loss  r loss  vchbs
2350101  230010000  240000000  0.024629  0.0  6.0  000
*
*      ctl flow-f  flow-g  velj
2350201  1  17.450  6.0  0.0
*
*****
* pump section leg
*****
*
* ref drawings: inlet plenum - 414271
*                  2.5pc-10 (sp-8) - 414428
*                  2.5pc-11 (sp-9) - 414425-2
*                  2.5pc-12 (sp-10) - 414426-2
*                  2.5pc-13 (sp-11) - 414429
*                  2.5pc-14 (sp-12) - 414025-1
*                  2.5pc-15 (sp-13) - 414026
*                  2.5pc-16 (sp-14) - 414027
*                  2.5pc-17 (sp-15) - 414025-2
*                  2.5pc-18 (sp-16) - 414028
*

```

```

* inlet elev = + 73.969 in.
* u-bend bottom elev = -110.750 in.
* outlet elev = - 9.850 in.
*
*      name      type
2400000      c240  pipe
*
*      no vol
2400001      9
*
*      area  vol no
2400101  0.024629  9 * 2.5 in sch-160
*
*      length  vol no
2400301  1.5217847  1 * spool piece - 8
2400302  3.6662500  2 * sp - 8,9,10
2400303  3.4475000  3 * sp - 11,12
2400304  2.8958333  4 * sp - 13
2400305  3.5076302  5 * sp - 14 straight + 30 deg bend
2400306  1.5219271  6 * sp - 14 60 deg of bend
2400307  1.5219271  7 * sp - 14 60 deg of bend
2400308  3.5076302  8 * sp - 14 straight + 30 deg bend
2400309  4.2083333  9 * sp - 15, 16
*
*      vr ang  vol no
2400601  -45.0  1
2400602  -90.0  4
2400603  -86.79  5
2400604  -30.0  6
2400605  +30.0  7
2400606  +86.79  8
2400607  +90.0  9
*
*      elv ch  vol no
2400701  -1.1836602  1
2400702  -3.6662500  2
2400703  -3.4475000  3
2400704  -2.8958333  4
2400705  -3.4733333  5
2400706  -0.7266667  6
2400707  0.7266667  7
2400708  3.4733333  8
2400709  4.2083333  9
*
*      rough  hy dia  vol no
2400801  6.667e-5  0  9
*
*      f loss  r loss  jum no
2400901  0.0  0.0  1
2400902  0.0  0.0  4
2400903  0.0  0.0  7
2400904  0.3  0.3  8
*
*      ctl flg  vol no
2401001  0  9
*
*      ctl flg  jum no
2401101  0  8

```

```

*
*   ctl  press  temp  zero  zero  air flg  vol no
2401201 3 2258.30 531.30 0.0 0.0 0 1
2401202 3 2258.30 531.30 0.0 0.0 0 2
2401203 3 2258.30 531.30 0.0 0.0 0 3
2401204 3 2258.30 531.30 0.0 0.0 0 4
2401205 3 2258.30 531.30 0.0 0.0 0 5
2401206 3 2258.30 531.30 0.0 0.0 0 6
2401207 3 2258.30 531.30 0.0 0.0 0 7
2401208 3 2258.30 531.30 0.0 0.0 0 8
2401209 3 2258.30 531.30 0.0 0.0 0 9
*
*   ctl flg
2401300 1
*
*   flow-f  flow-g  velj  jun no
2401301 17.450 0.0 0.0 8
*
*****
* intact loop pump
*****
* inlet elev = bottom = -9.850 in.
* outlet elev = top = 0.000 in. - elevation = 4773'-9.25"
*
*   name  type
2500000  ilpump  pump
*
*   area  length  volume  bz ang  vr ang  elv ch
2500101  0.0  2.25167  0.05584  +169.102  +90.00  0.8208334
*
*   ctl flg
2500102 0
*
*   vol no  jun area  f loss  r loss  jun flg
2500108 240010000 0.015578 0.0 0.0 0
*
*   vol no  jun area  f loss  r loss  jun flg
2500109 251000000 3.739e-3 0.0 0.0 20 * orifice
*
*   ctl  press  temp  zero
2500200 3 2258.30 531.30 0
*
*   ctl flow-f  flow-g  velj
2500201 1 17.450 0.0 0.0
*
*   ctl flow-f  flow-g  velj
2500202 1 17.450 0.0 0.0
*
*index  tab data  phase - dif  tab  tor  tab  sp  tab  trip  rever
2500301 0 0 0 0 -1 0 0 0 1
*
*   r-sp  isp/rsp  r-fl  r-hd  r-tor  m-in
2500302 22500.0 0.91843 159.8 397.0 9.34 0.3
*
*   r-den  r-m-tr  fr-tr3  fr-tr1  fr-tr2  fr-tr4
2500303 62.3 0 0.0 0 0 0
*

```

```

*stop data  els tm  mx-f-sp  mx-r-sp
2500310 0.0 0.0 0.0
*
*card ccccx00-cccx99 single phase pump head and torque curve set
* single phase 4 quadrant head tables (homologous curves)
*
2501100 1 1
2501101 0.000, 1.409 0.174, 1.364 - 0.347, 1.354 0.495, 1.317
2501102 0.700, 1.224 0.884, 1.093 1.001, 1.000
2501200 1 2
2501201 0.000, -0.650 0.250, -0.475 0.501, -0.194 0.624, 0.000
2501202 0.800, 0.400 0.900, 0.700 1.001, 1.000
2501300 1 3
2501301 -1.000, 2.725 -0.888, 2.470 -0.739, 2.240 -0.492, 1.880
2501302 -0.257, 1.670 0.000, 1.409
2501400 1 4
2501401 -1.000, 2.725 -0.783, 2.050 -0.658, 1.760 -0.494, 1.500
2501402 -0.263, 1.270 0.000, 1.057
2501500 1 5
2501501 0.000, 0.619 0.226, 0.577 0.411, 0.569 0.654, 0.612
2501502 0.875, 0.759 1.000, 1.000
2501600 1 6
2501601 0.000, 1.057 0.190, 0.888 0.315, 0.831 0.609, 0.807
2501602 0.934, 0.921 1.000, 1.000
2501700 1 7
2501701 -1.000, -0.550 -0.879, -0.275 -0.762, 0.000 -0.561, 0.367
2501702 -0.117, 0.642 0.000, 0.619
2501800 1 8
2501801 -1.000, -0.550 -0.500, -0.600 0.010, -0.650
*
* single phase 4 quadrant torque tables
*
2501900 2 1
2501901 0.000, 0.540 0.200, 0.530 0.410, 0.650 0.600, 0.770
2501902 0.800, 0.950 0.900, 0.980 0.930, 0.960 1.000, 0.870
2502000 2 2
2502001 0.000, -0.150 0.200, 0.020 0.410, 0.220 0.600, 0.460
2502002 0.800, 0.710 0.900, 0.810 0.950, 0.850 1.000, 0.870
2502100 2 3
2502101 -1.000, 0.620 -0.800, 0.680 -0.600, 0.530 -0.400, 0.460
2502102 -0.200, 0.490 0.000, 0.540
2502200 2 4
2502201 -1.000, 0.62 -0.800, 0.530 -0.600, 0.460 -0.400, 0.420
2502202 -0.200, 0.390 0.000, 0.360
2502300 2 5
2502301 0.000, -0.630 0.200, -0.510 0.400, -0.390 0.600, -0.290
2502302 0.800, -0.200 0.900, -0.160 1.000, -0.130
2502400 2 6
2502401 0.000, 0.360 0.200, 0.320 0.400, 0.270 0.600, 0.180
2502402 0.800, 0.050 1.000, -0.130
2502500 2 7
2502501 -1.000, -1.440 -0.800, -1.250 -0.600, -1.080 -0.400, -0.920
2502502 -0.200, -0.770 0.000, -0.630
2502600 2 8
2502601 -1.000, -1.440 -0.800, -1.120 -0.500, -0.790 -0.400, -0.520
2502602 -0.200, -0.310 0.000, -0.150
*
* two phase head multiplier tables

```

```

*
2503000 0
2503001 0.000, 0.000 0.100, 0.000 0.150, 0.050 0.240, 0.800
2503002 0.300, 0.950 0.400, 0.980 0.600, 0.970 0.800, 0.900
2503003 0.900, 0.800 0.950, 0.500 1.000, 0.000
2503100 0
2503101 0.000, -0.170 0.001, -0.170 0.006, 0.000 0.100, 0.000
2503102 0.150, 0.150 0.240, 0.550 0.800, 0.550 0.950, 0.450
2503103 1.000, 0.000
*
* two phase head difference tables
*
2504100 1 1
2504101 0.000, 0.000 0.100, 0.830 0.200, 1.090 0.500, 1.020
2504102 0.700, 1.010 0.900, 0.940 1.000, 1.000
2504200 1 2
2504201 0.000, 0.000 0.100, -0.040 0.200, 0.000 0.300, 0.100
2504202 0.400, 0.210 0.800, 0.670 0.900, 0.800 1.000, 1.000
2504300 1 3
2504301 -1.000, -1.160 -0.900, -1.240 -0.800, -1.770 -0.700, -2.360
2504302 -0.600, -2.790 -0.500, -2.910 -0.400, -2.570 -0.250, -1.690
2504303 -0.100, -0.500 0.000, 0.000
2504400 1 4
2504401 -1.000, -1.160 -0.900, -0.780 -0.800, -0.500 -0.700, -0.310
2504402 -0.600, -0.170 -0.500, -0.080 -0.350, 0.000 -0.200, 0.050
2504403 -0.100, 0.080 0.000, 0.110
2504500 1 5
2504501 0.000, 0.000 0.200, -0.034 0.400, -0.650 0.600, -0.930
2504502 0.800, -1.190 1.000, -1.470
2504600 1 6
2504601 0.000, 0.110 0.100, 0.130 0.250, 0.150 0.400, 0.130
2504602 0.500, 0.070 0.600, -0.040 0.700, -0.230 0.800, -0.510
2504603 0.900, -0.910 1.000, -1.470
2504700 1 7
2504701 -1.000, 0.000 0.000, 0.000
2504800 1 8
2504801 -1.000, 0.000 0.000, 0.000
*
* two phase torque difference tables
*
2504900 2 1
2504901 0.000, 0.540 0.200, 0.590 0.400, 0.650 0.600, 0.770
2504902 0.800, 0.950 0.900, 0.980 0.950, 0.960 1.000, 0.870
2505000 2 2
2505001 0.000, -0.150 0.200, 0.020 0.400, 0.220 0.600, 0.450
2505002 0.800, 0.710 0.900, 0.810 0.950, 0.850 1.000, 0.870
2505100 2 3
2505101 -1.000, 0.620 -0.800, 0.680 -0.600, 0.530 -0.400, 0.450
2505102 -0.200, 0.450 0.000, 0.540
2505200 2 4
2505201 -1.000, 0.620 -0.800, 0.530 -0.600, 0.450 -0.400, 0.420
2505202 -0.200, 0.390 0.000, 0.360
2505300 2 5
2505301 0.000, -0.630 0.200, -0.510 0.400, -0.390 0.600, -0.290
2505302 0.800, -0.200 0.900, -0.160 1.000, -0.130
2505400 2 6
2505401 0.000, 0.350 0.200, 0.320 0.400, 0.270 0.600, 0.180
2505402 0.800, 0.050 1.000, -0.130

```

```

2505500 2 7
2505501 -1.000, -1.440 -0.800, -1.250 -0.600, -1.050 -0.400, -0.920
2505502 -0.200, -0.770 0.000, -0.630
2505600 2 8
2505601 -1.000, -1.440 -0.800, -1.120 -0.600, -0.790 -0.400, -0.520
2505602 -0.200, -0.310 0.000, -0.150
*
* pump coast down table is general table 250
* use control variables 250 and 251 to set pump speed.
*
* trip parameter
2506100 420 ctrlvar 251
*table takes into account conversion of rad/sec to rev/min
2506101 -1.0 20665.000
2506102 0.0 0.000
2506103 1.0 9.549
2506104 100.0 954.930
2506105 500.0 4774.297
2506106 1000.0 9549.297
2506107 3000.0 28647.890
*
*****
* pressurizer spray line tee - time dependent junction
*****
*
* elev = 0.0 in.
*
* name type
2600000 pzspsyl twdpjun
*
* from to jun area
2600101 261000000 290000000 .012
*
* ctl flg trip
2600200 1 418
*
* time flow-f flow-g velj
2600201 -1.0 0.0 0.0 0.0
2600202 0.0 0.0 0.0 0.0
2600203 2000.0 0.0 0.0 0.0
*
*****
* pressurizer spray line - time dependent volume
*****
*
* elev = 0.0 in.
*
* name type
2900000 pzspsyl twdpvol
*
* area length volume hz ang vr ang elv ch
2900101 .012 10.00 0.0 0.0 0.0 0.0
*
* rough hy dia ctl
2900102 0.0 0.0 0
*
* ctl flg
2900200 3

```

```

*
*      time pressure temp
2900201      0.0    12.3    80.0
*
*****
* cold leg...pump outlet to ecc injection point tee
*****
*
* ref drawings: 3pc-11a (sp-19) - 412544
*                3pc-12 (sp-20) - 404759
*                3pc-13 (sp-21) - 404794 or 3pc-1a - 407718
*                3pc-19a (sp-22) - 414684-3
*
* inlet elev = outlet elev = 0.000 in.
*
*      name type
2610000      c261 pipe
*
*      no vol
2610001      2
*
*      area vol no
2610101      .0375539 2 * 3 in sch-160 (id = 2.624 in)
*
*      length vol no
2610301      2.0766667 1 * spool piece - 19,20
2610302      2.0766667 2 * sp - 21 & to ecc tap in sp-22
*
*      vr ang vol no
2610601      0.0 2
*
*      elv ch vol no
2610701      0.0 2
*
*      rough by dia vol no
2610801      6.667e-5 0 2
*
*      ctl flg vol no
2611001      0 2
*
*      vcabs jun no
2611101      000 1
*
*      ctl press temp zero zero air flg vol no
2611201      3 2258.30 531.30 0.0 0.0 0 2
*
*      ctl flg
2611300      1
*
*      flow-f flow-g velj jun no
2611301      17.450 0.0 0.0 1
*
*****
* ecc injection tee
*****
*
* ref drawing: 3pc-19a (sp-22) - 414684-3
*

```

```

* inlet elev = outlet elev = 0.000 in.
*
*      name type
2620000      c262 branch
*
*      no jun ctl
2620001      3 1
*
*      area length volume bz ang vr ang elv ch
2620101      .0375539 2.0766667 0.0 202.5 0.0 0.0
*
*      rough by dia ctl
2620102      6.667e-5 0.0 0
*
*      ctl press temp
2620200      3 2258.30 531.30
*
*      from to jun area f loss r loss vcabs
2621101      261010000 262000000 .0375539 0.30 0.30 0
2622101      262010000 263000000 .0375539 0.30 0.30 0
2623101      400010000 262000000 .0049952 0.0 0.0 20121
*
*      flow-f flow-g velj
2621201      17.450 0.0 0.0
2622201      17.450 0.0 0.0
2623201      0.0 0.0 0.0
*
*****
* ecc line
*****
*
* inlet elev = outlet elev = 0.000 in.
*
*      name type
4000000      ileccpip pipe
*
*      no vol
4000001      1
*
*      area vol no
4000101      .0049952 1
*
*      length vol no
4000301      10.0 1
*
*      vr ang vol no
4000601      0.0 1
*
*      elv ch vol no
4000701      0.0 1
*
*      rough by dia vol no
4000801      6.667e-5 0.0 1
*
*      ctl flg vol no
4001001      0 1
*
*      ctl press temp zero zero air flg vol no

```

```

4001201 3 2258.30 531.30 0.0 0.0 0 1
*
*****
* hpis - time dep junction
*****
*
* elev = 0.0 in.
*
*      name      type
4100000  ilhpisj  twdpjrn
*
*      from      to  jun area
4100101  42000000 40000000 .0049952
*
*      ctl flg  trip  table  volume
4100200      1      408      p  262010000
*
*      pres(psia)  flow-f  flow-g  velj
4100201      -1.0  0.0000  0.0  0.0
4100202      0.0  0.0000  0.0  0.0
4100203      15.0  0.03219  0.0  0.0
4100204      332.25  0.02545  0.0  0.0
4100205      384.51  0.02434  0.0  0.0
4100206      431.70  0.02509  0.0  0.0
4100207      472.88  0.02400  0.0  0.0
4100208      510.39  0.02398  0.0  0.0
4100209      549.09  0.02371  0.0  0.0
4100210      581.93  0.02375  0.0  0.0
4100211      652.46  0.02531  0.0  0.0
4100212      729.93  0.02516  0.0  0.0
4100213      812.43  0.02329  0.0  0.0
4100214      820.29  0.01873  0.0  0.0
4100215      1123.66  0.01480  0.0  0.0
4100216      1158.0  0.01418  0.0  0.0
4100217      1258.0  0.01184  0.0  0.0
4100218      1348.0  0.00968  0.0  0.0
4100219      1407.0  0.00717  0.0  0.0
4100220      1455.0  0.00460  0.0  0.0
4100221      1560.0  0.00  0.0  0.0
4100222      1600.0  0.00  0.0  0.0
*
*****
* hpis time dependent volume
*****
*
* inlet elev = outlet elev = 0.000 in.
*
*      name      type
4200000  ilhpisv  twdpvol
*
*      area  length  volume  hz ang  vr ang  elv ch
4200101  10.0  10.0  0.0  0.0  0.0  0.0
*
*      rough  hy dia  ctl
4200102  6.667e-5  0.0  0
*
*      ctl flg
4200200      3

```

```

*
*      time pressure  temp
4200201  0.0  12.3  80.0
*
*****
* accumulator
*****
*
* inlet elev = bottom = 0.000 in.
* outlet elev = top = + 43.066 in.
*
*      name      type
4300000  ilacc  accum
*
*      area  length  volume  hz ang  vr ang  elv ch
4300101  0.7085  3.5888  0.0  0.0  90.0  3.5888
*
*      rough  hy dia  ctl
4300102  6.667e-5  0.0  10
*
*      pressure  temp
4300200  615.0  80.0
*
*      to jun area  f loss  r loss  vchks
4301101  40000000 .004995 17227.44 17227.44 000
*
*      vliq liq lev  helen elev  thick htr-flg  takrko  takcp  nit-k
4301200  1.582  0  30.0  0 .0574  0  0  0  0
*
*****
* cold leg...ecc injection point to downcomer inlet
*****
*
* ref drawings: 407986 (downcomer cold leg nozzle)
*
* inlet elev = outlet elev = 0.000 in.
*
*      name      type
2630000  c263  pipe
*
*      no vol
2630001  1
*
*      area  vol no
2630101  .0396802  1 * 3 in sch-160 (id = 2.624 in)
*
*      length  vol no
2630301  2.1535  1 * cold leg downcomer nozzle
*
*      vr ang  vol no
2630501  0.0  1
*
*      elv ch  vol no
2630701  0.0  1
*
*      rough  hy dia  vol no
2630801  6.667e-5  0.0  1
*

```

```

*      ctl flg  vol no
2631001      0      1
*
*      ctl press  temp  zero  zero  air flg  vol no
2631201  3  2258.30  531.30  0.0  0.0  0      1
*
*
*
* reactor vessel
* simulator
*
*****
* cold leg inlet annulus to downcomer tee
*****
*
* ref drawings: assembly - 407986
*                  inner liner - 407990
*                  outer liner - 407991
*
* inlet elev = top  = + 12.000 in.
* outlet elev = bottom = - 12.000 in.
*
*      name  type
1010000  coldtee  branch
*
*      no jrn  ctl
1010001      4      1
*
*      area  length  volume  hz ang  vr ang  elv ch
1010101  .1056970  2.0000  0.0  0.0  -90.0  -2.0000
*
*      rough  by dia  ctl
1010102  6.667e-5  .142750  0
*
*      ctl press  temp
1010200  3  2258.30  531.30
*
*      from  to jrn area  f loss  r loss  vcabs
1011101  101000000  181000000  7.46674e-4  0.0  0.0  100
1012101  101010000  110000000  0.026039  0.0  0.0  0
1013101  263010000  101000000  0.045082  1.5  1.5  001
1014101  363010000  101000000  0.045082  1.5  1.5  001
*
*      flow-f  flow-g  velj
1011201  0.5908  0.0  0.0
1012201  22.900  0.0  0.0
1013201  17.450  0.0  0.0
1014201  5.840  0.0  0.0
*
*****
* downcomer
*****
*
* inlet elev = top  = - 12.000 in.
* outlet elev = bottom = -214.770 in.
*
*      name  type
1100000  dcomer  pipe

```

```

*
*      no vol
1100001      10
*
*      area  vol no
1100101  0.030975  1 * includes reducing section of annulus
1100102  0.026039  8 * downcomer pipe
1100103  0.031502  9 * slanted pipe + entrance half annulus
1100104  0.0762104  10 * distribution annulus
*
*      length  vol no
1100301  2.260833  1
1100302  1.000833  2
1100303  2.000000  7
1100304  1.465567  8
1100305  1.434751  9
1100306  0.962500  10
*
*      vr ang  vol no
1100601  -90.0  8
1100602  -55.75  9
1100603  -90.0  10
*
*      elv ch  vol no
1100701  -2.260833  1
1100702  -1.000833  2
1100703  -2.000000  7
1100704  -1.465567  8
1100705  -1.207667  9
1100706  -0.962500  10
*
*      rough  by dia  vol no
1100801  6.667e-5  0.159635  1
1100802  6.667e-5  0.0  9
1100803  6.667e-5  0.111833  10
*
*      f loss  r loss  jrn no
1100901  0.0  0.0  6
1100902  1.35  1.35  7 * mass flow measurement station
1100903  0.0  0.0  8
1100904  0.0  0.0  9
*
*      ctl flg  vol no
1101001      0      10
*
*      vcabs  jrn no
1101101      0      9
*
*      ctl press  temp  zero  zero  air flg  vol no
1101201  3  2258.30  531.30  0.0  0.0  0  1
1101202  3  2258.30  531.30  0.0  0.0  0  2
1101203  3  2258.30  531.30  0.0  0.0  0  3
1101204  3  2258.30  531.30  0.0  0.0  0  4
1101205  3  2258.30  531.30  0.0  0.0  0  5
1101206  3  2258.30  531.30  0.0  0.0  0  6
1101207  3  2258.30  531.30  0.0  0.0  0  7
1101208  3  2258.30  531.30  0.0  0.0  0  8
1101209  3  2258.30  531.30  0.0  0.0  0  9

```

```

1101210 3 2258.30 531.30 0.0 0.0 0 10
*
*      ctl flg
1101300      1
*
*      flow-f flow-g velj jun no
1101301 22.900 0.0 0.0 9
*
*****
* lower plenum
*****
*
* inlet elev = top = -214.770 in.
* outlet elev = bottom = -223.433 in.
*
*      name type
1300000 lo-plen branch
*
*      no jun ctl
1300001 3 1
*
*      area length volume hz ang vr ang elv ch
1300101 0.322478 0.721917 0.0 0.0 -90.0 -0.721917
*
*      rough hy dia ctl
1300102 6.667e-5 0.229414 0
*
*      ctl press temp
1300200 3 2258.30 531.30
*
*      from to jun area f loss r loss vchls
1301101 11001000 13000000 0.0762104 1.0 1.0 100
1302101 13000000 14000000 0.075129 0.0 0.0 100
1303101 13001000 12000000 0.322478 0.0 0.0 000
*
*      flow-f flow-g velj
1301201 22.900 0.0 0.0
1302201 22.900 0.0 0.0
1303201 0.0 0.0 0.0
*kt
1302110 0.229414 1.0 1.0 1.0
1303110 0.229414 1.0 1.0 1.0
*
*****
* lower plenum lower volume
*****
*
* inlet elev = top = -223.433 in.
* outlet elev = bottom = -229.033 in.
*
*      name type
1200000 lplovol suglvol
*
*      area length volume hz ang vr ang elv ch
1200101 0.510279 0.466667 0.0 0.0 -90.0 -0.466667
*
*      rough hy dia ctl
1200102 6.667e-5 0.381247 0

```

```

*
*      ctl press temp zero
1200200 3 2258.30 531.30 0.0
*
*****
* core inlet
*****
*
* inlet elev = bottom = -214.770 in.
* outlet elev = top = -195.140 in.
*
*      name type
1400000 core-in suglvol
*
*      area length volume hz ang vr ang elv ch
1400101 0.075129 1.635833 0.0 0.0 90.0 1.635833
*
*      rough hy dia ctl
1400102 6.667e-5 0.278329 0
*
*      ctl press temp zero
1400200 3 2258.30 531.30 0.0
*kt
*
*****
* core inlet junction
*****
*
* elev = -195.140 in.
*
*      name type
1450000 core-in-j sugljun
*
*      from to jun area f loss r loss vchls
1450101 14001000 15000000 0.025780 0.2 0.1 0
*
*      ctl flow-f flow-g velj
1450201 1 22.900 0.0 0.0
*
*****
* average channel
*****
*
* inlet elev = bottom = -195.140 in.
* outlet elev = top = -51.140 in.
*
*      name type
1500000 a-chnel pipe
*
*      no vol
1500001 6
*
*      area vol no
1500101 0.030376 6
*
*      area jun no
1500201 0.025780 5
*

```

```

*      length  vol no
1500301      2.0      6
*
*      vr ang   vol no
1500601     +90.0      6
*
*      elv ch   vol no
1500701      2.0      6
*
*      rough   hy dia   vol no
1500801  6.667e-5  0.032836      6
*
*      f loss   r loss   jun no
1500901      0.10      0.10      5
*
*      ctl flg   vol no
1501001      0      6
*
*      vcabs     jun no
*kkf
1501101      00100      5
*
*      ctl press   temp   zero   zero   air flg   vol no
1501201  3 2258.30  531.30  0.0  0.0  0      1
1501202  3 2258.30  531.30  0.0  0.0  0      2
1501203  3 2258.30  531.30  0.0  0.0  0      3
1501204  3 2258.30  591.90  0.0  0.0  0      4
1501205  3 2258.30  591.90  0.0  0.0  0      5
1501206  3 2258.30  591.90  0.0  0.0  0      6
*
*      ctl flg
1501300      1
*
*      flow-f   flow-g   velj   jun no
1501301  22.900      0.0      0.0      5
*kkf
1501401  0.032836  1.0  1.0  1.0  5
*
*****
* upper core
*****
*      inlet elev = bottom = -51.140 in
*      outlet elev = top   = -39.130 in
*
*      name      type
1510000  up-core  branch
*
*      no jun     ctl
1510001      4      1
*
*      area   length   volume   hz ang   vr ang   elv ch
1510101  0.057859  1.000833  0.0  0.0  90.0  1.000833
*
*      rough   hy dia   ctl
1510102  6.667e-5  0.07561  0
*
*      ctl press   temp

```

```

1510200  3 2258.30  591.90
*
*      from   to jun area   f loss   r loss   vcabs
1511101  150010000  151000000  0.026780  0.8  0.8  000
1512101  151010000  152000000  0.017208  0.0  0.0  100
1513101  152010000  151010000  0.0016085  0.0  0.0  100
1514101  156010000  151010000  0.004606  .43613  .43613  100
*
*      flow-f   flow-g   velj
1511201  22.900      0.0      0.0
1512201  21.000      0.0      0.0
1513201  0.0      0.0      0.0
1514201  -1.900      0.0      0.0
*kkf
1512110  0.07651  1.0  1.0  1.0
1513110  0.07651  1.0  1.0  1.0
*
*****
* core outlet
*****
*
*      inlet elev = bottom = -39.130 in.
*      outlet elev = top   = -6.000 in.
*
*      name      type
1520000  coreout  branch
*
*      no jun     ctl
1520001      1      1
*
*      area   length   volume   hz ang   vr ang   elv ch
1520101  0.045640  2.760833  0.0  0.0  90.0  2.760833
*
*      rough   hy dia   ctl
1520102  6.667e-5  0.120892  0
*
*      ctl press   temp
1520200  3 2258.30  591.90
*
*      from   to jun area   f loss   r loss   vcabs
1521101  156000000  152000000  0.075341  .32664  .77720  00003
*
*      flow-f   flow-g   velj
1521201  0.500      0.0      0.0
*kkf
1521110  0.120892  1.0  1.0  1.0
*
*****
* hot leg outlet tee
*****
*
*      inlet elev = bottom = -6.000 in.
*      outlet elev = top   = +23.000 in.
*
*      name      type
1530000  botout  branch
*
*      no jun     ctl

```

```

1630001      4      1
*
*      area  length  volume  hz ang  vr ang  elv ch
1630101  0.050621  2.416667  0.0      0.0    90.0  2.416667
*
*      rough  hy dia  ctl
1630102  6.667e-5  0.143638  0
*
*      ctl  press  temp
1630200  3  2258.30  531.30
*
*      from  to  jum area  f loss  r loss  vchks
1631101  16300000  20100000  0.045082  2.5    2.5    002
1632101  16300000  30100000  0.045082  2.5    2.5    002
1633101  16201000  16300000  0.037583  3.0    3.0    000
1634101  16301000  16400000  0.056700  0.0    0.0    000
*
*      flow-f  flow-g  velj
1631201  17.450  0.0  0.0
1632201  5.840  0.0  0.0
1633201  21.500  0.0  0.0
1634201  -2.360  0.0  0.0
* kkt
1632110  0.143638  1.0  1.0  1.0
1633110  0.143638  1.0  1.0  1.0
*
*****
* top of upper plenum
*****
* inlet elev = bottom = + 23.000 in.
* outlet elev = top = + 53.600 in.
*
*      name  type
1640000  upplen  singvol
*
*      area  length  volume  hz ang  vr ang  elv ch
1640101  0.056700  2.5500  0.0      0.0    90.0  2.5500
*
*      rough  hy dia  ctl
1640102  6.667e-5  0.168707  0
*
*      ctl  press  temp  zero
1640200  3  2258.30  538.00  0.0
*
*****
* upper head top volume
*****
*      * geometry with nbi *
* inlet elev = top = +166.760 in.  * tube removed *
* outlet elev = bottom = +132.190 in.  *****
*
*      name  type
1940000  uphpmv  branch
*
*      no jum  ctl
1940001  2  1
*

```

```

*      area  length  volume  hz ang  vr ang  elv ch
1940101  0.061685  2.880833  0.0      0.0   -90.0 -2.880833
*
*      rough  hy dia  ctl
1940102  6.667e-5  0.280250  0
*
*      ctl  press  temp
1940200  3  2258.30  531.30
*
*      from  to  jum area  f loss  r loss  vchks
1941101  19401000  19300000  2.19233e-3  0.0    0.0    100
1942101  19401000  19300000  0.053694  0.0    0.0    000
*
*      flow-f  flow-g  velj
1941201  0.5908  0.0  0.0
1942201  -0.5908  0.0  0.0
*
*****
* upper head - top mid volume
*****
*      * geometry with nbi *
* inlet elev = top = +132.190 in.  * tube removed *
* outlet elev = bottom = + 90.750 in.  *****
*
*      name  type
1930000  tmphd  branch
*
*      no jum  ctl
1930001  2  1
*
*      area  length  volume  hz ang  vr ang  elv ch
1930101  0.053694  3.453333  0.0      0.0   -90.0 -3.453333
*
*      rough  hy dia  ctl
1930102  6.667e-5  0.206333  0
*
*      ctl  press  temp
1930200  3  2258.30  531.30
*
*      from  to  jum area  f loss  r loss  vchks
1931101  19301000  19200000  0.052230  0.0    0.0    000
1932101  18101000  19301000  7.46674e-4  0.0    0.0    100
*
*      flow-f  flow-g  velj
1931201  0.0  0.0  0.0
1932201  0.5908  0.0  0.0
*
*****
* upper head middle volume
*****
*      * geometry with nbi *
* inlet elev = top = + 90.750 in.  * tube removed *
* outlet elev = bottom = + 67.160 in.  *****
*
*      name  type
1920000  lo-plen  branch
*
*      no jum  ctl

```

```

1920001      2      1
*
*      area  length  volume  bz ang  vr ang  elv ch
1920101  0.052330  1.965833  0.0      0.0    -90.0  -1.965833
*
*      rough  hy dia  ctl
1920102  6.667e-5  0.178630  0
*
*      ctl press  temp
1920200  3  2258.30  532.30
*
*      from  to  jun area  f loss  r loss  vcabs
1921101  192010000  192000000  0.049603  0.0  0.0  000
1922101  192010000  182000000  0.0015085  5000.0  5000.0  000
*
*      flow-f  flow-g  velj
1921201  0.0  0.0  0.0
1922201  0.0  0.0  0.0
*
*****
* upperhead lower volume
*****
*
* inlet elev = top = + 67.160 in.
* outlet elev = bottom = + 61.440 in.
*
*      name  type
1910000  uphlow  pipe
*
*      no vol
1910001  1
*
*      area  vol no
1910101  0.049603  1
*
*      length  vol no
1910301  0.476667  1
*
*      vr ang  vol no
1910601  -90.0  1
*
*      elv ch  vol no
1910701  -0.476667  1
*
*      rough  hy dia  vol no
1910801  6.667e-5  0.138401  1
*
*      ctl flg  vol no
1911001  0  1
*
*      ctl press  temp  zero  zero  air flg  vol no
1911201  3  2258.30  532.30  0.0  0.0  0  1
*
*****
* bypass line from dc upper inlet annulus to upper head
*****
*
* inlet elev = bottom = + 12.000 in.

```

```

* outlet elev = top = + 90.750 in.
*
*      name  type
1810000  bpline  pipe
*
*      no vol
1810001  2
*
*      area  vol no
1810101  7.46674e-4  2
*
*      area  jun no
1810201  1.09978e-4  1
*
*      length  vol no
1810301  3.421917  1
1810302  4.390583  2 * includes horizontal section
*
*      bz ang  vol no
1810501  0.0  2
*
*      vr ang  vol no
1810601  90.0  2
*
*      elv ch  vol no
1810701  3.421917  1
1810702  3.140583  2
*
*      rough  hy dia  vol no
1810801  5.000e-6  0.0  2
*
*      f loss  r loss  jun no
1810901  2.5700  2.5700  1 * adjust to get 0.9%
*
*      ctl flg  vol no
1811001  0  2
*
*      vcabs  jun no
1811101  000  1
*
*      ctl press  temp  zero  zero  air flg  vol no
1811201  3  2258.30  531.30  0.0  0.0  0  1
1811202  3  2258.30  531.30  0.0  0.0  0  2
*
*      ctl flg
1811300  1
*
*      flow-f  flow-g  velj  jun no
1811301  0.5908  0.0  0.0  1
*
*****
* core support column(s) - both modeled as single flow path
*****
*
* inlet elev = top = + 67.160 in.
* outlet elev = bottom = - 39.130 in.
*
*      name  type

```

```

1820000  septub  pipe
*
*      no vol
1820001      1
*
*      area  vol no
1820101  0.0016085  1
*
*      length  vol no
1820301  8.85750  1
*
*      vr ang  vol no
1820601  -90.0  1
*
*      elv ch  vol no
1820701  -8.85750  1
*
*      rough  by dia  vol no
1820801  5.000e-6  0  1
*
*      ctl flg  vol no
1821001  0  1
*
*      ctl  press  temp  zero  zero  air flg  vol no
1821201  3  2258.30  592.30  0.0  0.0  0  1
*
*****
* control rod guide tube (top)
*****
*
*      inlet elev = top  = +132.190 in.
*      outlet elev = bottom = + 84.200 in.
*
*      name  type
1830000  guitub1  pipe
*
*      no vol
1830001      1
*
*      area  vol no
1830101  2.19233e-3  1
*
*      length  vol no
1830301  3.999167  1
*
*      vr ang  vol no
1830601  -90.0  1
*
*      elv ch  vol no
1830701  -3.999167  1
*
*      rough  by dia  vol no
1830801  5.000e-6  0.0  1
*
*      ctl flg  vol no
1831001  0  1
*
*      ctl  press  temp  zero  zero  air flg  vol no

```

```

1831201  3  2258.30  592.30  0.0  0.0  0  1
*
*****
* cross-flow volume in guide tube through drill holes to upper plenum
*****
*
*      inlet elev = top  = + 84.200 in.
*      outlet elev = bottom = + 23.000 in.
*
*      name  type
1840000  guitub2  branch
*
*      no jum  ctl
1840001      3  1
*
*      area  length  volume  hz ang  vr ang  elv ch
1840101  2.19233e-3  5.1600  0.0  0.0  -90.0  -5.1000
*
*      rough  by dia  ctl
1840102  5.000e-6  0.0  0
*
*      ctl  press  temp
1840200  3  2258.30  600.00
*
*      from  to jum area  f loss  r loss  vchgs
1841101  183010000  184000000  2.19233e-3  0.0  0.0  0
1842101  184010000  185000000  2.19233e-3  0.0  0.0  0
1843101  184000000  164010000  4.26106e-3  5000.0  0.0  2
* 8 - 5/16 in. diameter holes connect guide tube to upper plenum (164)
*
*      flow-f  flow-g  velj
1841201  2.3600  0.0  0.0
1842201  2.3600  0.0  0.0
1843201  -1.4000  0.0  0.0
*
*****
* middle part of guide tube
*****
*
*      inlet elev = top  = + 23.000 in.
*      outlet elev = bottom = - 6.000 in.
*
*      name  type
1850000  guitub3  pipe
*
*      no vol
1850001      1
*
*      area  vol no
1850101  2.19233e-3  1
*
*      length  vol no
1850301  2.416667  1
*
*      vr ang  vol no
1850601  -90.0  1
*
*      elv ch  vol no

```

```

1850701 -2.41667 1
*
* rough by dia vol no
1850801 5.000e-6 0.0 1
*
* ctl flg vol no
1851001 0 1
*
* ctl press temp zero zero air flg vol no
1851201 3 2258.30 591.90 0.0 0.0 0 1
*
*****
* lower part of guide tube (slotted section) *
*****
* ref drawing: 408010
*
* inlet elev = top = - 6.000 in.
* outlet elev = bottom = - 39.130 in.
*
* name type
1860000 gmslot branch
*
* no jun ctl
1860001 1 1
*
* area length volume hz ang vr ang elv ch
1860101 0.010809 2.760833 0.0 0.0 -90.0 -2.760833
*
* rough by dia ctl
1860102 5.000e-6 0.120415 0
*
* ctl press temp
1860200 3 2258.30 591.90
*
* from to jun area f loss r loss vchgs
1861101 18501000 18600000 2.19233e-3 .43613 .43613 100
*
* flow-f flow-g velj
1861201 -1.4000 0.0 0.0
*
*
* *****
* * broken *
* * loop *
*
*****
* hot leg *
*****
* ref drawings: hot leg nozzle - 407975
* 1.5abl-1 (sp-50) - 407670
* 1.5abl-14a (sp-55) - 414670
* 1.5abl-30 (sp-55) - 414671
* 1.5abl-31 (sp-57) - 414672
* 1.5abl-32 (sp-58) - 414673
* 1.5abl-33 (sp-59) - 414674
* inlet plenum - 414272
*
* inlet elev = + 8.500 in.
* outlet elev = + 71.969 in.

```

```

*
* name type
3010000 bl-bl pipe
*
* no vol
3010001 6
*
* area vol no
3010101 0.0268943 1 * 3 in. sch-160
3010102 0.0097643 6 * 1.5 in sch-160
*
* length vol no
3010301 2.1725000 1 * hot leg nozzle
3010302 2.2101267 3 * spool piece - 50
3010303 2.7245243 4 * sp-55
3010304 2.3580833 5 * sp-56,57,58 & 90 bend of 55
3010305 1.9753140 6 * sp-59, and inlet plenum
*
* hz ang vol no
3010501 0.0 6
*
* vr ang vol no
3010601 0.0 3
3010602 +45.0 4
3010603 +90.0 5
3010604 +45.0 6
*
* elv ch vol no
3010701 0.0 3
3010702 1.4025000 4
3010703 2.3580833 5
3010704 1.5284935 6
*
* rough by dia vol no
3010801 6.667e-5 0.0 6
*
* f loss r loss jun no
3010901 0.3 0.3 1
3010902 0.1 0.1 2
3010903 0.8 0.8 3
3010904 0.8 0.8 5
*
* ctl flg vol no
3011001 0 6
*
* vchgs jun no
* kkt
3011101 100000 5
*
* ctl press temp zero zero air flg vol no
3011201 3 2258.30 592.30 0.0 0.0 0 1
3011202 3 2258.30 592.30 0.0 0.0 0 2
3011203 3 2258.30 592.30 0.0 0.0 0 3
3011204 3 2258.30 592.30 0.0 0.0 0 4
3011205 3 2258.30 592.30 0.0 0.0 0 5
3011206 3 2258.30 592.30 0.0 0.0 0 6
*
* ctl flg

```

```

3011300      1
*
*      flow-f  flow-g  velj  jun no
3011301      5.840    0.0    0.0    5
* kkt
3011401 0.0 0.0 0.55 0.785 5
*
*****
* steam generator inlet
*****
*
* ref drawing: 414772 sh.2
*
* elev = +71.969 in.
*
*      name      type
3050000      j305  sngljum
*
*      from      to jun area  f loss  r loss  vcabs
3050101 301010000 310000000 0.0097643 0.0 0.0 000
*
*      ctl flow-f  flow-g  velj
3050201 1 5.840 0.0 0.0
*
*****
* steam generator inlet plenum
*****
*
* reference - type-ii (broken loop) steam generator pant-leg drwg.
*               and plenum drwg. 414772 (1,2)
* note - inlet plenum entrance is circular (dia=1.388 in),
*        plenum tapers outward, nonuniformly, with rise to
*        tube sheet inlet (inlet plenum outlet).
*        outlet is rectangular with radiused corners.
*
* inlet elev = + 71.969 in.
* outlet elev = + 81.594 in.
*
*      name      type
3100000      blsgip  snglvol
*
*      area  length  volume  hz ang  vr ang  elv ch
3100101      0.0 0.8020833 .0495847 0.0 90.0 0.8020833
*
*      rough  by dia  ctl
3100102 6.667e-5 0.2600218 0
*
*      ctl press  temp  zero
3100200 3 2258.30 592.30 0.0
*
*****
* broken loop steam generator tube sheet
*****
*
* ref drawing: 418972
*
* inlet elev = + 81.594 in. (bottom of tube sheet)
* outlet elev = +102.604 in. (top of tube sheet)

```

```

*
*      name      type
3150000      blts-in  branch
*
*      no jun  ctl
3150001      2 1
*
*      area  length  volume  hz ang  vr ang  elv ch
3150101 0.0060544 1.751830 0.0 0.0 88.07 1.7508333
*
*      rough  by dia  ctl
3150102 5.000e-6 .0620833 0
*
*      ctl press  temp  zero
3150200 3 2250.00 548.00
*
*      from      to jun area  f loss  r loss  vcabs
3151101 310010000 315000000 0.0060544 0.0 0.0 100
3152101 315010000 320000000 0.0060544 0.0 0.0 000
*
*      flow-f  flow-g  velj
3151201 7.310 0.0 0.0
3152201 7.310 0.0 0.0
* kkt
3170000 blsgin sngljum
3170101 315010000 320000000 6.0544e-3 0.0 0.0 100100
3170110 0.0 0.0 0.725 1.0
3170201 0 0.855 0.855 0.0
*
*****
* steam generator tube bundle
*****
*
* ref drawings: 418977 & 418980
*
* inlet elev = outlet elev = +102.604 in. (top of tube sheet)
*
* elev long tube = 391.00 in. above top of tube sheet
* elev short tube = 336.00 in. above top of tube sheet
*
* elev model tube = 363.50 in. above top of tube sheet
*
*      name      type
3200000      bsgrnb  pipe
*
*      no vol
3200001      8
*
*      area  vol no
3200101 6.0544e-3 8
*
*      length  vol no
3200301 7.7916667 1 * volumes 2 & 3, 6 & 7 have lengths
3200302 7.5000000 3 * and elevations equal to their corres-
3200303 7.5428097 5 * ponding secondary side volumes.
3200304 7.5000000 7 * volumes 4 & 5 are each half of the
3200305 7.7916667 8 * 180 degree bend.
*

```

```

*      hz ang  vol no
3200501  -90.0    8
*
*      vr ang  vol no
3200601  +90.0    4
3200602  -90.0    8
*
*      elv ch  vol no
3200701  +7.791667  1
3200702  +7.500000  3
3200703  +7.500000  4
3200704  -7.500000  5
3200705  -7.500000  7
3200706  -7.791667  8
*
*      rough  by dia  vol no
3200801  5.000e-6 .0620833  8
*
*      f loss  r loss  jun no
3200901  0.34    0.34    7
*
*      ctl flg  vol no
3201001  0      8
*
*      ctl flg  jun no
3201101  0      7
*
*      ctl  press  temp  zero  zero  air flg  vol no
3201201  3  2250.00  548.00  0.0  0.0  0      4
3201202  3  2250.00  548.00  0.0  0.0  0      8
*
*      ctl flg
3201300  1
*
*      flow-f  flow-g  vel-j  jun no
3201301  7.310  0.0  0.0  7
*
*****
* steam generator secondary volume
*****
*
* ref drawings: assembly - $$$$$$  baffle plates - $$$$$$
*                  separator - $$$$$$
*
* inlet elev = 13.000 in. above top of tube sheet
* outlet elev = 445.375 in. above top of tube sheet
*
*      name  type
7000000  bsgsec  pipe
*
*      no vol
7000001  5
*
*      area  vol no
7000101  0.0  5
*
*      area  jun no
7000201  0.0242568  3 * baffle plates

```

```

7000302  0.0203199  4 * 180 deg return - top of short tube
*
*      length  vol no
7000301  6.7083333  1
7000302  7.5000000  4
7000303  6.8229167  5
*
*      volume  vol no
7000401  0.2213819  1
7000402  0.2476839  2
7000403  0.2461911  3
7000404  0.2649840  4
7000405  0.3268035  5
*
*      vr ang  vol no
7000601  +90.0    5
*
*      elv ch  vol no
7000701  6.7083333  1
7000702  7.5000000  4
7000703  6.8229167  5
*
*      rough  by dia  vol no
7000802  6.667e-5  0.0659845  3
7000803  6.667e-5  0.0753070  4
7000804  6.667e-5  0.1934227  5
*
*      ctl flg  vol no
7001001  0      5
*
*      abs  jun no
7001101  100  3 * baffle plates
7001102  100  4 * 180 deg return
*
*      ctl  press  quals  zero  zero  air flg  vol no
7001201  2  876.000  0.00880  0.0  0.0  0      5
*
*      ctl flg
7001300  0
*
*      vel-f  vel-g  vel-j  jun no
7001301  2.4000  3.4000  0.0  1
7001302  3.5000  4.8000  0.0  2
7001303  4.0000  6.4000  0.0  3
7001304  3.4000  7.6000  0.0  4
* kkt
7001401  0.0  1.0  1.0  1.0  3
7001402  0.0  1.0  1.0  1.0  4
*
*****
* broken loop steam generator secondary riser (top) (swirl vane)
*****
*
* ref drawing: $$$$$$
*
* inlet elev = 445.375 in. above top of tube sheet
* outlet elev = 461.375 in. above top of tube sheet
*

```

```

*      name      type
7010000      swirl      branch
*
*      no jun      ctl
7010001      2      0
*
*      area      length      volume      hz ang      vr ang      elv ch
7010101      0.0      1.3333333      .5794734      0.0      90.0      1.3333333
*
*      rough      hy dia      ctl
7010102      6.667e-5      .6944443      0
*
*      ctl press      quals      zero
7010200      2      876.000      1.00
*
*      from      to jun area      f loss      r loss      vchgs
7011101      700010000      701000000      .0458694      50.0      50.0      100
7012101      701000000      711000000      .0205061      1.5      1.5      00000
*
*      vel-f      vel-g      velj
7011201      0.3500      0.3300      0.0
7012201      0.0      0.0      0.0
*
*****
* broken loop steam generator preliminary separator
*****
* ref drawing: $$$$$$
*
* inlet elev = 451.375 in. above top of tube sheet
* outlet elev = 455.875 in. above top of tube sheet
*
*      name      type
7030000      blsgsep      branch
*
*      no jun      ctl
7030001      1      0
*
*      area      length      volume      hz ang      vr ang      elv ch
7030101      0.0      0.375      .1534235      0.0      90.0      0.375
*
*      rough      hy dia      ctl
7030102      6.667e-5      .2429779      0
*
*      ctl press      quals      zero
7030200      2      876.000      1.0
*
*      from      to jun area      f loss      r loss      vchgs
7031101      701010000      703000000      .3477297      0.0      0.0      100
*
*      vel-f      vel-g      velj
7031201      0.3500      0.3500      0.0
*
*****
* broken loop steam generator secondary separator
*****
* ref drawing: $$$$$$

```

```

*      inlet elev = 451.375 in. above top of tube sheet
*      outlet elev = 455.875 in. above top of tube sheet
*
*      name      type
7040000      bsgsep      separator
*
*      no jun      ctl
7040001      3      0
*
*      area      length      volume      hz ang      vr ang      elv ch
7040101      0.0      0.375      .1002201      0.0      90.0      0.375
*
*      rough      hy dia      ctl
7040102      6.667e-5      0.0      0
*
*      ctl press      quals      zero
7040200      2      876.000      1.00
*
*      from      to jun area      f loss      r loss      cabs      voidgf
7041101      704010000      705000000      .0796875      0.0      0.0      1000      1.00
7042101      704000000      712000000      .0032519      50.0      50.0      1000      0.15
7043101      703000000      704000000      .2672536      0.0      0.0      1003
*
*      vel-f      vel-g      velj
7041201      0.3500      0.3500      0.0
7042201      0.3500      0.3500      0.0
7043201      0.3500      0.3500      0.0
*
*****
* broken loop steam generator steam dome
*****
* ref drawing: $$$$$$
*
* inlet elev = 455.875 in. above top of tube sheet
* outlet elev = 476.125 in. above top of tube sheet
*
*      name      type
7050000      blsgsd      singlvol
*
*      area      length      volume      hz ang      vr ang      elv ch
7050101      0.0      .8541667      .0680664      0.0      90.0      .8541667
*
*      rough      hy dia      ctl
7050102      6.667e-5      .3836702      0
*
*      ctl press      quals      zero
7050200      2      876.000      1.00      0.0
*
*****
* broken loop steam generator riser to downcomer pipe - muffler
*****
* ref drawing: assembly - $$$$$$
*
* inlet elev = 445.375 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet

```

```

*
*      name      type
7110000  bsgmrf    pipe
*
*      no vol
7110001      1
*
*      area      vol no
7110101      0.0      1
*
*      length     vol no
7110301  5.5088494    1
*
*      volume      vol no
7110401  0.6232431    1
*
*      vr ang      vol no
7110601  -30.0      1
*
*      elv ch      vol no
7110701  -2.8229167  1
*
*      rough      by dia      vol no
7110801  6.667e-5  .3989363    1
*
*      ctl flg      vol no
7111001      0      1
*
*      ctl press      quals      zero      zero      air flg      vol no
7111201  2 876.000    0.0      0.0      0.0      0      1
*
*****
* broken loop steam generator riser to downcomer pipe - drains *
*****
*
* ref drawing: assembly - $$$$$$
*
* inlet elev = 451.375 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet
*
*      name      type
7120000  bsgdm    pipe
*
*      no vol
7120001      1
*
*      area      vol no
7120101      0.0      1
*
*      length     vol no
7120301  8.9387346    1
*
*      volume      vol no
7120401  0.0718342    1
*
*      vr ang      vol no
7120601  -30.0      1
*

```

```

*      elv ch      vol no
7120701  -4.15625      1
*
*      rough      by dia      vol no
7120801  6.667e-5  .0751667    1
*
*      ctl flg      vol no
7121001      0      1
*
*      ctl press      quals      zero      zero      air flg      vol no
7121201  2 876.000    0.0      0.0      0.0      0      1
*
*****
* broken loop steam generator secondary downcomer (top - horizontal) *
*****
*
* ref drawing: $$$$$$
*
* inlet elev = 411.500 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet
*
*      name      type
7130000  bsgdm    branch
*
*      no jun      ctl
7130001      3      0
*
*      area      length      volume      hz ang      vr ang      elv ch
7130101      0.0      3.1426389  .0366917    0.0      0.0      0.0
*
*      rough      by dia      ctl
7130102  6.667e-5  .1316182    0
*
*      ctl press      quals      zero
7130200  2 876.000    1.00
*
*      from      to jun area      f loss      r loss      vcabs
7131101  711010000  713000000  .0120117    3.5      3.5      000
7132101  712010000  713000000  .0080362    50.0      50.0      000
7133101  713010000  714000000  .0102869    0.0      0.0      0
*
*      vel-f      vel-g      vel-j
7131201  0.3500    0.3300    0.0
7132201  0.0      0.0      0.0
7133201  0.3500    0.3300    0.0
*
*****
* broken loop steam generator secondary downcomer *
*****
*
* ref drawing: assembly - $$$$$$
* fillers - $$$$$$
*
* inlet elev = 411.500 in. above top of tube sheet
* outlet elev = 6.500 in. above top of tube sheet
*
*      name      type
7140000  bsgmc    pipe

```

```

*
*      no vol
7140001      5
*
*      area  vol no
7140101 .0103869      5
*
*      area  jun no
7140201 .0103869      4
*
*      length vol no
*
7140301 4.0891869      1
7140302 7.5000010      4
7140303 7.3391869      5
*
*7140401 0.0415476      1
*7140402 0.0779017      4
*7140403 -0.0753050      5
*
*      vr ang  vol no
7140601 -90.0      5
*
*      elv ch  vol no
7140701 -4.0000      1
7140702 -7.5000      4
7140703 -7.2500      5
*
*      rough  by dia  vol no
7140801 6.667e-5      0.115      5
*
*      ctl flg  vol no
7141001      0      5
*
*      abs  jun no
7141101      0      4
*
*      ctl press  quals  zero  zero  air flg  vol no
7141201 2 876.000      0.0      0.0      0.0      0      5
*
*      ctl flg
7141300      0
*
*      vel-f  vel-g  velj  jun no
7141301 6.9000      6.5900      0.0      4
*
*****
* broken loop steam generator secondary downcomer (bottom - horizontal)*
*****
*
* ref drawing: $$$$$$
*
* inlet elev = 6.500 in. above top of tube sheet
* outlet elev = 6.500 in. above top of tube sheet
*
*      name  type
7150000 bsgdbb branch
*
*      no jun  ctl
*

```

```

7150001      3      0
*
*      area  length  volume  bz ang  vr ang  elv ch
7150101      0.0 7.8734167 .0972227      0.0      0.0      0.0
*
*      rough  by dia  ctl
7150102 6.667e-5 .1302273      0
*
*      ctl press  quals  zero
7150200 2 876.000      0.00
*
*      from  to jun area  f loss  r loss  vclabs
7151101 71401000 715000000 .0103869      0.0      0.0      000
7152101 71501000 716000000 .0513379      50.0      50.0      00001
7153101 71500000 720010000 .0103869      0.0      0.0      20002
*
*      vel-f  vel-g  velj
7151201 0.3500      0.3300      0.0
7152201 0.3500      0.3300      0.0
7153201 0.0      0.0      0.0
*
*****
* broken loop steam generator riser bottom volume below feedwater inlet*
*****
*
* ref drawing: $$$$$$
*
* inlet elev = 0.000 in. above top of tube sheet
* outlet elev = 13.000 in. above top of tube sheet
*
*      name  type
7160000 bsgsbb branch
*
*      no jun  ctl
7160001      1      0
*
*      area  length  volume  bz ang  vr ang  elv ch
7160101      0.0 1.083333      .0344994      0.0      90.0      1.083333
*
*      rough  by dia  ctl
7160102 6.667e-5 .0659845      0
*
*      ctl press  quals  zero
7160200 2 876.000      0.00
*
*      from  to jun area  f loss  r loss  vclabs
7161101 71601000 700000000 .0242668      0.0      0.0      100
*
*      vel-f  vel-g  velj
7161201 0.3500      0.3300      0.0
*
*****
* broken loop steam generator bottom feedwater pipe
*****
*
* ref drawing: assembly - $$$$$$
*
* inlet elev = -3.500 in. above top of tube sheet

```

```

* outlet elev = 6.500 in. above top of tube sheet
*
*      name      type
720000    bsgfed    pipe
*
*      no vol
720001      1
*
*      area      vol no
720101    .0103869    1
*
*      length     vol no
720301    .8333333    1
*
*      vr ang      vol no
720601      90.0      1
*
*      elv ch      vol no
720701    .8333333    1
*
*      rough      hy dia      vol no
720801    6.667e-5    0.115    1
*
*      ctl flg      vol no
721001      0      1
*
*      ctl press    quals      zero      zero      air flg      vol no
7201201    2 876.000    0.0    0.0    0.0    0    1
*
*****
* steam generator secondary - main feedwater junction
*****
*
* elev = 411.5 in. above top of tube sheet - top feed (to 726)
* elev = 6.5 in. above top of tube sheet - bottom feed (to 720)
*
*      name      type
722000    bsgfij    tmpjmn
*
*      from      to      jmn area
7220101    724000000    720000000    0.004 * bot feed
*
*      ctl flg      trip
*7220200      1      415
*
*      time      flow-f      flow-g      velj
*7220201      -1.0    0.56119    0.0    0.0
*7220202      0.0    0.56119    0.0    0.0
*7220203      24.0    0.56119    0.0    0.0
*7220204      26.0    0.0    0.0    0.0
*
* for steady state - input for keeping steam generator mass constant,
* put in what goes out steam valve - (comment out cards 71002xx above)
*
7220200      1      420      ctrlvar 710
*      table takes into account conversion of kg to lb
*7220201      -10.0    0.0    0.0    0.0
*7220201      -10.0    -22.046    0.0    0.0

```

```

7220201      -0.1    -0.22046    0.0    0.0
7220202      0.0    0.0    0.0    0.0
7220203      0.1    0.22046    0.0    0.0
7220204      10.0    22.046    0.0    0.0
*
*****
* steam generator secondary - main feedwater volume
*****
*
*      name      type
724000    bsgfiv    tmpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
7240101    10.00    10.00    0.0    0.0    0.0    0.0
*
*      rough      hy dia      ctl
7240102      0.0    0.0    0
*
*      ctl flg
7240200      3
*
*      time      pressure      temp
7240201      0.0    1250.0    405.0 *eji
*
*****
* break valve
*****
*
* top feedline break connects from 727 inlet
* bottom feedline break connects from 720 inlet
*
**      name      type
725000    brk-rlv    valve
**
**      from      to      jmn area      f loss      r loss      vrabs
7250101    720000000    730000000    0.0097643    0.0    0.0    000
**
**      cd1      cd2
7250102      0.90    0.80
**
**      ctl flow-f      flow-g      velj
7250201    1    0.0    0.0    0.0
**
**      vlv type
7250300      trpvlv
**
**      trip
7250301      402
**
*****
* containment
*****
*
* elev = 0.000 in.
*
**      name      type
7300000    feedcn    tmpvol

```

```

**
**      area  length  volume  hz ang  vr ang  elv ch
7900101  10.0    10.0    0.0    0.0    0.0    0.0
**
**      rough  by dia  ctl
7900102  0.0      0.0      0
**
**      ctl flg
7900200  2
**
**      time pressure  quale
7900201  0.0    12.3    1.0
**
*****
* broken loop steam generator top feedwater pipe
*****
*
* ref drawing: $$$$$$
*
* inlet elev = 411.500 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet
*
*      name  type
7260000  bsgfd  branch
*
*      no jun  ctl
7260001  2      0
*
*      area  length  volume  hz ang  vr ang  elv ch
7260101  .0103869  2.0    0.0    0.0    0.0    0.0
*
*      rough  by dia  ctl
7260102  6.667e-5  0.115    0
*
*      ctl press  quals  zero
7260200  2  876.000  0.0
*
*      from  to  jun area  f loss  r loss  vcabs
7261101  726010000  714000000  .0103869  0.0    0.0    000
7262101  726000000  727010000  .0103869  0.0    0.0    20002
*
*      vel-f  vel-g  vel-j
7261201  0.0    0.0    0.0
7262201  0.0    0.0    0.0
*
*****
* broken loop steam generator top feedwater break pipe
*****
*
* ref drawing: assembly - $$$$$$
*
* inlet elev = 411.500 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet
*
*      name  type
7270000  bsgthk  pipe
*
*      no vol

```

```

7270001  1
*
*      area  vol no
7270101  0.0103869  1
*
*      length  vol no
7270301  0.8333333  1
*
*      vr ang  vol no
7270501  +90.0    1
*
*      elv ch  vol no
7270701  +0.8333333  1
*
*      rough  by dia  vol no
7270801  6.667e-5  0.115    1
*
*      ctl flg  vol no
7271001  0      1
*
*      ctl press  quals  zero  zero  air flg  vol no
7271201  2  876.000  0.0    0.0    0.0    0    1
*
*****
* steam generator secondary - auxiliary feedwater junction
*****
*
* elev = 411.500 in. above top of tube sheet
*
*      name  type
7280000  bsgafvj  twdpjun
*
*      from  to  jun area
7280101  729000000  726000000  .004
*
*      ctl flg  trip
7280200  1      417
*
*      time  flow-f  flow-g  vel-j
7280201  -1.0    0.0    0.0    0.0
7280202  0.0    0.0    0.0    0.0
7280206  2000.0  0.0    0.0    0.0
*
*****
* steam generator secondary - auxiliary feedwater volume
*****
*
* elev = 411.500 in. above top of tube sheet
*
*      name  type
7290000  bsgafvr  twdpvol
*
*      area  length  volume  hz ang  vr ang  elv ch
7290101  10.00  10.00  0.0    0.0    0.0    0.0
*
*      rough  by dia  ctl
7290102  0.0    0.0    0
*

```

```

*      ctl flg
729000      3
*
*      time pressure temp
7290201      0.0 900.0 80.0
*
*****
* steam generator secondary - relief valve *
*****
*
* elev = 476.125 in. above top of tube sheet
*
*      name type
7340000      bsgrv valve
*
*      from to jun area f loss r loss vcabs
7340101 705010000 740000000 .007 0.0 0.0 100
*
*      ctl flow-f flow-g velj
7340201 i 0.0 0.0 0.0
*
*      vlv type
7340300      trpvlv
*
*      trip
7340301 671
*
*****
* steam generator secondary - time dep relief discharge volume *
*****
*
* elev = 476.125 in. above top of tube sheet
*
*      name type
7400000      bsgrov tndpvol
*
*      area length volume hz ang vr ang elv ch
7400101 10.0 10.00 0.0 0.0 0.0 0.0
*
*      rough by dia ctl
7400102 0.0 0.0 0
*
*      ctl flg
7400200 2
*
*      time pressure quals
7400201 0.0 12.3 1.0
*
*****
* steam generator secondary - discharge junction valve *
*****
*
* elev = 476.125 in. above top of tube sheet
*
*      name type
7350000      bsglj valve
*
*      from to jun area f loss r loss vcabs

```

```

7350101 705010000 750000000 0.007 1022.36 1022.36 100
*
*      ctl flow-f flow-g velj
7350201 1 0.0 0.56119 0.0
*
*      vlv type
*7350300      mtrvlv
*
*      op trip cl trip slope init pos table
*7350301 403 411 0.2 .04367422 0
*
*
*input for steady state control systems (comment out cards 73503xx above)
7350300      srvlv
7350301 737
*
*****
* steam generator secondary - time dep discharge volume *
*****
*
* elev = 476.125 in. above top of tube sheet
*
*      name type
7500000      bsgrov tndpvol
*
*      area length volume hz ang vr ang elv ch
7500101 10.0 10.00 0.0 0.0 0.0 0.0
*
*      rough by dia ctl
7500102 0.0 0.0 0
*
*      ctl flg
7500200 2
*
*      time pressure quals
7500201 0.0 12.3 1.0
*
*****
* cross connection - junction to cross connection pipe from blsg *
*****
*
* elev = 476.125 in. above top of tube sheet
*
**      name type
*7370000      blcnj sngljun
**
**      from to jun area f loss r loss vcabs
*7370101 705010000 745000000 0.003003 0.0 0.0 100
**
**      ctl vel-f vel-g velj
*7370201 0 0.0 0.0 0.0
**
*****
* broken loop steam dome cross connection pipe to il steam dome *
*****
*
* inlet elev = outlet elev = 476.125 in. above top of tube sheet
*

```

```

* note - cross-over pipe snakes around:
*   horizontally back 2.000 ft
*   horizontally over 5.000 ft
*   vertically down 18.000 ft, part of 647
*   horizontally forward 6.000 ft, part of 647
*   horizontally over 8.000 ft, part of 647
*   vertically up 19.730 ft, part of 647
*
**      name      type
*7460000      blcup      pipe
**
**      no vol
*7460001      1
**
**      area      vol no
*7460101      .003003      1
**
**      length     vol no
*7460301      7.0      1
**
**      vr ang     vol no
*7460601      0.0      1
**
**      elv ch     vol no
*7460701      0.0      1
**
**      rough      by dia      vol no
*7460801      6.667e-5      0.0      1
**
**      ctl fig     vol no
*7461001      0      1
**
**      ctl press    quals      zero      zero      air flg      vol no
*7461201      2 675.900      0.0      0.0      0.0      0      1
**
*****
* broken loop steam generator tube sheet outlet
*****
*
* ref drawing: 418972
*
* inlet elev = +102.604 in. (top of tube sheet)
* outlet elev = + 81.594 in. (bottom of tube sheet)
*
**      name      type
3250000      blts-ot      branch
*
*      no jun      ctl
3250001      2      1
*
*      area      length     volume      hz ang      vr ang      elv ch
3250101      6.0544e-3      1.751830      0.0      0.0      -88.07      -1.7908333
*
*      rough      by dia      ctl
3250102      5.000e-6      .0620833      0
*
*      ctl press    temp      zero
3250200      3 2250.00      547.00      zero

```

```

*
*      from      to jun area      f loss      r loss      vrchs
3251101      330010000      325000000      6.0544e-3      0.0      0.0      000
3252101      325010000      330000000      6.0544e-3      0.0      0.0      100
*
*      flow-f      flow-g      velj
3251201      7.310      0.0      0.0
3252201      7.310      0.0      -0.0
*
*****
* steam generator outlet plenum
*****
*
* ref drawing: 414272, sh.2, see note for sg inlet plenum (c310)
*
* inlet elev = top = + 81.594 in.
* outlet elev = bottom = + 71.969 in.
*
*      name      type
3300000      st-outpl      singlvol
*
*      area      length     volume      hz ang      vr ang      elv ch
3300101      0.0      0.8020833      .0495847      0.0      -90.0      -0.8020833
*
*      rough      by dia      ctl
3300102      6.667e-5      0.2600218      0
*
*      ctl press    temp      zero
3300200      3 2258.30      531.30      0.0
*
*****
* steam generator outlet
*****
*
* elev = +71.969 in.
*
*      name      type
3350000      sg-to-ps      singljun
*
*      from      to jun area      f loss      r loss      vrchs
3350101      330010000      340000000      0.0097643      0.0      0.0      000
*
*      ctl flow-f      flow-g      velj
3350201      1 5.840      0.0      0.0
*
*****
* pump section leg
*****
*
* ref drawings: inlet plenum - 414272
*      1.5ab1-34 (sp-60) - 414675-1
*      1.5ab1-35 (sp-61) - 414676-1
*      1.5ab1-36 (sp-62) - 414677-2
*      1.5ab1-37 (sp-63) - 414678-2
*      1.5ab1-6a (sp-64) - 414677-1
*      1.5ab1-7 (sp-65) - 407384-1
*      1.5ab1-9 (sp-72) - 407380-1
*      1.5ab1-11 (sp-73) - 407673-1

```

```

*
* inlet elev = + 71.969 in.
* u-tube bottom elev = -110.155 in.
* outlet elev = - 10.640 in.
*
*      name      type
340000      bl-ps      pipe
*
*      no vol
340001      9
*
*      area      vol no
340101      0.0097643      9 * 1 1/2 in sch-160
*
*      length      vol no
3400301      1.6054810      1 * spool piece-60 and inlet plenum
3400302      2.3393333      2 * sp-61,62
3400303      1.6437500      3 * sp-63 & 64 to pressure tap
3400304      4.9431250      4 * sp-64
3400305      4.2964583      5 * sp-64 & 65 to bend of u
3400306      1.0157816      6 * sp-65 1/2 of bend
3400307      1.0157816      7 * sp-65 1/2 of bend
3400308      5.3495833      8 * sp-65,72
3400309      2.2966667      9 * sp-73
*
*      hz ang      vol no
3400501      0.0      9
*
*      vr ang      vol no
3400601      -45.0      1
3400602      -90.0      5
3400603      -45.0      6
3400604      +45.0      7
3400605      +90.0      9
*
*      elv ch      vol no
3400701      -1.3076602      1
3400702      -2.3393333      2
3400703      -1.6437500      3
3400704      -4.9431250      4
3400705      -4.2964583      5
3400706      -0.6466667      6
3400707      +0.6466667      7
3400708      +5.3495833      8
3400709      +2.2966667      9
*
*      rough      hy dia      vol no
3400801      6.667e-5      0.0      9
*
*      f loss      r loss      jun no
3400901      0.0      0.0      1
3400902      0.0      0.0      2
3400903      0.0      0.0      7
3400904      1.3      1.3      8
*
*      ctl flg      vol no
3401001      0      9

```

```

*      ctl flg      jun no
3401101      0      8
*
*      ctl press      temp      zero      zero      air flg      vol no
3401201      3      2258.30      531.30      0.0      0.0      0      1
3401202      3      2258.30      531.30      0.0      0.0      0      2
3401203      3      2258.30      531.30      0.0      0.0      0      3
3401204      3      2258.30      531.30      0.0      0.0      0      4
3401205      3      2258.30      531.30      0.0      0.0      0      5
3401206      3      2258.30      531.30      0.0      0.0      0      6
3401207      3      2258.30      531.30      0.0      0.0      0      7
3401208      3      2258.30      531.30      0.0      0.0      0      8
3401209      3      2258.30      531.30      0.0      0.0      0      9
*
*      ctl flg
3401300      1
*
*      flow-f      flow-g      velj      jun no
3401301      5.840      0.0      0.0      8
*
*****
* pump discharge pipe and ecc injection tee
*****
*
* ref drawing: 1.5ab1-12 (sp-74) - 407674
*
* inlet elev = outlet elev = 0.000 in.
*
*      name      type
3610000      pep-disc      branch
*
*      no jun      ctl
3610001      2      1
*
*      area      length      volume      hz ang      vr ang      elv ch
3610101      0.0097643      1.9700      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
3610102      6.667e-5      0.0      0
*
*      ctl press      temp
3610200      3      2258.30      531.30
*
*      from      to      jun area      f loss      r loss      vchks
3611101      361010000      362000000      .0097643      1.2      1.2      000
3612101      500010000      361000000      .002695      0.0      0.0      20121
*
*      flow-f      flow-g      velj
3611201      5.840      0.0      0.0
3612201      0.0      0.0      0.0
*
*****
* ecc line
*****
*
* inlet elev = outlet elev = 0.000 in.
*

```

```

*      name      type
5000000  bleccpip  pipe
*
*      no vol
5000001      1
*
*      area      vol no
5000101  0.002595      1  * 0.703 in. id
*
*      length    vol no
5000301  10.0      1
*
*      vr ang     vol no
5000601  0.0      1
*
*      elv ch     vol no
5000701  0.0      1
*
*      rough      by dia  vol no
5000801  6.667e-5  0.0      1
*
*      ctl flg     vol no
5001001  0      1
*
*      ctl press  temp  zero  zero  air flg  vol no
5001201  3  2258.30  531.30  0.0  0.0  0  1
*
*****
* hpis injection junction
*****
*
* elev = 0.000 in.
*
*      name      type
5100000  blhpisj  twdipjn
*
*      from      to  jun area
5100101  52000000 50000000 0.002595
*
*      ctl flg     trip  table  volume
5100200      1      408      p  361010000
*
*      pres(psia)  flow-f  flow-g  velj
5100201      -1.0  0.00  0.0  0.0
5100202      0.0  0.00  0.0  0.0
5100203      15.0  0.0125  0.0  0.0
5100204      333.57  0.01113  0.0  0.0
5100205      581.36  0.01000  0.0  0.0
5100206      609.77  0.00974  0.0  0.0
5100207      770.0  0.00868  0.0  0.0
5100208      881.0  0.00795  0.0  0.0
5100209      1007.23  0.00705  0.0  0.0
5100210      1024.0  0.00683  0.0  0.0
5100211      1158.0  0.0059  0.0  0.0
5100212      1258.0  0.0051  0.0  0.0
5100213      1348.0  0.0039  0.0  0.0
5100214      1407.0  0.0031  0.0  0.0
5100215      1455.0  0.0019  0.0  0.0

```

```

5100216      1550.0  0.00  0.0  0.0
5100217      1600.0  0.00  0.0  0.0
*
*****
* hpis volume
*****
*
* elev = 0.000 in.
*
*      name      type
5200000  blhpisv  twdipvol
*
*      area      length  volume  hz ang  vr ang  elv ch
5200101  10.0  10.0  0.0  0.0  0.0  0.0
*
*      rough      by dia  ctl
5200102  0.0  0.0  0
*
*      ctl flg
5200200      3
*
*      time pressure  temp
5200201  0.0  12.3  80.0
*
*****
* accumulator
*****
*
* inlet elev = bottom = 0.000 in.
* outlet elev = top = + 13.757 in.
*
*      name      type
5300000  blacc  accum
*
*      area      length  volume  hz ang  vr ang  elv ch
5300101  0.7085  1.1464  0.0  0.0  90.0  1.1464
*
*      rough      by dia  ctl
5300102  0.0  0.0  10
*
*      pressure  temp
5300200  615.0  80.0
*
*      to  jun area  f loss  r loss  vchhs
5301101  500000000  0.002595  50149.59  50149.59  000
*
*      vliq  liq lev  lolen  elev  thick  htr-flg  takrho  takcp  nit-k
5302200  0.565  0  20.00  0  .0417  0  0  0  0
*
*****
* broken loop cold leg break tee
*****
*
* ref drawing: 1.5ab1-17 or 1.5ab126a (sp-76) - 407875
*
* inlet elev = outlet elev = 0.000 in.
*
*      name      type

```

```

3620000 brk-tee branch
*
* no jun ctl
3620001 1 1
*
* area length volume hz ang vr ang elv ch
3620101 0.0097643 1.647500 0.0 0.0 0.0 0.0
*
* rough hy dia ctl
3620102 6.667e-5 0.0 0
*
* ctl press temp
3620200 3 2258.30 531.30
*
* from to jun area f loss r loss vcabs
3621101 362010000 363000000 .0097643 1.2 1.2 000
*
* flow-f flow-g velj
3621201 5.840 0.0 0.0
*
*****
* broken loop cold leg (downstream of break)
*****
* ref drawings: 1.5ab1-17 (sp-76) - 407875
* 1.5ab1-15 (sp-79) - 407675
* cold leg nozzle - 407986
*
* name type
3630000 bl-rl pipe
*
* no vol
3630001 2
*
* area vol no
3630101 0.0097643 1 * 1 1/2 in sch-160 pipe
3630102 0.0375539 2 * downcomer inlet annulus nozzle
*
* length vol no
3630301 2.3341667 1 * sp-79
3630302 1.2761677 2 * cold leg nozzle
*
* vr ang vol no
3630601 0.0 2
*
* elv ch vol no
3630701 0.0 2
*
* rough hy dia vol no
3630801 6.667e-5 0.0 2
*
* ctl flg vol no
3631001 0 2
*
* vcabs jun no
3631101 0 1
*
* ctl press temp zero zero air flg vol no

```

```

3631201 3 2258.30 531.30 0.0 0.0 0 2
*
* ctl flg
3631300 1
*
* flow-f flow-g velj jun no
3631301 5.840 0.0 0.0 1
*
*****
* break junction
*****
* elev = 0.000 in.
*
* break sizes:
* 0.5% - 0.00001279 (nominal) s-nh-1
* 2.1% - 0.00005116 (nominal)
* 2.5% - 0.00006175 (nominal)
* 5.0% - 0.00012079 (nominal)
* 10.0% - 0.000247 (nominal)
*
* name type
*3750000 brk-rlv valve
*
* from to jun area f loss r loss vcabs
*3750101 362010000 900000000 0.00001279 0.0 0.0 100
*
* cd1 cd2
*3750102 0.90 0.90
*
* ctl flow-f flow-g velj
*3750201 1 0.0 0.0 0.0
*
* vlv type
*3750300 trypvlv
*
* trip
*3750301 402
*
*****
* containment
*****
* elev = 0.000 in.
*
* name type
*9000000 contain lwdpvol
*
* area length volume hz ang vr ang elv ch
*9000101 10.0 10.0 0.0 0.0 0.0 0.0
*
* rough hy dia ctl
*9000102 0.0 0.0 0
*
* ctl flg
*9000200 2
*
* time pressure quale

```

```

*9000201      0.0  12.3   1.0
*
*****
* heat loss ambient volumes
*****
*
*      name      type
8000000      ilsg      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8000101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8000102      0.0       0.0       0
*
*      ctl flg
8000200      1
*
*      time      temp      quale
8000201      0.0      80.0      1.0
*
*****
*
*      name      type
8010000      ibbl      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8010101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8010102      0.0       0.0       0
*
*      ctl flg
8010200      1
*
*      time      temp      quale
8010201      0.0      80.0      1.0
*
*****
*
*      name      type
8020000      blps      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8020101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8020102      0.0       0.0       0
*
*      ctl flg
8020200      1
*
*      time      temp      quale
8020201      0.0      80.0      1.0
*
*****
*
*      name      type

```

```

8030000      ibcl      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8030101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8030102      0.0       0.0       0
*
*      ctl flg
8030200      1
*
*      time      temp      quale
8030201      0.0      80.0      1.0
*
*****
*
*      name      type
8040000      ilps      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8040101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8040102      0.0       0.0       0
*
*      ctl flg
8040200      1
*
*      time      temp      quale
8040201      0.0      80.0      1.0
*
*****
*
*      name      type
8050000      vsldac      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8050101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8050102      0.0       0.0       0
*
*      ctl flg
8050200      1
*
*      time      temp      quale
8050201      0.0      80.0      1.0
*
*****
*
*      name      type
8060000      pzrcap      tmdpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8060101      10.0       1.0       0.0       0.0       0.0       0.0
*
*      rough      hy dia      ctl
8060102      0.0       0.0       0

```

```

*
*      ctl flg
8060200      1
*
*      time      temp      quale
8060201      0.0      80.0      1.0
*
*****
*
*      name      type
8070000      pzrs1      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8070101      10.0      1.0      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
8070102      0.0      0.0      0
*
*      ctl flg
8070200      1
*
*      time      temp      quale
8070201      0.0      80.0      1.0
*
*****
*
*      name      type
8080000      thsht      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8080101      10.0      1.0      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
8080102      0.0      0.0      0
*
*      ctl flg
8080200      1
*
*      time      temp      quale
8080201      0.0      80.0      1.0
*
*****
*
*      name      type
8090000      blsg      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8090101      10.0      1.0      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
8090102      0.0      0.0      0
*
*      ctl flg
8090200      1
*
*      time      temp      quale
8090201      0.0      80.0      1.0
*

```

```

*****
*
*      name      type
8110000      ibblh      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8110101      10.0      1.0      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
8110102      0.0      0.0      0
*
*      ctl flg
8110200      1
*
*      time      temp      quale
8110201      0.0      80.0      1.0
*
*****
*
*      name      type
8120000      blpsh      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8120101      10.0      1.0      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
8120102      0.0      0.0      0
*
*      ctl flg
8120200      1
*
*      time      temp      quale
8120201      0.0      80.0      1.0
*
*****
*
*      name      type
8130000      ibclh      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8130101      10.0      1.0      0.0      0.0      0.0      0.0
*
*      rough      hy dia      ctl
8130102      0.0      0.0      0
*
*      ctl flg
8130200      1
*
*      time      temp      quale
8130201      0.0      80.0      1.0
*
*****
*
*      name      type
8140000      ilpsh      tndpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8140101      10.0      1.0      0.0      0.0      0.0      0.0
*

```

```

*
*      rough  hy dia    ctl
8140102    0.0    0.0    0
*
*      ctl flg
8140200    1
*
*      time    temp    quale
8140201    0.0    80.0    1.0
*
*****
*
*      name    type
8150000    vsldmh    twdpyol
*
*      area    length    volume    hz ang    vr ang    elv ch
8150101    10.0    1.0    0.0    0.0    0.0    0.0
*
*      rough  hy dia    ctl
8150102    0.0    0.0    0
*
*      ctl flg
8150200    1
*
*      time    temp    quale
8150201    0.0    80.0    1.0
*
*****
*
*      name    type
8160000    pzrb    twdpyol
*
*      area    length    volume    hz ang    vr ang    elv ch
8160101    10.0    1.0    0.0    0.0    0.0    0.0
*
*      rough  hy dia    ctl
8160102    0.0    0.0    0
*
*      ctl flg
8160200    1
*
*      time    temp    quale
8160201    0.0    80.0    1.0
*
*****
*****
*****      heat structure *****
*****      information *****
*****
*
*****
* downcomer inlet annulus heat loss (above cold leg nozzle)
*
*
* left boundary = component 101
* right boundary = ambient volume (805)
*

```

```

*gl data      nh      np      type      s-flg      l-cor
11010000      1      8      2      1      0.271375
*
*mesh      loc flg      frm flg
11010100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11010101      2      0.279708      -1      0.283850      2      0.359375
11010102      2      0.526042
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11010201      1      2      2      3      1      5
11010202      8      7
*
*source dis      source      itv no
11010301      0.0      7
*
*init temp      flg
11010400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh
11010401      542.3      3      301.9      6      232.6      7      175.7      8
*
*l-body      hy-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11010501      101010000      0      1      1      0.875000      1
*
*r-body      hy-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11010601      805010000      0      4100      1      0.875000      1
*
*source      type      is-mpir      l-dr-ht      r-dr-ht      ht-str-no
11010701      0      0      0      0      1
*
*l-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11010801      0      0.0      0.247955      1.875000      1
11010801      0.247955      10.0      10.0      0 0 0 0      1.0      1
*
*r-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11010901      0      0.0      0.0      1.875000      1
11010901      0.0      10.0      10.0      0 0 0 0      1.0      1
*
*****
* downcomer inlet annulus hollow center (above cold leg nozzle)
*****
*
* left boundary = adiabatic
* right boundary = component 101
*
*gl data      nh      np      type      s-flg      l-cor
11011000      1      6      2      1      0.12500
*
*mesh      loc flg      frm flg
11011100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11011101      2      0.18750      1      0.191667      2      0.20000
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11011201      1      2      2      3      1      5

```

```

*
*source dis source itv no
11011301 0.0 5
*
*init temp flg
11011400 0
*
* temp mesh temp mesh
11011401 550.0 3 549.7 6
*
* l-body hy-vol inc b-cdt a-code cy-length ht-str-no
11011501 0 0 0 1 0.87500 1
*
* r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11011601 101010000 0 1 1 0.87500 1
*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
11011701 0 0 0 0 1
*
* l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
11011801 0 0.0 0.0 0.0 1
11011801 0.0 10.0 10.0 0 0 0 1.0 1
*
* r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
11011901 0 0.0 0.336444 1.87500 1
11011901 0.336444 10.0 10.0 0 0 0 1.0 1
*
*****
* downcomer inlet annulus heat loss (below cold leg nozzle) *
*****
*
* left boundary = component 102
* right boundary = ambient volume (805)
*
*gl data nb np type s-flg l-cor
11020000 1 8 2 1 0.271375
*
*mesh loc flg frn flg
11020100 0 1
*
*geometry no itv r-cor no itv r-cor no itv r-cor
11020101 2 0.275708 1 0.283850 2 0.359375
11020102 2 0.526042
*
*materials cmp no itv no cmp no itv no cmp no itv no
11020201 1 2 2 3 1 5
11020202 8 7
*
*source dis source itv no
11020301 0.0 7
*
*init temp flg
11020400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
11020401 549.0 3 308.0 5 299.6 6 234.6 7 176.9 8
*
* l-body hy-vol inc b-cdt a-code cy-length ht-str-no

```

```

11020501 101010000 0 1 1 1.0000 1
*
* r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11020601 805010000 0 4100 1 1.0000 1
*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
11020701 0 0 0 0 1
*
* l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
11020801 0 0.0 0.247955 1.87500 1
11020801 0.247955 10.0 10.0 0 0 0 1.0 1
*
*****
* downcomer inlet annulus hollow center (below cold leg nozzle) *
*****
*
* left boundary = adiabatic
* right boundary = component 102
*
*gl data nb np type s-flg l-cor
11021000 1 6 2 1 0.12500
*
*mesh loc flg frn flg
11021100 0 1
*
*geometry no itv r-cor no itv r-cor no itv r-cor
11021101 2 0.18750 1 0.191667 2 0.20000
*
*materials cmp no itv no cmp no itv no cmp no itv no
11021201 1 2 2 3 1 5
*
*source dis source itv no
11021301 0.0 5
*
*init temp flg
11021400 0
*
* temp mesh temp mesh
11021401 550.0 3 550.3 6
*
* l-body hy-vol inc b-cdt a-code cy-length ht-str-no
11021501 0 0 0 1 1.000000 1
*
* r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11021601 101010000 0 1 1 1.000000 1
*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
11021701 0 0 0 0 1
*
* l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
11021801 0 0.0 0.0 0.0 1
11021801 0.0 10.0 10.0 0 0 0 1.0 1
*
* r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
11021901 0 0.0 0.336444 1.87500 1
11021901 0.336444 10.0 10.0 0 0 0 1.0 1
*
*****

```

```

* downcomer pipe (heat loss to environment) - unheated
*****
*
* left boundary = component 110 (volumes 1,2,3,4,5,6,7,8,9)
* right boundary = ambient volume (805)
*
*gl data      nh      np      type      s-flg      l-cor
11100000      9      10      2          1      .091041667
*
*mesh      loc flg      frm flg
11100100      0          1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11100101      1      .092541667      2      .107825000      1      .109325000
11100102      3      .145833333      2      .312500000
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11100201      10          1      12          3      10          4
11100202      1          7      8          9
*
*source dis      source      itv no
11100301      0.0          9
*
*init temp      flg
11100400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11100401      549.9      2      395.0      3      249.3      8      189.7      9      149.3      10
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11100501      110010000      0          1          1      1.715159      1
11100502      110020000      0          1          1      0.273268      2
11100503      110030000      0          1          1      1.272435      3
11100504      110040000      0          1          1      1.272435      4
11100505      110050000      0          1          1      1.272435      5
11100506      110060000      0          1          1      1.272435      6
11100507      110070000      0          1          1      1.272435      7
11100508      110080000      0          1          1      1.465667      8
11100509      110090000      0          1          1      1.434751      9
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11100601      805010000      0      4100          1      1.715159      1
11100602      805010000      0      4100          1      0.273268      2
11100603      805010000      0      4100          1      1.272435      3
11100604      805010000      0      4100          1      1.272435      4
11100605      805010000      0      4100          1      1.272435      5
11100606      805010000      0      4100          1      1.272435      6
11100607      805010000      0      4100          1      1.272435      7
11100608      805010000      0      4100          1      1.465667      8
11100609      805010000      0      4100          1      1.434751      9
*
*source      type      is-mlr      l-dr-ht      r-dr-ht      ht-str-no
11100701      0          0          0          0          9
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
11100801      0          0.0          0.0          16.244581      9
11100801      0.0      10.0      10.0      0 0 0 0      1.0      9

```

```

*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11100901      0          0.0          0.0          1.0          9
11100901      0.0      10.0      10.0      0 0 0 0      1.0      9
*
*****
* downcomer pipe (external heaters)
*****
*
* left boundary = component 110 (volumes 1,2,3,4,5,6,7)
* right boundary = ambient volume (815)
*
*gl data      nh      np      type      s-flg      l-cor
11101000      7      13      2          1      .091041667
*
*mesh      loc flg      frm flg
11101100      0          1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11101101      1      .092541667      2      .107825000      1      .109325000
11101102      3      .145833333      1      .145833333      2      .15635
11101103      2      .3230167
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11101201      10          1      12          3      10          4
11101202      1          7      13          8          9          10
11101203      8          12
*
*source dis      source      itv no      source      itv no      source      itv no
11101301      0.0          8          1.0          10          0.0          12
*
*init temp      flg
11101400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11101401      549.6      2      401.5      3      263.9      8      277.5      11      198.5      12
11101402      152.6      13
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11101501      110010000      0          1          1      0.545674      1
11101502      110020000      0          1          1      0.727565      2
11101503      110030000      0          1          1      0.727565      3
11101504      110040000      0          1          1      0.727565      4
11101505      110050000      0          1          1      0.727565      5
11101506      110060000      0          1          1      0.727565      6
11101507      110070000      0          1          1      0.727565      7
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11101601      815010000      0      4100          1      0.545674      1
11101602      815010000      0      4100          1      0.727565      2
11101603      815010000      0      4100          1      0.727565      3
11101604      815010000      0      4100          1      0.727565      4
11101605      815010000      0      4100          1      0.727565      5
11101606      815010000      0      4100          1      0.727565      6
11101607      815010000      0      4100          1      0.727565      7
*
*source      type      is-mlr      l-dr-ht      r-dr-ht      ht-str-no
11101701      10225      .026003          0          0          1
11101702      10225      .035114          0          0          2

```

```

11101703 10225 .035114 0 0 3
11101704 10225 .035114 0 0 4
11101705 10225 .035114 0 0 5
11101706 10225 .035114 0 0 6
11101707 10225 .035114 0 0 7
*
* l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*11101801 0 0.0 0.0 15.244581 7
11101801 0.0 10.0 10.0 0 0 0 1.0 7
*
* r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*11101901 0 0.0 0.0 15.244581 7
11101901 0.0 10.0 10.0 0 0 0 1.0 7
*
*****
* lower downcomer distribution annulus heat loss (with honeycomb) *
*****
* left boundary = component 110 (volume 10)
* right boundary = ambient volume (805)
*
* gl data nh np type s-flg l-cor
11102000 1 10 2 1 0.244875
*
* mesh loc flg frn flg
11102100 0 1
*
* geometry no itv r-cor no itv r-cor no itv r-cor
11102101 1 .246541667 2 .256958333 1 .2586250
11102102 3 .411541667 2 .578208333
*
* materials cap no itv no cap no itv no cap no itv no
11102201 10 1 11 3 10 4
11102202 1 7 8 9
*
* source dis source itv no
11102301 0.0 9
*
* init temp flg
11102400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
11102401 549.3 2 440.6 3 323.7 8 241.6 9 181.1 10
*
* l-body hy-vol inc b-cdt a-code cy-length ht-str-no
11102501 110100000 0 1 1 0.704681 1
*
* r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11102601 805010000 0 4100 1 0.704681 1
*
* source type is-mplr l-dr-ht r-dr-ht ht-str-no
11102701 0 0 0 0 0 1
*
* l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*11102801 0 0.0 0.198130 0.96250 1
11102801 0.198130 10.0 10.0 0 0 0 1.0 1
*
* r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no

```

```

*11102901 0 0.0 0.0 0.96250 1
11102901 0.0 10.0 10.0 0 0 0 1.0 1
*
*****
* lower downcomer distribution annulus - external heaters *
*****
*
* left boundary = component 110 (volume 10)
* right boundary = ambient volume (815)
*
* gl data nh np type s-flg l-cor
11103000 1 13 2 1 .244875
*
* mesh loc flg frn flg
11103100 0 1
*
* geometry no itv r-cor no itv r-cor no itv r-cor
11103101 1 .246541667 2 .256958333 1 .25862500
11103102 3 .411541667 1 .411641667 2 .42605833
11103103 2 .592725000
*
* materials cap no itv no cap no itv no cap no itv no
11103201 10 1 11 3 10 4
11103202 1 7 13 8 9 10
11103203 8 12
*
* source dis source itv no source itv no source itv no
11103301 0.0 8 1.0 10 0.0 12
*
* init temp flg
11103400 - 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
11103401 549.3 2 444.1 3 331.6 8 335.1 11 247.6 12
11103402 182.9 13
*
* l-body hy-vol inc b-cdt a-code cy-length ht-str-no
11103501 110100000 0 1 1 0.257819 1
*
* r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11103601 815010000 0 4100 1 0.257819 1
*
* source type is-mplr l-dr-ht r-dr-ht ht-str-no
11103701 10225 .035114 0 0 1
*
* l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*11103801 0 0 0.198130 0.96250 1
11103801 0.198130 10.0 10.0 0 0 0 1.0 1
*
* r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*11103901 0 0 0.0 0.96250 1
11103901 0.0 10.0 10.0 0 0 0 1.0 1
*
*****
* downcomer distribution annulus to core inlet (thru lower extension) *
*****
*
* left boundary = component 140

```

```

* right boundary = component 110 (volume 10)
*
*gl data      nh      ep      type      s-flg      l-cor
11140000      1      3      2      1      0.1796667
*
*mesh      loc flg      frm flg
11140100      0      1
*
*geometry      no itv      r-cor
11140101      2      0.188958
*
*materials      cmp no      itv no
11140201      1      2
*
*source dis      source      itv no
11140301      0.0      2
*
*init temp      flg
11140400      0
*
*      temp mesh
11140401      550.0      3
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11140501      140010000      0      1      1      0.96250      1
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11140601      110100000      0      1      1      0.96250      1
*
*source      type      is-mp/r      l-dr-ht      r-dr-ht      ht-str-no
11140701      0      0      0      0      1
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11140801      0      0.0      0.0      0.96250      1
11140801      0.0      10.0      10.0      0 0 0 0      1.0      1
*
*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11140901      0      0.0      0.256760      0.96250      1
11140901      0.25676      10.0      10.0      0 0 0 0      1.0      1
*
*****
* core inlet heat loss (core hous'g lower ext'n above dncvr an'ins) *
*****
* left boundary = component 140
* right boundary = ambient volume (805)
*
*gl data      nh      ep      type      s-flg      l-cor
11400000      1      6      2      1      .14934039
*
11400100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor
11400101      3      .4826737      2      .64934039
*
*materials      cmp no      itv no      cmp no      itv no
11400201      1      3      8      5

```

```

*source dis      source      itv no
11400301      0.0      5
*
*init temp      flg
11400400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11400401      547.6      1      494.2      2      459.0      3      432.7      4      328.3      5
11400402      232.4      6
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11400501      140010000      0      1      1      0.6258333      1
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11400601      805010000      0      4100      1      0.6258333      1
*
*source      type      is-mp/r      l-dr-ht      r-dr-ht      ht-str-no
11400701      0      0      0      0      1
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11400801      0      0.0      0.0      0.0      1
11400801      0.0      10.0      10.0      0 0 0 0      1.0      1
*
*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11400901      0      0.0      0.0      0.0      1
11400901      0.0      10.0      10.0      0 0 0 0      1.0      1
*
*****
* vessel bottom head (with honeycomb) *
*****
* left boundary = component 120
* right boundary = ambient volume (805)
*
*gl data      nh      ep      type      s-flg      l-cor
11200000      1      9      2      1      0.412500
*
*mesh      loc flg      frm flg
11200100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11200101      1      .41416667      2      .42458333      1      .42625000
11200102      2      .740416666      2      .90708333
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11200201      10      1      11      3      10      4
11200202      1      6      8      8
*
*source dis      source      itv no
11200301      0.0      8
*
*init temp      flg
11200400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11200401      540.1      2      441.3      3      343.5      5      317.0      6      296.6      7
11200402      237.0      8      179.5      9

```

```

*l-body   by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
11200501  120010000   0     1     1   0.466667     1
*
*r-body   by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
11200601  805010000   0    4100    1   0.466667     1
*
*source   type   is-mplr   l-dr-bt   r-dr-bt   ht-str-no
11200701      0       0         0         0         1
*
*l-h-st   chf-btr   by-dia   h-eq-dia   ch-length   ht-str-no
*11200801      0       0.0       0.0   0.466667     1
11200801  0.0  10.0 10.0 0 0 0 0 1.0 1
*
*r-h-st   chf-btr   by-dia   h-eq-dia   ch-length   ht-str-no
*11200901      0       0.0       0.0   0.466667     1
11200901  0.0  10.0 10.0 0 0 0 0 1.0 1
*
*****
* vessel lower plenum wall (with honeycomb)
*****
*
* left boundary = component 130
* right boundary = ambient volume (805)
*
*gl data   nh     np     type   s-flg   l-cor
11300000   1      9      2      1   .363403395
*
*mesh      loc flg   frm flg
11300100   0        1
*
*geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
11300101     1   .365070062     2   .375486729     1   .37715339
11300102     2   .691320063     2   .857986730
*
*materials   cmp no   itv no   cmp no   itv no   cmp no   itv no
11300201     10       1      11       3      10       4
11300202      1       6       8       8
*
*source dis   source   itv no
11300301     0.0       8
*
*init temp    flg
11300400      0
*
*      temp mesh   temp mesh   temp mesh   temp mesh   temp mesh
11300401  540.8   2   438.3   3   337.1   5   310.3   6   290.3   7
11300402  232.2   8   176.5   9
*
*l-body   by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
11300501  130010000   0     1     1   0.721917     1
*
*r-body   by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
11300601  805010000   0    4100    1   0.721917     1
*
*source   type   is-mplr   l-dr-bt   r-dr-bt   ht-str-no
11300701      0       0         0         0         1
*
*l-h-st   chf-btr   by-dia   h-eq-dia   ch-length   ht-str-no

```

```

*11300801      0       0.0       0.0   0.721917     1
11300801  0.0  10.0 10.0 0 0 0 0 1.0 1
*
*r-h-st   chf-btr   by-dia   h-eq-dia   ch-length   ht-str-no
*11300901      0       0.0       0.0   0.721917     1
11300901  0.0  10.0 10.0 0 0 0 0 1.0 1
*
*****
* heated core (active length)
*****
*
* left boundary = adiabatic
* right boundary = component 150
*
*      note: the mod-2a core is a 5 x 5 rod matrix with
*            two (2) unpowered rods in opposing corners.
*            each rod has an od = 0.422 in.  each power
*            step (two per hydrodynamic volume) is
*            modeled individually.
*
*gl data   nh     np     type   s-flg   l-cor
11500000   12     18     2       1     0.0
*
*mesh      loc flg   frm flg
11500100   0        1
*
*geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
11500101     1   0.002917     4   0.003075     4   0.014500
11500102     4   0.015500     4   0.017583
*
*materials   cmp no   itv no   cmp no   itv no   cmp no   itv no
11500201      3       1       4       5       3       9
11500202      1      13       1      17
*
*source dis   source   itv no   source   itv no   source   itv no
11500301     0.0       1       1.0       5       0.0      17
*
*init temp    flg
11500400     -1
*
*temp distribution
11500401  692.4  692.4  689.8  683.2  673.1  659.6  638.3  619.6  602.9
+      587.8  585.7  583.7  581.7  579.7  575.7  571.7  567.9  564.2
11500402  822.4  822.4  817.5  804.9  785.6  760.1  717.9  681.2  648.7
+      619.6  615.7  611.9  608.1  604.3  596.7  589.3  582.1  575.2
11500403  979.3  979.3  971.9  952.9  923.8  885.2  818.5  760.9  710.4
+      665.5  659.7  654.1  648.5  642.9  631.6  620.7  610.0  599.5
11500404  1143.1 1143.1 1133.1 1107.0 1067.1 1014.2  917.8  835.8  764.6
+      701.8  694.0  686.3  678.8  671.3  656.0  641.1  626.6  612.4
11500405  1275.5 1275.5 1263.7 1232.9 1185.7 1123.4 1004.1  903.7  817.4
+      741.8  732.7  723.8  715.0  706.3  688.5  671.2  654.3  637.7
11500406  1333.6 1333.6 1320.8 1287.7 1236.9 1169.8 1038.8  929.3  835.4
+      753.5  743.8  734.3  724.9  715.5  696.5  677.9  659.7  641.9
11500407  1350.8 1350.8 1338.1 1304.9 1254.2 1187.1 1055.0  944.6  850.1
+      767.7  758.0  748.6  739.2  729.9  711.0  692.5  674.5  656.8
11500408  1293.2 1293.2 1281.4 1250.6 1203.4 1141.1 1020.7  919.6  832.6
+      756.6  747.6  738.7  730.0  721.3  703.7  686.5  669.6  653.2

```

```

11500409 1190.8 1190.8 1180.7 1154.6 1114.7 1061.9 963.3 879.5 806.9
+ 743.0 735.4 727.9 720.4 713.1 698.1 683.5 660.2 655.3
11500410 1026.1 1026.1 1018.7 999.7 970.6 932.0 863.9 805.2 753.7
+ 707.9 702.3 696.7 691.2 685.8 674.7 663.9 653.5 643.3
11500411 886.2 886.2 881.3 868.7 849.4 823.9 780.6 742.9 709.5
+ 679.7 675.9 672.1 668.4 664.8 657.7 650.2 643.2 636.4
11500412 755.6 755.6 753.0 746.4 736.2 722.8 700.9 681.7 664.6
+ 649.1 647.1 645.1 643.1 641.2 637.3 633.5 629.8 626.2
*
* l-body   hy-vol   inc   b-cdt   a-code   surf-area   ht-str-no
11500501      0      0      0      0      0.0      12
*
* r-body   hy-vol   inc   b-cdt   a-code   surf-area   ht-str-no
11500601 150010000      0      1      0      2.5410249      1
11500602 150010000      0      1      0      2.5410249      2
11500603 150020000      0      1      0      2.5410249      3
11500604 150020000      0      1      0      2.5410249      4
11500605 150030000      0      1      0      2.5410249      5
11500606 150030000      0      1      0      2.5410249      6
11500607 150040000      0      1      0      2.5410249      7
11500608 150040000      0      1      0      2.5410249      8
11500609 150050000      0      1      0      2.5410249      9
11500610 150050000      0      1      0      2.5410249     10
11500611 150060000      0      1      0      2.5410249     11
11500612 150060000      0      1      0      2.5410249     12
*
* source   type   is-mpir   l-dr-ht   r-dr-ht   ht-str-no
11500701 10151 0.02384      0      0      1
11500702 10151 0.04917      0      0      2
11500703 10151 0.07416      0      0      3
11500704 10151 0.10166      0      0      4
11500705 10151 0.12001      0      0      5
11500706 10151 0.12916      0      0      6
11500707 10151 0.12916      0      0      7
11500708 10151 0.12001      0      0      8
11500709 10151 0.10166      0      0      9
11500710 10151 0.07416      0      0     10
11500711 10151 0.04917      0      0     11
11500712 10151 0.02384      0      0     12
*
* l-h-st   chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
* 11500801      0      0.0      0.0      12.0      12
11500801 0.0 10.0 10.0 0 0 0 0 1.0 12
*
* r-h-st   chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
* 11500901      0      0.0      0.043992      12.0      12
11500901 0.043992 10.0 10.0 0 0 0 0 1.0 12
*
*****
* vessel core barrel wall (mod-3 "steam-gap") - unheated
*****
*
* left boundary = component 150
* right boundary = ambient volume (805)
*
* gl data   nh   mp   type   s-flg   l-cor
11501000    6   13    2      1  0.132114
*

```

```

* mesh   loc flg   frm flg
11501100      0      1
*
* geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
11501101      2   .133964      1   .135531      2   .143864
11501102      3   .200256      2   .272256      2   .438956
*
* materials   cap no   itv no   cap no   itv no   cap no   itv no
11501201      1      2      2      3      1      5
11501202      1      8      1     10      8     12
*
* source dis   source   itv no
11501301      0.0     12
*
* init temp   flg
11501400     -1
*
* temp distribution
11501401 551.6 551.3 551.0 360.7 359.2 357.8 351.9 346.7 342.1
+ 334.4 328.0 257.4 186.8
11501402 564.4 564.1 563.7 367.8 366.3 364.8 358.7 353.4 348.6
+ 340.7 334.0 261.6 189.2
11501403 581.9 581.5 581.2 377.5 375.5 374.4 368.1 362.5 357.5
+ 349.3 342.4 267.4 192.4
11501404 598.5 598.1 597.8 386.9 385.3 383.7 377.1 371.3 366.1
+ 357.6 350.5 273.1 195.6
11501405 609.7 609.3 609.0 393.4 391.7 390.0 383.3 377.3 372.0
+ 363.3 356.0 276.9 197.8
11501406 614.2 613.8 613.5 395.2 393.5 391.8 384.9 378.9 373.6
+ 364.8 357.4 277.9 198.3
*
* l-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
11501501 150010000      0      1      1   0.635984      1
11501502 150020000      0      1      1   0.635984      2
11501503 150030000      0      1      1   0.830843      3
11501504 150040000      0      1      1   0.830843      4
11501505 150050000      0      1      1   0.830843      5
11501506 150060000      0      1      1   0.635984      6
*
* r-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
11501601 805010000      0     4100      1   0.635984      1
11501602 805010000      0     4100      1   0.635984      2
11501603 805010000      0     4100      1   0.830843      3
11501604 805010000      0     4100      1   0.830843      4
11501605 805010000      0     4100      1   0.830843      5
11501606 805010000      0     4100      1   0.635984      6
*
* source   type   is-mpir   l-dr-ht   r-dr-ht   ht-str-no
11501701      0      0      0      0      6
*
* l-h-st   chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
* 11501801      0      0.0      0.129489      12.0      6
11501801 0.129489 10.0 10.0 0 0 0 0 1.0 6
*
* r-h-st   chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
* 11501901      0      0.0      0.0      12.0      6
11501901 0.0 10.0 10.0 0 0 0 0 1.0 6
*

```

```

*****
* vessel core barrel wall - external heaters *
*****
*
* left boundary = component 150
* right boundary = ambient volume (815)
*
*gl data      nh      np      type      s-flg      l-cor
11502000      6      16      2      1      0.132114
*
*mesh      loc flg      frm flg
11502100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11502101      2      .133964      -1      .135531      2      .143864
11502102      3      .200256      2      .272255      1      .272356
11502103      2      .2827727      2      .4494394
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11502201      1      2      2      3      1      5
11502202      1      8      1      10      13      11
11502203      9      13      8      15
*
*source dis      source      itv no      source      itv no      source      itv no
11502301      0.0      11      1.0      13      0.0      15
*
*init temp      flg
11502400      -1
*
*temp distribution
11502401  637.7  637.5  637.2  492.3  491.2  490.1  485.7  481.9  478.7
+         473.8  470.2  466.8  461.8  453.4  344.5  235.6
11502402  643.0  642.8  642.6  497.0  495.9  494.8  490.3  486.5  483.3
+         478.3  474.6  471.1  465.9  457.4  347.3  237.1
11502403  648.7  648.5  648.2  503.1  502.0  500.9  496.4  492.6  489.4
+         484.3  480.4  476.8  471.5  462.8  351.0  239.1
11502404  653.2  653.0  652.8  508.3  507.0  506.1  501.7  497.9  494.6
+         489.4  485.5  481.7  476.3  467.4  354.2  240.9
11502405  653.3  653.1  652.9  510.7  509.6  508.6  504.2  500.4  497.2
+         492.0  488.1  484.3  478.7  469.8  355.8  241.8
11502406  653.4  653.1  652.9  511.5  510.4  509.4  505.0  501.3  498.0
+         492.9  488.9  485.1  479.5  470.6  356.4  242.1
*
*l-body      hy-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11502501  150010000      0      1      1      1.364016      1
11502502  150020000      0      1      1      1.364016      2
11502503  150030000      0      1      1      1.169157      3
11502504  150040000      0      1      1      1.169157      4
11502505  150050000      0      1      1      1.169157      5
11502506  150060000      0      1      1      1.364016      6
*
*r-body      hy-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11502601  815010000      0      4100      1      1.364016      1
11502602  815010000      0      4100      1      1.364016      2
11502603  815010000      0      4100      1      1.169157      3
11502604  815010000      0      4100      1      1.169157      4
11502605  815010000      0      4100      1      1.169157      5
11502606  815010000      0      4100      1      1.364016      6

```

```

*
*source      type      is-wplr      l-dr-ht      r-dr-ht      ht-str-no
11502701      10225      .122678      0      0      1
11502702      10225      .122678      0      0      2
11502703      10225      .105342      0      0      3
11502704      10225      .105342      0      0      4
11502705      10225      .105342      0      0      5
11502706      10225      .122678      0      0      6
*
*l-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11502801      0      0.0      0.129489      12.0      6
11502801  0.129489  10.0 10.0 0 0 0 0 1.0 6
*
*r-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11502901      0      0.0      0.0      12.0      6
11502901  0.0 10.0 10.0 0 0 0 0 1.0 6
*
*****
* vessel upper core wall (no honeycomb) - unheated *
*****
*
* left boundary = component 161
* right boundary = ambient volume (805)
*
*gl data      nh      np      type      s-flg      l-cor
11610000      1      13      2      1      0.132114
*
*mesh      loc flg      frm flg
11610100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11610101      2      .133964      1      .135531      2      .143864
11610102      3      .200256      2      .560256      2      .7269227
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11610201      1      2      2      3      1      5
11610202      1      8      1      10      8      12
*
*source dis      source      itv no
11610301      0.0      12
*
*init temp      flg
11610400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11610401  609.7  3  371.4  6  362.1  7  353.0  9  310.4  10
11610402  286.0  11  228.0  12  173.8  13
*
*l-body      hy-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11610501  161010000      0      1      1      0.764104      1
*
*r-body      hy-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11610601  805010000      0      4100      1      0.764104      1
*
*source      type      is-wplr      l-dr-ht      r-dr-ht      ht-str-no
11610701      0      0      0      0      1
*
*l-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no

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```

*11610801      0      0.0  0.173513  1.00083  1
11610801 0.173513 10.0 10.0 0 0 0 1.0 1
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*11610901      0      0.0  0.0  1.00083  1
11610901 0.0 10.0 10.0 0 0 0 1.0 1
*
*****
* vessel upper core wall - external heaters
*****
*
* left boundary = component 161
* right boundary = ambient volume (815)
*
*gl data      nh      np      type      s-flg      l-cor
11611000      1      16      2      1      0.132114
*
*mesh      loc flg      frm flg
11611100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11611101      2      .133964      1      .135531      2      .143864
11611102      3      .200256      2      .550256      1      .550356
11611103      2      .570777      2      .7374394
*
*materials      comp no      itv no      comp no      itv no      comp no      itv no
11611201      1      2      2      3      1      5
11611202      1      8      1      10      13      11
11611203      9      13      8      15
*
*source dis      source      itv no      source      itv no      source      itv no
11611301      0.0      11      1.0      13      0.0      15
*
*init temp      flg
11611400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11611401 609.7 3 376.5 6 360.8 9 309.5 11 315.1 13
11611402 313.1 14 238.5 15 178.0 16
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11611501 161010000      0      1      1      0.236729      1
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11611601 815010000      0      4100      1      0.236729      1
*
*source      type      is-mplr      l-dr-ht      r-dr-ht      ht-str-no
11611701 10225      .043539      0      0      1
*
*l-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11611801      0      0.0  0.173513  1.00083  1
11611801 0.173513 10.0 10.0 0 0 0 1.0 1
*
*r-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11611901      0      0.0  0.0  1.00083  1
11611901 0.0 10.0 10.0 0 0 0 1.0 1
*
*****

```

```

* vessel upper plenum wall - unheated
*****
*
* left boundary = components 162,163,164
* right boundary = ambient volume (805)
*
*gl data      nh      np      type      s-flg      l-cor
11600000      3      13      - 2      1      0.133854
*
*mesh      loc flg      frm flg
11600100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11600101      2      0.142184      1      0.146351      3      .200518
11600102      4      0.422392      2      0.589059
*
*materials      comp no      itv no      comp no      itv no      comp no      itv no
11600201      1      2      2      3      1      6
11600202      1      10      8      12
*
*source dis      source      itv no
11600301      0.0      12
*
*init temp      flg
11600400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11600401 600.0 3 270.0 4 266.0 5 260.0 7 245.0 9
11600402 232.0 11 188.0 12 150.0 13
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11600501 162010000      0      1      1      1.756048      1
11600502 163010000      0      1      1      1.411882      2
11600503 164010000      0      1      1      1.796411      3
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11600601 805010000      0      4100      1      1.756048      1
11600602 805010000      0      4100      1      1.411882      2
11600603 805010000      0      4100      1      1.796411      3
*
*source      type      is-mplr      l-dr-ht      r-dr-ht      ht-str-no
11600701      0      0      0      0      3
*
*l-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11600801      0      0.0  0.201536  2.760833      1
11600801 0.201536 10.0 10.0 0 0 0 1.0 1
*11600802      0      0.0  0.244660  2.416667      2
11600802 0.244660 10.0 10.0 0 0 0 1.0 2
*11600803      0      0.0  0.255926  2.550000      3
11600803 0.255926 10.0 10.0 0 0 0 1.0 3
*
*r-h-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11600901      0      0.0  0.0  0.0  0.0  3
11600901 0.0 10.0 10.0 0 0 0 1.0 3
*
*****
* vessel upper plenum wall - external heaters
*****

```

```

*
* left boundary = components 162,163,164
* right boundary = ambient volume (815)
*
*gl data      nb      np      type      s-flg      l-cor
11601000      3      16      2          1      0.133854
*
*mesh      loc flg      frn flg
11601100      0          1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11601101      2      0.142184      1      0.146351      3      0.200518
11601102      4      0.422392      1      0.422492      2      0.4329087
11601103      2      0.5995754
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11601201      1          2          2          3          1          6
11601202      1          10         13         11         9          13
11601203      8          15
*
*source dis      source      itv no      source      itv no      source      itv no
11601301      0.0          11         1.0         13         0.0         15
*
*init temp      flg
11601400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
11601401      600.0  3      275.0  4      267.4  7      248.7  10      260.0  13
11601402      264.2  14      200.3  15      155.0  16
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11601501      162010000      0          1          1      1.004785      1
11601502      163010000      0          1          1      1.004785      2
11601503      164010000      0          1          1      0.753589      3
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11601601      815010000      0      4100          1      1.004785      1
11601602      815010000      0      4100          1      1.004785      2
11601603      815010000      0      4100          1      0.753589      3
*
*source      type      is-mp/r      l-dr-ht      r-dr-ht      ht-str-no
11601701      10217      .500072      0          0          1
11601702      10217      .499928      0          0          2
11601703      10212      1.0          0          0          3
*
*l-h-st      chf-ht-r      by-dia      h-eq-dia      ch-length      ht-str-no
*11601801      0          0.0          0.201536      2.760833      1
11601801      0.201536      10.0 10.0 0 0 0 0 1.0 1
*11601802      0          0.0          0.244660      2.416667      2
11601802      0.244660      10.0 10.0 0 0 0 0 1.0 2
*11601803      0          0.0          0.255000      2.550000      3
11601803      0.255000      10.0 10.0 0 0 0 0 1.0 3
*
*r-h-st      chf-ht-r      by-dia      h-eq-dia      ch-length      ht-str-no
*11601901      0          0.0          0.0          0.0          3
11601901      0.0 10.0 10.0 0 0 0 0 1.0 3
*
*****

```

```

* upper core support plate (separates upper plenum and upper head) *
*****
*
* left boundary = component 164
* right boundary = component 191
*
*gl data      nb      np      type      s-flg      l-cor
11690000      1          4      -1          1          0.0
*
*mesh      loc flg      frn flg
11690100      0          1
*
*geometry      no itv      r-cor
11690101      3      0.654
*
*materials      cmp no      itv no
11690201      1          3
*
*source dis      source      itv no
11690301      0.0          3
*
*init temp      flg
11690400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh
11690401      602.9  1      611.9  2      612.0  3      611.2  4
*
*l-body      by-vol      inc      b-cdt      a-code      surf-area      ht-str-no
11690501      164010000      0          1          1      0.1263155      1
*
*r-body      by-vol      inc      b-cdt      a-code      surf-area      ht-str-no
11690601      191010000      0          1          1      0.1263155      1
*
*source      type      is-mp/r      l-dr-ht      r-dr-ht      ht-str-no
11690701      0          0          0          0          1
*
*l-h-st      chf-ht-r      by-dia      h-eq-dia      ch-length      ht-str-no
*11690801      0          0.0          0.0          0.0          1
11690801      0.0 10.0 10.0 0 0 0 0 1.0 1
*
*r-h-st      chf-ht-r      by-dia      h-eq-dia      ch-length      ht-str-no
*11690901      0          0.0          0.0          0.0          1
11690901      0.0 10.0 10.0 0 0 0 0 1.0 1
*
*****
* vessel upper head wall - top & bottom - unheated *
*****
*
* left boundary = components 191 & 194
* right boundary = ambient volume (805)
*
*gl data      nb      np      type      s-flg      l-cor
11901000      2      13      2          1      0.133854
*
*mesh      loc flg      frn flg
11901100      0          1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor

```

```

11901101      2 0.142184      1 0.146351      3 0.200518
11901102      4 0.348434      2 0.5151007
*
*materials    cmp no  itv no  cmp no  itv no  cmp no  itv no
11901201      1      2      2      3      1      6
11901202      1     10      8     12
*
*source dis   source   itv no
11901301      0.0      12
*
*init temp    flg
11901400      0
*
*      temp mesh  temp mesh  temp mesh  temp mesh  temp mesh
11901401  577.5  3  276.9  4  271.0  6  263.0  8  250.9  11
11901402  197.7  12  155.3  13
*
*l-body      by-vol    inc    b-cdt  a-code  cy-length  ht-str-no
11901501  191010000    0      1      1  0.172152      1
11901502  194010000    0      1      1  2.424058      2
*
*r-body      by-vol    inc    b-cdt  a-code  cy-length  ht-str-no
11901601  805010000    0     4100      1  0.172152      1
11901602  805010000    0     4100      1  2.424058      2
*
*source      type  is-mpir  l-dr-ht  r-dr-ht  ht-str-no
11901701      0      0      0      0      2
*
*l-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*11901801      0      0.0  0.209097  8.776667      1
11901801  0.209097  10.0 10.0 0 0 0 0 1.0 1
*11901802      0      0.0  0.255479  8.776667      2
11901802  0.255479  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*11901901      0      0.0  0.0  8.776667      2
11901901  0.0  10.0 10.0 0 0 0 0 1.0 2
*
*****
* vessel upper head wall - middle - unheated
*****
*
* left boundary = components 192 & 193
* right boundary = ambient volume (805)
*
*gl data      nh      np      type  s-flg  l-cor
11902000      2      13      2      1  0.133854
*
*mesh      loc flg  frm flg
11902100      0      1
*
*geometry    no itv  r-cor  no itv  r-cor  no itv  r-cor
11902101      2  0.142184      1  0.146351      3  0.200518
11902102      4  0.274476      2  0.441143
*
*materials    cmp no  itv no  cmp no  itv no  cmp no  itv no
11902201      1      2      2      3      1      6
11902202      1     10      8     12

```

```

*
*source dis   source   itv no
11902301      0.0      12
*
*init temp    flg
11902400      0
*
*      temp mesh  temp mesh  temp mesh  temp mesh  temp mesh
11902401  573.1  3  289.2  4  285.4  5  282.0  6  279.0  7
11902402  272.0  11  211.0  12  162.8  13
*
*l-body      by-vol    inc    b-cdt  a-code  cy-length  ht-str-no
11902501  192010000    0      1      1  1.579266      1
11902502  193010000    0      1      1  2.486916      2
*
*r-body      by-vol    inc    b-cdt  a-code  cy-length  ht-str-no
11902601  805010000    0     4100      1  1.579266      1
11902602  805010000    0     4100      1  2.486916      2
*
*source      type  is-mpir  l-dr-ht  r-dr-ht  ht-str-no
11902701      0      0      0      0      2
*
*l-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*11902801      0      0.0  0.222013  8.776667      1
11902801  0.222013  10.0 10.0 0 0 0 0 1.0 1
*11902802      0      0.0  0.228473  8.776667      2
11902802  0.228473  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*11902901      0      0.0  0.0  0.0  0.0      2
11902901  0.0  10.0 10.0 0 0 0 0 1.0 2
*
*****
* vessel upper head wall - middle - external heaters
*****
*
* left boundary = components 192 & 193
* right boundary = ambient volume (815)
*
*gl data      nh      np      type  s-flg  l-cor
11903000      2      16      2      1  0.133854
*
*mesh      loc flg  frm flg
11903100      0      1
*
*geometry    no itv  r-cor  no itv  r-cor  no itv  r-cor
11903101      2  0.142184      1  0.146351      3  0.200518
11903102      4  0.274476      1  0.274576      2  0.2849927
11903103      2  0.4516594
*
*materials    cmp no  itv no  cmp no  itv no  cmp no  itv no
11903201      1      2      2      3      1      6
11903202      1     10      13     11      9     13
11903203      8     15
*
*source dis   source   itv no  source   itv no  source   itv no
11903301      0.0     11      1.0     13      0.0     15
*

```

```

*init temp    flg
11903400      0
*
*      temp mesh    temp mesh    temp mesh    temp mesh    temp mesh
11903401  573.1  3  295.6  4  292.0  5  289.0  6  286.8  7
11903402  284.0 10  288.0 11  297.5 12  301.7 13  299.0 14
11903403  221.6 15  166.4 16
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11903501  192010000      0      1      1      0.386567      1
11903502  193010000      0      1      1      0.966417      2
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11903601  815010000      0      4100      1      0.386567      1
11903602  815010000      0      4100      1      0.966417      2
*
*source      type      is-mplr      l-dr-ht      r-dr-ht      ht-str-no
11903701  10208      .166667      0      0      1
11903702  10208      .416667      0      0      2
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11903801      0      0.0      0.222013      8.776667      1
11903801  0.222013  10.0 10.0 0 0 0 0 1.0 1
*11903802      0      0.0      0.228473      8.776667      2
11903802  0.228473  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11903901      0      0.0      0.0      0.0      2
11903901  0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* vessel upper head wall - top & bottom - external heaters *
*****
*
* left boundary = components 191 & 194
* right boundary = ambient volume (815)
*
*gl data      nh      np      type      s-flg      l-cor
11904000      2      16      2      1      0.133854
*
*mesh      loc flg      frm flg
11904100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
11904101      2      0.142184      1      0.146351      3      0.200518
11904102      4      0.348434      1      0.348534      2      0.3589507
11904103      2      0.5256174
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
11904201      1      2      2      3      1      6
11904202      1      10      13      11      9      13
11904203      8      15
*
*source dis      source      itv no      source      itv no      source      itv no
11904301      0.0      11      1.0      13      0.0      15
*
*init temp      flg
11904400      0

```

```

*
*      temp mesh    temp mesh    temp mesh    temp mesh    temp mesh
11904401  577.9  3  282.0  4  278.1  5  274.8  6  271.7  7
11904402  262.0 10  264.6 11  275.4 12  280.4 13  278.4 14
11904403  209.0 15  159.9 16
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11904501  191010000      0      1      1      0.304515      1
11904502  194010000      0      1      1      0.456772      2
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11904601  815010000      0      4100      1      0.304515      1
11904602  815010000      0      4100      1      0.456772      2
*
*source      type      is-mplr      l-dr-ht      r-dr-ht      ht-str-no
11904701  10208      .166667      0      0      1
11904702  10208      .250000      0      0      2
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11904801      0      0.0      0.209097      8.776667      1
11904801  0.209097  10.0 10.0 0 0 0 0 1.0 1
*11904802      0      0.0      0.255470      8.776667      2
11904802  0.255470  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*11904901      0      0.0      0.0      8.776667      2
11904901  0.0 10.0 10.0 0 0 0 0 1.0 2
*
*
*
*****
* heat slab... steam generator tube bundle (intact loop) *
* (rising primary coolant...first half of u-tube) *
*****
*
* left boundary = steam generator primary coolant (component 220)
* right boundary = steam generator secondary coolant (component 600)
*
*gl data      nh      np      type      s-flg      l-cor
12200000      4      5      2      1      0.032375
*
*mesh      loc flg      frm flg
12200100      0      1
*
*geometry      no itv      r-cor
12200101      4      0.036458333
*
*materials      cmp no      itv no
12200201      5      4
*
*source dis      source      itv no
12200301      0.0      4
*
*init temp      flg
12200400      -1
*
*temp distribution
12200401  575.9  565.1  554.5  544.2  534.2

```

12200402 557.9 558.9 550.1 541.6 533.3
 12200403 551.0 553.5 546.3 541.6 533.3
 12200404 555.5 550.3 544.3 538.4 532.7

*
 *l-body by-vol inc b-cdt a-code cy-length ht-str-no
 12200501 220010000 0 1 1 47.715000 1
 12200502 220020000 10000 1 1 47.465000 3
 12200503 220040000 0 1 1 40.152175 4

*
 *r-body by-vol inc b-cdt a-code cy-length ht-str-no
 12200601 600010000 0 1 1 47.715000 1
 12200602 600020000 10000 1 1 47.465000 3
 12200603 600040000 0 1 1 40.152175 4

*
 *source type is-mlr l-dr-ht r-dr-ht ht-str-no
 12200701 0 0 0 0 4

*
 *l-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
 *12200801 0 0.064750 0.064750 29.5 4
 12200801 0.064750 10.0 10.0 0 0 0 1.0 4

*
 *r-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
 *12200901 0 .0687292 .3115210 29.5 3
 12200901 0.3115210 10.0 10.0 0 0 0 1.0 3
 *12200902 0 .1077433 .4104615 29.5 4
 12200902 0.4104615 10.0 10.0 0 0 0 1.0 4

*

 * heat slab... intact loop st. generator heat transfer from
 * the riser to the downcomer

*
 * left boundary = steam generator primary coolant (component 220)
 * right boundary = steam generator secondary coolant (component 600)

*
 *gl data nh np type s-flg l-cor
 12201000 4 5 2 1 0.032375

*
 *mesh loc flg frn flg
 12201100 0 1

*
 *geometry no itv r-cor
 12201101 4 0.036458333

*
 *materials cmp no itv no
 12201201 5 4 * inconel 600

*
 *source dis source itv no
 12201301 0.0 4

*
 *init temp flg
 12201400 -1

*
 *temp distribution
 12201401 551.9 546.5 541.2 538.4 532.7
 12201402 546.5 541.7 537.0 532.5 528.1
 12201403 542.2 538.1 534.1 530.2 526.4
 12201404 538.5 535.0 531.5 528.3 525.1

*
 *l-body by-vol inc b-cdt a-code cy-length ht-str-no
 12201501 220050000 0 1 1 40.152175 1
 12201502 220060000 10000 1 1 47.465000 3
 12201503 220080000 0 1 1 47.715000 4

*
 *r-body by-vol inc b-cdt a-code cy-length ht-str-no
 12201601 600040000 0 -1 1 40.152175 1
 12201602 600030000 0 1 1 47.465000 2
 12201603 600020000 0 1 1 47.465000 3
 12201604 600010000 0 1 1 47.715000 4

*
 *source type is-mlr l-dr-ht r-dr-ht ht-str-no
 12201701 0 0 0 0 4

*
 *l-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
 *12201801 0 .0647500 .0647500 29.5 4
 12201801 0.0647500 10.0 10.0 0 0 0 1.0 4

*
 *r-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
 *12201901 0 .1077433 .4104615 29.5 1
 12201901 0.4104615 10.0 10.0 0 0 0 1.0 1
 *12201902 0 .0687292 .3115210 29.5 4
 12201902 0.3115210 10.0 10.0 0 0 0 1.0 4

*

 * heat slab... intact loop st. generator heat transfer from
 * the riser to the downcomer

*
 * left boundary = component 600
 * right boundary = component 602 & 603

*
 *gl data nh np type s-flg l-cor
 16000000 5 6 2 1 .2680135

*
 *mesh loc flg frn flg
 16000100 0 1

*
 *geometry no itv r-cor no itv r-cor no itv r-cor
 16000101 2 .3637826 1 .3665038 2 .3782030

*
 *materials cmp no itv no cmp no itv no cmp no itv no
 16000201 14 2 15 3 1 5

*
 *source dis source itv no
 16000301 0.0 5

*
 *init temp flg
 16000400 0

*
 * temp mesh temp mesh temp mesh temp mesh temp mesh
 16000401 514.0 1 522.5 2 503.2 3 501.8 4 501.7 5
 16000402 501.3 6

*
 *l-body by-vol inc b-cdt a-code cy-length ht-str-no
 16000501 600010000 0 1 1 7.9525000 1
 16000502 600020000 10000 1 1 7.9108334 3

```

16000503 600040000 0 1 1 7.4762500 4
16000504 600050000 0 1 1 1.4054167 5
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
16000601 603040000 0 1 1 7.9525000 1
16000602 603030000 0 1 1 7.9108334 2
16000603 603020000 0 1 1 7.9108334 3
16000604 603010000 0 1 1 7.4762500 4
16000605 602010000 0 1 1 1.4054167 5
*
*source type is-mp/r l-dr-ht r-dr-ht ht-str-no
16000701 0 0 0 0 5
*
*l-h-st chf-ht/r by-dia h-eq-dia ch-length ht-str-no
*16000801 0 .0884737 .2535283 7.9525000 1
16000801 0.2535283 10.0 10.0 0 0 0 1.0 1
*16000802 0 .0884737 .2535283 7.9108334 3
16000802 0.2535283 10.0 10.0 0 0 0 1.0 3
*16000803 0 .1058911 .2728816 7.4762500 4
16000803 0.2728816 10.0 10.0 0 0 0 1.0 4
*16000804 0 .2145338 .3379089 1.4054167 5
16000804 0.3379089 10.0 10.0 0 0 0 1.0 5
*r-h-st chf-ht/r by-dia h-eq-dia ch-length ht-str-no
*16000901 0 .0201639 .0732836 7.9525000 1
16000901 0.0732836 10.0 10.0 0 0 0 1.0 1
*16000902 0 .0126981 .0518749 7.9108334 3
16000902 0.0518749 10.0 10.0 0 0 0 1.0 3
*16000903 0 .0128227 .0523927 7.4762500 4
16000903 0.0523927 10.0 10.0 0 0 0 1.0 4
*16000904 0 .3369291 .7902365 1.4054167 5
16000904 0.7902365 10.0 10.0 0 0 0 1.0 5
*
*****
* heat slab... steam generator steam dome heat loss to environment *
* (includes upper section of downcomer) *
*****
*
* left boundary = components 612,611,602
* right boundary = ambient volume (800)
*
*gl data nh np type s-flg l-cor
16100000 3 6 2 1 .6719167
*
*mesh loc flg frm flg
16100100 0 1
*
*geometry no itv r-cor no itv r-cor
16100101 2 0.750 3 1.000
*
*materials cmp no itv no cmp no itv no
16100201 1 2 17 5
*
*source dis source itv no
16100301 0.0 5
*
*init temp flg
16100400 0
*

```

```

* temp mesh temp mesh temp mesh temp mesh
16100401 516.5 3 376.6 4 239.5 5 96.4 6
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no
16100501 612010000 0 1 1 1.1334992 1
16100502 611010000 0 1 1 0.1497007 2
16100503 602010000 0 1 1 4.8530686 3
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
16100601 800010000 0 4100 1 1.1334992 1
16100602 800010000 0 4100 1 0.1497007 2
16100603 800010000 0 4100 1 4.8530686 3
*
*source type is-mp/r l-dr-ht r-dr-ht ht-str-no
16100701 0 0 0 0 3
*
*l-h-st chf-ht/r by-dia h-eq-dia ch-length ht-str-no
*16100801 0 .6533449 .6533449 1.5404167 1
16100801 0.6533449 10.0 10.0 0 0 0 1.0 1
*16100802 0 .5664365 2.6836228 0.7487500 2
16100802 2.6836228 10.0 10.0 0 0 0 1.0 2
*16100803 0 .3369291 .5873578 5.5166667 3
16100803 0.5873578 10.0 10.0 0 0 0 1.0 3
*
*r-h-st chf-ht/r by-dia h-eq-dia ch-length ht-str-no
*16100901 0 0.0 0.0 0.0 3
16100901 0.0 10.0 10.0 0 0 0 1.0 3
*
*****
* heat slab... broken loop st. generator heat transfer from *
* the riser to the downcomer (top) *
*****
*
* left boundary = components 600, 601
* right boundary = components 602
*
*gl data nh np type s-flg l-cor
16001000 2 3 2 1 .4341667
*
*mesh loc flg frm flg
16001100 0 1
*
*geometry no itv r-cor
16001101 2 .4479167
*
*materials cmp no itv no
16001201 1 2
*
*source dis source itv no
16001301 0.0 2
*
*init temp flg
16001400 0
*
* temp mesh temp mesh temp mesh
16001401 519.1 1 501.3 2 488.0 3
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no

```

```

16001501 600050000 0 1 1 3.5802339 1
16001502 600010000 0 1 1 0.4375000 2
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
16001601 602010000 0 1 1 3.5802339 1
16001602 602010000 0 1 1 0.4375000 2
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
16001701 0 0 0 0 2
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*16001801 0 .7369291 .7902365 1.3912500 1
16001801 0.8251205 10.0 10.0 0 0 0 1.0 1
*16001802 0 .8683333 .8683333 0.4375000 2
16001802 0.8683333 10.0 10.0 0 0 0 1.0 2
*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*16001901 0 .3369291 .7902365 3.7504167 1
16001901 0.7902365 10.0 10.0 0 0 0 1.0 1
*16001902 0 .3369291 .7902365 0.4375000 2
16001902 0.7902365 10.0 10.0 0 0 0 1.0 2
*
*****
* heat slab... intact loop steam generator downcomer fillers *
*****
*
* left boundary = component 602, 603
* right boundary = components 602, 603
*
*gl data nh np type s-flg l-cor
16031000 5 3 2 1 .3645833
*
*mesh loc flg frn flg
16031100 0 1
*
*geometry no itv r-cor
16031101 2 .3958333
*
*materials cmp no itv no
16031201 1 2
*
*source dis source itv no
16031301 0.0 2
*
*init temp flg
16031400 0
*
* temp mesh temp mesh temp mesh
16031401 524.5 1 528.7 2 517.9 3
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
16031501 602010000 0 1 1 1.1902917 1
16031502 603010000 0 1 1 6.3963472 2
16031503 603020000 0 1 1 6.7681575 3
16031504 603030000 0 1 1 6.7681575 4
16031505 603040000 0 1 1 5.3422315 5
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no

```

```

16031601 602010000 0 1 1 1.1902917 1
16031602 603010000 0 1 1 6.3963472 2
16031603 603020000 0 1 1 6.7681575 3
16031604 603030000 0 1 1 6.7681575 4
16031605 603040000 0 1 1 5.3422315 5
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
16031701 0 0 0 0 5
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*16031801 0 .3369291 .7902365 1.3912500 1
16031801 0.7902365 10.0 10.0 0 0 0 1.0 1
*16031802 0 .0128227 .0523927 7.4762500 2
16031802 0.0523927 10.0 10.0 0 0 0 1.0 2
*16031803 0 .0126981 .0518749 7.9108334 3
16031803 0.0518749 10.0 10.0 0 0 0 1.0 3
*16031804 0 .0126981 .0518749 7.9108334 4
16031804 0.0518749 10.0 10.0 0 0 0 1.0 4
*16031805 0 .0126981 .0518749 6.2441667 5
16031805 0.0518749 10.0 10.0 0 0 0 1.0 5
*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*16031901 0 .3369291 .7902365 1.3912500 1
16031901 0.7902365 10.0 10.0 0 0 0 1.0 1
*16031902 0 .0128227 .0472456 7.4762500 2
16031902 0.0472456 10.0 10.0 0 0 0 1.0 2
*16031903 0 .0126981 .0467818 7.9108334 3
16031903 0.0467818 10.0 10.0 0 0 0 1.0 3
*16031904 0 .0126981 .0467818 7.9108334 4
16031904 0.0467818 10.0 10.0 0 0 0 1.0 4
*16031905 0 .0126981 .0467818 6.2441667 5
16031905 0.0467818 10.0 10.0 0 0 0 1.0 5
*
*****
* heat slab... intact loop steam generator downcomer *
* heat transfer to the environment *
*****
*
* left boundary = components 603
* right boundary = ambient volume (800)
*
*gl data nh np type s-flg l-cor
16030000 4 6 2 1 .3985000
*
*mesh loc flg frn flg
16030100 0 1
*
*geometry no itv r-cor no itv r-cor
16030101 2 .4479167 3 .6979167
*
*materials cmp no itv no cmp no itv no
16030201 1 2 17 5
*
*source dis source itv no
16030301 0.0 5
*
*init temp flg
16030400 0

```

```

*
*      temp mesh  temp mesh  temp mesh  temp mesh  temp mesh
16030401 514.1 1 514.0 2 513.9 3 369.0 4 232.0 5
16030402 95.3 6
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
16030501 603010000 0 1 1 7.4762500 1
16030502 603020000 0 1 1 7.9108334 2
16030503 603030000 0 1 1 7.9108334 3
16030504 603040000 0 1 1 7.9525000 4
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
16030601 800010000 0 4100 1 7.4762500 1
16030602 800010000 0 4100 1 7.9108334 3
16030603 800010000 0 4100 1 7.9525000 4
*
*source  type  is-mlr  l-dr-hi  r-dr-hi  ht-str-no
16030701 0 0 0 0 4
*
*l-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*16030801 9 .0128227 .0472456 7.4762500 1
16030801 0.0472456 10.0 10.0 0 0 0 1.0 1
*16030802 0 .0126981 .0467818 7.9108334 2
16030802 0.0467818 10.0 10.0 0 0 0 1.0 2
*16030803 0 .0126981 .0467818 7.9108334 3
16030803 0.0467818 10.0 10.0 0 0 0 1.0 3
*16030804 0 .0201639 .0667482 7.9525000 4
16030804 0.0667482 10.0 10.0 0 0 0 1.0 4
*
*r-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*16030901 0 0.0 0.0 0.0 4
16030901 0.0 10.0 10.0 0 0 0 1.0 4
*
*****
* heat slab... steam generator tube bundle (broken loop) *
* (rising primary coolant...first half of u-tubes) *
*****
*
* left boundary = steam generator primary coolant (component 320)
* right boundary = steam generator secondary coolant (component 700)
*
*gl data  nb  np  type  s-flg  l-cor
13200000 5 5 2 1 0.0310417
*
*mesh  loc flg  frm flg
13200100 0 1
*
*geometry  no itv  r-cor
13200101 4 0.0364583
*
*materials  cmp no  itv no
13200201 5 4 *incoel 600
*
*source dis  source  itv no
13200301 0.0 4
*
*init temp  flg
13200400 -1

```

```

*
*temp distribution
13200401 579.0 569.2 569.6 550.3 541.2
13200402 575.0 566.0 562.3 548.8 540.5
13200403 570.9 562.8 554.9 547.2 539.7
13200404 567.5 560.1 552.9 545.9 539.0
13200405 564.1 557.4 550.9 544.5 538.3
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13200501 320010000 0 1 1 2.1666667 1
13200502 320010000 0 1 1 13.4166667 2
13200503 320020000 10000 1 1 15.0000000 4
13200504 320040000 0 1 1 15.0856194 5
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13200601 716010000 0 1 1 2.1666667 1
13200602 700010000 0 1 1 13.4166667 2
13200603 700020000 10000 1 1 15.0000000 4
13200604 700040000 0 1 1 15.0856194 5
*
*source  type  is-mlr  l-dr-hi  r-dr-hi  ht-str-no
13200701 0 0 0 0 5
*
*l-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*13200801 0 .0620833 .0620833 0.0 5
13200801 0.0620833 10.0 10.0 0 0 0 1.0 5
*
*r-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*13200901 0 .0659845 .2900678 0.0 4
13200901 0.2900678 10.0 10.0 0 0 0 1.0 4
*13200902 0 .0753070 .3067184 0.0 5
13200902 0.3067184 10.0 10.0 0 0 0 1.0 5
*
*****
* heat slab... steam generator tube bundle (broken loop) *
* (decending primary coolant...second half of u-tubes) *
*****
*
* left boundary = steam generator primary coolant (component 320)
* right boundary = steam generator secondary coolant (component 700)
*
*gl data  nb  np  type  s-flg  l-cor
13201000 5 5 2 1 0.0310417
*
*mesh  loc flg  frm flg
13201100 0 1
*
*geometry  no itv  r-cor
13201101 4 0.0364583
*
*materials  cmp no  itv no
13201201 5 4 *incoel 600
*
*source dis  source  itv no
13201301 0.0 4
*
*init temp  flg
13201400 -1

```

```

*
*temp distribution
13201401 554.5 549.6 544.9 540.3 535.8
13201402 552.4 547.9 543.6 539.4 535.3
13201403 550.2 546.2 542.2 538.4 534.7
13201404 548.4 544.7 541.1 537.6 534.2
13201405 546.6 543.2 540.0 536.8 533.7
*
*l-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
13201501  320050000   0     1     1 15.0856194     1
13201502  320060000 10000     1     1 15.0000000     3
13201503  320080000   0     1     1 13.4166667     4
13201504  320080000   0     1     1 2.1666667     5
*
*r-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
13201601  700040000   0     1     1 15.0856194     1
13201602  700030000 -10000     1     1 15.0000000     3
13201603  700010000   0     1     1 13.4166667     4
13201604  716010000   0     1     1 2.1666667     5
*
*source    type   is-mplr   l-dr-ht   r-dr-ht   ht-str-no
13201701   0       0         0         0         5
*
*l-h-st    chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*13201801   0   .0620833   .0620833     0.0         5
13201801 0.0620833 10.0 10.0 0 0 0 0 1.0 5
*
*r-h-st    chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*13201901   0   .0753070   .3067184     0.0         1
13201901 0.3067184 10.0 10.0 0 0 0 0 1.0 1
*13201902   0   .0659845   .2900678     0.0         5
13201902 0.2900678 10.0 10.0 0 0 0 0 1.0 5
*
*****
* heat slab... steam generator steam dome heat loss to environment *
* (includes upper section of riser and separator) *
*****
*
* left boundary = components 701 & 703
* right boundary = ambient volume (809)
*
*gl data    nh     np     type   s-flg   l-cor
17023000    2      5      2       1 0.3984167
*
*mesh       loc flg   frm flg
17023100    0        1
*
*geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
17023101    2   .4479167    2   .6145834
*
*materials  cmp no   itv no   cmp no   itv no
17023201    1      2      32      4
*
*source dis source   itv no
17023301    0.0      4
*
*init temp  flg
17023400    0

```

```

*
*      temp mesh   temp mesh   temp mesh   temp mesh
17023401 516.5 2 501.3 3 300.5 4 96.4 5
*
*l-body     hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
17023501  701010000   0     1     1 1.3615856     1
17023502  703010000   0     1     1 0.7925179     2
*
*r-body     hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
17023601  809010000   0    4300     1 1.3615856     1
17023602  809010000   0    4300     1 0.7925179     2
*
*source     type   is-mplr   l-dr-ht   r-dr-ht   ht-str-no
17023701   0       0         0         0         2
*
*l-h-st     chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*17023801   0   .6944443   .6944443     0.0         1
17023801 0.6944443 10.0 10.0 0 0 0 0 1.0 1
*17023802   0   .2429779   .3342205     0.0         2
17023802 0.3342205 10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st     chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*17023901   0     0.0     0.0     0.0         2
17023901 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... broken loop st. generator secondary riser heat loss *
* to the environment *
*****
*
* left boundary = component 700 & 716
* right boundary = ambient volume (809)
*
*gl data    nh     np     type   s-flg   l-cor
17000000    6      5      2       1 .1278333
*
*mesh       loc flg   frm flg
17000100    0        1
*
*geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
17000101    2   .1458333    2   .3135000
*
*materials  cmp no   itv no   cmp no   itv no
17000201    1      2      32      4
*
*source dis source   itv no
17000301    0.0      4
*
*init temp  flg
17000400    0
*
*      temp mesh   temp mesh   temp mesh   temp mesh   temp mesh
17000401 519.1 1 501.3 2 488.9 3 320.6 4 94.1 5
*
*l-body     hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
17000501  700010000   0     1     1 6.7083333     1
17000502  700020000 10000     1     1 7.5000000     4
17000503  700050000   0     1     1 6.8229167     5

```

```

17000504 716010000 0 1 1 1.0833333 6
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
17000601 809010000 0 4400 1 6.7083333 1
17000602 809010000 0 4400 1 7.5000000 4
17000603 809010000 0 4400 1 6.8229157 5
17000604 809010000 0 4400 1 1.0833333 6
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
17000701 0 0 0 0 0 6
*
*l-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*17000801 0 .0653845 .1654559 0.0 3
17000801 0.1654559 10.0 10.0 0 0 0 0 1.0 3
*17000802 0 .0753070 .1753521 0.0 4
17000802 0.1753521 10.0 10.0 0 0 0 0 1.0 4
*17000803 0 .1934227 .2385353 0.0 5
17000803 0.2385353 10.0 10.0 0 0 0 0 1.0 5
*17000804 0 .0653845 .1654559 0.0 6
17000804 0.1654559 10.0 10.0 0 0 0 0 1.0 6
*
*r-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*17000901 0 0.0 0.0 0.0 6
17000901 0.0 10.0 10.0 0 0 0 0 1.0 6
*
*****
* heat slab... broken loop st. generator riser to downcomer *
* heat loss to the environment *
*****
*
* left boundary = component 711
* right boundary = ambient volume (809)
*
*gl data nh np type s-flg l-cor
17110000 1 5 2 1 .2102917
*
*mesh loc flg frm flg
17110100 0 1
*
*geometry no itv r-cor no itv r-cor
17110101 2 .2317917 2 .3984584
*
*materials cap no itv no cap no itv no
17110201 1 2 32 4
*
*source dis source itv no
17110301 0.0 4
*
*init temp flg
17110400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
17110401 514.5 1 514.7 2 513.9 3 300.0 4 95.3 5
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no
17110501 711010000 0 1 1 4.6776013 1
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no

```

```

17110601 809010000 0 4400 1 4.6776013 1
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
17110701 0 0 0 0 1
*
*l-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*17110801 0 .3983353 .3983353 0.0 1
17110801 0.3983353 10.0 10.0 0 0 0 0 1.0 1
*
*r-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*17110901 0 0.0 0.0 0.0 1
17110901 0.0 10.0 10.0 0 0 0 0 1.0 1
*
*****
* heat slab... broken loop st. generator downcomer *
* heat loss to the environment *
*****
*
* left boundary = components 713, 714, & 715
* right boundary = ambient volume (809)
*
*gl data nh np type s-flg l-cor
17140000 7 5 2 1 .0575
*
*mesh loc flg frm flg
17140100 0 1
*
*geometry no itv r-cor no itv r-cor
17140101 2 .0691667 2 .2358334
*
*materials cap no itv no cap no itv no
17140201 1 2 32 4
*
*source dis source itv no
17140301 0.0 4
*
*init temp flg
17140400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
17140401 514.1 1 514.0 2 513.9 3 300.0 4 95.3 5
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no
17140501 713010000 0 1 1 3.1426389 1
17140502 714010000 0 1 1 4.0891869 2
17140503 714020000 10000 1 1 7.5000000 5
17140504 714050000 0 1 1 7.4537703 6
17140505 715010000 0 1 1 7.8734157 7
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
17140601 809010000 0 4500 1 3.1426389 1
17140602 809010000 0 4500 1 4.0891869 2
17140603 809010000 0 4500 1 7.5000000 5
17140604 809010000 0 4500 1 7.4537703 6
17140605 809010000 0 4500 1 7.8734157 7
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
17140701 0 0 0 0 7

```

```

*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*1719301  0  .1316182  .1316182  0.0  1
1719301  0.1316182  10.0 10.0 0 0 0 0 1.0 1
*1719302  0  .1150000  .1150000  0.0  6
1719302  0.1150000  10.0 10.0 0 0 0 0 1.0 6
*1719303  0  .1303373  .1303373  0.0  7
1719303  0.1303373  10.0 10.0 0 0 0 0 1.0 7
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*1719001  0  0.0  0.0  0.0  0.0  7
1719001  0.0  10.0 10.0 0 0 0 0 1.0 7
*
*****
* heat slab... il sg inlet-outlet plenum - top rectangular section *
*****
*
* left boundary = components 210 & 230
* right boundary = ambient volume (808)
*
*gl data  nh  np  type  s-flg  l-cor
1210000  2  10  2  1  .329989
*
*mesh  loc flg  frn flg
1210000  0  1
*
*geometry  no itv  r-cor  no itv  r-cor
1210001  7  .953333  2  1.125
*
*materials  cmp no  itv no  cmp no  itv no
1210001  1  7  26  9
*
*source dis  source  itv no
1210001  0.0  9
*
*init temp  flg
1210000  -1
*
*temp distribution
1210001  606.0 600.0 597.0 594.0 591.0 588.0 585.0 582.0 325.0
+ 68.0
1210002  540.0 534.0 531.0 528.0 525.0 522.0 519.0 516.0 292.0
+ 68.0
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12100501  210010000  0  1  1  0.078125  1
12100502  230010000  0  1  1  0.078125  2
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12100601  808010000  0  4100  1  0.078125  1
12100602  808010000  0  4100  1  0.078125  2
*
*source  type  is-mlpr  l-dr-ht  r-dr-ht  ht-str-no
12100701  0  0  0  0  0  2
*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*12100801  0  .3258603  .5192263  0.156250  2
12100801  0.5192263  10.0 10.0 0 0 0 0 1.0 2

```

```

*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*12100901  0  0.0  0.0  0.0  0.156250  2
12100901  0.0  10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... il sg inlet-outlet plenum - middle trapizoidal section *
*****
*
* left boundary = components 210 & 230
* right boundary = ambient volume (808)
*
*gl data  nh  cp  type  s-flg  l-cor
12101000  2  11  2  1  .243733
*
*mesh  loc flg  frn flg
12101000  0  1
*
*geometry  no itv  r-cor  no itv  r-cor  no itv  r-cor
12101101  1  .333333  7  .953333  2  1.125
*
*materials  cmp no  itv no  cmp no  itv no
12101201  1  8  26  10
*
*source dis  source  itv no
12101301  0.0  10
*
*init temp  flg
12101400  -1
*
*temp distribution
12101401  606.0 603.0 600.0 597.0 594.0 591.0 588.0 585.0 582.0
+ 325.0 68.0
12101402  540.0 537.0 534.0 531.0 528.0 525.0 522.0 519.0 516.0
+ 292.0 68.0
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12101501  210010000  0  1  1  0.072917  1
12101502  230010000  0  1  1  0.072917  2
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12101601  808010000  0  4100  1  0.072917  1
12101602  808010000  0  4100  1  0.072917  2
*
*source  type  is-mlpr  l-dr-ht  r-dr-ht  ht-str-no
12101701  0  0  0  0  0  2
*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*12101801  0  .2513333  .4800904  0.145834  2
12101801  0.4800904  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*12101901  0  0.0  0.0  0.0  0.145834  2
12101901  0.0  10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... il sg inlet-outlet plenum - bottom trapizoidal section *
*****

```

```

*
* left boundary = components 210 & 230
* right boundary = ambient volume (808)
*
*gl data      nh      np      type      s-flg      l-cor
12102000      2        4        2        1      .243733
*
*mesh      loc flg      frn flg
12102100      0        1
*
*geometry      no itv      r-cor      no itv      r-cor
12102101      1      .333333      2      0.5
*
*materials      cmp no      itv no      cmp no      itv no
12102201      1        1      26        3
*
*source dis      source      itv no
12102301      0.0        3
*
*init temp      flg
12102400      -1
*
*temp distribution
12102401 606.0 582.0 325.0 80.0
12102402 540.0 516.0 282.0 80.0
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
12102501 210010000      0        1        1      0.166667      1
12102502 230010000      0        1        1      0.166667      2
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
12102601 808010000      0      4100      1      0.166667      1
12102602 808010000      0      4100      1      0.166667      2
*
*source      type      is-mlpr      l-dr-bt      r-dr-bt      ht-str-no
12102701      0        0        0        0        2
*
*l-b-st      chf-btr      by-dia      h-eq-dia      ch-length      ht-str-no
*12102801      0      .2513333      .4800904      0.333334      2
12102801 0.4800904 10.0 10.0 0 0 0 0 1.0 2
*
*r-b-st      chf-btr      by-dia      h-eq-dia      ch-length      ht-str-no
*12102901      0      0.0      0.0      0.333334      2
12102901 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... il sg plenum between up & dn stream rectangular section *
*****
*
* left boundary = component 210
* right boundary = component 230
*
*gl data      nh      np      type      s-flg      l-cor
12103000      1        4        1        1      0.0
*
*mesh      loc flg      frn flg
12103100      0        1
*
*geometry      no itv      r-cor
12104101      3      .162938
*
*materials      cmp no      itv no
12104201      1        3
*
*source dis      source      itv no
12104301      0.0        3
*
*init temp      flg
12104400      -1
*
*temp distribution

```

```

*geometry      no itv      r-cor
12103101      3      .095417
*
*materials      cmp no      itv no
12103201      1        3
*
*source dis      source      itv no
12103301      0.0        3
*
*init temp      flg
12103400      -1
*
*temp distribution
12103401 606.0 584.0 562.0 540.0
*
*l-body      by-vol      inc      b-cdt      a-code      surf-area      ht-str-no
12103501 210010000      0        1        0      0.102761      1
*
*r-body      by-vol      inc      b-cdt      a-code      surf-area      ht-str-no
12103601 230010000      0        1        0      0.102761      1
*
*source      type      is-mlpr      l-dr-bt      r-dr-bt      ht-str-no
12103701      0        0        0        0        1
*
*l-b-st      chf-btr      by-dia      h-eq-dia      ch-length      ht-str-no
*12103801      0      .3258603      0.875000      0.156250      1
12103801 0.875000 10.0 10.0 0 0 0 0 1.0 1
*
*r-b-st      chf-btr      by-dia      h-eq-dia      ch-length      ht-str-no
*12103901      0      .3258603      0.875000      0.156250      1
12103901 0.875000 10.0 10.0 0 0 0 0 1.0 1
*
*****
* heat slab... il sg plenum between up & dn stream trapezoidal section *
*****
*
* left boundary = component 210
* right boundary = component 230
*
*gl data      nh      np      type      s-flg      l-cor
12104000      1        4        1        1      0.0
*
*mesh      loc flg      frn flg
12104100      0        1
*
*geometry      no itv      r-cor
12104101      3      .162938
*
*materials      cmp no      itv no
12104201      1        3
*
*source dis      source      itv no
12104301      0.0        3
*
*init temp      flg
12104400      -1
*
*temp distribution

```

```

1210401 606.0 584.0 562.0 540.0
*
* l-body   hy-vol   inc   b-cdt   a-code   surf-area   ht-str-no
12104501 210010000    0     1     0     0.229152     1
*
* l-body   hy-vol   inc   b-cdt   a-code   surf-area   ht-str-no
12104601 230010000    0     1     0     0.229152     1
*
* source    type   is-mlpr   l-dr-ht   r-dr-ht   ht-str-no
12104701      0       0         0         0         1
*
* l-h-st    chf-ht   hy-dia   h-eq-dia   ch-length   ht-str-no
*12104801      0 .2513333 .5274709  0.479167     1
12104808 0.5274709 10.0 10.0 0 0 0 0 1.0 1
*
* r-h-st    chf-ht   hy-dia   h-eq-dia   ch-length   ht-str-no
*12104901      0 .2513333 .5274709  0.479167     1
12104901 0.5274709 10.0 10.0 0 0 0 0 1.0 1
*
*****
* heat slabs... il sg tube sheet flanges - up(1) & downstream(2) *
*****
*
* left boundary = components 215 & 225
* right boundary = ambient volume (808)
*
* gl data    nb     np     type    s-flg    l-cor
12150000     2     14     2       1     .212031
*
* mesh      loc flg   fut flg
12150100      0       1
*
* geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
12150101     1     .216114     1     .216406     3     .447917
12150102     1     .528545     5     .958333     2     1.12500
*
* materials  cap no   itv no   cap no   itv no   cap no   itv no
12150201      5       1      13       2      25      11
12150202     26      13
*
* source dis  source   itv no
12150301      0.0     13
*
* init temp   flg
12150400     -1
*
* temp distribution
12150401 606.0 605.5 605.0 604.5 604.0 601.0 600.0 598.0 596.0
+      584.0 582.0 580.0 329.0 80.0
12150402 540.0 539.5 539.0 538.6 538.2 536.4 534.6 532.8 531.0
+      529.2 527.4 526.6 296.6 80.0
*
* l-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
12150501 215010000    0     1     1     0.380208     1
12150502 225010000    0     1     1     0.380208     2
*
* r-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
12150601 808010000    0    4100     1     0.380208     1

```

```

12150602 808010000    0    4100     1     0.380208     2
*
* source    type   is-mlpr   l-dr-ht   r-dr-ht   ht-str-no
12150701      0       0         0         0         2
*
* l-h-st    chf-ht   hy-dia   h-eq-dia   ch-length   ht-str-no
*12150801      0 0.064750  0.120724  0.760417     2
12150801 0.120724 10.0 10.0 0 0 0 0 -1.0 2
*
* r-h-st    chf-ht   hy-dia   h-eq-dia   ch-length   ht-str-no
*12150901      0       0.0       0.0     0.760417     2
12150901 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slabs... il sg tube sheet conical section - up(1), downstream(2)*
*****
*
* left boundary = components 215 & 225
* right boundary = ambient volume (808)
*
* gl data    nb     np     type    s-flg    l-cor
12151000     2     9      2       1     .212031
*
* mesh      loc flg   fut flg
12151100      0       1
*
* geometry   no itv   r-cor   no itv   r-cor   no itv   r-cor
12151101     1     .216114     1     .216406     3     .447917
12151102     1     .528545     2     .695211
*
* materials  cap no   itv no   cap no   itv no   cap no   itv no
12151201      5       1      13       2      25      6
12151202     26      8
*
* source dis  source   itv no
12151301      0.0     8
*
* init temp   flg
12151400     -1
*
* temp distribution
12151401 606.0 605.5 605.0 604.0 600.0 595.0 590.0 329.0 80.0
12151402 540.0 539.5 539.0 536.4 534.6 530.8 526.6 296.6 80.0
*
* l-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
12151501 215010000    0     1     1     0.327925     1
12151502 225010000    0     1     1     0.327925     2
*
* r-body   hy-vol   inc   b-cdt   a-code   cy-length   ht-str-no
12151601 808010000    0    4100     1     0.327925     1
12151602 808010000    0    4100     1     0.327925     2
*
* source    type   is-mlpr   l-dr-ht   r-dr-ht   ht-str-no
12151701      0       0         0         0         2
*
* l-h-st    chf-ht   hy-dia   h-eq-dia   ch-length   ht-str-no
*12151801      0 0.064750  0.120724  0.655849     2
12151801 0.120724 10.0 10.0 0 0 0 0 1.0 2

```

```

*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*12151901 0 0.0 0.0 0.739583 2
12151901 0.0 10.0 10.0 0 0 0 1.0 2
*
*****
* heat slabs... il sg tube sheet center section - up(1) & downstream(2)*
*****
*
* left boundary = components 215 & 225
* right boundary = ambient volume (808)
*
*gl data nh np type s-flg l-cor
12152000 2 8 2 1 .212031
*
*mesh loc flg fnt flg
12152100 0 1
*
*geomerty no itv r-cor no itv r-cor no itv r-cor
12152101 1 .216114 1 .216406 3 .47917
12152102 2 .614583
*
*materials cmp no itv no cmp no itv no cmp no itv no
12152201 5 1 13 2 25 5
12152202 26 7
*
*source dis source itv no
12152301 0.0 7
*
*init temp flg
12152400 -1
*
*temp distribution
12152401 606.0 605.5 605.0 604.0 600.0 590.0 329.0 80.0
12152402 540.0 539.5 539.0 536.4 534.6 530.8 296.6 80.0
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
12152501 215010000 0 1 1 0.166867 1
12152502 225010000 0 1 1 0.166867 2
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
12152601 808010000 0 4100 1 0.166867 1
12152602 808010000 0 4100 1 0.166867 2
*
*source type is-mlpr l-dr-hl r-dr-hl ht-str-no
12152701 0 0 0 0 2
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*12152801 0 0.064750 0.120724 0.333734 2
12152801 0.120724 10.0 10.0 0 0 0 1.0 2
*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*12152901 0 0.0 0.0 0.333734 2
12152901 0.0 10.0 10.0 0 0 0 1.0 2
*
*****
* heat slab... il sg tube sheet between up & dn stream hyd. volumes *
*****

```

```

*
* left boundary = component 215
* right boundary = component 225
*
*gl data nh np type s-flg l-cor
12153000 1 4 1 1 0.0
*
*mesh loc flg fnt flg
12153100 0 1
*
*geomerty no itv r-cor
12153101 3 .256517
*
*materials cmp no itv no
12153201 25 3
*
*source dis source itv no
12153301 0.0 3
*
*init temp flg
12153400 -1
*
*temp distribution
12153401 606.0 584.0 562.0 540.0
*
*l-body hy-vol inc b-cdt a-code surf-area ht-str-no
12153501 215010000 0 1 0 0.693967 1
*
*r-body hy-vol inc b-cdt a-code surf-area ht-str-no
12153601 225010000 0 1 0 0.693967 1
*
*source type is-mlpr l-dr-hl r-dr-hl ht-str-no
12153701 0 0 0 0 1
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*12153801 0 0.064750 0.139652 1.75 1
12153801 0.139652 10.0 10.0 0 0 0 1.0 1
*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*12153901 0 0.064750 0.139652 1.75 1
12153901 0.139652 10.0 10.0 0 0 0 1.0 1
*
*****
* heat slab... bl sg inlet-outlet plenum - top rectangular section *
*****
*
* left boundary = components 310 & 330
* right boundary = ambient volume (808)
*
*gl data nh np type s-flg l-cor
13100000 2 10 2 1 .329960
*
*mesh loc flg fnt flg
13100100 0 1
*
*geomerty no itv r-cor no itv r-cor
13100101 7 .958333 2 1.125
*

```

```

*materials  cmp no  itv no  cmp no  itv no
13100201    1      7      26      9
*
*source dis  source  itv no
13100301    0.0      9
*
*init temp   flg
13100400    -1
*
*temp distribution
13100401  606.0 600.0 597.0 594.0 591.0 588.0 585.0 582.0 325.0
+        68.0
13100402  540.0 534.0 531.0 528.0 525.0 522.0 519.0 516.0 292.0
+        68.0
*
*l-body      by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13100501    310010000  0    1    1    0.078125  1
13100502    330010000  0    1    1    0.078125  2
*
*r-body      by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13100601    808010000  0   4100  1    0.078125  1
13100602    808010000  0   4100  1    0.078125  2
*
*source      type  is-mlpr  l-dr-ht  r-dr-ht  ht-str-no
13100701    0      0      0      0      2
*
*l-h-st      chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*13100801    0      3.258603  .5192263  0.156250  2
13100801  0.5192263 10.0 10.0 0 0 0 0 1.0 2
*r-h-st      chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*13100901    0      0.0      0.0      0.156250  2
13100901  0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... bl sg inlet-outlet plenum - middle trapezoidal section *
*****
*
* left boundary = components 310 & 330
* right boundary = ambient volume (808)
*
*gl data      nh      np      type  s-flg  l-cor
13101000     2      11      2      1    .247205
*
*mesh         loc flg  fat flg
13101100     0      1
*
*geometry     no itv  r-cor  no itv  r-cor
13101101     1    .333333  7    .958333  2    1.125
*
*materials    cmp no  itv no  cmp no  itv no
13101201     1      8      26      10
*
*source dis   source  itv no
13101301     0.0      10
*
*init temp    flg
13101400     -1
*

```

```

*temp distribution
13101401  606.0 603.0 600.0 597.0 594.0 591.0 588.0 585.0 582.0
+        325.0 68.0
13101402  540.0 537.0 534.0 531.0 528.0 525.0 522.0 519.0 516.0
+        292.0 68.0
*
*l-body      by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13101501    310010000  0    -1    1    0.072917  1
13101502    330010000  0     1    1    0.072917  2
*
*r-body      by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13101601    808010000  0   4100  1    0.072917  1
13101602    808010000  0   4100  1    0.072917  2
*
*source      type  is-mlpr  l-dr-ht  r-dr-ht  ht-str-no
13101701    0      0      0      0      2
*
*l-h-st      chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*13101801    0      .2243822  .3974532  0.145834  2
13101801  0.3974532 10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*13101901    0      0.0      0.0      0.145834  2
13101901  0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... bl sg inlet-outlet plenum - bottom trapezoidal section *
*****
*
* left boundary = components 310 & 330
* right boundary = ambient volume (808)
*
*gl data      nh      np      type  s-flg  l-cor
13102000     2      4      2      1    .247205
*
*mesh         loc flg  fat flg
13102100     0      1
*
*geometry     no itv  r-cor  no itv  r-cor
13102101     1    .333333  2     0.5
*
*materials    cmp no  itv no  cmp no  itv no
13102201     1      1      26      3
*
*source dis   source  itv no
13102301     0.0      3
*
*init temp    flg
13102400     -1
*
*temp distribution
13102401  606.0 582.0 325.0 80.0
13102402  540.0 516.0 292.0 80.0
*
*l-body      by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13102501    310010000  0    1    1    0.250000  1
13102502    330010000  0    1    1    0.250000  2
*

```

```

*r-body    by-vol    inc    b-cdt    a-code    cy-length    ht-str-no
13102501   808010000    0    4100    1    0.250000    1
13102502   808010000    0    4100    1    0.250000    2
*
*source     type    is-mlpr    l-dr-ht    r-dr-ht    ht-str-no
13102701    0        0        0        0        2
*
*l-h-st     chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*13102801    0    .2243822    .3974532    0.500000    2
13102801    0.3974532    10.0    10.0    0 0 0 0    1.0 2
*
*r-h-st     chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*13102901    0        0.0        0.0    0.500000    2
13102901    0.0    10.0    10.0    0 0 0 0    1.0 2
*
*****
* heat slab... bl sg plenum between up & dn stream rectangular section *
*****
*
* left boundary = component 310
* right boundary = component 330
*
*gl data     nh     np     type     s-flg     l-cor
13103000     1     4     1     1     0.0
*
*mesh        loc flg    frm flg
13103100     0        1
*
*geometry     no itv     r-cor
13103101      3    .095333
*
*materials     cmp no     itv no
13103201        1         3
*
*source dis     source     itv no
13103301        0.0         3
*
*init temp      flg
13103400       -1
*
*temp distribution
13103401  606.0  584.0  562.0  540.0
*
*l-body     by-vol    inc    b-cdt    a-code    surf-area    ht-str-no
13103501   310010000    0     1     0    0.102753    1
*
*r-body     by-vol    inc    b-cdt    a-code    surf-area    ht-str-no
13103601   330010000    0     1     0    0.102753    1
*
*source     type    is-mlpr    l-dr-ht    r-dr-ht    ht-str-no
13103701    0        0        0        0        1
*
*l-h-st     chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*13103801    0    .3258603    .5192263    0.156250    1
13103801    0.5192263    10.0    10.0    0 0 0 0    1.0 1
*
*r-h-st     chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*13103901    0    .3258603    .5192263    0.156250    1

```

```

13103901    0.5192263    10.0    10.0    0 0 0 0    1.0 1
*
*****
* heat slab... bl sg plenum between up & dn stream trapezoidal section *
*****
*
* left boundary = component 310
* right boundary = component 330
*
*gl data     nh     np     type     s-flg     l-cor
13104000     1     4     1     1     0.0
*
*mesh        loc flg    frm flg
13104100     0        1
*
*geometry     no itv     r-cor
13104101      3    .222145
*
*materials     cmp no     itv no
13104201        1         3
*
*source dis     source     itv no
13104301        0.0         3
*
*init temp      flg
13104400       -1
*
*temp distribution
13104401  606.0  584.0  562.0  540.0
*
*l-body     by-vol    inc    b-cdt    a-code    surf-area    ht-str-no
13104501   310010000    0     1     0    0.228673    1
*
*r-body     by-vol    inc    b-cdt    a-code    surf-area    ht-str-no
13104601   330010000    0     1     0    0.228673    1
*
*source     type    is-mlpr    l-dr-ht    r-dr-ht    ht-str-no
13104701    0        0        0        0        1
*
*l-h-st     chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*13104801    0    .2243822    .5152883    0.479167    1
13104801    0.5152883    10.0    10.0    0 0 0 0    1.0 1
*
*r-h-st     chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*13104901    0    .2243822    .5152883    0.479167    1
13104901    0.5152883    10.0    10.0    0 0 0 0    1.0 1
*
*****
* heat slabs... bl sg tube sheet flanges - up(1) & downstream(2) *
*****
*
* left boundary = components 315 & 325
* right boundary = ambient volume (808)
*
*gl data     nh     np     type     s-flg     l-cor
13150000     2     15     2     1    .1277344
*
*mesh        loc flg    frm flg

```

```

13150100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
13150101      1      .1331511      1      .1334427      1      .1958013
13150102      1      .2916667      2      .4534361      6      .9583333
13150103      2      1.1250000
*
*materials      cap no      itv no      cap no      itv no      cap no      itv no
13150201      5      1      13      2      25      12
13150202      25      14
*
*source dis      source      itv no
13150301      0.0      14
*
*init temp      flg
13150400      -1
*
*temp distribution
13150401      606.0      605.5      605.0      604.0      604.0      601.0      600.0      598.0      596.0
+      594.0      593.0      592.0      590.0      329.0      80.0
13150402      540.0      539.5      539.0      538.6      538.2      536.4      534.6      532.8      531.0
+      529.2      528.3      527.4      526.2      296.6      80.0
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
13150501      315010000      0      1      1      0.203125      1
13150502      325010000      0      1      1      0.203125      2
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
13150601      808010000      0      4100      1      0.203125      1
13150602      808010000      0      4100      1      0.203125      2
*
*source      type      is-mlpr      l-dr-ht      r-dr-ht      ht-str-no
13150701      0      0      0      0      0      2
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*13150801      0      .0620833      .1167128      0.406250      2
13150801      0.1167128      10.0      10.0      0 0 0 0      1.0      2
*
*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*13150901      0      0.0      0.0      0.406250      2
13150901      0.0      10.0      10.0      0 0 0 0      1.0      2
*
*****
* heat slabs... bl sg tube sheet conical section - up(1), downstream(2)*
*****
*
* left boundary = components 315 & 325
* right boundary = ambient volume (808)
*
*gl data      nh      np      type      s-flg      l-cor
13151000      2      9      2      1      .1277344
*
*mesh      loc flg      frm flg
13151100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
13151101      1      .1331511      1      .1334427      1      .1958013
13151102      1      .2916667      2      .4534361      2      .6301027

```

```

*
*materials      cap no      itv no      cap no      itv no      cap no      itv no
13151201      5      1      13      2      25      6
13151202      25      8
*
*source dis      source      itv no
13151301      0.0      8
*
*init temp      flg
13151400      -1
*
*temp distribution
13151401      606.0      605.5      605.0      604.0      600.0      595.0      590.0      329.0      80.0
13151402      540.0      539.5      539.0      536.4      534.6      530.8      526.6      296.6      80.0
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
13151501      315010000      0      1      1      .2966746      1
13151502      325010000      0      1      1      .2966746      2
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
13151601      808010000      0      4100      1      .2966746      1
13151602      808010000      0      4100      1      .2966746      2
*
*source      type      is-mlpr      l-dr-ht      r-dr-ht      ht-str-no
13151701      0      0      0      0      0      2
*
*l-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*13151801      0      .0620833      .1167128      0.6770833      2
13151801      0.1167128      10.0      10.0      0 0 0 0      1.0      2
*
*r-h-st      chf-htr      by-dia      h-eq-dia      ch-length      ht-str-no
*13151901      0      0.0      0.0      0.6770833      2
13151901      0.0      10.0      10.0      0 0 0 0      1.0      2
*
*****
* heat slabs... bl sg tube sheet cylindrical section - up(1) & down(2) *
*****
*
* left boundary = components 315 & 325
* right boundary = ambient volume (808)
*
*gl data      nh      np      type      s-flg      l-cor
13152000      2      7      2      1      .1277344
*
*mesh      loc flg      frm flg
13152100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
13152101      1      .1331511      1      .1334427      1      .1958013
13152102      1      .2916667      2      .4583333
*
*materials      cap no      itv no      cap no      itv no      cap no      itv no
13152201      5      1      13      2      25      4
13152202      25      6
*
*source dis      source      itv no
13152301      0.0      6
*

```

```

*init temp    flg
13152400      -1
*
*temp distribution
13152401  606.0  605.0  604.0  600.0  590.0  329.0  80.0
13152402  540.0  539.0  536.4  534.6  530.8  296.6  80.0
*
*l-body      hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
13152501    315010000    0      1      1    0.2920754      1
13152502    325010000    0      1      1    0.2920754      2
*
*r-body      hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
13152601    808010000    0    4100      1    0.2920754      1
13152602    808010000    0    4100      1    0.2920754      2
*
*source      type    is-mlpr    l-dr-ht    r-dr-ht    ht-str-no
13152701      0      0      0      0      0      2
*
*l-h-st      chf-btr    hy-dia    h-eq-dia    ch-length    ht-str-no
*13152801      0    .0620833    .1167128    0.5841508      2
13152801  0.1167128  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st
*13152901      0      0.0      0.0    0.5841508      2
13152901  0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slabs... bl sg tube sheet bnb section - up(1) & downstream(2) *
*****
*
* left boundary = components 315 & 325
* right boundary = ambient volume (808)
*
*gl data      nh      np      type    s-flg    l-cor
13153000      2      6      2      1    .1277344
*
*mesh      loc flg    frm flg
13153100      0      1
*
*geometry    no itv    r-cor    no itv    r-cor    no itv    r-cor
13153101      1    .1331511      1    .1334427      1    .1958013
13153102      2    .3624679
*
*materials    cmp no    itv no    cmp no    itv no    cmp no    itv no
13153201      5      1      13      2      25      3
13153202      25      5
*
*source dis    source    itv no
13153301      0.0      5
*
*init temp    flg
13153400      -1
*
*temp distribution
13153401  606.0  604.0  600.0  590.0  329.0  80.0
13153402  540.0  536.4  534.6  530.8  296.6  80.0
*
*l-body      hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no

```

```

13153501  315010000    0      1      1    0.0835417      1
13153502  325010000    0      1      1    0.0835417      2
*
*r-body      hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
13153601    808010000    0    4100      1    0.0835417      1
13153602    808010000    0    4100      1    0.0835417      2
*
*source      type    is-mlpr    l-dr-ht    r-dr-ht    ht-str-no
13153701      0      0      0      0      0      2
*
*l-h-st      chf-btr    hy-dia    h-eq-dia    ch-length    ht-str-no
*13153801      0    .0620833    .1167128    0.1670833      2
13153801  0.1167128  10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-btr    hy-dia    h-eq-dia    ch-length    ht-str-no
*13153901      0      0.0      0.0    0.1670833      2
13153901  0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... bl sg tube sheet between up & dn stream hyd. volumes *
*****
*
* left boundary = component 315
* right boundary = component 325
*
*gl data      nh      np      type    s-flg    l-cor
13154000      1      3      1      1      0.0
*
*mesh      loc flg    frm flg
13154100      0      1
*
*geometry    no itv    r-cor
13154101      2    .165750
*
*materials    cmp no    itv no
13154201      25      2
*
*source dis    source    itv no
13154301      0.0      2
*
*init temp    flg
13154400      -1
*
*temp distribution
13154401  606.0  573.0  540.0
*
*l-body      hy-vol    inc    b-cdt    a-code    surf area    ht-str-no
13154501  315010000    0      1      0    0.4135420      1
*
*r-body      hy-vol    inc    b-cdt    a-code    surf area    ht-str-no
13154601  325010000    0      1      0    0.4135420      1
*
*source      type    is-mlpr    l-dr-ht    r-dr-ht    ht-str-no
13154701      0      0      0      0      0      1
*
*l-h-st      chf-btr    hy-dia    h-eq-dia    ch-length    ht-str-no
*13154801      0    .0620833    .1326376    1.751830      1
13154801  0.1326376  10.0 10.0 0 0 0 0 1.0 1

```

```

*
*r-h-st chf-btr hy-dia h-eq-dia ch-length ht-str-no
*13154901 0 0.064750 0.064750 1.751830 1
13154901 0.064750 10.0 10.0 0 0 0 1.0 1
*
*****
* heat slab... intact & broken loop, 3 in. sch-160 piping
* note - contains only volume lengths which
* are heated by heater tape.
*
*****
*
* left boundary = components 201,261,262,263,301,363
* right boundary = ambient volumes (811 & 813)
*
*gl data nh np type s-flg l-cor
12002000 8 8 2 1 .10933333
*
*mesh loc flg frn flg
12002100 0 1
*
*geometry no itv r-cor no itv r-cor no itv r-cor
12002101 2 .14533333 1 .1453333 2 .156350
12002102 2 .32301667
*
*materials comp no itv no comp no itv no comp no itv no
12002201 1 2 13 3 9 5
12002202 16 7
*
*source dis source itv no source itv no source itv no
12002301 0.0 3 1.0 5 0.0 7
*
*init temp flg
12002400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
12002401 548.9 1 560.4 2 570.4 3 580.2 4 604.8 5
12002402 606.3 6 357.7 7 154.3 8
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
12002501 201010000 0 1 1 0.18189 1
12002502 201020000 0 1 1 0.54567 2
12002503 261010000 0 1 1 1.03188 3
12002504 261020000 0 1 1 0.78704 4
12002505 262010000 0 1 1 0.72757 5
12002506 263010000 0 1 1 0.54567 6
12002507 301010000 0 1 1 0.72757 7
12002508 363020000 0 1 1 0.36378 8
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
12002601 811010000 0 4100 1 0.18189 1
12002602 811020000 0 4100 1 0.54567 2
12002603 813010000 0 4100 1 1.03188 3
12002604 813020000 0 4100 1 0.78704 4
12002605 813030000 0 4100 1 0.72757 5
12002606 813040000 0 4100 1 0.54567 6
12002607 811010000 0 4100 1 0.72757 7
12002608 813010000 0 4100 1 0.36378 8
*

```

```

*source type is-mlr l-dr-ht r-dr-ht ht-str-no
12002701 110 .013207 0 0 1
12002702 110 .039077 0 0 2
12002703 112 .246930 0 0 3
12002704 112 .186657 0 0 4
12002705 112 .174759 0 0 5
12002706 112 .129414 0 0 6
12002707 110 .052769 0 0 7
12002708 112 .087280 0 0 8
*
*l-h-st chf-btr hy-dia h-eq-dia ch-length ht-str-no
*12002801 0 0.0 0.0 0.218666 8
12002801 0.0 10.0 10.0 0 0 0 1.0 8
*
*r-h-st chf-btr hy-dia h-eq-dia ch-length ht-str-no
*12002901 0 0.0 0.0 0.218666 8
12002901 0.0 10.0 10.0 0 0 0 1.0 8
*
*****
* heat slab... intact loop, 3 in. sch-160 piping
* note - heat slab contains only volume lengths which
* are not heated
*
*****
*
* left boundary = intact loop primary coolant (201,261,262,263)
* right boundary = ambient volumes (801 & 803)
*
*gl data nh np type s-flg l-cor
12003000 6 5 2 1 0.10933333
*
*mesh loc flg frn flg
12003100 0 1
*
* actual wall thk. mult by 2.0 to account for clamp/hub mass
*geometry no itv r-cor no itv r-cor
12003101 2 0.182333 2 0.349000
* 0.43233 for 3 in. of insul
*
*materials comp no itv no comp no itv no
12003201 1 2 16 4
*
*source dis source itv no
12003301 0.0 4
*
*init temp flg
12003400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
12003401 550.5 1 544.9 2 540.8 3 328.2 4 147.7 5
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
12003501 201010000 0 1 1 2.46061 1
12003502 201020000 0 1 1 0.75516 2
12003503 261010000 0 1 1 1.04479 3
12003504 261020000 0 1 1 1.28963 4
12003505 262010000 0 1 1 1.34910 5
12003506 263010000 0 1 1 1.60783 6
*

```

```

*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12003501  801010000  0  4100  1  2.46061  1
12003502  801010000  0  4100  1  0.75516  2
12003503  803010000  0  4100  1  1.04479  3
12003504  803010000  0  4100  1  1.28953  4
12003505  803010000  0  4100  1  1.34910  5
12003506  803010000  0  4100  1  1.60783  6
*
*source  type  is-mlpr  l-dr-ht  r-dr-ht  ht-str-no
12003701  0  0  0  0  6
*
*l-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
* 0 0.0 0.0 0.218666 6
12003801 0.0 10.0 10.0 0 0 0 1.0 6
*
*r-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*12003901 0 0.0 0.0 0.218666 6
12003901 0.0 10.0 10.0 0 0 0 1.0 6
*
*****
* heat slab... intact loop , 2 1/2 in. sch-160 piping
* note - heat slab contains only volume lengths which
* are heated with heater tape.
*****
*
* left boundary = intact loop primary coolant (201,202,203,240)
* right boundary = ambient volumes (811 & 814)
*
*gl data  nh  np  type  s-flg  l-cor
12004000  15  8  2  1  0.088542
*
*mesh  loc flg  frm flg
12004100  0  1
*
*geometry  no itv  r-cor  no itv  r-cor  no itv  r-cor
12004101  2  0.119792  1  0.119892  2  0.130309
12004102  2  0.296975
*
*materials  cmp no  itv no  cmp no  itv no  cmp no  itv no
12004201  1  2  13  3  9  5
12004202  15  7
*
*source dis  source  itv no  source  itv no  source  itv no
12004301  0.0  3  1.0  5  0.0  7
*
*init temp  flg
12004400  0
*
* temp mesh  temp mesh  temp mesh  temp mesh  temp mesh
12004401  553.0  4  583.4  5  582.8  6  342.0  7  149.9  8
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12004501  201020000  0  1  1  0.88573  1
12004502  202010000  0  1  1  1.77146  2
12004503  203010000  0  1  1  1.99290  3
12004504  203020000  0  1  1  0.66430  4
12004505  203030000  0  1  1  0.88573  5
12004506  240010000  0  1  1  0.88573  6

```

```

12004507  240020000  0  1  1  1.55003  7
12004508  240030000  0  1  1  0.66430  8
12004509  240030000  0  1  1  1.77146  9
12004510  240040000  0  1  1  2.21433  10
12004511  240050000  0  1  1  3.08856  11
12004512  240060000  0  1  1  1.34009  12
12004513  240070000  0  1  1  1.34009  13
12004514  240080000  0  1  1  3.08856  14
12004515  240090000  0  1  1  2.65719  15
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12004601  811010000  0  4100  1  0.88573  1
12004602  811010000  0  4100  1  1.77146  2
12004603  811010000  0  4100  1  1.99290  3
12004604  811010000  0  4100  1  0.66430  4
12004605  811010000  0  4100  1  0.88573  5
12004606  811010000  0  4100  1  0.88573  6
12004607  811010000  0  4100  1  1.55003  7
12004608  811010000  0  4100  1  0.66430  8
12004609  814010000  0  4100  1  1.77146  9
12004610  814010000  0  4100  1  2.21433  10
12004611  814010000  0  4100  1  3.08856  11
12004612  814010000  0  4100  1  1.34009  12
12004613  814010000  0  4100  1  1.34009  13
12004614  814010000  0  4100  1  3.08856  14
12004615  814010000  0  4100  1  2.65719  15
*
*source  type  is-mlpr  l-dr-ht  r-dr-ht  ht-str-no
12004701  110  .052769  0  0  1
12004702  110  .105537  0  0  2
12004703  110  .118744  0  0  3
12004704  110  .039077  0  0  4
12004705  110  .052769  0  0  5
12004706  110  .052769  0  0  6
12004707  110  .091845  0  0  7
12004708  110  .039077  0  0  8
12004709  113  .114289  0  0  9
12004710  113  .142829  0  0  10
12004711  113  .199265  0  0  11
12004712  113  .066459  0  0  12
12004713  113  .066459  0  0  13
12004714  113  .199265  0  0  14
12004715  113  .171434  0  0  15
*
*l-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*12004801  0  0.0 0.0 0.177084 15
12004801 0.0 10.0 10.0 0 0 0 1.0 15
*
*r-h-st  chf-htr  by-dia  h-eq-dia  ch-length  ht-str-no
*12004901  0  0.0 0.0 0.177084 15
12004901 0.0 10.0 10.0 0 0 0 1.0 15
*
*****
* heat slab... intact loop , 2 1/2 in. sch-160 piping
* note - heat slab contains only volume lengths which
* are not heated.
*****
*

```

```

* left boundary = intact loop primary coolant (201,202,203,240)
* right boundary = ambient volumes (801 & 804)
*
*gl data      nh      np      type      s-flg      l-cor
12005000      14       5       2         1      0.068542
*
*mesh      loc flg      frm flg
12005100      0         1
*
*      actual wall thk. mult. by 2.0 to account for clamp + hub mass
*geometry      no itv      r-cor      no itv      r-cor
12005101      2      0.151042      2      0.317709
*
*materials      cmp no      itv no      cmp no      itv no
12005201      1         2         16         4
*
*source dis      source      itv no
12005301      0.0         4
*
*init temp      flg
12005400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
12005401      550.1      1      545.2      2      541.5      3      323.6      4      146.1      5
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
12005501      201010000      0      1      1      0.28510      1
12005502      202010000      0      1      1      0.97187      2
12005503      203010000      0      1      1      0.66131      3
12005504      203020000      0      1      1      1.66862      4
12005505      203030000      0      1      1      1.30272      5
12005506      240010000      0      1      1      0.63605      6
12005507      240020000      0      1      1      2.11622      7
12005508      240030000      0      1      1      1.01174      8
12005509      240040000      0      1      1      0.68150      9
12005510      240050000      0      1      1      0.41907      10
12005511      240060000      0      1      1      0.18183      11
12005512      240070000      0      1      1      0.18183      12
12005513      240080000      0      1      1      0.41907      13
12005514      240090000      0      1      1      1.55114      14
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
12005601      801010000      0      4100      1      0.28510      1
12005602      801010000      0      4100      1      0.97187      2
12005603      801010000      0      4100      1      0.66131      3
12005604      801010000      0      4100      1      1.66862      4
12005605      801010000      0      4100      1      1.30272      5
12005606      801010000      0      4100      1      0.63605      6
12005607      801010000      0      4100      1      2.11622      7
12005608      804010000      0      4100      1      1.01174      8
12005609      804010000      0      4100      1      0.68150      9
12005610      804010000      0      4100      1      0.41907      10
12005611      804010000      0      4100      1      0.18183      11
12005612      804010000      0      4100      1      0.18183      12
12005613      804010000      0      4100      1      0.41907      13
12005614      804010000      0      4100      1      1.55114      14
*
*source      type      is-mlr      l-dr-ht      r-dr-ht      ht-str-no

```

```

12005701      0      0      0      0      14
*
*l-b-st      chf-htr      by-dia      b-eq-dia      ch-length      ht-str-no
*12005801      0      0.0      0.0      0.177084      14
12005901      0.0      10.0      10.0      0 0 0 0      1.0      14
*
*r-b-st      chf-htr      by-dia      b-eq-dia      ch-length      ht-str-no
*12005901      0      0.0      0.0      0.177084      14
12005901      0.0      10.0      10.0      0 0 0 0      1.0      14
*
*****
* heat slab... broken loop - 1 1/2 in. sch 160 piping
*      note - heat slab contains only volume lengths which
*      are heated by heater bands
*****
*
* left boundary = broken loop primary coolant (340 - volumes 4,5,7)
* right boundary = ambient volume (812)
*
*gl data      nh      np      type      s-flg      l-cor
13001000      3      11      2         1      .0557500
*
*mesh      loc flg      frm flg
13001100      0         1
*
*geometry      no itv      r-cor      no itv      r-cor      no itv      r-cor
13001101      2      .07916667      1      .0792000      1      .081804167
13001102      3      .09222083      1      .094824997      2      .261491663
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
13001201      -1         2         13         3         1         4
13001202      -9         7         1         8         16         10
*
*source dis      source      itv no      source      itv no      source      itv no
13001301      0.0         5         1.0         6         0.0         10
*
*init temp      flg
13001400      0
*
*      temp mesh      temp mesh      temp mesh      temp mesh      temp mesh
13001401      555.0      1      573.4      2      588.8      3      675.0      5      640.0      6
13001402      652.8      7      648.0      9      363.3      10      145.0      11
*
*l-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
13001501      340010000      0      1      1      2.29167      1
13001502      340050000      0      1      1      2.25000      2
13001504      340090000      0      1      1      0.20833      3
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
13001601      812010000      0      4100      1      2.29167      1
13001602      812010000      0      4100      1      2.25000      2
13001604      812010000      0      4100      1      0.20833      3
*
*source      type      is-mlr      l-dr-ht      r-dr-ht      ht-str-no
13001701      111      .399475      0      0      1
13001702      111      .392055      0      0      2
13001704      111      .036122      0      0      3
*

```

```

*l-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*13001801 0 0.0 0.0 0.111500 3
13001801 0.0 10.0 10.0 0 0 0 0 1.0 3
*
*r-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*13001901 0 0.0 0.0 0.111500 3
13001901 0.0 10.0 10.0 0 0 0 0 1.0 3
*
*****
* heat slab... broken loop - 1 1/2 in. sch-160 piping *
* note - heat slab contains only volume lengths which *
* are heated with heater tape. *
*****
*
* left boundary = broken loop primary coolant (301,340,361,362,363)
* right boundary = ambient volumes (811,812,813)
*
*gl data nh np type s-flg l-cor
13002000 17 8 2 1 .05575000
*
*mesh loc flg frn flg
13002100 0 1
*
*geometry no itv r-cor no itv r-cor
13002101 2 .07916667 1 .07920000
13002102 2 .0896840 2 .256350
*
*materials comp no itv no comp no itv no comp no itv no
13002201 1 2 13 3 9 5
13002202 16 7
*
*source dis source itv no source itv no source itv no
13002301 0.0 3 1.0 5 0.0 7
*
*init temp flg
13002400 0
*
* temp mesh temp mesh temp mesh temp mesh temp mesh
13002401 548.7 1 545.0 3 542.7 4 536.9 5 531.6 6
13002402 299.4 7 139.1 8
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no
13002501 301010000 0 1 1 0.33506 1
13002502 301020000 0 1 1 0.67013 2
13002503 301030000 0 1 1 1.34025 3
13002504 301040000 0 1 1 1.34025 4
13002505 301050000 0 1 1 0.67013 5
13002506 301060000 0 1 1 1.00519 6
13002507 340010000 0 1 1 0.67013 7
13002508 340020000 0 1 1 0.67013 8
13002509 340030000 0 1 1 0.67013 9
13002510 340040000 0 1 1 1.34025 10
13002511 340050000 0 1 1 0.33506 11
13002512 340060000 0 1 1 0.67013 12
13002513 340070000 0 1 1 0.67013 13
13002514 340080000 0 1 1 4.35581 14
13002515 361010000 0 1 1 0.33506 15
13002516 362010000 0 1 1 0.67013 16

```

```

13002517 363010000 0 1 1 0.33506 17
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
13002601 811010000 0 4100 1 0.33506 1
13002602 811010000 0 4100 1 0.67013 2
13002603 811010000 0 4100 1 1.34025 3
13002604 811010000 0 4100 1 1.34025 4
13002605 811010000 0 4100 1 0.67013 5
13002606 811010000 0 4100 1 1.00519 6
13002607 811010000 0 4100 1 0.67013 7
13002608 811010000 0 4100 1 0.67013 8
13002609 811010000 0 4100 1 0.67013 9
13002610 811010000 0 4100 1 1.34025 10
13002611 812010000 0 4100 1 0.33506 11
13002612 812010000 0 4100 1 0.67013 12
13002613 812010000 0 4100 1 0.67013 13
13002614 812010000 0 4100 1 4.35581 14
13002615 813010000 0 4100 1 0.33506 15
13002616 813010000 0 4100 1 0.67013 16
13002617 813010000 0 4100 1 0.33506 17
*
*source type is-mpir l-dr-hr r-dr-hr ht-str-no
13002701 110 .013207 0 0 1
13002702 110 .026384 0 0 2
13002703 110 .052769 0 0 3
13002704 110 .052738 0 0 4
13002705 110 .026354 0 0 5
13002706 110 .039077 0 0 6
13002707 110 .026354 0 0 7
13002708 110 .026354 0 0 8
13002709 110 .026354 0 0 9
13002710 110 .052769 0 0 10
13002711 111 .009585 0 0 11
13002712 111 .019147 0 0 12
13002713 111 .019147 0 0 13
13002714 111 .124468 0 0 14
13002715 112 .043740 0 0 15
13002716 112 .087480 0 0 16
13002717 112 .043740 0 0 17
*
*l-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*13002801 0 0.0 0.0 0.111500 17
13002801 0.0 10.0 10.0 0 0 0 0 1.0 17
*
*r-h-st chf-htr by-dia h-eq-dia ch-length ht-str-no
*13002901 0 0.0 0.0 0.111500 17
13002901 0.0 10.0 10.0 0 0 0 0 1.0 17
*
*****
* heat slab... broken loop - 1 1/2 in. sch-160 piping *
* note - heat slab contains only volume lengths which *
* are not heated. *
*****
*
* left boundary = broken loop primary coolant (301,340,361,362,363)
* right boundary = ambient volumes (801,802,803)
*
*gl data nh np type s-flg l-cor
13003000 18 5 2 1 0.0557500

```

```

*
*mesh      loc flg   frw flg
13003100   0       1
*
*      actual wall thk. melt by 2.0 to acct for clamp+hub mass
*geometry   no itv   r-cor   no itv   r-cor
13003101    2   0.1002584    2   0.2669251
*
*materials  cmp no   itv no   cmp no   itv no
13003201    1       2       16       4
*
*source dis  source   itv no
13003301    0.0       4
*
*init temp   flg
13003400     0
*
*      temp mesh   temp mesh   temp mesh   temp mesh   temp mesh
13003401  549.7   1   541.8   2   541.5   3   306.7   4   140.5   5
*
*l-body      by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
13003501  301010000    0     1     1     0.49827     1
13003502  301020000    0     1     1     1.54000     2
13003503  301030000    0     1     1     0.86987     3
13003504  301040000    0     1     1     1.38427     4
13003505  301050000    0     1     1     1.68796     5
13003506  301060000    0     1     1     0.97012     6
13003507  340010000    0     1     1     0.93535     7
13003508  340020000    0     1     1     1.66920     8
13003509  340030000    0     1     1     0.97362     9
13003510  340040000    0     1     1     1.31120    10
13003511  340050000    0     1     1     1.71140    11
13003512  340060000    0     1     1     0.34555    12
13003513  340070000    0     1     1     0.34555    13
13003514  340080000    0     1     1     0.99377    14
13003515  340090000    0     1     1     2.08834    15
13003516  363010000    0     1     1     1.63494    16
13003517  363020000    0     1     1     0.97737    17
13003518  363010000    0     1     1     1.99911    18
*
*r-body      by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
13003601  801010000    0    4100     1     0.49827     1
13003602  801010000    0    4100     1     1.54000     2
13003603  801010000    0    4100     1     0.86987     3
13003604  801010000    0    4100     1     1.38427     4
13003605  801010000    0    4100     1     1.68796     5
13003606  801010000    0    4100     1     0.97012     6
13003607  801010000    0    4100     1     0.93535     7
13003608  801010000    0    4100     1     1.66920     8
13003609  801010000    0    4100     1     0.97362     9
13003610  801010000    0    4100     1     1.31120    10
13003611  802010000    0    4100     1     1.71140    11
13003612  802010000    0    4100     1     0.34555    12
13003613  802010000    0    4100     1     0.34555    13
13003614  802010000    0    4100     1     0.99377    14
13003615  802010000    0    4100     1     2.08834    15
13003616  803010000    0    4100     1     1.63494    16
13003617  803010000    0    4100     1     0.97737    17

```

```

13003618  803010000    0    4100     1     1.99911    18
*
*source      type   is-mlpr   l-dr-ht   r-dr-ht   ht-str-no
13003701     0       0         0         0         18
*
*l-b-st      chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*13003801    0       0.0       0.0       0.111500    18
13003801  0.0  10.0 10.0 0 0 0 0 1.0- 18
*
*r-b-st      chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*13003901    0       0.0       0.0       0.111500    18
13003901  0.0  10.0 10.0 0 0 0 0 1.0 18
*
*****
* heat slab... broken loop, vessel nozzles (3 in. sch-160)
*      note - heat slab contains only volume lengths which
*      are not heated
*****
*
* left boundary = broken loop primary coolant vessel nozzles (301,363)
* right boundary = ambient volumes (801,803)
*
*gl data      nh      ep      type   s-flg   l-cor
13004000      2       5       2       1   0.10933333
*
*mesh      loc flg   frw flg
13004100   0       1
*
*geometry   no itv   r-cor   no itv   r-cor
13004101    2   0.145333    2   0.312500
*
*materials  cmp no   itv no   cmp no   itv no
13004201    1       2       16       4
*
*source dis  source   itv no
13004301    0.0       4
*
*init temp   flg
13004400    -1
*
*temp distribution
13004401  610.1  606.8  604.3  352.4  152.5
13004402  546.9  544.1  541.9  318.8  144.8
*
*l-body      by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
13004501  301010000    0     1     1     0.61160     1
13004502  363020000    0     1     1     0.91239     2
*
*r-body      by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
13004601  801010000    0    4100     1     0.61160     1
13004602  803010000    0    4100     1     0.91239     2
*
*source      type   is-mlpr   l-dr-ht   r-dr-ht   ht-str-no
13004701     0       0         0         0         2
*
*l-b-st      chf-htr   hy-dia   h-eq-dia   ch-length   ht-str-no
*13004801    0       0.0       0.0       0.218666     2

```

```

1300301 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*1300301 0 0.0 0.0 0.218666 2
1300301 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
* heat slab... intact loop pump
* note - heat slab models heat loss due to pump seal cooling
*****
*
* left boundary = component 250
* right boundary = specified in table 251
*
* pump heat loss is tabulated as a linear function of pump angular speed
*
*gl data nh np type s-flg l-cor
1250000 1 4 2 1 0.08865
*
*mesh loc flg frm flg
12500100 0 1
*
*geometry no itv r-cor
12500101 3 0.1500
*
*materials cmp no itv no
12500201 1 3
*
*source dis source itv no
12500301 0.0 3
*
*init temp flg
12500400 0
*
* temp mesh temp mesh temp mesh temp mesh
12500401 540.7 1 436.6 2 345.9 3 265.0 4
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no
12500501 250010000 0 1 1 2.26167 1
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
12500601 0 0 2251 1 2.26167 1
*
*source type is-mp/r l-dr-ht r-dr-ht ht-str-no
12500701 0 0 0 0 1
*
*l-h-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*12500801 0 0.0 0.0 2.26167 1
12500801 0.0 10.0 10.0 0 0 0 0 1.0 1
*
*r-h-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*12500901 0 0.0 0.0 2.26167 1
12500901 0.0 10.0 10.0 0 0 0 0 1.0 1
*
*****
* heat slab... broken loop pump
* note - heat slab models heat loss due to pump seal cooling
*****

```

```

*
* left boundary = component 350
* right boundary = specified in table 351
*
* pump heat loss is tabulated as a linear function of pump angular speed
*
*gl data nh np type s-flg l-cor
13500000 1 4 -2 1 0.07014
*
*mesh loc flg frm flg
13500100 0 1
*
*geometry no itv r-cor
13500101 3 0.12325
*
*materials cmp no itv no
13500201 1 3
*
*source dis source itv no
13500301 0.0 3
*
*init temp flg
13500400 0
*
* temp mesh temp mesh temp mesh temp mesh
13500401 531.1 1 434.0 2 350.8 3 277.4 4
*
*l-body by-vol inc b-cdt a-code cy-length ht-str-no
13500501 350010000 0 1 1 1.9635 1
*
*r-body by-vol inc b-cdt a-code cy-length ht-str-no
13500601 0 0 2351 1 1.9635 1
*
*source type is-mp/r l-dr-ht r-dr-ht ht-str-no
13500701 0 0 0 0 1
*
*l-h-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*13500801 0 0.0 0.0 1.9635 1
13500801 0.0 10.0 10.0 0 0 0 0 1.0 1
*
*r-h-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*13500901 0 0.0 0.0 1.9635 1
13500901 0.0 10.0 10.0 0 0 0 0 1.0 1
*
*****
* heat slab... pressurizer heat transfer to pressurizer walls
* without liner - aluminum sheath heated by heater tape
*****
*
* left boundary = component 999
* right boundary = ambient volume (816)
*
*gl data nh np type s-flg l-cor
19990000 8 14 2 1 1512917
*
*mesh loc flg frm flg
19990100 0 1
*

```

```

*geometry  no itv  r-cor  no itv  r-cor  no itv  r-cor
19990101    3  .187500    4  .270833    1  .272167
19990102    1  .272267    2  .282683    2  .49350
*
*materials  cap no  itv no  cap no  itv no  cap no  itv no
19990201    1    3    19    7    20    8
19990202   13    9    9    11   30   13
*
*source dis  source  itv no  source  itv no  source  itv no
19990301    0.0    9    1.0    11    0.0   13
*
*init temp  flg
19990400    0
*
*      temp mesh  temp mesh  temp mesh
19990401  602.0  2  602.0  12  140.0  14
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19990501  999010000  0    1    1  2.500000    1
19990502  999020000 10000  1    1  2.562500    6
19990503  999070000  0    1    1  2.583333    7
19990504  999080000  0    1    1  2.093750    8
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19990601  816010000  0  4100  1  2.500000    1
19990602  816010000  0  4100  1  2.562500    6
19990603  816010000  0  4100  1  2.583333    7
19990604  816010000  0  4100  1  2.093750    8
*
*source  type  is-mlr  l-dr-ht  r-dr-ht  ht-str-no
19990701   117  .125065  0    0    1
19990702   117  .128192  0    0    6
19990703   117  .129234  0    0    7
19990704   117  .104742  0    0    8
*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19990801  0  .2858333  .2914500  2.500000    1
19990801  0.29145 10.0 10.0 0 0 0 1.0 1
*19990802  0  .3025833  .3025833  2.562500    6
19990802  0.30258 10.0 10.0 0 0 0 1.0 6
*19990803  0  .3025833  .3025833  2.583333    7
19990803  0.30258 10.0 10.0 0 0 0 1.0 7
*19990804  0  .1005325  .2251253  2.093750    8
19990804  0.22512 10.0 10.0 0 0 0 1.0 8
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19990901  0  0.0  0.0  2.500000    1
19990901  0.0 10.0 10.0 0 0 0 1.0 1
*19990902  0  0.0  0.0  2.562500    6
19990902  0.0 10.0 10.0 0 0 0 1.0 6
*19990903  0  0.0  0.0  2.583333    7
19990903  0.0 10.0 10.0 0 0 0 1.0 7
*19990904  0  0.0  0.0  2.093750    8
19990904  0.0 10.0 10.0 0 0 0 1.0 8
*
*****
* heat slab... pressurizer heater rods — data from rama corp., *
*      heater rod manufacturer *

```

```

*****
*
* left boundary = adiabatic
* right boundary = component 999
*
*gl data  nh  np  type  s-flg  l-cor
19992000    1    8    2    1    0.0
*
*mesh  loc flg  frm flg
19992100    0    1
*
*geometry  no itv  r-cor  no itv  r-cor  no itv  r-cor
19992201    2  2.1539e-2    1  2.1833e-2    2  2.6958e-2
19992202    2  3.1042e-2
*
*materials  cap no  itv no  cap no  itv no  cap no  itv no
19992301    21    2    22    3    21    5
19992302    23    7
*
*source dis  source  itv no  source  itv no  source  itv no
19992301    0.0    2    1.0    3    0.0    7
*
*init temp  flg
19992400    0
*
*      temp mesh
19992401  631.0  8
*
*l-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19992501  0    0    0    0    0.0    1
*
*r-body  by-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19992501  999080000  0    1    1  12.0    1
*
*source  type  is-mlr  l-dr-ht  r-dr-ht  ht-str-no
19992701  10999  1.0    0    0    1
*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19992801  0  0.0  0.0  2.093750    1
19992801  0.0 10.0 10.0 0 0 0 1.0 1
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19992901  0  .1005325  .1901660  2.093750    1
19992901  0.1901660 10.0 10.0 0 0 0 1.0 1
*
*****
* heat slab... pressurizer heat transfer out end caps and instrument *
*      ports - thermal conductivity calculated to match test *
*****
*
* left boundary = component 999
* right boundary = ambient volume (806)
*
*gl data  nh  np  type  s-flg  l-cor
19993000    8    3    2    1  .1512917
*
*mesh  loc flg  frm flg
19993100    0    1

```

```

*
*geometry    no itv    r-cor
19993101      2    .419350
*
*materials   cmp no    itv no
19993201      31      2
*
*source dis   source    itv no
19993301      0.0      2
*
*init temp    flg
19993400      0
*
*      temp mesh    temp mesh    temp mesh
19993401    602.0    1    370.0    2    140.0    3
*
*l-body      by-vol    inc    b-cdt    a-code    cy-length    ht-str-no
19993501    999010000    0      1      1      2.500000      1
19993502    999020000    1000    1      1      2.562500      6
19993503    999070000      0      1      1      2.583333      7
19993504    999080000      0      1      1      2.093750      8
*
*r-body      by-vol    inc    b-cdt    a-code    cy-length    ht-str-no
19993601    806010000      0    4100      1      2.500000      1
19993602    806010000      0    4100      1      2.562500      6
19993603    806010000      0    4100      1      2.583333      7
19993604    806010000      0    4100      1      2.093750      8
*
*source      type    is-mp/r    l-dr-ht    r-dr-ht    ht-str-no
19993701      0      0      0      0      8
*
*l-h-st      chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*19993801      0    .285833    .291450    2.500000      1
19993801    0.29145    10.0    10.0    0 0 0 0    1.0    1
*19993802      0    .302583    .302583    2.562500      6
19993802    0.30258    10.0    10.0    0 0 0 0    1.0    6
*19993803      0    .302583    .302583    2.583333      7
19993803    0.30258    10.0    10.0    0 0 0 0    1.0    7
*19993804      0    .1005325    .2251253    2.093750      8
19993804    0.22512    10.0    10.0    0 0 0 0    1.0    8
*
*r-h-st      chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*19993901      0      0.0      0.0      2.500000      1
19993901    0.0    10.0    10.0    0 0 0 0    1.0    1
*19993902      0      0.0      0.0      2.562500      6
19993902    0.0    10.0    10.0    0 0 0 0    1.0    6
*19993903      0      0.0      0.0      2.583333      7
19993903    0.0    10.0    10.0    0 0 0 0    1.0    7
*19993904      0      0.0      0.0      2.093750      8
19993904    0.0    10.0    10.0    0 0 0 0    1.0    8
*
*****
* heat slab... pressurizer surge line heat loss
*****
*
* left boundary = component 997
* right boundary = ambient volume (807)
*

```

```

*gl data      nh      np      type    s-flg    l-cor
19970000      2      5      2      1    .0154167
*
*mesh         loc flg    fra flg
19970100      0      1
*
*geometry     no itv    r-cor    no itv    r-cor
19970101      2    .035000    -2    .054450
*
*materials     cmp no    itv no    cmp no    itv no
19970201      1      2      24      4
*
*source dis    source    itv no
19970301      0.0      4
*
*init temp     flg
19970400      0
*
*      temp mesh    temp mesh
19970401    602.0    2    602.0    5
*
*l-body      by-vol    inc    b-cdt    a-code    cy-length    ht-str-no
19970501    997020000      0      1      1    5.6458333      1
19970502    997030000      0      1      1    4.0625000      2
*
*r-body      by-vol    inc    b-cdt    a-code    cy-length    ht-str-no
19970601    807010000      0    4100      1    5.6458333      1
19970602    807010000      0    4100      1    4.0625000      2
*
*source      type    is-mp/r    l-dr-ht    r-dr-ht    ht-str-no
19970701      0      0      0      0      2
*
*l-h-st      chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*19970801      0      0.0      0.0      0.0      0.0      2
19970801    0.0    10.0    10.0    0 0 0 0    1.0    2
*
*r-h-st      chf-htr    by-dia    h-eq-dia    ch-length    ht-str-no
*19970901      0      0.0      0.0      0.0      0.0      2
19970901    0.0    10.0    10.0    0 0 0 0    1.0    2
*
*****
***** heat structure thermal property data *****
*****
*
*      type    ca flg    ca flg
*3161 stainless steel
20100100    tbl/ctn      1      1
*
*average two phase data
20100200    tbl/ctn      1      1
*
*boron nitride
20100300    tbl/ctn      1      1
*
*constantan
20100400    tbl/ctn      1      1

```

*
 *incoel 600
 20100500 tbl/fctn 1 1
 *
 *grafoil (grafoil is a trade name of a union carbide product)
 20100600 tbl/fctn 1 1
 *
 *copper ca 102 (oxygen free copper)
 20100700 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for vessel heat loss)
 20100800 tbl/fctn 1 1
 *
 *alumina (aluminum oxide)
 20100900 tbl/fctn 1 1
 *
 *incoel 718
 20101000 tbl/fctn 1 1
 *
 *honeycomb - hexagonal matrix core
 20101100 tbl/fctn 1 1
 *
 *honeycomb - square matrix core
 20101200 tbl/fctn 1 1
 *
 *contact resistance properties (conductivity of air: storage = 0.0)
 20101300 tbl/fctn 1 1
 *
 *steam generator filler piece construction
 20101400 tbl/fctn 1 1
 *
 *water
 20101500 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for piping heat loss)
 20101600 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for steam generator heat loss)
 20101700 tbl/fctn 1 1
 *
 *thermal liner - john's manville min-k 2000, 30-35 pcf
 20101800 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for pressurizer heat loss)
 20101900 tbl/fctn 1 1
 *
 *aluminum (used in pressurizer guard heaters)
 20102000 tbl/fctn 1 1
 *
 *magnesium oxide (used in pressurizer heater rods)
 20102100 tbl/fctn 1 1
 *
 *nichrome v (used in pressurizer heater rods)
 20102200 tbl/fctn 1 1
 *
 *incoloy 800 (used in pressurizer heater rods)
 20102300 tbl/fctn 1 1
 *

*cal-temp insulation (for pressurizer surge line heat loss)
 20102400 tbl/fctn 1 1
 *
 * 0.35% carbon steel used for sg tube sheets
 20102500 tbl/fctn 1 1
 *
 *cal-temp insulation (for inlet plenum heat loss)
 20102600 tbl/fctn 1 -1
 *
 *uo2 used in nuclear core
 20102700 tbl/fctn 1 1
 *
 *zircaloy used in nuclear core
 20102800 tbl/fctn 1 1
 *
 *gap used in nuclear core
 20102900 tbl/fctn 1 1
 *
 *temp-mat insulation (modified values for pressurizer heat loss)
 20103000 tbl/fctn 1 1
 *
 *pressurizer end cap and instrument heat loss - calculated values
 20103100 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for bl steam generator heat loss)
 20103200 tbl/fctn 1 1
 *
 *.....
 *
 *thermal conductivity btu/(s ft f)
 *
 * temp cond temp cond temp cond
 *316l stainless steel
 20100101 32.00 .00215
 20100102 100.00 .00215 800.00 .00306 1600.00 .00397
 20100103 400.00 .00397
 *
 *average two phase data
 20100201 32.00 .000006
 20100202 212.00 .000036 572.00 .000008 4000.00 .000008
 *
 *boron nitride (new curve from c.finem..in 1/30/79 by dsk)
 20100301 32.00 .00255
 20100302 200.00 .00241 500.00 .00216 1000.00 .00174
 20100303 1500.00 .00133 2000.00 .000909 2500.00 .000491
 20100304 3000.00 .000074 3500.00 .000074 4000.00 .000074
 *
 *constantan
 20100401 0.00 .00389 3000.00 .00389 4000.00 .00389
 *
 *incoel 600
 20100501 32.00 .00236
 20100502 100.00 .00236 300.00 .00267 500.00 .00294
 20100503 700.00 .00322 900.00 .00350 1100.00 .00378
 20100504 4000.00 .00378
 *
 *grafoil
 20100601 32.00 .000799

20100602	250.00	.000799	500.00	.000683	750.00	.000579
20100603	1000.00	.000509	1250.00	.000494	1500.00	.000468
20100604	2000.00	.000463	3000.00	.000456	4000.00	.000456
*						
*copper ca 102						
20100701	32.00	.0622	212.00	.0606	572.00	.0589
20100702	932.00	.0575	4000.00	.0575		
*						
*cal-temp insul (increased by factor of 35.0 for vessel heat loss)						
20100801	0.00	3.2410e-4	100.00	3.2410e-4	200.00	3.4420e-4
20100802	300.00	3.8500e-4	400.00	4.0540e-4	500.00	4.4530e-4
20100803	600.00	4.8610e-4	700.00	5.3290e-4	800.00	5.8720e-4
*						
*alumina (aluminum oxide)						
20100901	0.00	.00034722	3300.00	.00034722		
*						
*inconel 718						
20101001	0.00	.0021667	200.00	.0022778	400.00	.0023333
20101002	600.00	.0025556	800.00	.0026056	1000.00	.0030556
20101003	1200.00	.0033333	1400.00	.0035556	1600.00	.0038333
*						
*honeycomb - hexagonal matrix core						
20101101	0.00	2.61110e-5	700.00	2.61110e-5		
*						
*honeycomb - square matrix core						
20101201	0.00	2.27780e-5	700.00	2.27780e-5		
*						
*contact resistance (heaters to piping) (conductivities of air)						
20101301	0.00	3.5750e-6	80.00	4.2110e-6	170.00	4.8190e-6
20101302	260.00	5.4000e-6	350.00	5.9500e-6	440.00	6.4810e-6
20101303	530.00	6.9970e-6	620.00	7.4780e-6	710.00	7.9500e-6
20101304	800.00	8.3940e-6	890.00	8.8420e-6	980.00	9.2750e-6
*						
*steam generator filler pieces (conductivities from test grb-14-82)						
20101401	80.00	3.0280e-4	260.00	3.3610e-4	440.00	3.6950e-4
20101402	620.00	4.0280e-4	800.00	4.3610e-4		
*						
*water						
20101501	32.0	88.6110e-6	104.0	100.8330e-6	176.0	107.2220e-6
20101502	248.0	110.0000e-6	356.0	108.3370e-6	464.0	101.9440e-6
20101503	500.0	98.0550e-6	572.0	86.6660e-6	700.0	86.6660e-6
*						
*cal-temp insul (increased by factor of 7.0 for piping heat loss)						
20101601	0.00	6.4810e-5	100.00	6.4810e-5	200.00	6.8830e-5
20101602	300.00	7.7000e-5	400.00	8.1080e-5	500.00	8.9050e-5
20101603	600.00	9.7220e-5	700.00	10.6580e-5	800.00	11.7440e-5
*						
*cal-temp insul (increased by factor of 2.6125 for ilsg heat loss)						
20101701	0.00	2.4189e-5	100.00	2.4189e-5	200.00	2.5697e-5
20101702	300.00	2.8740e-5	400.00	3.0255e-5	500.00	3.3230e-5
20101703	600.00	3.6586e-5	700.00	3.9784e-5	800.00	4.3987e-5
*						
*thermal liner - john's manville min-k 2000, 30-35 pcf						
20101801	300.00	1.1110e-5	600.00	1.2730e-5	1000.00	1.4810e-5
*						
*cal-temp insul (increased by factor of 1.0 for pressurizer heat loss)						
20101901	0.00	9.2600e-6	100.00	9.2600e-6	200.00	9.8330e-6
20101902	300.00	1.1000e-5	400.00	1.1580e-5	500.00	1.2720e-5

20101903	600.00	1.3890e-5	700.00	1.5230e-5	800.00	1.6780e-5
20101904	1000.00	1.9880e-5				
*						
*aluminum (used in pressurizer guard heaters)						
20102001	32.00	3.2434e-2	212.00	3.3076e-2	392.00	3.4521e-2
20102002	572.00	3.6609e-2	752.00	3.9980e-2	1000.00	4.2608e-2
*						
*magnesium oxide (used in pressurizer heater rods)						
20102101	100.00	4.6296e-4	1000.00	3.3796e-4		
*						
*nichrome v (used in pressurizer heater rods)						
20102201	32.00	1.9749e-3	212.00	2.2158e-3	392.00	2.5048e-3
20102202	572.00	2.7456e-3	752.00	2.8902e-3	1112.00	3.6127e-3
*						
*incoloy 800 (used in pressurizer heater rods)						
20102301	70.00	1.8519e-3	1000.00	3.2176e-3	1500.00	4.0278e-3
*						
*cal-temp insul (increased by factor of 1.0 per surge line heat loss)						
20102401	0.00	9.2600e-6	100.00	9.2600e-6	200.00	9.8330e-6
20102402	300.00	1.1000e-5	400.00	1.1580e-5	500.00	1.2720e-5
20102403	600.00	1.3890e-5	700.00	1.5230e-5	800.00	1.6780e-5
*						
* 0.35% carbon steel used for sg tube sheets						
20102501	32.00	.00944	68.00	.00917	212.00	.00889
20102502	392.00	.00817	572.00	.00750	752.00	.00694
20102503	1112.00	.00564	1472.00	.00478		
*						
*cal-temp insul (increased by factor of 1.0 for inlet plenum heat loss)						
20102601	0.00	9.2600e-6	100.00	9.2600e-6	200.00	9.8330e-6
20102602	300.00	1.1000e-5	400.00	1.1580e-5	500.00	1.2720e-5
20102603	600.00	1.3890e-5	700.00	1.5230e-5	800.00	1.6780e-5
20102604	1000.00	1.9880e-5				
*						
*no2 used in nuclear core						
20102701	32.00	.00152	200.00	.00120	400.00	.00100
20102702	600.00	.00090	800.00	.00074	1000.00	.00066
20102703	1200.00	.00059	1500.00	.00052	2000.00	.00044
20102704	2500.00	.00039	3000.00	.00037	4000.00	.00038
*						
*zircaloy used in nuclear core						
20102801	32.00	.00197	1099.50	.00320	1199.80	.00330
20102802	1478.80	.00366	1498.60	.00369	1529.20	.00373
20102803	1579.80	.00381	1599.60	.00384	1619.70	.00387
20102804	1639.70	.00391	1759.80	.00411	1999.20	.00458
*						
*gap used in nuclear core						
20102901	32.00	2.2500e-5	602.30	3.8520e-5	998.33	4.6500e-5
20102902	1502.30	5.7800e-5	2006.30	6.7420e-5	5408.33	1.2040e-5
*						
*temp-mat ins (increased by a factor of 1.0 for pressurizer heat loss)						
20103001	0.00	4.9770e-6	100.00	5.7870e-6	200.00	6.5970e-6
20103002	300.00	7.6390e-6	400.00	8.7960e-6	500.00	1.0420e-5
20103003	600.00	1.2040e-5	700.00	1.4120e-5	800.00	1.6320e-5
20103004	1000.00	1.6860e-5				
*						
*pressurizer end cap and instrument heat loss - calculated values						
20103101	0.00	1.8334e-6	1000.00	1.8334e-6		
*						

*cal-temp insul (increased by factor of 2.2049 for blsg heat loss)
 20103201 0.00 2.0340e-5 100.00 2.0340e-5 200.00 2.1571e-5
 20103202 300.00 2.4238e-5 400.00 2.5521e-5 500.00 2.8028e-5
 20103203 600.00 3.0606e-5 700.00 3.3564e-5 800.00 3.6975e-5
 20103204 1000.00 4.3794e-5

*
 *.....
 *

*rhometric heat capacity data (btu/cuft-f)
 * temp cap temp cap temp cap

*3161 stainless steel
 20100151 32.00 61.30 400.00 61.30 600.00 64.60
 20100152 800.00 67.10 1000.00 69.35 4000.00 69.35

*
 *average two phase
 20100251 32.00 1.00 212.00 1.00 572.00 64.00
 20100252 4000.00 64.00

*
 *boron nitride
 20100351 32.00 37.50 400.00 37.50 800.00 48.30
 20100352 1200.00 54.60 1600.00 58.30 2000.00 60.00
 20100353 2400.00 61.40 3400.00 62.50 4000.00 62.50

*
 *constantan
 20100451 32.00 56.00 212.00 56.00 572.00 61.00
 20100452 932.00 67.00 1472.00 73.00 2192.00 78.00
 20100453 2552.00 84.00 3000.00 90.00 4000.00 90.00

*
 *incoel 600
 20100551 32.00 52.225 400.00 52.225

*
 *grafoil
 20100651 32.00 11.90 80.40 11.90 170.40 14.70
 20100652 260.40 17.15 350.40 19.60 440.40 21.35
 20100653 530.40 22.40 620.40 23.80 710.40 25.20
 20100654 800.40 26.32 4000.00 26.32

*
 *copper ca 102
 20100751 32.00 51.336 400.00 51.336

*
 *cal-temp insulation
 20100851 0.00 2.898 1000.00 2.898

*
 *alumina (aluminum oxide)
 20100951 0.00 55.20 3300.00 55.20

*
 *incoel 718
 20101051 0.00 48.5797 200.00 53.7597 400.00 56.458
 20101052 600.00 61.5912 800.00 65.1840 1000.00 69.290
 20101053 1200.00 74.4227 1400.00 76.9890 1600.00 82.121

*
 *honeycomb - hexagonal matrix core
 20101151 0.00 2.28969 200.00 2.53081 400.00 2.6512
 20101152 600.00 2.89224 800.00 3.06095 1000.00 3.2537
 20101153 1200.00 3.49379 1400.00 3.61530 1600.00 3.8563

*
 *honeycomb - square matrix core
 20101251 0.00 2.15978 200.00 2.38713 400.00 2.5008

20101252 600.00 2.71815 800.00 2.88729 1000.00 3.0691
 20101253 1200.00 3.29651 1400.00 3.41018 1600.00 3.6375

*
 *contact resistance (heaters to piping)
 20101351 0.00 0.00 3300.00 0.00

*
 *steam generator filler piece (calculation from test grb-14-82)
 20101451 0.00 13.00 1000.00 13.00

*
 *water (saturated)
 20101551 32.00 63.033 104.00 61.966 176.00 60.950
 20101552 248.00 59.895 356.00 58.553 464.00 57.845
 20101553 500.00 57.989 572.00 60.999 700.00 62.576

*
 *cal-temp insulation
 20101651 0.00 2.898 1000.00 2.898

*
 *cal-temp insulation
 20101751 0.00 2.898 1000.00 2.898

*
 *thermal liner - john's manville min-k 2000, 30-35 pcf
 20101851 400.00 7.475 800.00 8.125
 20101852 1200.00 8.775 1600.00 8.775

*
 *cal-temp insulation
 20101951 0.00 2.898 1000.00 2.898

*
 *aluminum (used in pressurizer guard heaters)
 20102051 32.00 36.177 1000.00 36.177

*
 *magnesium oxide (used in pressurizer heater rods)
 20102151 10.00 43.07 1000.00 43.07

*
 *nichrome v (used in pressurizer heater rods)
 20102251 10.00 55.07 1000.00 55.07

*
 *incoloy 800 (used in pressurizer heater rods)
 20102351 10.00 61.00 1000.00 61.00

*
 *cal-temp insulation
 20102451 0.00 2.898 1000.00 2.898

*
 *0.35% carbon steel
 20102551 68.00 51.40 3000.00 51.40

*
 *cal-temp insulation
 20102651 0.00 2.898 1000.00 2.898

*
 *no2 used in nuclear core
 20102751 32.00 43.255 200.00 45.394 400.00 47.459
 20102752 600.00 49.072 800.00 50.308 1000.00 51.238
 20102753 1200.00 51.939 1500.00 52.721 2000.00 53.920
 20102754 2500.00 55.994 3000.00 60.096 4000.00 79.014

*
 *zircaloy used in nuclear core
 20102851 32.00 27.820 1099.50 33.550 1199.80 35.190
 20102852 1478.80 35.190 1498.60 53.180 1529.20 59.330
 20102853 1579.80 62.190 1599.60 73.640 1619.70 77.790

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20102854 1639.70 79.780 1759.80 34.790 1999.20 34.790
*
*gap used in nuclear core
20102951 32.00 8.051e-5 5408.30 8.0514e-5
*
*temp-mat insulation
20103051 0.00 2.125 1000.00 2.125
*
*pressurizer end cap and instrument heat loss
20103151 0.00 0.000 1000.00 0.000
*
*cal-temp insulation
20103251 0.00 2.898 1000.00 2.898
*
*
*****
*
* tables
*
*****
*
***** core power *****
*
* table trip time coef power coef
20115000 power 409 1.0 1.000 * mw
*
* time power (ans standard decay curve)
20115001 0.0 1.000
20115002 1.1957 .98216
20115003 5.9783 .29432
20115004 7.1739 .22553
20115005 10.7608 .11781
20115006 11.9555 .10006
20115007 21.5217 .05289
20115008 31.0870 .04263
20115009 51.4130 .03680
20115010 81.3048 .03500
20115011 100.4348 .03313
20115012 979.2388 .02080
*
*****
*
***** pressurizer heater rod power *****
*
* table trip time coef power coef
20299900 power 439 1.0 10.4200e-3 * mw
*
* time power
20299901 0.0 0.000
20299902 10000.0 0.000
*
*****
*
* pump speed tables (normalized speed)
*
*****
*
* table trip
20225000 reac-t 412 * intact loop pump
*
* time norm pump speed
20225001 -1.0 1.0

```

```

20225002 0.0 1.0
20225003 1.1956 0.97220
20225004 8.3695 0.55521
20225005 9.5652 0.50440
20225006 19.1304 0.32739
20225007 29.8913 0.23488
20225008 38.2608 0.22025
20225009 59.7826 0.21159
20225010 62.1739 0.19573
20225011 64.5652 0.18887
20225012 66.9565 0.04289
20225013 68.1521 0.0
20225014 4000.0 0.0
*
*
20235000 reac-t 413 * broken loop pump
20235001 -1.0 1.0
20235002 0.0 1.0
20235003 1.1956 0.98527
20235004 8.3695 0.63678
20235005 10.7608 0.55975
20235006 20.3260 0.42278
20235007 40.6521 0.40220
20235008 59.7826 0.40315
20235009 60.9782 0.32766
20235010 64.5652 0.25842
20235011 65.7608 0.16130
20235012 69.3478 0.0
20235013 4000.0 0.0
*
*****
*
* system heat loss tables
*
*****
*
*heat loss due to intact loop pump passive cooling, 20.0 kw at full flow
* 1.0 btm = 1055.055 joules (international table)
**
** table trip time coef rate coef
*20225100 btmrate 412 1.0 8.8331 * btm/s-ft2
**
** time norm h.t.rate
*20225101 -1.0 1.000
*20225102 0.0 1.000
*20225103 10.4 0.505
*20225104 20.8 0.325
*20225105 32.0 0.227
*20225106 42.4 0.181
*20225107 62.4 0.150
*20225108 64.0 0.000
*20225109 4000.0 0.000
**
*heat loss due to intact loop pump active cooling, 4.3 kw always
*
* table trip time coef rate coef
20225100 btmrate 412 1.0 1.9120 * btm/s-ft2
*
* time norm h.t.rate

```

```

20225101      0.0      1.000
20225102    2000.9      1.000
*
*****
*heat loss due to broken loop pump passive cooling, 14.7 kw at full flow
* from test so-2b-38, h. s. crapo, hsc-2-84, 3 feb 1984
* 1.0 btu = 1055.056 joules (international table)
**
**      table      trip      time coef      rate coef
*20235100  htrrate      413      1.0      9.1631 * btu/s-ft2
**
**      time      norm h.t.rate
*20235101      -1.0      1.000
*20235102      0.0      1.000
*20235103      9.6      0.590
*20235104     13.6      0.498
*20235105     20.8      0.407
*20235106     30.4      0.385
*20235107     60.0      0.385
*20235108     64.8      0.000
*20235109    4000.0      0.000
**
*heat loss due to broken loop pump active cooling, 4.3 kw always
* from test so-2b-38, h. s. crapo, hsc-2-84, 3 feb 1984
*
*      table      trip      time coef      rate coef
20235100  htrrate      413      1.0      2.6804 * btu/s-ft2
*
*      time      norm h.t.rate
20235101      0.0      1.000
20235102    2000.0      1.000
*
*****
*
* specified heat transfer coefficients on piping insulation surface
* (values calculated for free convection in air + radiation)
*
*      table
20210000  htc-temp
*
*      temp      h.t.coef (btu/s-ft2-f)
20210001    100.0      0.00136
20210002    150.0      0.00206
20210003    200.0      0.00247
20210004    300.0      0.00302
20210005    500.0      0.00374
20210006    750.0      0.00438
*
* specified heat transfer coefficients on ilsg insulation surface
* (values calculated for free convection in air + radiation)
*
*      table
20220000  htc-temp      0  1.0  0.0  3.5426
*
*      temp      h.t.coef (btu/s-ft2-f)
20220001    100.0      0.00136
20220002    150.0      0.00206
20220003    200.0      0.00247

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20220004    300.0      0.00302
20220005    500.0      0.00374
20220006    750.0      0.00438
*
* specified heat transfer coefficients on blsg steam dome insulation
* surface (values calculated for free convection in air + radiation)
*
*      table
20230000  htc-temp      0  1.0  0.0  3.35
*
*      temp      h.t.coef (btu/s-ft2-f)
20230001    100.0      0.00136
20230002    150.0      0.00206
20230003    200.0      0.00247
20230004    300.0      0.00302
20230005    500.0      0.00374
20230006    750.0      0.00438
*
* specified heat transfer coefficients on blsg riser insulation
* surface (values calculated for free convection in air + radiation)
*
*      table
20240000  htc-temp      0  1.0  0.0  3.35
*
*      temp      h.t.coef (btu/s-ft2-f)
20240001    100.0      0.00136
20240002    150.0      0.00206
20240003    200.0      0.00247
20240004    300.0      0.00302
20240005    500.0      0.00374
20240006    750.0      0.00438
*
* specified heat transfer coefficients on blsg downcomer insulation
* surface (values calculated for free convection in air + radiation)
*
*      table
20250000  htc-temp      0  1.0  0.0  3.35
*
*      temp      h.t.coef (btu/s-ft2-f)
20250001    100.0      0.00136
20250002    150.0      0.00206
20250003    200.0      0.00247
20250004    300.0      0.00302
20250005    500.0      0.00374
20250006    750.0      0.00438
*
*****
*
* power tables for piping heaters
*****
*
* ***** power table for guard heater power bus 110 *****
* ***** (power to intact and broken loop hot legs) *****
*
*      table      trip      time coef      power coef
20211000  power      430      1.0      8.4380e-3 * mw
*
*      time      power
20211001      0.0      1.00

```

```

20211002 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 111 *****
* ***** (power to broken loop pump section) *****
*
* table trip time coef power coef
20211100 power 431 1.0 4.0130e-3 * MW
*
* time power
20211101 0.0 1.00
20211102 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 112 *****
* ***** (power to intact and broken loop cold legs) *****
*
* table trip time coef power coef
20211200 power 432 1.0 3.1220e-3 * MW
*
* time power
20211201 0.0 1.00
20211202 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 113 *****
* ***** (power to intact loop pump section) *****
*
* table trip time coef power coef
20211300 power 433 1.0 8.2610e-3 * MW
*
* time power
20211301 0.0 1.00
20211302 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 116 *****
* ***** (power to external heaters on vessel and downcomer) *****
*
* table trip time coef power coef
20211600 power 436 1.0 19.8320e-3 * MW
*
* time power
20211601 0.0 1.00
20211602 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 117 *****
* ***** (power to external heaters on pressurizer) *****
*
* table trip time coef power coef
20211700 power 437 1.0 1.5930e-3 * MW
*

```

```

* time power
20211701 -1.0 1.00
20211702 0.0 0.00
20211703 10000.0 0.00
*
*****
* control variables *
*****
**
** 1 vessel interface level (-13 -578) **
** 2 core interface level (105 -501) **
** 3 downcomer interface level (+29 -578) **
** 4 upper plenum interface level (+153 -13) **
** 5 upper head interface level (+421 +160) **
** 6 pressurizer interface level **
** 7 intact loop u-tube up side interface level **
** 8 intact loop u-tube down side interface level **
** 9 intact loop pump section down side interface level **
** 10 intact loop pump section up side interface level **
** 11 broken loop u-tube up side interface level **
** 12 broken loop u-tube down side interface level **
** 13 broken loop pump section down side interface level **
** 14 broken loop pump section up side interface level **
** 15 intact loop steam generator riser interface level **
** 16 intact loop steam generator downcomer interface level **
** 17 broken loop steam generator riser interface level **
** 18 broken loop steam generator downcomer interface level **
** 19 intact loop steam generator secondary riser mass **
** 20 intact loop steam generator secondary downcomer mass **
** 21 intact loop steam generator secondary total mass **
** 22 broken loop steam generator secondary riser mass **
** 23 broken loop steam generator secondary downcomer mass **
** 24 broken loop steam generator secondary total mass **
** 25 total steam generator secondary mass **
** 26 energy removed from primary to secondary by intact loop sg **
** 27 energy removed from primary to secondary by broken loop sg **
** 28 energy removed from core heater rods to primary coolant **
** 29 maximum core heater rod temperature **
** 150-151 control system for core heater rod power **
** 200-221 control system to redistribute power on vessel heaters **
** 250-251 control system to obtain desired intact loop mass flow rate**
** 350-351 control system to obtain desired broken loop mass flow rate**
** 400 fluid mass in downcomer **
** 401 fluid mass in lower plenum **
** 402 fluid mass in core **
** 403 fluid mass in upper plenum **
** 404 fluid mass in upper head **
** 405 fluid mass in bypass line, support columns, guide tubes **
** 406 fluid mass in pressurizer **
** 407 fluid mass in intact loop hot leg **
** 408 fluid mass in intact loop u-tubes **
** 409 fluid mass in intact loop cold leg **
** 410 fluid mass in broken loop hot leg **
** 411 fluid mass in broken loop u-tubes **
** 412 fluid mass in broken loop cold leg **
** 413 total primary coolant system fluid mass **
** 501 vessel delta p -13 to -578 cm **
** 502 vessel core delta p -105 to -501 cm **

```

```

** 503 vessel downcomer delta p 29 to -578 cm **
** 504 vessel upper plenum delta p 135 to -13 cm **
** 505 vessel upper head delta p 421 to 160 cm **
** 506 pressurizer delta p 632 to 30 cm **
** 507 intact loop steam generator u-tube upside delta p 926 to -57e **
** 508 intact loop steam generator u-tube downside delta p 926 to -57x **
** 509 intact loop pump section downside delta p -57x to i14 **
** 510 intact loop pump section upside delta p i14 to i16 **
** 511 broken loop steam generator u-tube upside delta p 925 to -57e **
** 512 broken loop steam generator u-tube downside delta p 925 to -57x **
** 513 broken loop pump section downside delta p -57x to b65 **
** 514 broken loop pump section upside delta p b65 to b73 **
** 515 intact loop steam generator riser delta p 1117 to 89 cm **
** 516 intact loop steam generator downcomer delta p 1117 to 51 cm **
** 517 broken loop steam generator riser delta p 1186 to -7 cm **
** 518 broken loop steam generator downcomer delta p 1186 to 18 cm **
** 519 broken loop steam generator downcomer delta p between horiz **
** 531 vessel collapsed level -13 to -578(ref) cm **
** 532 vessel core collapsed level -105 to -501(ref) cm **
** 533 vessel downcomer collapsed level 29 to -578(ref) cm **
** 534 vessel upper plenum collapsed level 135 to -13(ref) cm **
** 535 vessel upper head collapsed level 421 to 160(ref) cm **
** 536 pressurizer collapsed level 632 to 30(ref) cm **
** 537 ilsg u-tube upside collapsed level 926 to -57e(ref) cm **
** 538 ilsg u-tube downside collapsed level 926 to -57x(ref) cm **
** 539 intact loop pump section downside collapsed level ref i16 cm **
** 540 intact loop pump section upside collapsed level ref i16 cm **
** 541 blsg u-tube upside collapsed level 925 to -57e(ref) cm **
** 542 blsg u-tube downside collapsed level 925 to -57x(ref) cm **
** 543 broken loop pump section downside collapsed level ref b65 cm **
** 544 broken loop pump section upside collapsed level ref b65 cm **
** 545 intact loop steam generator riser collapsed level ref 89 cm **
** 546 intact loop steam generator downcomer collapsed level ref 51cm **
** 547 broken loop steam generator riser collapsed level ref -7 cm **
** 548 broken loop steam generator downcomer collapsed level ref 18cm **
** 549 broken loop steam generator downcomer collapsed level ref 18cm **
** 561 vessel collapsed level -13 to -578 ref cold leg **
** 562 vessel core collapsed level -105 to -501 ref cold leg **
** 563 vessel downcomer collapsed level 29 to -578 ref cold leg **
** 564 vessel upper plenum collapsed level 135 to -13 ref cold leg **
** 565 vessel upper head collapsed level 421 to 160 ref cold leg **
** 566 pressurizer collapsed level 632 to 30 ref zero cm **
** 567 ilsg u-tube upside collapsed level 926 to -57e ref tube sheet **
** 568 ilsg u-tube downside collapsed level 926 to -57x ref tub sht **
** 569 intact loop pump section downside collapsed level ref cold leg **
** 570 intact loop pump section upside collapsed level ref cold leg **
** 571 blsg u-tube upside collapsed level 925 to -57e ref tube sheet **
** 572 blsg u-tube downside collapsed level 925 to -57x ref tub sht **
** 573 broken loop pump section downside collapsed level ref cold leg **
** 574 broken loop pump section upside collapsed level ref cold leg **
** 575 intact loop steam generator riser collapsed level ref tub sht **
** 576 intact loop steam generator downcomer collapsed lvl ref tub sht **
** 577 broken loop steam generator riser collapsed level ref tub sht **
** 578 broken loop steam generator downcomer collapsed lvl ref tub sht **
** 579 broken loop steam generator downcomer collapsed lvl ref tub sht **
** 606-610 control system to obtain desired mass in intact loop sg **
** 620 intact loop steam generator recirculation ratio **
** 625 intact loop steam generator circulation ratio **

** 630-637 control system to hold il steam dome pressure within band **
** 706-710 control system to obtain desired mass in broken loop sg **
** 720 broken loop steam generator recirculation ratio **
** 725 broken loop steam generator circulation ratio **
** 730-737 control system to hold bl steam dome pressure within band **
** 800 total heat loss monitoring system **
** 960-965 control system to obtain desired pressurizer liquid level **
** 990-999 control system for pressurizer internal heater rods **
**
*****
*
* control variables for comparison to equivalent semiscale data
* ***** liquid levels *****
*
* name type coef init val flg
*
20500100 vsllvl sum 30.48 -13.000 1 * vessel level (cm)
* * (-13 to -578)
20500101 -19.08608 0.073491 voidf 162010000
20500102 2.760833 voidf 162010000
20500103 1.000833 voidf 161010000
20500104 2.0 voidf 150060000
20500105 2.0 voidf 150050000
20500106 2.0 voidf 150040000
20500107 2.0 voidf 150030000
20500108 2.0 voidf 150020000
20500109 2.0 voidf 150010000
20500110 1.635833 voidf 140010000
20500111 0.721917 voidf 130010000
20500112 0.466667 voidf 120010000
*
20500200 corelvl sum 30.48 -105.092 1 * core level (cm)
* * (-105. to -501.)
20500201 -16.42833 0.16667 voidf 140010000
20500202 2.00000 voidf 150010000
20500203 2.00000 voidf 150020000
20500204 2.00000 voidf 150030000
20500205 2.00000 voidf 150040000
20500206 2.00000 voidf 150050000
20500207 2.00000 voidf 150060000
20500208 0.81375 voidf 161010000
*
20500300 dncrlvl sum 30.48 30.480 1 * downcomer lvl (cm)
* * (+29 to -578)
20500301 -19.08608 2.0 voidf 101010000
20500302 2.260833 voidf 110010000
20500303 1.000833 voidf 110020000
20500304 2.0 voidf 110030000
20500305 2.0 voidf 110040000
20500306 2.0 voidf 110050000
20500307 2.0 voidf 110060000
20500308 2.0 voidf 110070000
20500309 1.466667 voidf 110080000
20500310 1.207667 voidf 110090000
20500311 0.962500 voidf 110100000
20500312 0.721917 voidf 130010000
20500313 0.466667 voidf 120010000
*

```

```

20500400 uplavl sm 30.48 136.144 1 * up plenum lvl (cm)
* * (+135 to -13)
20500401 -0.426509 2.550000 voidf 164010000
20500402 2.343176 voidf 163010000
*
20500500 whlvl sm 30.48 423.570 1 * up. head lvl (cm)
* * (+421 to +160)
20500501 +5.120 2.880833 voidf 194010000
20500502 3.453333 voidf 193010000
20500503 1.965833 voidf 192010000
20500504 0.476667 voidf 191010000
*
20500600 parlvl sm 30.48 625.793 1 * par level (cm)
*
20500601 0.0 2.50 voidf 999010000
20500602 2.5625 voidf 999020000
20500603 2.5625 voidf 999030000
20500604 2.5625 voidf 999040000
20500605 2.5625 voidf 999050000
20500606 2.5625 voidf 999060000
20500607 2.583333 voidf 999070000
20500608 2.09375 voidf 999080000
20500609 0.541667 voidf 997010000
*
*
20500700 ilrtm sm 30.48 925.830 1 * il n-tube up
* * (cm) - from
20500701 -1.75 1.750000 voidf 215010000 * -57 cm below
20500702 7.952500 voidf 220010000 * top of tube sheet
20500703 7.9108334 voidf 220020000 * to top of model
20500704 7.9108334 voidf 220030000 * n-tube
20500705 6.999883 voidf 220040000
*
20500800 ilrtd sm 30.48 925.830 1 * il n-tube down
* * (cm) - from
20500801 -1.75 1.750000 voidf 225010000 * -57 cm below
20500802 6.999883 voidf 220050000 * top of tube sheet
20500803 7.9108334 voidf 220060000 * to top of model
20500804 7.9108334 voidf 220070000 * n-tube
20500805 7.952500 voidf 220080000
*
20500900 ilpsd sm 30.48 151.803 1 * il p-s down (cm)
* * (dpi-57x14)
20500901 -9.229167 0.6354167 voidf 230010000
*
*****
* heat slab... broken loop, vessel nozzles (3 in. sch-160) *
* note - heat slab contains only volume lengths which *
* are not heated *
*****
* left boundary = broken loop primary coolant vessel nozzles (301,363)
* right boundary = ambient volumes (801,803)
*
*gl data nh np type s-flg l-cor
13004000 2 5 2 1 0.10933333
*
*mesh loc flg frm flg

```

```

13004100 0 1
*
*geometry no itv r-cor no itv r-cor
13004101 2 0.145833 2 0.312500
*
*materials cap no itv no cap no itv no
13004201 1 2 16 4
*
*source dis source itv no
13004301 0.0 4
*
*init temp flg
13004400 -1
*
*temp distribution
13004401 610.1 606.8 604.3 352.4 152.5
13004402 546.9 544.1 541.9 318.8 144.8
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
13004501 301010000 0 1 1 0.61160 1
13004502 363020000 0 1 1 0.91239 2
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
13004601 801010000 0 4100 1 0.61160 1
13004602 803010000 0 4100 1 0.91239 2
*
*source type is-mlpr l-dr-ht r-dr-ht ht-str-no
13004701 0 0 0 0 2
*
*l-h-st chf-ht hy-dia h-eq-dia ch-length ht-str-no
*13004801 0 0.0 0.0 0.218666 2
13004801 0.0 10.0 10.0 0 0 0 1.0 2
*
*r-h-st chf-ht hy-dia h-eq-dia ch-length ht-str-no
*13004901 0 0.0 0.0 0.218666 2
13004901 0.0 10.0 10.0 0 0 0 1.0 2
*
*****
* heat slab... intact loop pump *
* note - heat slab models heat loss due to pump seal cooling *
*****
* left boundary = component 250
* right boundary = specified in table 251
*
* pump heat loss is tabulated as a linear function of pump angular speed
*
*gl data nh np type s-flg l-cor
12500000 1 4 2 1 0.08865
*
*mesh loc flg frm flg
12500100 0 1
*
*geometry no itv r-cor
12500101 3 0.1500
*
*materials cap no itv no

```

```

12500201      1      3
*
*source dis  source  itv no
12500301      0.0      3
*
*init temp    flg
12500400      0
*
*      temp mesh  temp mesh  temp mesh  temp mesh
12500401  540.7  1  436.6  2  345.9  3  265.0  4
*
*l-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12500501  250010000  0  1  1  2.26167  1
*
*r-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
12500601      0  0  2251  1  2.26167  1
*
*source  type  is-mpir  l-dr-ht  r-dr-ht  ht-str-no
12500701      0  0  0  0  0  1
*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*12500801      0  0.0  0.0  2.26167  1
12500801  0.0  10.0  10.0  0 0 0 0  1.0  1
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*12500901      0  0.0  0.0  2.26167  1
12500901  0.0  10.0  10.0  0 0 0 0  1.0  1
*
*****
* heat slab... broken loop pump *
* note - heat slab models heat loss due to pump seal cooling *
*****
*
* left boundary = component 350
* right boundary = specified in table 351
*
* pump heat loss is tabulated as a linear function of pump angular speed
*
*gl data  nh  np  type  s-flg  l-cor
13500000  1  4  2  1  0.07014
*
*mesh  loc flg  frm flg
13500100  0  1
*
*geometry  no itv  r-cor
13500101  3  0.12325
*
*materials  cmp no  itv no
13500201  1  3
*
*source dis  source  itv no
13500301  0.0  3
*
*init temp  flg
13500400  0
*
*      temp mesh  temp mesh  temp mesh  temp mesh
13500401  531.1  1  434.0  2  350.8  3  277.4  4

```

```

*
*l-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13500501  350010000  0  1  1  1.9635  1
*
*r-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
13500601      0  0  2351  1  1.9635  1
*
*source  type  is-mpir  l-dr-ht  r-dr-ht  ht-str-no
13500701      0  0  0  0  0  1
*
*l-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*13500801      0  0.0  0.0  1.9635  1
13500801  0.0  10.0  10.0  0 0 0 0  1.0  1
*
*r-h-st  chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*13500901      0  0.0  0.0  1.9635  1
13500901  0.0  10.0  10.0  0 0 0 0  1.0  1
*
*****
* heat slab... pressurizer heat transfer to pressurizer walls *
* without liner - aluminum sheath heated by heater tape *
*****
*
* left boundary = component 999
* right boundary = ambient volume (816)
*
*gl data  nh  np  type  s-flg  l-cor
19990000  8  14  2  1  .1512917
*
*mesh  loc flg  frm flg
19990100  0  1
*
*geometry  no itv  r-cor  no itv  r-cor  no itv  r-cor
19990101  3  .187500  4  .270833  1  .272167
19990102  1  .272267  2  .282683  2  .493350
*
*materials  cmp no  itv no  cmp no  itv no  cmp no  itv no
19990201  1  3  19  7  20  8
19990202  13  9  9  11  30  13
*
*source dis  source  itv no  source  itv no  source  itv no
19990301  0.0  9  1.0  11  0.0  13
*
*init temp  flg
19990400  0
*
*      temp mesh  temp mesh  temp mesh
19990401  602.0  2  602.0  12  140.0  14
*
*l-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19990501  999010000  0  1  1  2.500000  1
19990502  999020000  10000  1  1  2.562500  6
19990503  999070000  0  1  1  2.583333  7
19990504  999080000  0  1  1  2.093750  8
*
*r-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19990601  816010000  0  4100  1  2.500000  1
19990602  816010000  0  4100  1  2.562500  6

```

```

19990603 816010000 0 4100 1 2.583333 7
19990604 816010000 0 4100 1 2.093750 8
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
19990701 117 .125065 0 0 1
19990702 117 .128192 0 0 6
19990703 117 .129234 0 0 7
19990704 117 .104742 0 0 8
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19990801 0 .2858333 .2914500 2.500000 1
19990801 0.29145 10.0 10.0 0 0 0 1.0 1
*19990802 0 .3025833 .3025833 2.562500 6
19990802 0.30258 10.0 10.0 0 0 0 1.0 6
*19990803 0 .3025833 .3025833 2.583333 7
19990803 0.30258 10.0 10.0 0 0 0 1.0 7
*19990804 0 .1005325 .2251253 2.093750 8
19990804 0.22512 10.0 10.0 0 0 0 1.0 8
*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19990901 0 0.0 0.0 2.500000 1
19990901 0.0 10.0 10.0 0 0 0 1.0 1
*19990902 0 0.0 0.0 2.562500 6
19990902 0.0 10.0 10.0 0 0 0 1.0 6
*19990903 0 0.0 0.0 2.583333 7
19990903 0.0 10.0 10.0 0 0 0 1.0 7
*19990904 0 0.0 0.0 2.093750 8
19990904 0.0 10.0 10.0 0 0 0 1.0 8
*
*****
* heat slab... pressurizer heater rods --- data from rama corp., *
* heater rod manufacturer *
*****
*
* left boundary = adiabatic
* right boundary = component 999
*
*gl data nh np type s-flg l-cor
19992000 1 8 2 1 0.0
*
*mesh loc flg frm flg
19992100 0 1
*
*geometry no itv r-cor no itv r-cor no itv r-cor
19992101 2 2.1539e-2 1 2.1833e-2 2 2.6958e-2
19992102 2 3.1042e-2
*
*materials comp no itv no comp no itv no comp no itv no
19992201 21 2 22 3 21 5
19992202 23 7
*
*source dis source itv no source itv no source itv no
19992301 0.0 2 1.0 3 0.0 7
*
*init temp flg
19992400 0
*
* temp mesh

```

```

19992401 631.0 8
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
19992501 0 0 0 0 0.0 1
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
19992601 999060000 0 1 1 12.0 1
*
*source type is-mlr l-dr-ht r-dr-ht ht-str-no
19992701 10999 1.0 0 0 1
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19992801 0 0.0 0.0 2.093750 1
19992801 0.0 10.0 10.0 0 0 0 1.0 1
*
*r-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19992901 0 .1005325 .1901660 2.093750 1
19992901 0.1901660 10.0 10.0 0 0 0 1.0 1
*
*****
* heat slab... pressurizer heat transfer out end caps and instrument *
* ports - thermal conductivity calculated to match test *
*****
*
* left boundary = component 999
* right boundary = ambient volume (806)
*
*gl data nh np type s-flg l-cor
19993000 8 3 2 1 .1512917
*
*mesh loc flg frm flg
19993100 0 1
*
*geometry no itv r-cor
19993101 2 .449350
*
*materials comp no itv no
19993201 31 2
*
*source dis source itv no
19993301 0.0 2
*
*init temp flg
19993400 0
*
* temp mesh temp mesh temp mesh
19993401 602.0 1 370.0 2 140.0 3
*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
19993501 999010000 0 1 1 2.500000 1
19993502 999020000 10000 1 1 2.562500 6
19993503 999070000 0 1 1 2.583333 7
19993504 999080000 0 1 1 2.093750 8
*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
19993601 806010000 0 4100 1 2.500000 1
19993602 806010000 0 4100 1 2.562500 6
19993603 806010000 0 4100 1 2.583333 7

```

```

19993604 866010000 0 4100 1 2.093750 8
*
*source      type  is-aplr  l-dr-ht  r-dr-ht  ht-str-no
19993701      0      0      0      0      8
*
*l-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19993801      0 .2658333 .2914500 2.500000 1
19993801 0.29145 10.0 10.0 0 0 0 0 1.0 1
*19993802      0 .3025833 .3025833 2.562500 6
19993802 0.30258 10.0 10.0 0 0 0 0 1.0 6
*19993803      0 .3025833 .3025833 2.583333 7
19993803 0.30258 10.0 10.0 0 0 0 0 1.0 7
*19993804      0 .1095325 .2251253 2.093750 8
19993804 0.22512 10.0 10.0 0 0 0 0 1.0 8
*
*r-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19993901      0 0.0 0.0 0.0 2.500000 1
19993901 0.0 10.0 10.0 0 0 0 0 1.0 1
*19993902      0 0.0 0.0 0.0 2.562500 6
19993902 0.0 10.0 10.0 0 0 0 0 1.0 6
*19993903      0 0.0 0.0 0.0 2.583333 7
19993903 0.0 10.0 10.0 0 0 0 0 1.0 7
*19993904      0 0.0 0.0 0.0 2.093750 8
19993904 0.0 10.0 10.0 0 0 0 0 1.0 8
*
*****
* heat slab... pressurizer surge line heat loss *
*****
*
* left boundary = component 997
* right boundary = ambient volume (807)
*
*gl data      nh      np      type  s-flg  l-cor
19970000      2      5      2      1 .0154167
*
*mesh      loc flg  frn flg
19970100      0      1
*
*geometry  no itv  r-cor  no itv  r-cor
19970101      2 .035000 2 .054460
*
*materials  cap no  itv no  cap no  itv no
19970201      1      2      24      4
*
*source dis  source  itv no
19970301      0.0      4
*
*init temp  flg
19970400      0
*
*      temp mesh  temp mesh
19970401 602.0 2 602.0 5
*
*l-body      hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
19970501 997020000 0 1 1 5.6458333 1
19970502 997030000 0 1 1 4.0625000 2
*
*r-body      hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no

```

```

19970601 807010000 0 4100 1 5.6458333 1
19970602 807010000 0 4100 1 4.0625000 2
*
*source      type  is-aplr  l-dr-ht  r-dr-ht  ht-str-no
19970701      0      0      0      0      2
*
*l-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19970801      0 0.0 0.0 0.0 0.0 2
19970801 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*r-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*19970901      0 0.0 0.0 0.0 0.0 2
19970901 0.0 10.0 10.0 0 0 0 0 1.0 2
*
*****
***** heat structure thermal property data *****
*****
*
*      type  cn flg  ca flg
*316l stainless steel
20100100  tbl/fctn  1 1
*
*average two phase data
20100200  tbl/fctn  1 1
*
*boron nitride
20100300  tbl/fctn  1 1
*
*constantan
20100400  tbl/fctn  1 1
*
*incoel 600
20100500  tbl/fctn  1 1
*
*grafloil (grafloil is a trade name of a union carbide product)
20100600  tbl/fctn  1 1
*
*copper ca 102 (oxygen free copper)
20100700  tbl/fctn  1 1
*
*cal-temp insulation (modified values for vessel heat loss)
20100800  tbl/fctn  1 1
*
*alumina (aluminum oxide)
20100900  tbl/fctn  1 1
*
*incoel 718
20101000  tbl/fctn  1 1
*
*honeycomb - hexagonal matrix core
20101100  tbl/fctn  1 1
*
*honeycomb - square matrix core
20101200  tbl/fctn  1 1
*
*contact resistance properties (conductivity of air; storage = 0.0)

```

20101300 tbl/fctn 1 1
 *
 *steam generator filler piece construction
 20101400 tbl/fctn 1 1
 *
 *water
 20101500 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for piping heat loss)
 20101600 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for steam generator heat loss)
 20101700 tbl/fctn 1 1
 *
 *thermal liner - john's manville min-k 2000, 30-35 pcf
 20101800 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for pressurizer heat loss)
 20101900 tbl/fctn 1 1
 *
 *aluminum (used in pressurizer guard heaters)
 20102000 tbl/fctn 1 1
 *
 *magnesium oxide (used in pressurizer heater rods)
 20102100 tbl/fctn 1 1
 *
 *nichrome v (used in pressurizer heater rods)
 20102200 tbl/fctn 1 1
 *
 *incoloy 800 (used in pressurizer heater rods)
 20102300 tbl/fctn 1 1
 *
 *cal-temp insulation (for pressurizer surge line heat loss)
 20102400 tbl/fctn 1 1
 *
 * 0.35% carbon steel used for sg tube sheets
 20102500 tbl/fctn 1 1
 *
 *cal-temp insulation (for inlet plenum heat loss)
 20102600 tbl/fctn 1 1
 *
 *uo₂ used in nuclear core
 20102700 tbl/fctn 1 1
 *
 *zircaloy used in nuclear core
 20102800 tbl/fctn 1 1
 *
 *gap used in nuclear core
 20102900 tbl/fctn 1 1
 *
 *temp-mat insulation (modified values for pressurizer heat loss)
 20103000 tbl/fctn 1 1
 *
 *pressurizer end cap and instrument heat loss - calculated values
 20103100 tbl/fctn 1 1
 *
 *cal-temp insulation (modified values for bl steam generator heat loss)
 20103200 tbl/fctn 1 1

*
 *.....
 *
 *thermal conductivity btu/(s ft f)
 *

	temp	cond	temp	cond	temp	cond
*3161 stainless steel						
20100101	32.00	.00215				
20100102	100.00	.00215	800.00	.00306	1600.00	.00397
20100103	400.00	.00397				
*average two phase data						
20100201	32.00	.000006				
20100202	212.00	.000006	572.00	.000008	4000.00	.000008
*boron nitride (new curve from c.finegan..in 1/30/79 by dmk)						
20100301	32.00	.00255				
20100302	200.00	.00241	500.00	.00216	1000.00	.00174
20100303	1500.00	.00133	2000.00	.00099	2500.00	.000491
20100304	3000.00	.00074	3500.00	.00074	4000.00	.00074
*constantan						
20100401	0.00	.00383	3000.00	.00383	4000.00	.00383
*incomel 600						
20100501	32.00	.00236				
20100502	100.00	.00236	300.00	.00267	500.00	.00294
20100503	700.00	.00322	900.00	.00350	1100.00	.00378
20100504	4000.00	.00378				
*grafoil						
20100601	32.00	.000799				
20100602	250.00	.000799	500.00	.000683	750.00	.000579
20100603	1000.00	.000509	1250.00	.000484	1500.00	.000468
20100604	2000.00	.000463	3000.00	.000486	4000.00	.000486
*copper ca 102						
20100701	32.00	.0622	212.00	.0606	572.00	.0589
20100702	932.00	.0575	4000.00	.0575		
*cal-temp insul (increased by factor of 35.0 for vessel heat loss)						
20100801	0.00	3.2410e-4	100.00	3.2410e-4	200.00	3.4420e-4
20100802	300.00	3.8500e-4	400.00	4.0540e-4	500.00	4.4530e-4
20100803	600.00	4.8610e-4	700.00	5.3290e-4	800.00	5.8720e-4
*alumina (aluminum oxide)						
20100901	0.00	.00034722	3300.00	.00034722		
*incomel 718						
20101001	0.00	.0021667	200.00	.0022778	400.00	.0023333
20101002	600.00	.0025556	800.00	.0028056	1000.00	.0030556
20101003	1200.00	.0033333	1400.00	.0035556	1600.00	.0038333
*honeycomb - hexagonal matrix core						
20101101	0.00	2.61110e-5	700.00	2.61110e-5		
*honeycomb - square matrix core						
20101201	0.00	2.27780e-5	700.00	2.27780e-5		

*
 *contact resistance (heaters to piping) (conductivities of air)
 20101301 0.00 3.5750e-6 80.00 4.2110e-6 170.00 4.8190e-6
 20101302 260.00 5.4000e-6 350.00 5.9500e-6 440.00 6.4810e-6
 20101303 530.00 6.9970e-6 620.00 7.4780e-6 710.00 7.9500e-6
 20101304 800.00 8.3940e-6 890.00 8.8420e-6 980.00 9.2750e-6
 *
 *steam generator filler pieces (conductivities from test grb-14-82)
 20101401 80.00 3.0280e-4 260.00 3.3610e-4 440.00 3.6950e-4
 20101402 620.00 4.0280e-4 800.00 4.3610e-4
 *
 *water
 20101501 32.0 88.6110e-6 104.0 100.8330e-6 176.0 107.2220e-6
 20101502 248.0 110.0000e-6 356.0 108.3370e-6 464.0 101.9440e-6
 20101503 500.0 98.0550e-6 572.0 86.6660e-6 700.0 86.6660e-6
 *
 *cal-temp insul (increased by factor of 7.0 for piping heat loss)
 20101601 0.00 6.4810e-5 100.00 6.4810e-5 200.00 6.8830e-5
 20101602 300.00 7.7000e-5 400.00 8.1080e-5 500.00 8.9050e-5
 20101603 600.00 9.7220e-5 700.00 10.6580e-5 800.00 11.7440e-5
 *
 *cal-temp insul (increased by factor of 2.6125 for islg heat loss)
 20101701 0.00 2.4189e-5 100.00 2.4189e-5 200.00 2.5697e-5
 20101702 300.00 2.8740e-5 400.00 3.0255e-5 500.00 3.3233e-5
 20101703 600.00 3.6536e-5 700.00 3.9784e-5 800.00 4.3987e-5
 *
 *thermal liner - john's manville min-k 2000, 30-35 pcf
 20101801 300.00 1.1110e-5 600.00 1.2730e-5 1000.00 1.4810e-5
 *
 *cal-temp insul (increased by factor of 1.0 for pressurizer heat loss)
 20101901 0.00 9.2600e-6 100.00 9.2600e-6 200.00 9.8330e-6
 20101902 300.00 1.1000e-5 400.00 1.1580e-5 500.00 1.2720e-5
 20101903 600.00 1.3890e-5 700.00 1.5230e-5 800.00 1.6780e-5
 20101904 1000.00 1.9880e-5
 *
 *aluminum (used in pressurizer guard heaters)
 20102001 32.00 3.2434e-2 212.00 3.3076e-2 392.00 3.4521e-2
 20102002 572.00 3.6609e-2 752.00 3.9980e-2 1000.00 4.2608e-2
 *
 *magnesium oxide (used in pressurizer heater rods)
 20102101 100.00 4.6286e-4 1000.00 3.3796e-4
 *
 *nichrome v (used in pressurizer heater rods)
 20102201 32.00 1.9749e-3 212.00 2.2158e-3 392.00 2.5048e-3
 20102202 572.00 2.7456e-3 752.00 2.8902e-3 1112.00 3.6127e-3
 *
 *incoloy 800 (used in pressurizer heater rods)
 20102301 70.00 1.8519e-3 1000.00 3.2176e-3 1500.00 4.0278e-3
 *
 *cal-temp insul (increased by factor of 1.0 pwr surge line heat loss)
 20102401 0.00 9.2600e-6 100.00 9.2600e-6 200.00 9.8330e-6
 20102402 300.00 1.1000e-5 400.00 1.1580e-5 500.00 1.2720e-5
 20102403 600.00 1.3890e-5 700.00 1.5230e-5 800.00 1.6780e-5
 *
 * 0.351 carbon steel used for sg tube sheets
 20102501 32.00 .00944 68.00 .00917 212.00 .00889
 20102502 392.00 .00817 572.00 .00750 752.00 .00694
 20102503 1112.00 .00564 1472.00 .00478

*
 *cal-temp insul (increased by factor of 1.0 for inlet plenum heat loss)
 20102601 0.00 9.2600e-6 100.00 9.2600e-6 200.00 9.8330e-6
 20102602 300.00 1.1000e-5 400.00 1.1580e-5 500.00 1.2720e-5
 20102603 600.00 1.3890e-5 700.00 1.5230e-5 800.00 1.6780e-5
 20102604 1000.00 1.9880e-5
 *
 *no2 used in nuclear core
 20102701 32.00 .00152 260.00 .00120 400.00 .00100
 20102702 600.00 .00090 800.00 .00074 1000.00 .00066
 20102703 1200.00 .00059 1500.00 .00052 2000.00 .00044
 20102704 2500.00 .00039 3000.00 .00037 4000.00 .00038
 *
 *zircaloy used in nuclear core
 20102801 32.00 .00197 1099.50 .00320 1199.80 .00330
 20102802 1478.80 .00366 1498.60 .00369 1529.20 .00373
 20102803 1579.80 .00381 1529.60 .00384 1619.70 .00387
 20102804 1639.70 .00391 1759.80 .00411 1999.20 .00458
 *
 *gap used in nuclear core
 20102901 32.00 2.2500e-5 602.30 3.8520e-5 998.33 4.6500e-5
 20102902 1502.30 5.7800e-5 2006.30 6.7420e-5 5408.33 1.2040e-5
 *
 *temp-mat ins (increased by a factor of 1.0 for pressurizer heat loss)
 20103001 0.00 4.9770e-6 100.00 5.7870e-6 200.00 6.5970e-6
 20103002 300.00 7.6390e-6 400.00 8.7960e-6 500.00 1.0420e-5
 20103003 600.00 1.2040e-5 700.00 1.4120e-5 800.00 1.6320e-5
 20103004 1000.00 1.6960e-5
 *
 *pressurizer end cap and instrument heat loss - calculated values
 20103101 0.00 1.8334e-6 1000.00 1.8334e-6
 *
 *cal-temp insul (increased by factor of 2.2040 for blsg heat loss)
 20103201 0.00 2.0340e-5 100.00 2.0340e-5 200.00 2.1671e-5
 20103202 300.00 2.4238e-5 400.00 2.5521e-5 500.00 2.8025e-5
 20103203 600.00 3.0606e-5 700.00 3.3564e-5 800.00 3.6975e-5
 20103204 1000.00 4.3794e-5
 *
 *.....
 *
 *volumetric heat capacity data (btu/cuft-f)
 *
 *3161 stainless steel
 20100151 32.00 61.30 400.00 61.30 600.00 64.60
 20100152 800.00 67.10 1000.00 69.35 4000.00 69.35
 *
 *average two phase
 20100251 32.00 1.00 212.00 1.00 572.00 64.00
 20100252 4000.00 64.00
 *
 *boron nitride
 20100351 32.00 37.50 400.00 37.50 800.00 48.30
 20100352 1200.00 54.60 1600.00 58.30 2000.00 60.00
 20100353 2400.00 61.40 3400.00 62.50 4000.00 62.50
 *
 *constantan
 20100451 32.00 56.00 212.00 56.00 572.00 61.00
 20100452 932.00 67.00 1472.00 73.00 2192.00 78.00

20100453	2552.00	84.00	3000.00	90.00	4000.00	90.00
*incoel 600						
20100551	32.00	52.225	4000.00	52.225		
*grafoil						
20100651	32.00	11.90	80.40	11.90	170.40	14.70
20100652	260.40	17.15	350.40	19.60	440.40	21.35
20100653	530.40	22.40	620.40	23.80	710.40	25.20
20100654	800.40	26.32	4000.00	26.32		
*copper ca 102						
20100751	32.00	51.336	4000.00	51.336		
*cal-temp insulation						
20100851	0.00	2.898	1000.00	2.898		
*alumina (aluminum oxide)						
20100951	0.00	55.20	3300.00	55.20		
*incoel 718						
20101051	0.00	48.5797	200.00	53.7597	400.00	56.458
20101052	600.00	61.5912	800.00	65.1849	1000.00	69.290
20101053	1200.00	74.4227	1400.00	76.9890	1600.00	82.121
*honeycomb - hexagonal matrix core						
20101151	0.00	2.28969	200.00	2.53081	400.00	2.6512
20101152	600.00	2.89224	800.00	3.06095	1000.00	3.2537
20101153	1200.00	3.49379	1400.00	3.61530	1600.00	3.8563
*honeycomb - square matrix core						
20101251	0.00	2.15978	200.00	2.38713	400.00	2.5008
20101252	600.00	2.71815	800.00	2.88729	1000.00	3.0691
20101253	1200.00	3.29651	1400.00	3.41018	1600.00	3.6375
*contact resistance (heaters to piping)						
20101351	0.00	0.00	3300.00	0.00		
*steam generator filler piece (calculation from test grb-14-82)						
20101451	0.00	13.00	1000.00	13.00		
*water (saturated)						
20101551	32.00	63.033	104.00	61.966	176.00	60.950
20101552	248.00	59.895	356.00	58.553	464.00	57.845
20101553	500.00	57.989	572.00	60.999	700.00	62.576
*cal-temp insulation						
20101651	0.00	2.898	1000.00	2.898		
*cal-temp insulation						
20101751	0.00	2.898	1000.00	2.898		
*thermal liner - john's manville min-k 2000, 30-35 pcf						
20101851	400.00	7.475	800.00	8.125		
20101852	1200.00	8.775	1600.00	8.775		
*cal-temp insulation						
20101951	0.00	2.898	1000.00	2.898		

*alumina (used in pressurizer guard heaters)						
20102051	32.00	36.177	10000.00	36.177		
*magnesium oxide (used in pressurizer heater rods)						
20102151	10.00	43.07	10000.00	43.07		
*nichrome v (used in pressurizer heater rods)						
20102251	10.00	55.07	10000.00	55.07		
*incoloy 800 (used in pressurizer heater rods)						
20102351	10.00	61.00	10000.00	61.00		
*cal-temp insulation						
20102451	0.00	2.898	1000.00	2.898		
*0.35% carbon steel						
20102551	68.00	51.40	3000.00	51.40		
*cal-temp insulation						
20102651	0.00	2.898	1000.00	2.898		
*co2 used in nuclear core						
20102751	32.00	43.255	200.00	45.394	400.00	47.459
20102752	600.00	49.072	800.00	50.308	1000.00	51.238
20102753	1200.00	51.939	1500.00	52.721	2000.00	53.920
20102754	2500.00	55.994	3000.00	60.096	4000.00	79.014
*zircaloy used in nuclear core						
20102851	32.00	27.820	1099.50	33.550	1199.80	35.190
20102852	1478.80	35.190	1498.60	53.180	1529.20	59.330
20102853	1579.80	62.190	1599.60	73.640	1619.70	77.790
20102854	1639.70	79.780	1759.80	34.790	1999.20	34.790
*gap used in nuclear core						
20102951	32.00	8.051e-5	5408.30	8.051e-5		
*temp-mat insulation						
20103051	0.00	2.125	1000.00	2.125		
*pressurizer end cap and instrument heat loss						
20103151	0.00	0.000	1000.00	0.000		
*cal-temp insulation						
20103251	0.00	2.898	1000.00	2.898		
***** tables *****						
***** core power *****						
	table	trip	time coef	power coef		
20215000	power	409	1.0	1.000	* mw	
	time		power	(ans standard decay curve)		
20215001	0.0		1.000			

```

20215002    1.1957    .98216
20215003    5.9783    .29432
20215004    7.1739    .22553
20215005    10.7608    .11781
20215006    11.9565    .10006
20215007    21.5217    .05289
20215008    31.0570    .04263
20215009    51.4130    .03680
20215010    81.3048    .03500
20215011    100.4348    .03313
20215012    979.2388    .02080
*
*****
*
***** pressurizer heater rod power *****
*
*      table      trip      time coef      power coef
20299900      power      439      1.0      10.4200e-3 * m;
*
*      time      power
20299901      0.0      0.000
20299902      10000.0      0.000
*
*****
*      pump speed tables (normalized speed)      *
*****
*
*      table      trip
20225000      reac-t      412      * intact loop pump
*
*      time      norm pump speed
20225001      -1.0      1.0
20225002      0.0      1.0
20225003      1.1956      0.97220
20225004      8.3695      0.55521
20225005      9.5652      0.50440
20225006      19.1304      0.32739
20225007      29.8913      0.23488
20225008      38.2508      0.20025
20225009      59.7826      0.21159
20225010      62.1739      0.19573
20225011      64.5652      0.18887
20225012      66.9565      0.04289
20225013      68.1521      0.0
20225014      4000.0      0.0
*
*      table      trip      * broken loop pump
20235000      reac-t      413
20235001      -1.0      1.0
20235002      0.0      1.0
20235003      1.1956      0.98527
20235004      8.3695      0.63678
20235005      10.7608      0.55975
20235006      20.3260      0.42278
20235007      40.6521      0.40220
20235008      59.7826      0.40315
20235009      60.9782      0.32766
20235010      64.5652      0.25842
20235011      65.7608      0.16130

```

```

20235012    69.3478    0.0
20235013    4000.0    0.0
*
*****
*
*      system heat loss tables      *
*
*****
*
*heat loss due to intact loop pump passive cooling, 20.0 kw at full flow
* 1.0 btm = 1055.056 joules (international table)
**
**      table      trip      time coef      rate coef
*20225100      btmrate      412      1.0      8.8931 * btm/s-ft2
**
**      time      norm h.t.rate
*20225101      -1.0      1.000
*20225102      0.0      1.000
*20225103      19.4      0.505
*20225104      29.8      0.325
*20225105      32.0      0.227
*20225106      42.4      0.181
*20225107      62.4      0.150
*20225108      64.0      0.000
*20225109      4000.0      0.000
**
*heat loss due to intact loop pump active cooling, 4.3 kw always
*
*      table      trip      time coef      rate coef
20225100      btmrate      412      1.0      1.9120 * btm/s-ft2
*
*      time      norm h.t.rate
20225101      0.0      1.000
20225102      20000.0      1.000
*
*****
*heat loss due to broken loop pump passive cooling, 14.7 kw at full flow
* from test so-2b-38, h. s. crapo, hsc-2-84, 3 feb 1984
* 1.0 btm = 1055.056 joules (international table)
**
**      table      trip      time coef      rate coef
*20235100      btmrate      413      1.0      9.1631 * btm/s-ft2
**
**      time      norm h.t.rate
*20235101      -1.0      1.000
*20235102      0.0      1.000
*20235103      9.6      0.590
*20235104      13.6      0.498
*20235105      20.8      0.407
*20235106      30.4      0.385
*20235107      60.0      0.385
*20235108      64.8      0.000
*20235109      4000.0      0.000
**
*heat loss due to broken loop pump active cooling, 4.3 kw always
* from test so-2b-38, h. s. crapo, hsc-2-84, 3 feb 1984
*
*      table      trip      time coef      rate coef

```

```

20235100 htrrate 413 1.0 2.6804 * btu/s-ft2
*
* time norm h.t.rate
20235101 0.0 1.000
20235102 2000.0 1.000
*
*****
*
* specified heat transfer coefficients on piping insulation surface
* (values calculated for free convection in air + radiation)
*
* table
20210000 htr-temp
*
* temp h.t.coef (btu/s-ft2-f)
20210001 100.0 0.00136
20210002 150.0 0.00206
20210003 200.0 0.00247
20210004 300.0 0.00302
20210005 500.0 0.00374
20210006 750.0 0.00438
*
* specified heat transfer coefficients on ilsg insulation surface
* (values calculated for free convection in air + radiation)
*
* table
20220000 htr-temp 0 1.0 0.0 3.5426
*
* temp h.t.coef (btu/s-ft2-f)
20220001 100.0 0.00136
20220002 150.0 0.00206
20220003 200.0 0.00247
20220004 300.0 0.00302
20220005 500.0 0.00374
20220006 750.0 0.00438
*
* specified heat transfer coefficients on blsg steam dome insulation
* surface (values calculated for free convection in air + radiation)
*
* table
20230000 htr-temp 0 1.0 0.0 3.35
*
* temp h.t.coef (btu/s-ft2-f)
20230001 100.0 0.00136
20230002 150.0 0.00206
20230003 200.0 0.00247
20230004 300.0 0.00302
20230005 500.0 0.00374
20230006 750.0 0.00438
*
* specified heat transfer coefficients on blsg riser insulation
* surface (values calculated for free convection in air + radiation)
*
* table
20240000 htr-temp 0 1.0 0.0 3.35
*
* temp h.t.coef (btu/s-ft2-f)
20240001 100.0 0.00136

```

```

20240002 150.0 0.00206
20240003 200.0 0.00247
20240004 300.0 0.00302
20240005 500.0 0.00374
20240006 750.0 0.00438
*
* specified heat transfer coefficients on blsg downcomer insulation
* surface (values calculated for free convection in air + radiation)
*
* table
20250000 htr-temp 0 1.0 0.0 3.35
*
* temp h.t.coef (btu/s-ft2-f)
20250001 100.0 0.00136
20250002 150.0 0.00206
20250003 200.0 0.00247
20250004 300.0 0.00302
20250005 500.0 0.00374
20250006 750.0 0.00438
*
*****
*
* power tables for piping heaters
*****
*
* ***** power table for guard heater power bus 110 *****
* ***** (power to intact and broken loop hot legs) *****
*
* table trip time coef power coef
20211000 power 430 1.0 8.4380e-3 * mw
*
* time power
20211001 0.0 1.00
20211002 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 111 *****
* ***** (power to broken loop pump section) *****
*
* table trip time coef power coef
20211100 power 431 1.0 4.0130e-3 * mw
*
* time power
20211101 0.0 1.00
20211102 10000.0 1.00
*
*****
*
* ***** power table for guard heater power bus 112 *****
* ***** (power to intact and broken loop cold legs) *****
*
* table trip time coef power coef
20211200 power 432 1.0 3.1220e-3 * mw
*
* time power
20211201 0.0 1.00
20211202 10000.0 1.00
*

```

```

*****
*
* ***** power table for guard heater power bus 113 *****
* ***** (power to intact loop pump section) *****
*
*      table      trip      time coef      power coef
20211300      power      433      1.0      8.2610e-3 * m
*
*      time      power
20211301      0.0      1.00
20211302      10000.0      1.00
*
*****
*
* ***** power table for guard heater power bus 116 *****
* ***** (power to external heaters on vessel and downcomer) *****
*
*      table      trip      time coef      power coef
20211600      power      436      1.0      19.8320e-3 * m
*
*      time      power
20211601      0.0      1.00
20211602      10000.0      1.00
*
*****
*
* ***** power table for guard heater power bus 117 *****
* ***** (power to external heaters on pressurizer) *****
*
*      table      trip      time coef      power coef
20211700      power      437      1.0      1.5930e-3 * m
*
*      time      power
20211701      -1.0      1.00
20211702      0.0      0.00
20211703      10000.0      0.00
*
*****
*
*      control variables
*
*****
**
** 1 vessel interface level (-13 -578)
** 2 core interface level (105 -501)
** 3 downcomer interface level (+29 -578)
** 4 upper plenum interface level (+153 -13)
** 5 upper head interface level (+421 +160)
** 6 pressurizer interface level
** 7 intact loop u-tube up side interface level
** 8 intact loop u-tube down side interface level
** 9 intact loop pump section down side interface level
** 10 intact loop pump section up side interface level
** 11 broken loop u-tube up side interface level
** 12 broken loop u-tube down side interface level
** 13 broken loop pump section down side interface level
** 14 broken loop pump section up side interface level
** 15 intact loop steam generator riser interface level
** 16 intact loop steam generator downcomer interface level
** 17 broken loop steam generator riser interface level

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** 18 broken loop steam generator downcomer interface level
** 19 intact loop steam generator secondary riser mass
** 20 intact loop steam generator secondary downcomer mass
** 21 intact loop steam generator secondary total mass
** 22 broken loop steam generator secondary riser mass
** 23 broken loop steam generator secondary downcomer mass
** 24 broken loop steam generator secondary total mass
** 25 total steam generator secondary mass
** 26 energy removed from primary to secondary by intact loop sg
** 27 energy removed from primary to secondary by broken loop sg
** 28 energy removed from core heater rods to primary coolant
** 29 maximum core heater rod temperature
** 150-151 control system for core heater rod power
** 200-221 control system to redistribute power on vessel heaters
** 250-251 control system to obtain desired intact loop mass flow rate**
** 350-351 control system to obtain desired broken loop mass flow rate**
** 400 fluid mass in downcomer
** 401 fluid mass in lower plenum
** 402 fluid mass in core
** 403 fluid mass in upper plenum
** 404 fluid mass in upper head
** 405 fluid mass in bypass line, support columns, guide tubes
** 406 fluid mass in pressurizer
** 407 fluid mass in intact loop hot leg
** 408 fluid mass in intact loop u-tubes
** 409 fluid mass in intact loop cold leg
** 410 fluid mass in broken loop hot leg
** 411 fluid mass in broken loop u-tubes
** 412 fluid mass in broken loop cold leg
** 413 total primary coolant system fluid mass
** 501 vessel delta p -13 to -578 cm
** 502 vessel core delta p -105 to -501 cm
** 503 vessel downcomer delta p 29 to -578 cm
** 504 vessel upper plenum delta p 135 to -13 cm
** 505 vessel upper head delta p 421 to 160 cm
** 506 pressurizer delta p 632 to 30 cm
** 507 intact loop steam generator u-tube upside delta p 926 to -57e
** 508 intact loop steam generator u-tube downside delta p 926 to -57x
** 509 intact loop pump section downside delta p -57x to i14
** 510 intact loop pump section upside delta p i14 to i16
** 511 broken loop steam generator u-tube upside delta p 926 to -57e
** 512 broken loop steam generator u-tube downside delta p 926 to -57x
** 513 broken loop pump section downside delta p -57x to b65
** 514 broken loop pump section upside delta p b65 to b73
** 515 intact loop steam generator riser delta p 1117 to 89 cm
** 516 intact loop steam generator downcomer delta p 1117 to 51 cm
** 517 broken loop steam generator riser delta p 1186 to -7 cm
** 518 broken loop steam generator downcomer delta p 1186 to 18 cm
** 519 broken loop steam generator downcomer delta p between horiz
** 531 vessel collapsed level -13 to -578(ref) cm
** 532 vessel core collapsed level -105 to -501(ref) cm
** 533 vessel downcomer collapsed level 29 to -578(ref) cm
** 534 vessel upper plenum collapsed level 135 to -13(ref) cm
** 535 vessel upper head collapsed level 421 to 160(ref) cm
** 536 pressurizer collapsed level 632 to 30(ref) cm
** 537 ilsg u-tube upside collapsed level 926 to -57e(ref) cm
** 538 ilsg u-tube downside collapsed level 926 to -57x(ref) cm
** 539 intact loop pump section downside collapsed level ref i16 cm

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** 540 intact loop pump suction upside collapsed level ref i16 cm **
** 541 blsg u-tube upside collapsed level 925 to -57e(ref) cm **
** 542 blsg u-tube downside collapsed level 925 to -57x(ref) cm **
** 543 broken loop pump suction downside collapsed level ref b65 cm **
** 544 broken loop pump suction upside collapsed level ref b65 cm **
** 545 intact loop steam generator riser collapsed level ref 89 cm **
** 546 intact loop steam generator downcomer collapsed level ref 51cm**
** 547 broken loop steam generator riser collapsed level ref -7 cm **
** 548 broken loop steam generator downcomer collapsed level ref 18cm**
** 549 broken loop steam generator downcomer collapsed level ref 18cm**
** 551 vessel collapsed level -13 to -578 ref cold leg **
** 552 vessel core collapsed level -105 to -501 ref cold leg **
** 553 vessel downcomer collapsed level 29 to -578 ref cold leg **
** 554 vessel upper plenum collapsed level 135 to -13 ref cold leg **
** 555 vessel upper head collapsed level 421 to 160 ref cold leg **
** 556 pressurizer collapsed level 632 to 30 ref zero cm **
** 557 ilsg u-tube upside collapsed level 925 to -57e ref tube sheet **
** 558 ilsg u-tube downside collapsed level 925 to -57x ref tub sht **
** 559 intact loop pump suction downside collapsed level ref cold leg**
** 570 intact loop pump suction upside collapsed level ref cold leg **
** 571 blsg u-tube upside collapsed level 925 to -57e ref tube sheet **
** 572 blsg u-tube downside collapsed level 925 to -57x ref tub sht **
** 573 broken loop pump suction downside collapsed level ref cold leg**
** 574 broken loop pump suction upside collapsed level ref cold leg **
** 575 intact loop steam generator riser collapsed level ref tub sht **
** 576 intact loop steam generator downcomer collapsed lvl ref tub sht **
** 577 broken loop steam generator riser collapsed level ref tub sht **
** 578 broken loop steam generator downcomer collapsed lvl ref tub sht **
** 579 broken loop steam generator downcomer collapsed lvl ref tub sht **
** 606-610 control system to obtain desired mass in intact loop sg **
** 620 intact loop steam generator recirculation ratio **
** 625 intact loop steam generator circulation ratio **
** 630-637 control system to hold il steam dome pressure within band **
** 706-710 control system to obtain desired mass in broken loop sg **
** 720 broken loop steam generator recirculation ratio **
** 725 broken loop steam generator circulation ratio **
** 730-737 control system to hold bl steam dome pressure within band **
** 800 total heat loss monitoring system **
** 980-985 control system to obtain desired pressurizer liquid level **
** 990-999 control system for pressurizer internal heater rods **
**
*****
* control variables for comparison to equivalent semiscale data
* ***** liquid levels *****
*
* name type coef init val flg
*
20500100 vsllvl sum 30.48 -13.000 1 * vessel level (cm)
* * (-13 to -578)
20500101 -19.08608 0.073491 voidf 163010000
20500102 2.760833 voidf 162010000
20500103 1.000833 voidf 161010000
20500104 2.0 voidf 150060000
20500105 2.0 voidf 150050000
20500106 2.0 voidf 150040000
20500107 2.0 voidf 150030000
20500108 2.0 voidf 150020000

```

```

20500109 2.0 voidf 150010000
20500110 1.635833 voidf 140010000
20500111 0.721917 voidf 130010000
20500112 0.466667 voidf 120010000
*
20500200 corelvl sum 30.48 -105.092 1 * core level (cm)
* * (-105. to -501.)
20500201 -16.42833 0.15667 voidf 140010000
20500202 2.00000 voidf 150010000
20500203 2.00000 voidf 150020000
20500204 2.00000 voidf 150030000
20500205 2.00000 voidf 150040000
20500206 2.00000 voidf 150050000
20500207 2.00000 voidf 150060000
20500208 0.81375 voidf 161010000
*
20500300 dnclvl sum 30.48 30.480 1 * downcomer lvl (cm)
* * (+29 to -578)
20500301 -19.08608 2.0 voidf 101010000
20500302 2.260833 voidf 110010000
20500303 1.000833 voidf 110020000
20500304 2.0 voidf 110030000
20500305 2.0 voidf 110040000
20500306 2.0 voidf 110050000
20500307 2.0 voidf 110060000
20500308 2.0 voidf 110070000
20500309 1.465667 voidf 110080000
20500310 1.207667 voidf 110090000
20500311 0.962500 voidf 110100000
20500312 0.721917 voidf 130010000
20500313 0.466667 voidf 120010000
*
20500400 uplmlvl sum 30.48 136.144 1 * up plenum lvl (cm)
* * (+135 to -13)
20500401 -0.426509 2.550000 voidf 164010000
20500402 2.343176 voidf 163010000
*
20500500 uhlvl sum 30.48 423.570 1 * up. head lvl (cm)
* * (+421 to +160)
20500501 +5.120 2.880833 voidf 194010000
20500502 3.453333 voidf 193010000
20500503 1.965833 voidf 192010000
20500504 0.476667 voidf 191010000
*
20500600 prlvl sum 30.48 625.793 1 * pr level (cm)
*
20500601 0.0 2.50 voidf 999010000
20500602 2.5625 voidf 999020000
20500603 2.5625 voidf 999030000
20500604 2.5625 voidf 999040000
20500605 2.5625 voidf 999050000
20500606 2.5625 voidf 999060000
20500607 2.583333 voidf 999070000
20500608 2.09375 voidf 999080000
20500609 0.541667 voidf 997010000
*
*
20500700 ilotn sum 30.48 925.830 1 * il u-tube up

```

```

*
20500701 -1.75 1.750000 voidf 215010000 * (cm) - from
20500702 7.952500 voidf 220010000 * -57 cm below
20500703 7.9108334 voidf 220020000 * top of tube sheet
20500704 7.9108334 voidf 220030000 * to top of model
20500705 6.599583 voidf 220040000 * n-tube
20500800
*
20500800 ilntd sum 30.48 925.830 1 * il -tube down
*
20500801 -1.75 1.750000 voidf 225010000 * (cm) - from
20500802 6.599583 voidf 220050000 * -57 cm below
20500803 7.9108334 voidf 220060000 * top of tube sheet
20500804 7.9108334 voidf 220070000 * to top of model
20500805 7.952500 voidf 220080000 * n-tube
20500900
*
20500900 ilpsd sum 30.48 151.803 1 * il p-s down (cm)
*
20500901 -9.229167 0.6354167 voidf 230010000 * (dpi=57x14)
20500902 1.1836002 voidf 240010000
20500903 3.6662500 voidf 240020000
20500904 3.4475000 voidf 240030000
20500905 2.8558333 voidf 240040000
20500906 3.4733333 voidf 240050000
20500907 0.7266667 voidf 240060000
20501000
*
20501000 ilpsa sum 30.48 -25.019 1 * il p-s up (cm)
*
20501001 -9.229167 0.7266667 voidf 240070000 * (dpi=14x16)
20501002 3.4733333 voidf 240080000
20501003 4.2083333 voidf 240090000
20501100
*
20501100 blnta sum 30.48 923.290 1 * bl n-tube up
*
20501101 -1.7508333 1.7508333 voidf 315010000 * (cm) - from
20501102 7.7916667 voidf 320010000 * -57 cm below
20501103 7.5000000 voidf 320020000 * top of tube sheet
20501104 7.5000000 voidf 320030000 * to top of model
20501105 7.5000000 voidf 320040000 * n-tube
20501200
*
20501200 blntd sum 30.48 923.290 1 * bl -tube down
*
20501201 -1.7508333 1.7508333 voidf 325010000 * (cm) - from
20501202 7.5000000 voidf 320050000 * -57 cm below
20501203 7.5000000 voidf 320060000 * top of tube sheet
20501204 7.5000000 voidf 320070000 * to top of model
20501205 7.7916667 voidf 320080000 * n-tube
20501300
*
20501300 blpsd sum 30.48 142.944 1 * bl p-s down (cm)
*
20501301 -9.179583 0.8020833 voidf 330010000 * (dpi=57x65a)
20501302 1.3076602 voidf 340010000
20501303 2.3393333 voidf 340020000
20501304 1.6437500 voidf 340030000
20501305 4.9431250 voidf 340040000
20501306 4.2964583 voidf 340050000
20501307 0.6466667 voidf 340060000

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```

20501400 blpsa sum 30.48 -27.025 1 * bl p-s up (cm)
*
20501401 -9.179583 0.6456667 voidf 340070000 * (dpi=65x73a)
20501402 5.3495833 voidf 340080000
20501403 2.2966667 voidf 340090000
20501500
*
20501500 ilsgsl sum 30.48 1130.780 1 * i.l. s.g. lvl (cm)
*
20501501 0.0 7.9525000 voidf 600010000 * (top of tube
20501502 7.9108334 voidf 600020000 * sheet to top of
20501503 7.9108334 voidf 600030000 * cent. separator)
20501504 7.4762500 voidf 600040000 * (0 to +1130)
20501505 5.1558333 voidf 600050000 * riser side
20501600
*
20501600 ilsgdcl sum 30.48 1130.780 1 * i.l. s.g. lvl (cm)
*
20501601 0.0 7.4762500 voidf 600060000 * (top of tube
20501602 7.9108334 voidf 600070000 * sheet to top of
20501603 7.9108334 voidf 600080000 * cent. separator)
20501604 7.9525000 voidf 600090000 * (0 to +1130)
20501605 5.5516667 voidf 600100000 * downcomer side
20501606 1.5404167 voidf 612010000
20501700
*
20501700 blsgsl sum 30.48 1120.150 1 * b.l.s.g. lvl (cm)
*
20501701 0.0 1.0833333 voidf 716010000 * (top of tube
20501702 6.7083333 voidf 700010000 * sheet to top of
20501703 7.5000000 voidf 700020000 * grav. separator)
20501704 7.5000000 voidf 700030000 * (0.0 to 1172)
20501705 7.5000000 voidf 700040000 * riser side
20501706 6.8229167 voidf 700050000
20501707 1.3333333 voidf 701010000
20501800
*
20501800 blsgdcl sum 30.48 1120.140 1 * b.l.s.g. lvl (cm)
*
20501801 .5416667 4.0000000 voidf 714010000 * (top of tube
20501802 7.5000000 voidf 714020000 * sheet to bot of
20501803 7.5000000 voidf 714030000 * grav. separator)
20501804 7.5000000 voidf 714040000 * (0.0 to 1131)
20501805 7.2500000 voidf 714050000 * downcomer side
20501806 2.8229167 voidf 711010000
20501900
*
20501900 ilsgmr sum .028316846 0.0 1 * il s.g. secondary
*
20501901 0.0 1.0038417 rho 600010000 * riser mass (kg)
20501902 0.9402046 rho 600020000
20501903 0.8926058 rho 600030000
20501904 1.0017945 rho 600040000
20501905 2.2709806 rho 600050000
20501906 0.4508175 rho 601010000
20501907 0.4249623 rho 611010000
20502000
*
20502000 ilsgmd sum .028316846 0.0 1 * il s.g. secondary
*
20502001 0.0 3.0085308 rho 602010000 * downcomer mass(kg)

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```

20502002      0.7316260  rho  612010000
20502003      0.2211171  rho  603010000
20502004      0.2316581  rho  603020000
20502005      0.2316581  rho  603030000
20502006      0.3322701  rho  603040000
*
20502100  ilsgm  sum  1.0  0.0  1  * il s.g. secondary
*                               * mass (kg)
20502101  0.0  1.00  ctrlvar  19
20502102  1.00  ctrlvar  20
*
*
20502200  blsgm  sum  .028316846  0.0  1  * bl s.g. secondary
*                               * riser mass (kg)
20502201  0.0  0.0344994  rho  716010000
20502202  0.2213819  rho  700010000
20502203  0.2476839  rho  700020000
20502204  0.2451911  rho  700030000
20502205  0.2649540  rho  700040000
20502206  0.3268035  rho  700050000
20502207  0.5794734  rho  701010000
20502208  0.1534235  rho  703010000
20502209  0.1002201  rho  704010000
20502210  0.0680664  rho  705010000
*
20502300  blsgm  sum  .028316846  0.0  1  * bl s.g. secondary
*                               * downcomer mass(kg)
20502301  0.0  0.6232431  rho  711010000
20502302  0.0718342  rho  712010000
20502303  0.0366917  rho  713010000
20502304  0.0424740  rho  714010000
20502305  0.0779018  rho  714020000
20502306  0.0779018  rho  714030000
20502307  0.0779018  rho  714040000
20502308  0.0774216  rho  714050000
20502309  0.0972227  rho  715010000
*
20502400  blsgm  sum  1.0  0.0  1  * bl s.g. secondary
*                               * liquid mass (kg)
20502401  0.0  1.00  ctrlvar  22
20502402  1.00  ctrlvar  23
*
*
20502500  totsgm  sum  1.0  0.0  1  * total secondary
*                               * liquid mass (kg)
20502501  0.0  1.00  ctrlvar  21
20502502  1.00  ctrlvar  24
*
*
20502600  ilsgm  sum  -1.0e-3  0.0  1  * il sg q (kw)
*
20502601  0.0  1.00  q  220010000
20502602  1.00  q  220020000
20502603  1.00  q  220030000
20502604  1.00  q  220040000
20502605  1.00  q  220050000
20502606  1.00  q  220060000

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```

20502607  1.00  q  220070000
20502608  1.00  q  220080000
*
20502700  blsgm  sum  -1.0e-3  0.0  1  * bl sg q (kw)
*
20502701  0.0  1.00  q  320010000
20502702  1.00  q  320020000
20502703  1.00  q  320030000
20502704  1.00  q  320040000
20502705  1.00  q  320050000
20502706  1.00  q  320060000
20502707  1.00  q  320070000
20502708  1.00  q  320080000
*
20502800  corpow  sum  .23507e-3  0.0  1  * core power (kw)
*
20502801  0.0  1.00  htrmr  150000101
20502802  1.00  htrmr  150000201
20502803  1.00  htrmr  150000301
20502804  1.00  htrmr  150000401
20502805  1.00  htrmr  150000501
20502806  1.00  htrmr  150000601
20502807  1.00  htrmr  150000701
20502808  1.00  htrmr  150000801
20502809  1.00  htrmr  150000901
20502810  1.00  htrmr  150001001
20502811  1.00  htrmr  150001101
20502812  1.00  htrmr  150001201
*
*
20502900  maxrod  stdfactn  1.0  0.0  1  * max rod temp
*
20502901  max  htrmp  150000118
20502902  htrmp  150000218
20502903  htrmp  150000318
20502904  htrmp  150000418
20502905  htrmp  150000518
20502906  htrmp  150000618
20502907  htrmp  150000718
20502908  htrmp  150000818
20502909  htrmp  150000918
20502910  htrmp  150001018
20502911  htrmp  150001118
20502912  htrmp  150001218
*
*****
* control block for primary coolant system mass *
*****
*
20540000  dmcrmas  sum  .028316846  0.0  1  * downcomer mass
*                               * (kg)
20540001  0.0  0.2113940  rho  101010000
20540002  0.0700293  rho  110010000
20540003  0.0260607  rho  110020000
20540004  0.0520780  rho  110030000
20540005  0.0520780  rho  110040000
20540006  0.0520780  rho  110050000

```

2054007	0.0520780	rho	110060000	
2054008	0.0520780	rho	110070000	
2054009	0.0381645	rho	110080000	
2054010	0.0451975	rho	110090000	
2054011	0.0733525	rho	110100000	
*				
20540100	lplmas	sum .028316845	0.0	1 * lower plenum
*				* mass (kg)
20540101	0.0	0.2381304	rho	120010000
20540102		0.2328024	rho	130010000
20540103		0.1229966	rho	140010000
*				
20540200	coremas	sum .028316845	0.0	1 * core mass (kg)
*				
20540201	0.0	0.0607520	rho	150010000
20540202		0.0607520	rho	150020000
20540203		0.0607520	rho	150030000
20540204		0.0607520	rho	150040000
20540205		0.0607520	rho	150050000
20540206		0.0607520	rho	150060000
*				
20540300	uplmas	sum .028316845	0.0	1 * upper plenum
*				* mass (kg)
20540301	0.0	0.0579072	rho	161010000
20540302		0.1260044	rho	162010000
20540303		0.1223341	rho	163010000
20540304		0.1445850	rho	164010000
*				
20540400	uphdmas	sum .028316845	0.0	1 * upper head
*				* mass (kg)
20540401	0.0	0.0236441	rho	191010000
20540402		0.1028720	rho	192010000
20540403		0.1854233	rho	193010000
20540404		0.1777042	rho	194010000
*				
20540500	byscgt	sum .028316845	0.0	1 * bypass line,
*				* support columns,
20540501	0.0	0.0025551	rho	181010000
20540502		0.0032783	rho	181020000
20540503		0.0142473	rho	182010000
20540504		0.0087675	rho	183010000
20540505		0.0111809	rho	184010000
20540506		0.0052981	rho	185010000
20540507		0.0298418	rho	186010000
*				
20540600	pzmass	sum .028316845	0.0	1 * pressurizer
*				* mass (kg)
20540601	0.0	0.0033454	rho	997010000
20540602		0.0042156	rho	997020000
20540603		0.0030333	rho	997030000
20540604		0.1731566	rho	999010000
20540605		0.1842654	rho	999020000
20540606		0.1842654	rho	999030000
20540607		0.1842654	rho	999040000
20540608		0.1842654	rho	999050000
20540609		0.1842654	rho	999060000
20540610		0.1857634	rho	999070000
20540611		0.1120170	rho	999080000

*				
20540700	ihotmas	sum .028316845	0.0	1 * intact loop
*				* hot leg
20540701	0.0	0.1047757	rho	201010000
20540702		0.0776879	rho	201020000
20540703		0.0675653	rho	202010000
20540704		0.0553702	rho	203010000
20540705		0.0574572	rho	203020000
20540706		0.0538994	rho	203030000
20540707		0.0478580	rho	210010000
20540708		0.0345745	rho	215010000
*				
20540800	itnlmas	sum .028316845	0.0	1 * intact loop
*				* n-tube
20540801	0.0	0.1571175	rho	220010000
20540802		0.1562943	rho	220020000
20540803		0.1562943	rho	220030000
20540804		0.1322144	rho	220040000
20540805		0.1322144	rho	220050000
20540806		0.1562943	rho	220060000
20540807		0.1562943	rho	220070000
20540808		0.1571175	rho	220080000
*				
20540900	icldmas	sum .028316845	0.0	1 * intact loop
*				* cold leg
20540901	0.0	0.0345748	rho	225010000
20540902		0.0478680	rho	230010000
20540903		0.0374799	rho	240010000
20540904		0.0902957	rho	240020000
20540905		0.0849051	rho	240030000
20540906		0.0713212	rho	240040000
20540907		0.0863894	rho	240050000
20540908		0.0374835	rho	240060000
20540909		0.0374835	rho	240070000
20540910		0.0863894	rho	240080000
20540911		0.1036356	rho	240090000
20540912		0.0558400	rho	250010000
20540913		0.0779669	rho	261010000
20540914		0.0779669	rho	261020000
20540915		0.0779669	rho	262010000
20540916		0.0545113	rho	263010000
*				
20541000	bhotmas	sum .028316845	0.0	1 * broken loop
*				* hot leg
20541001	0.0	0.0584279	rho	301010000
20541002		0.0215803	rho	301020000
20541003		0.0215803	rho	301030000
20541004		0.0266031	rho	301040000
20541005		0.0230250	rho	301050000
20541006		0.0192876	rho	301060000
20541007		0.0495847	rho	310010000
20541008		0.0115250	rho	315010000
*				
20541100	btlnmas	sum .028316845	0.0	1 * broken loop
*				* n-tube
20541101	0.0	0.0471739	rho	320010000
20541102		0.0454080	rho	320020000
20541103		0.0454080	rho	320030000

```

20541104      0.0456672 rho 320040000
20541105      0.0456672 rho 320050000
20541106      0.0454360 rho 320060000
20541107      0.0454360 rho 320070000
20541108      0.0471739 rho 320080000
*
20541200 beldaas sum .028316245 0.0 1 * broken loop
*
20541201 0.0 0.0115250 rho 325010000 * cold leg
20541202 0.0495847 rho 330010000 * mass (kg)
20541203 0.0156764 rho 340010000
20541204 0.0228420 rho 340020000
20541205 0.0160501 rho 340030000
20541206 0.0482662 rho 340040000
20541207 0.0419519 rho 340050000
20541208 0.0099184 rho 340060000
20541209 0.0099184 rho 340070000
20541210 0.0522349 rho 340080000
20541211 0.0224253 rho 340090000
20541212 0.0303500 rho 350010000
20541213 0.0192357 rho 361010000
20541214 0.0160867 rho 362010000
20541215 0.0227915 rho 363010000
20541216 0.0479251 rho 363020000
*
20541300 pcsmass sum 1.0 0.0 1 * total primary
*
20541301 0.0 1.00 ctrlvar 400 * coolant system
20541302 1.00 ctrlvar 401 * mass (kg)
20541303 1.00 ctrlvar 402
20541304 1.00 ctrlvar 403
20541305 1.00 ctrlvar 404
20541306 1.00 ctrlvar 405
20541307 1.00 ctrlvar 406
20541308 1.00 ctrlvar 407
20541309 1.00 ctrlvar 408
20541310 1.00 ctrlvar 409
20541311 1.00 ctrlvar 410
20541312 1.00 ctrlvar 411
20541313 1.00 ctrlvar 412
*
*****
* ctrlvar delta p (kpa) *
*****
*
* name type scale init val flg
20550100 vessdp sum 1.0e-3 100.0 1 * vessel level dp
*
20550101 0.0 1.0 p 120010000 0.3303 rho 120010000 * -13 to -578 cm
20550102 -1.0 p 163010000 -3.3898 rho 163010000
*
* name type scale init val flg
20550200 coredp sum 1.0e-3 100.0 1 * core level dp
*
20550201 0.0 1.0 p 140010000 -1.9198 rho 140010000 * -105 to -501 cm
20550202 -1.0 p 161010000 0.9447 rho 161010000
*
* name type scale init val flg

```

```

20550300 dwncdp sum 1.0e-3 100.0 1 * dwnc level dp
*
20550301 0.0 1.0 p 120010000 0.3303 rho 120010000 * 29 to -578 cm
20550302 -1.0 p 101010000 2.8420 rho 101010000
*
* name type scale init val flg
20550400 vesscp sum 1.0e-3 100.0 1 * vessel upper
*
20550401 0.0 1.0 p 163010000 3.3898 rho 163010000 * plenum dp
20550402 -1.0 p 164010000 3.6364 rho 164010000 * 135 to -13 cm
*
* name type scale init val flg
20550500 vesshdp sum 1.0e-3 100.0 1 * vessel upper
*
20550501 0.0 1.0 p 191010000 0.3256 rho 191010000 * head dp
20550502 -1.0 p 194010000 4.0503 rho 194010000 * 421 to 160 cm
*
* name type scale init val flg
20550600 prcdp sum 1.0e-3 100.0 1 * pressurizer
*
20550601 0.0 1.0 p 999080000 1.8327 rho 999080000 * 632 to 30 cm
20550602 -1.0 p 999010000 4.3145 rho 999010000
*
* name type scale init val flg
20550700 isgndp sum 1.0e-3 100.0 1 * ilsg upside
*
20550701 0.0 1.0 p 210010000 -0.5900 rho 210010000 * 926 to -57e cm
20550702 -1.0 p 220040000 9.8588 rho 220040000
*
* name type scale init val flg
20550800 isghndp sum 1.0e-3 100.0 1 * ilsg downside
*
20550801 0.0 1.0 p 230010000 -0.5900 rho 230010000 * 926 to -57x cm
20550802 -1.0 p 220050000 9.8588 rho 220050000
*
* name type scale init val flg
20550900 ipsdndp sum 1.0e-3 100.0 1 * il pump section
*
20550901 0.0 0.5 p 240060000 0.5115 rho 240060000 * downside
20550902 0.5 p 240070000 0.5115 rho 240070000 * -57x to il4
20550903 -1.0 p 230010000 0.5900 rho 230010000
*
* name type scale init val flg
20551000 ipsupdp sum 1.0e-3 100.0 1 * il pump section
*
20551001 0.0 0.5 p 240060000 0.5115 rho 240060000 * upside
20551002 0.5 p 240070000 0.5115 rho 240070000 * il4 to il6
20551003 -1.0 p 240090000 4.3006 rho 240090000
*
* name type scale init val flg
20551100 bsgndp sum 1.0e-3 100.0 1 * blsg upside
*
20551101 0.0 1.0 p 310010000 -0.8393 rho 310010000 * 925 to -57e
20551102 -1.0 p 320040000 10.0822 rho 320040000

```

```

*
*      name  type  scale  init val  flg
20551200  bsgndp  sum  1.0e-3  100.0  1  * blsg downside
*
*      name  type  scale  init val  flg
20551201  0.0  1.0  p  330010000  -0.8393  rho  330010000
20551202  -1.0  p  320050000  10.0822  rho  320050000
*
*      name  type  scale  init val  flg
20551300  bpsndp  sum  1.0e-3  100.0  1  * bl pump section
*
*      name  type  scale  init val  flg
20551301  0.0  0.5  p  340060000  0.4829  rho  340060000
20551302  0.5  p  340070000  0.4829  rho  340070000
20551303  -1.0  p  330010000  0.8393  rho  330010000
*
*      name  type  scale  init val  flg
20551400  bpsrpd  sum  1.0e-3  100.0  1  * bl pump section
*
*      name  type  scale  init val  flg
20551401  0.0  0.5  p  340060000  0.4829  rho  340060000
20551402  0.5  p  340070000  0.4829  rho  340070000
20551403  -1.0  p  340090000  0.6504  rho  340090000
*
*      name  type  scale  init val  flg
20551500  ilsgrip  sum  1.0e-3  100.0  1  * ilsg riser
*
*      name  type  scale  init val  flg
20551501  0.0  1.0  p  600010000  3.1356  rho  600010000
20551502  -1.0  p  602010000  7.8576  rho  602010000
*
*      name  type  scale  init val  flg
20551600  ilsgtdp  sum  1.0e-3  100.0  1  * ilsg downcomer
*
*      name  type  scale  init val  flg
20551601  0.0  1.0  p  603040000  6.9282  rho  603040000
20551602  -1.0  p  602010000  7.8576  rho  602010000
*
*      name  type  scale  init val  flg
20551700  blsgrip  sum  1.0e-3  100.0  1  * blsg riser
*
*      name  type  scale  init val  flg
20551701  0.0  1.0  p  716010000  2.3040  rho  716010000
20551702  -1.0  p  703010000  0.5601  rho  703010000
*
*      name  type  scale  init val  flg
20551800  blsgtdp  sum  1.0e-3  100.0  1  * blsg downcomer
*
*      name  type  scale  init val  flg
20551801  0.0  1.0  p  715010000
20551802  -1.0  p  703010000  0.5601  rho  703010000
*
*      name  type  scale  init val  flg
20551900  blsgtdp  sum  1.0e-3  100.0  1  * blsg dwn horiz
*
*      name  type  scale  init val  flg
20551901  0.0  1.0  p  715010000
20551902  -1.0  p  713010000
*
*
*****
*      ctrlvar collapsed liquid level cm
*****
*

```

```

*      name  type  scale  val0  flg  * vessel clspd
20553100  vescl  div  10204.082  100.  1  * level -13 to
*
*      name  type  scale  val0  flg  * vessel clspd
20553101  rhof  163010000  ctrlvar  501  * -578 ref -578
*
*      name  type  scale  val0  flg  * core clspd
20553200  corecl  div  10204.082  100.  1  * level -105 to
*
*      name  type  scale  val0  flg  * core clspd
20553201  rhof  161010000  ctrlvar  502  * -501 ref -501
*
*      name  type  scale  val0  flg  * dwncom clspd
20553300  dwncomcl  div  10204.082  100.  1  * level 29 to
*
*      name  type  scale  val0  flg  * dwncom clspd
20553301  rhof  101010000  ctrlvar  503  * -578 ref -578
*
*      name  type  scale  val0  flg  * ves up clspd
20553400  vesupcl  div  10204.082  100.  1  * level 135 to
*
*      name  type  scale  val0  flg  * ves up clspd
20553401  rhof  164010000  ctrlvar  504  * -13 ref -13
*
*      name  type  scale  val0  flg  * ves nb clspd
20553500  vesnbcl  div  10204.082  100.  1  * level 421 to
*
*      name  type  scale  val0  flg  * ves nb clspd
20553501  rhof  194010000  ctrlvar  505  * 160 ref 160
*
*      name  type  scale  val0  flg  * prz clspd
20553600  przcl  div  10204.082  100.  1  * level 632 to
*
*      name  type  scale  val0  flg  * prz clspd
20553601  rhof  999010000  ctrlvar  506  * 30 ref 30
*
*      name  type  scale  val0  flg  * ilsg up clspd
20553700  isgupcl  div  10204.082  100.  1  * level 926 to
*
*      name  type  scale  val0  flg  * ilsg up clspd
20553701  rhof  220040000  ctrlvar  507  * -57e ref -57
*
*      name  type  scale  val0  flg  * ilsg dn clspd
20553800  isgdncl  div  10204.082  100.  1  * level 926 to
*
*      name  type  scale  val0  flg  * ilsg dn clspd
20553801  rhof  220050000  ctrlvar  508  * -57x ref -57
*
*      name  type  scale  val0  flg  * ilps dn clspd
20553900  ipsdncl  div  10204.082  100.  1  * level -57x to
*
*      name  type  scale  val0  flg  * ilps dn clspd
20553901  rhof  230010000  ctrlvar  509  * il4 ref il4
*
*      name  type  scale  val0  flg  * ilps up clspd
20554000  ipsupcl  div  10204.082  100.  1  * level il4 to
*
*      name  type  scale  val0  flg  * ilps up clspd
20554001  rhof  240090000  ctrlvar  510  * il6 ref il4

```

```

*
*
*      name type      scale val0 flg * blsg up clspd
20554100 bsgupcl div 10204.082 100. 1 * level 925 to
*      * -57e ref -57
20554101 rhof 320040000 cntrlvar 511
*
*
*      name type      scale val0 flg * blsg dn clspd
20554200 bsgdncl div 10204.082 100. 1 * level 925 to
*      * -57x ref -57
20554201 rhof 320050000 cntrlvar 512
*
*
*      name type      scale val0 flg * blps dn clspd
20554300 bpsdncl div 10204.082 100. 1 * level -57x to
*      * b65 ref b65
20554301 rhof 330010000 cntrlvar 513
*
*
*      name type      scale val0 flg * blps up clspd
20554400 bpsupcl div 10204.082 100. 1 * level b65 to
*      * b73 ref b65
20554401 rhof 340090000 cntrlvar 514
*
*
*      name type      scale val0 flg * ilsg ris clspd
20554500 ilsgrel div 10204.082 100. 1 * level 1117 to
*      * 89 ref 89
20554501 rhof 611010000 cntrlvar 515
*
*
*      name type      scale val0 flg * ilsg dn clspd
20554600 ilsgdcl div 10204.082 100. 1 * level 1117 to
*      * 51 ref 51
20554601 rhof 611010000 cntrlvar 516
*
*
*      name type      scale val0 flg * blsg ris clspd
20554700 blsgrel div 10204.082 100. 1 * level 1186 to
*      * -7 ref -7
20554701 rhof 703010000 cntrlvar 517
*
*
*      name type      scale val0 flg * blsg dn clspd
20554800 blsgdcl div 10204.082 100. 1 * level 1186 to
*      * 18 ref 18
20554801 rhof 703010000 cntrlvar 518
*
*
*      name type      scale val0 flg * blsg dmz clspd
20554900 blsgdcl div 10204.082 100. 1 * level 1036 to
*      * 18 ref 18
20554901 rhof 703010000 cntrlvar 519
*
*****
*
*      name type      scale val0 flg * vessel clspd

```

```

20556100 vesclr sca 1.0 -13.0 1 * level -13 to
*      * -578 ref zero
20556101 -578.0 1.0 cntrlvar 531
*
*
*      name type      scale val0 flg * core clspd
20556200 coreclr sca 1.0 -105.0 1 * level -105 to
*      * -501 ref zero
20556201 -501.0 1.0 cntrlvar 532
*
*
*      name type      scale val0 flg * dwnm clspd
20556300 dwnmclr sca 1.0 +29.0 1 * level 29 to
*      * -578 ref zero
20556301 -578.0 1.0 cntrlvar 533
*
*
*      name type      scale val0 flg * ves up clspd
20556400 vesupclr sca 1.0 +135.0 1 * level 135 to
*      * -13 ref zero
20556401 -13.0 1.0 cntrlvar 534
*
*
*      name type      scale val0 flg * ves dn clspd
20556500 vesdnclr sca 1.0 +421.0 1 * level 421 to
*      * 160 ref zero
20556501 160.0 1.0 cntrlvar 535
*
*
*      name type      scale val0 flg * prz clspd
20556600 przclr sca 1.0 +632.0 1 * level 632 to
*      * 30 ref zero
20556601 30.0 1.0 cntrlvar 536
*
*
*      name type      scale val0 flg * ilsg up clspd
20556700 isgupclr sca 1.0 +926.0 1 * level 926 to
*      * -57e ref zero
20556701 -57.0 1.0 cntrlvar 537
*
*
*      name type      scale val0 flg * ilsg dn clspd
20556800 isgdncr sca 1.0 +926.0 1 * level 926 to
*      * -57x ref zero
20556801 -57.0 1.0 cntrlvar 538
*
*
*      name type      scale val0 flg * ilps dn clspd
20556900 ipsdnclr sca 1.0 203.6 1 * level -57x to
*      * i14 ref zero
20556901 -281.3 1.0 cntrlvar 539
*
*
*      name type      scale val0 flg * ilps up clspd
20557000 ipsupclr sca 1.0 0.0 1 * level i14 to
*      * i16 ref zero
20557001 -281.3 1.0 cntrlvar 540
*

```

```

*
*      name type      scale val0 flg * blsg up clspd
20557100 bsgupclr sum      1.0 +925.0 1 * level 925 to
*
*      * -57e ref zero
20557101 -57.0 1.0 ctrlvar 541
*
*
*
*      name type      scale val0 flg * blsg dn clspd
20557200 bsgdnclr sum      1.0 +925.0 1 * level 925 to
*
*      * -57x ref zero
20557201 -57.0 1.0 ctrlvar 542
*
*
*
*      name type      scale val0 flg * blps dn clspd
20557300 bpsdnclr sum      1.0 203.6 1 * level -57x to
*
*      * b65 ref zero
20557301 -279.8 1.0 ctrlvar 543
*
*
*
*      name type      scale val0 flg * blps up clspd
20557400 bpsupclr sum      1.0 0.0 1 * level b65 to
*
*      * b73 ref zero
20557401 -279.8 1.0 ctrlvar 544
*
*
*
*      name type      scale val0 flg * ilsg ris clspd
20557500 ilsgclr sum      1.0 +1117.0 1 * level 1117 to
*
*      * 83 ref zero
20557501 89.2 1.0 ctrlvar 545
*
*
*
*      name type      scale val0 flg * ilsg dwn clspd
20557600 ilsgdclr sum      1.0 +1117.0 1 * level 1117 to
*
*      * 51 ref zero
20557601 50.5 1.0 ctrlvar 546
*
*
*
*      name type      scale val0 flg * blsg ris clspd
20557700 blsgclr sum      1.0 +1186.0 1 * level 1186 to
*
*      * -7 ref zero
20557701 -7.0 1.0 ctrlvar 547
*
*
*
*      name type      scale val0 flg * blsg dwn clspd
20557800 blsgdclr sum      1.0 +1186.0 1 * level 1186 to
*
*      * 18 ref zero
20557801 16.51 1.0 ctrlvar 548
*
*
*
*      name type      scale val0 flg * blsg dmhz clspd
20557900 blsgdclr sum      1.0 0.0 1 * level 1036 to
*
*      * 18 ref zero
20557901 16.51 1.0 ctrlvar 549
*
*****
*      control block for core power
*
*****

```

```

20515000 dcypower function 2.1800000 0.0 1 * mw
20515001 time 0 150
*
*
20515100 actpower sea 1.0 0.0 1
20515101 0.0 1.0 ctrlvar 150 * watts
*
*
*****
*      control block for pressurizer heater rods
*
*****
*
20599500 varpower function 1.0 0.0 1 * mw
20599501 time 0 999
*
*
20599900 parpower sum 1.0 0.0 1
20599901 0.0 1.0 ctrlvar 995 * watts
*
*****
*      internal per heater controls ( ref gvj-9-82)
*
*****
**
*20599000 t698 tripunit 1.0 0.0 1
*20599001 698
**
*20599100 onoffhrs sum 875.0 0.0 1
*20599101 0.0 1.0 ctrlvar 990
**
*20599200 t495 tripunit 1.0 0.0 1
*20599201 495
**
*20599300 t497 tripunit 1.0 0.0 1
*20599301 497
**
*20599400 t699 tripunit 1.0 0.0 1
*20599401 699
**
*20599500 proppwr1 sum 250.0 0.0 1
*20599501 0.0 1.0 ctrlvar 993
**
*20599600 intermed sum 1.25e-3 0.0 1
*20599601 15.6e6 -1.0 p 999010000
**
*20599700 proppwr2 mult 1.0 0.0 1
*20599701 ctrlvar 994 ctrlvar 996 ctrlvar 992
**
*20599800 pzrinthtrs sum 1.0 0.0 1
*20599801 0. 1.0 ctrlvar 995 1.0 ctrlvar 997 1.0 ctrlvar 991
*
*
*****
*      control block for pressurizer level
*
*****
*
* obtain specified and maintain constant mass in the pressurizer
*
20598000 t429 tripunit 1.0 0.0 1
20598001 429
*

```

```

20598100 pzerr sum 0.01 0.0 1 * input desired
* ejl
20598101 484.0 -1.0 ctrlvar 6
*20598101 132.3 -1.0 ctrlvar 6 * level in cm
*
20598200 pzcorr mult 1.0 0.0 0 * correct level in
20598201 ctrlvar 980 ctrlvar 981 * pzr until t529
*
20598500 pzrv mult .0066805 0.0 0 * pressurizer
20598501 rho 99970000 ctrlvar 982 * feed flow rate
*
*****
* control block for pumps *
*****
*
***** steady state *****
*
*intact loop pump speed --- input desired intact loop flow rate (kg/s)*
20525000 ilmerr sum 1.0 0.0 1
20525001 7.05000 -1.0 mflowj 163010000
*
20525100 ilpspd integral 20.0 1873.37 1
20525101 ctrlvar 250
*
*broken loop pump speed --- input desired broken loop flow rate (kg/s)*
20535000 blmerr sum 1.0 0.0 1
20535001 2.47500 -1.0 mflowj 163020000
*
20535100 blpspd integral 60.0 1492.32 1
20535101 ctrlvar 350
*
***** transient *****
*
* intact loop
*
*20525100 ilpspd function 1873.37 0.0 1 * from ctrlvar 251
*20525101 time 0 250 * in steady-state
*
* broken loop
*
*20535100 blpspd function 1492.32 0.0 1 * from ctrlvar 351
*20535101 time 0 350 * in steady state
*
*****
* control block for steam generators *
*****
* obtain specified and maintain constant mass in the steam generators
*
20560600 t419 tripmit 1.0 0.0 1
20560601 419
*
20560700 ilmerr sum 1.0 0.0 1 * input desired ilsg
20560701 103.0 -1.0 ctrlvar 21 * liquid mass in kg
*
20560800 ilmcrr mult 1.0 0.0 0 * correct mass in
20560801 ctrlvar 606 ctrlvar 607 * ilsg until t519

```

```

*
20560900 ilsgls sum 1.0 0.0 0 * mass flow out ilsg
20560901 0.0 1.0 mflowj 635000000
*20560902 1.0 mflowj 637000000
*
20561000 ilsgfw sum 1.0 0.0 0 * intact loop
20561001 0.0 1.0 ctrlvar 608 * feed flow rate
20561002 1.0 ctrlvar 609
*
20562000 ircrr div 1.0 0.0 1 * recirc ratio
20562001 mflowj 601010000 mflowj 601020000
*
20562500 icrr div 1.0 0.0 1 * circulation ratio
20562501 mflowj 601010000 mflowj 601030000
*
*
20570600 t419 tripmit 1.0 0.0 1
20570601 419
*
20570700 blmerr sum 1.0 0.0 1 * input desired blsg
20570701 26.0 -1.0 ctrlvar 24 * liquid mass in kg
*
20570800 blmcrr mult 1.0 0.0 0 * correct mass in
20570801 ctrlvar 706 ctrlvar 707 * blsg until t519
*
20570900 blsgls sum 1.0 0.0 0 * mass flow out blsg
20570901 0.0 1.0 mflowj 735000000
*20570902 1.0 mflowj 737000000
*
20571000 blsgfw sum 1.0 0.0 0 * broken loop
20571001 0.0 1.0 ctrlvar 708 * feed flow rate
20571002 1.0 ctrlvar 709
*
20572000 brcrr div 1.0 0.0 1 * recirc ratio
20572001 mflowj 704010000 mflowj 713030000
*
20572500 bcrr div 1.0 0.0 1 * circulation ratio
20572501 mflowj 704010000 mflowj 701010000
*
* control intact loop steam valve to hold steam dome pressure in
* band given by trips 462 and 463 - open and close steam valve at
* rates given in trips 464 and 465 - open or close depending on
* trips 662 and 663
*
20563000 perr sum -1.0 0.0 1 * desired pressure
20563001 6.27e6 -1.0 p 611010000 * pascals - mid band
*
20563100 dperr diffrend 1.0 0.0 1
20563101 ctrlvar 630
*
20563200 posdpdt tripmit 1.0 0.0 1
20563201 662
*
20563300 negdpdt tripmit 1.0 0.0 1
20563301 663
*
20563400 open mult 1.0 0.0 1

```

```

20563401  ctrlvar  630  ctrlvar  632
*
20563500  close mult  1.0  0.0  1
20563501  ctrlvar  630  ctrlvar  633
*
20563600  rate sum  1.e-8  0.0  0
20563601  0.0  1.0  ctrlvar  634
20563602  1.0  ctrlvar  635
*
20563700  posn integral 1.0  0.294688  0
20563701  ctrlvar  636
*
*
* control broken loop steam valve to hold steam dome pressure in
* band given by trips 472 and 473 - open and close steam valve at
* rates given in trips 474 and 475 - open or close depending on
* trips 672 and 673
*
20573000  perr sum  -1.0  0.0  1 * desired pressure
20573001  6.23e5 -1.0  p  705010000 * pascals - mid band
*
20573100  dperr diffrend 1.0  0.0  1
20573101  ctrlvar  730
*
20573200  posdpdt tripmit 1.0  0.0  1
20573201  672
*
20573300  negdpdt tripmit 1.0  0.0  1
20573301  673
*
20573400  open mult  1.0  0.0  1
20573401  ctrlvar  730  ctrlvar  732
*
20573500  close mult  1.0  0.0  1
20573501  ctrlvar  730  ctrlvar  733
*
20573600  rate sum  4.e-9  0.0  0
20573601  0.0  1.0  ctrlvar  734
20573602  1.0  ctrlvar  735
*
20573700  posn integral 1.0  0.04367422  0
20573701  ctrlvar  736
*
*****
* vessel, downcomer, and upper head external heaters *
*****
*
20520000  pwrbase function 1.0  0.0  0
20520001  time  0  116
*
20520100  vsipwr mult  1.0  1.0  0
20520101  ctrlvar  200
*
20520200  mbtrip tripmit 1.0  0.0  1
20520201  640
*
20520300  wttrip tripmit 1.0  0.0  1
20520301  641

```

```

*
20520400  mbtrip tripmit 1.0  0.0  1
20520401  642
*
20520500  invwt sum  1.0  1.0  1
20520501  1.0  -1.0  ctrlvar  202
*
20520600  invwt sum  1.0  -1.0  1
20520601  1.0  -1.0  ctrlvar  203
*
20520700  invwt sum  1.0  1.0  1
20520701  1.0  -1.0  ctrlvar  204
*
20520800  mbpwr mult  0.13193 1.0  1
20520801  ctrlvar  201  ctrlvar  205
*
20520900  vspwra mult  0.06597 1.0  1
20520901  ctrlvar  201
*
20521000  vspwrh mult  0.01003 1.0  1
20521001  ctrlvar  201  ctrlvar  202
*
20521100  vspwrh sum  1.0  1.0  1
20521101  0.0  1.0  ctrlvar  209
*20521102  1.0  ctrlvar  210
*
20521200  vspwr mult  1.0  1.0  1
20521201  ctrlvar  211  ctrlvar  206
*
20521300  vspwra mult  0.17589 1.0  1
20521301  ctrlvar  201
*
20521400  vspwrh mult  0.02673 1.0  1
20521401  ctrlvar  201  ctrlvar  202
*
20521500  vspwrc mult  0.01667 1.0  1
20521501  ctrlvar  201  ctrlvar  203
*
20521600  vspwrh sum  1.0  1.0  1
20521601  0.0  1.0  ctrlvar  213
*20521602  1.0  ctrlvar  214
*20521603  1.0  ctrlvar  215
*
20521700  vspwr mult  1.0  1.0  1
20521701  ctrlvar  216  ctrlvar  207
*
20521800  vspwra mult  0.62621 1.0  1
20521801  ctrlvar  201
*
20521900  vspwrh mult  0.09517 1.0  1
20521901  ctrlvar  201  ctrlvar  202
*
20522000  vspwrc mult  0.05933 1.0  1
20522001  ctrlvar  201  ctrlvar  203
*
20522100  vspwrh mult  0.21929 1.0  1
20522101  ctrlvar  201  ctrlvar  204
*

```

```

20522200 vspwr sum 1.0 1.0 1
20522201 0.0 1.0 ctrlvar 218
*20522202 1.0 ctrlvar 219
*20522203 1.0 ctrlvar 220
*20522204 1.0 ctrlvar 221
*
*
20522300 vtrip tripunit 1.0 0.0 1
20522301 643
*
*
20522400 invst sum 1.0 1.0 1
20522401 1.0 -1.0 ctrlvar 223
*
*
20522500 vspwr mult 1.0 1.0 1
20522501 ctrlvar 222 ctrlvar 224
*
*****
* heat loss monitoring block *
*****
*
20580000 htloss sum 1.0 0.0 1
20580001 0. 1.0 q 800010000
20580002 1.0 q 801010000
20580003 1.0 q 802010000
20580004 1.0 q 803010000
20580005 1.0 q 804010000
20580006 1.0 q 805010000
20580007 1.0 q 806010000
20580008 1.0 q 807010000
20580009 1.0 q 808010000
20580010 1.0 q 809010000
20580011 1.0 q 810010000
20580012 1.0 q 812010000
20580013 1.0 q 813010000
20580014 1.0 q 814010000
20580015 1.0 q 815010000
20580016 1.0 q 816010000
*
* int brk
*
20505100 inthrk integral 1.0 0.0 0
20505101 mflowj 725000000
*
* run statistics
*
20507800 oldtime sum 1.0 0.0 0
20507801 0.0 1.0 ctrlvar 79
*
*
20507900 newtime sum 1.0 0.0 0
20507901 0.0 1.0 time 0.0
*
*
20508100 tstep sum 1.0 0.0 0
20508101 0.0 -1.9 ctrlvar 78
20508102 1.0 ctrlvar 79
*
* minor edit
*
0000301 mflowj 725000000 * mbrk (kg/s) (mdot+break)

```

```

0000302 p 162010000 * prup (Pa) (prup-13)
0000303 ctrlvar 6 * pr level (lprz+process)
0000304 p 999010000 * pr pressure (p-prz+532)
0000305 ctrlvar 150 * deacy power (dcypower)
0000306 mflowj 262010000 * ihl flowrate (qi+1)
0000307 mflowj 362010000 * bhl flowrate (qb+79)
0000308 mflowj 635000000 * il steam rate (mdot+ilsta)
0000309 mflowj 735000000 * bl steam rate (mdot+blsta)
0000310 p 601010000 * il sg pressure (pis+1117)
0000311 p 701010000 * bl sg pressure (pbs+1186)
0000312 ctrlvar 15 * il sg level (lip+971-57e)
0000313 ctrlvar 17 * bl sg level (lbp+993-57e)
0000314 mflowj 634000000 * il sg adv rate (mdot+iladv)
0000315 mflowj 734000000 * bl sg adv rate (mdot+bladv)
0000316 mflowj 430010000 * il acc rate (mdot+il+acca)
0000317 mflowj 530010000 * bl acc rate (mdot+bl+acca)
0000318 ctrlvar 510 * il pump up dp (dpi+14b+16)
0000319 ctrlvar 514 * bl pump up dp (dps+65+73a)
0000320 rho 363020000 * density blcl (rb+79a)
0000321 mflowj 110010000 * downcomer rate (q+dc-423)
0000322 ctrlvar 1 * core level (lv-13a-578)
0000323 htemp 15000612 * pct (thr+peak)
0000324 dt 0 * time step
*0000324 ctrlvar 81 * time step
0000325 cptime * cptime
0000326 ctrlvar 51 * int brk mass
0000327 mflowj 610000000 * il sgzi
0000328 mflowj 722000000 * bl sgzi
0000329 mflowj 615000000 * il sg2 aux
0000330 mflowj 728000000 * bl sg2 aux
0000331 voidf 220010000 * il sgl
0000332 voidf 220020000
0000333 voidf 220030000
0000334 voidf 220040000
0000335 voidf 320010000 * bl sgl
0000336 voidf 320020000
0000337 voidf 320030000
0000338 voidf 320040000
0000339 voidf 240080000 * il pump up
0000340 voidf 240090000
0000341 voidf 340080000 * bl pump up
0000342 voidf 340090000
0000343 voidf 150010000 * core void
0000344 voidf 150020000
0000345 voidf 150030000
0000346 voidf 150040000
0000347 voidf 150050000
0000348 voidf 150060000
0000349 pcpvel 250 * il pump vel
0000350 pcpvel 350 * bl pump vel
0000351 htemp 15000118 * core bot temp
0000352 htemp 150001218 * core top temp
0000353 tempf 162010000 * core up l temp
0000354 tempf 140010000 * core dn l temp
0000355 htemp 15000618
0000356 htemp 15000718
0000357 htemp 15000818
0000358 htemp 15000918

```

```
0000359 http 150001018
0000360 http 150001118
0000361 void 361010000
0000362 ctrlvar 21 * il sg total mass
0000363 ctrlvar 24 * bl
*
. *** end of relap5 mod3 input dek ***
```

```

= relap5 model for the semiscale fs-11 posttest - transient run
*
*problem      type  option
0000100      restart  transt
*
*      inp-chk or  run
0000101      run
*
*units      input  output (si or british)
0000102      british  si
*
0000103 3592 * sfsb.out & sfsb.rst
*
*      t end  min st  max st  st cl  nr  nj  wr
*
0000201 1000.0 1.0e-7 1.0 3 10 200 800 * blowdown phase
*
* isolate the break valve at 4100 sec
*
0000434 time 0 le null 0 4100.0 n -1.0
0000602 434 and 434 n -1.
*
7250000 brk-rlv valve
7250101 720000000 790000000 0.000314159 0.0 0.0 0100 * ejl
7250102 0.90 0.80 * ejl
7250201 1 0.0 0.0 0.0
7250300 trprlv
7250301 602
*
* cross valve
*
6370000 ilcnj sagljm
6370101 611010000 647000000 0.003003 0.0 0.0 000
6370201 0 0.0 0.0 0.0
*
* il steam dome cross connection pipe to bl steam dome
*
6470000 ilcnp pipe
6470001 3
6470101 0.003003 3
6470301 18.0 1
6470302 14.0 2
6470303 19.7304167 3
6470601 -90.0 1
6470602 0.0 2
6470603 90.0 3
6470701 -18.0 1
6470702 0.0 2
6470703 19.7304167 3
6470801 6.667e-5 0.0 3
6471001 0 3
6471101 0 2
6471201 2 829.6 0.0 0.0 0.0 0
6471202 2 829.6 0.0 0.0 0.0 0 2
6471203 2 829.6 0.0 0.0 0.0 0 3
6471300 0
6471301 0.0 0.0 0.0 2

```

```

*
* close the cross valve at 200 sec
*
0000435 time 0 lt null 0 200.0 n -1.0
0000624 402 and 435 n -1. * ejl 910423
0000625 -624 or -624 n -1.
*
6700000 ilble valve
6700101 647010000 746010000 0.000661 0.0 0.0 100
6700201 1 0.0 0.0 0.0
6700300 wtrvlv
6700301 624 625 1.0 0.0 0
*
7370000 blcnj sagljm
7370101 705010000 746000000 0.003003 0.0 0.0 100
7370201 0 0.0 0.0 0.0
*
7460000 blcnp pipe
7460001 1
7460101 0.003003 1
7460301 7.0 1
7460601 0.0 1
7460701 0.0 1
7460801 6.667e-5 0.0 1
7461001 0 1
7461201 2 675.9 0.0 0.0 0.0 0 1
*
* phase 1
* open break valve
0000402 time 0 ge null 0 0.0 1 -1.
* scram
0000404 p 999010000 ge null 0 2287.5 1 -1.
* msiv close
0000410 time 0 ge timeof 404 4.0 1 -1.
0000411 time 0 ge timeof 404 4.0 1 -1.
* rcp coastdown
0000412 time 0 ge timeof 404 2.0 1 -1.
0000413 time 0 ge timeof 404 2.0 1 -1.
* power decay
0000409 time 0 ge timeof 404 3.2 1 -1.
* sis
0000407 p 700010000 le null 0 635.5 n -1.
* hpis
0000450 time 0 ge timeof 407 25.0 1 -1.
0000451 ctrlrvar 6 le null 0 235.0 n -1.
0000608 450 or 451 n -1. * ejl
* main feedwater stop
*0000414 time 0 ge timeof 407 0.0 1 -1.
0000414 time 0 ge null 0 1.0 1 -1.
*0000415 time 0 ge timeof 407 0.0 1 -1.
0000415 time 0 ge null 0 1.0 1 -1.
* aux feedwater initiated
*0000416 time 0 ge timeof 407 4.0 1 -1.
0000416 time 0 ge timeof 407 5.0 1 -1.0
*0000417 time 0 ge timeof 407 4.0 1 -1.
0000426 ctrlrvar 15 lt null 0 955. n -1. * auxfeed on
0000445 time 0 ge null 0 600.0 n -1.0

```

```

0000611 445 and 426 n -1.
0000612 416 and 416 n -1.
*
0000616 407 and 407 n -1.
0000617 407 and 407 n -1.
*
* phase 2
*
* open letdown valve
0000453 ctrlrvar 30 ge null 0 33.0 n -1.
0000455 ctrlrvar 6 ge null 0 255.0 n -1. * open ldn vv EOS
0000456 ctrlrvar 6 le null 0 235.0 n -1. * open chg vv
*
0000651 456 and 456 n -1.
0000657 453 and 455 n -1.
*
4150000 ilchg twdpjen
4150101 425000000 400000000 0.004995
4150200 1 651
*4150201 0.0 0.0514 0.0 0.0
*4150202 1800.0 0.0514 0.0 0.0
*4150203 2000.0 0.0514 0.0 0.0
*4150204 2500.0 0.0514 0.0 0.0
4150201 -1.0 0.0 0.0 0.0
4150202 0.0 0.023 0.0 0.0
4150203 1000.0 0.023 0.0 0.0
4150204 1001.0 0.0 0.0 0.0
*4150205 300.0 0.0 0.0 0.0
*
4250000 ilchgv twdpvol
4250101 10.0 10.0 0.0 0.0 0.0 0.0
4250102 0.0 0.0 0
4250200 3
4250201 0.0 2500.0 80.0
*
5150000 blchg twdpjen
5150101 525000000 500000000 0.004995
*5150200 1 651 p 361010000
*5150201 0.0 0.00758 0.0 0.0
*5150202 1800.0 0.00758 0.0 0.0
*5150203 2000.0 0.00758 0.0 0.0
*5150204 2500.0 0.00758 0.0 0.0
5150200 1 651
5150201 -1.0 0.0 0.0 0.0
5150202 0.0 0.00758 0.0 0.0
5150203 1000.0 0.00758 0.0 0.0
5150204 1001.0 0.0 0.0 0.0
*5150205 300.0 0.0 0.0 0.0
*
5250000 blchgv twdpvol
5250101 10.0 10.0 0.0 0.0 0.0 0.0
5250102 0.0 0.0 0
5250200 3
5250201 0.0 2500.0 80.0
*
* subcooled margin control
*

```

```

20503000 subca sca 1.0 0.0 0
20503001 0.0 1.0 sattemp 99990000
20503002 -1.0 tempf 201010000
*
2450000 letdown twdpjen
2450101 251010000 245000000 0.004995
2450200 1 657
2450201 -1.0 0.0 0.0 0.0
2450202 0.0 0.024 0.0 0.0
2450203 1000.0 0.024 0.0 0.0
2450204 1001.0 0.0 0.0 0.0
*
2460000 letdmsk twdpvol
2460101 1.0 1.0 0.0 0.0 0.0 0.0
2460102 4.0-5 0.0 00
2460200 3
2460201 0.0 18.0 100.0
* adv control
0000452 p 630010000 ge null 0 1000.0 n -1.
0000454 ctrlrvar 16 ge null 0 955.0 n -1.
0000661 452 and 454 n -1.
0000671 452 and 454 n -1.
*
* phase 3 refill
*
*
* change hpis performance data p37, eos
*
4100000 ilhpijs twdpjen
*
* from to jma area
4100101 420000000 400000000 0.0049952
*
* ctl flg trip table volume
4100200 1 608 p 262010000
**
* pres(psia) flow-f flow-g velj
*4100201 -1.0 0.0000 0.0 0.0
*4100202 0.0 0.058626 0.0 0.0
*4100203 50.0 0.057690 0.0 0.0
*4100204 100.0 0.056985 0.0 0.0
*4100205 150.0 0.055847 0.0 0.0
*4100206 200.0 0.054910 0.0 0.0
*4100207 310.0 0.052798 0.0 0.0
*4100208 605.0 0.046988 0.0 0.0
*4100209 865.0 0.041142 0.0 0.0
*4100210 1095.0 0.035287 0.0 0.0
*4100211 1270.0 0.029422 0.0 0.0
*4100212 1490.0 0.023554 0.0 0.0
*4100213 1650.0 0.011784 0.0 0.0
*4100214 1730.0 0.005893 0.0 0.0
*4100215 1775.0 0.0 0.0 0.0
4100201 -1.0 0.0 0.0 0.0
4100202 0.0 0.0 0.0 0.0
4100203 15.0 0.03219 0.0 0.0
4100204 332.25 0.02545 0.0 0.0
4100205 384.51 0.02434 0.0 0.0

```

```

4100206 431.79 0.02559 0.0 0.0
4100207 471.88 0.02400 0.0 0.0
4100208 510.39 0.02538 0.0 0.0
4100209 519.09 0.02371 0.0 0.0
4100210 561.93 0.02375 0.0 0.0
4100211 652.45 0.02531 0.0 0.0
4100212 729.93 0.02516 0.0 0.0
4100213 812.43 0.02329 0.0 0.0
4100214 820.29 0.01873 0.0 0.0
4100215 1123.66 0.01480 0.0 0.0
4100216 1158.0 0.01418 0.0 0.0
4100217 1158.0 0.01184 0.0 0.0
4100218 1348.0 0.00968 0.0 0.0
4100219 1407.0 0.00717 0.0 0.0
4100220 1455.0 0.00450 0.0 0.0
4100221 1560.0 0.0 0.0 0.0
4100222 1600.0 0.0 0.0 0.0
*
5100000 blhpsj tcdpjun
*
*      from      to jun area
5100101 520000000 500000000 0.002695
*
*      ctl flg      trip      table      volume
5100200      1      608      p 361010000
*
*      pres(psia)  flow-f  flow-g  velj
5100201      -1.0  0.00  0.0  0.0
5100202      0.0  0.00  0.0  0.0
5100203      15.0  0.0125 0.0  0.0
5100204      333.57 0.01113 0.0  0.0
5100205      581.36 0.01000 0.0  0.0
5100206      609.77 0.00974 0.0  0.0
5100207      770.0  0.00868 0.0  0.0
5100208      881.0  0.00795 0.0  0.0
5100209      1007.23 0.00705 0.0  0.0
5100210      1024.0  0.00683 0.0  0.0
5100211      1158.0  0.0059 0.0  0.0
5100212      1258.0  0.0051 0.0  0.0
5100213      1348.0  0.0039 0.0  0.0
5100214      1407.0  0.0031 0.0  0.0
5100215      1455.0  0.0019 0.0  0.0
5100216      1560.0  0.00  0.0  0.0
5100217      1600.0  0.00  0.0  0.0
*
6010000 isgdet separatr
6010001 3 0
6010101 0.0 0.7916667 0.4508175 0.0 90.0 0.7916667
6010102 6.667e-5 0.0 0
6010200 2 829.6 0.3
6011101 601010000 612000000 0.4690572 0.0 0.0 0002 0.5
6012101 601000000 602000000 0.4690572 100.0 100.0 0002 0.15
6013101 600010000 601000000 0.5353713 0.0 0.0 0000
6011201 -2.50 1.60 0.0
6012201 1.00 0.00 0.0
6013201 1.60 1.60 0.0
*

```

```

* sfil trip changes
*
0000401 time 0 ge null 0 8000.0 1 -1.0
0000406 time 0 ge null 0 0.0 1 -1.0 * ej1
*
20505100 intbrk integral 1.0 0.0 0
20505101 rflowj 725000000
*
* add pump transient controller
*
20525100 ilpmspd function 1873.37 0.0 1
20525101 time 0 250
20535100 blpmspd function 1492.32 0.0 1
20535101 time 0 350
*
* restart pump
*
0000423 time 0 ge null 0 4400.00 1 -1.0
*
20525200 ilpmsr function 425.0 0.0 1
20525201 time 0 252
*
20225200 reac-t 423
20225201 -1.0 1.0
20225202 0.0 1.0
20225203 100.0 1.0
20225204 400.0 1.0
20225205 401.0 0.0
20225206 499.0 0.0
20225207 500.0 1.0
20225208 400.0 1.0
20225209 5000.0 1.0
*
0000439 time 0 ge null 0 700.0 1 -1.
20599500 varpower function 6.99 0.0 1
20599501 time 0 999
20599900 purpower sw 1.0 0.0 1
20599901 0.0 1.0 ctrlvar 995
20599900 power 439 1.0 1.0e-3
20599901 0.0 1.0
20599901 -1.0 0.0
20599902 0.0 1.0
20599903 300.0 1.0
20599904 301.0 0.0
*
* delete pwr level controller
*
20598000 t419 delete 0.0 0.0 0.0 0.0 0.0 0.0
20598100 pwrerr delete 0.0 0.0 0.0 0.0 0.0 0.0
20598200 pwrerr delete 0.0 0.0 0.0 0.0 0.0 0.0
20598500 pwriv delete 0.0 0.0 0.0 0.0 0.0 0.0
* delete pwr component
+9100000 pwrspv delete
+9200000 pwrspv delete
*
0000418 p 999010000 ge null 0 2250.0 n -1.
9100000 pwrspv tcdpjun

```

```

9100101 92000000 99900000 0.012
9100200 1 418
9100201 -1.0 0.0 0.0 0.0
9100202 0.0 0.0303 0.0 0.0
9100203 3000.0 0.0303 0.0 0.0
9100204 3001.0 0.0 0.0 0.0
*
9200000 prsrsv tndpvol
9200101 0.012 10.0 0.0 0.0 0.0 0.0
9200102 0.0 0.0 0
9200200 3
9200201 0.0 2400.0 80.0
*
9300000 prsrsv delete
9400000 prsdv delete
9500000 prlvlv delete
9550000 prlvlv delete
9590000 c559 delete
9910000 tnd-prz delete
* delete s/g level controller
20560600 t419 delete 0.0 0.0 0.0 0.0 0.0 0.0
20560700 ilmerr delete 0.0 0.0 0.0 0.0 0.0 0.0
20560800 ilmcorr delete 0.0 0.0 0.0 0.0 0.0 0.0
20560900 ilsgls delete 0.0 0.0 0.0 0.0 0.0 0.0
20561000 ilsgfv delete 0.0 0.0 0.0 0.0 0.0 0.0
20562000 icrrcr delete 0.0 0.0 0.0 0.0 0.0 0.0
20562500 icrrcr delete 0.0 0.0 0.0 0.0 0.0 0.0
20570600 t419 delete 0.0 0.0 0.0 0.0 0.0 0.0
20570700 blmerr delete 0.0 0.0 0.0 0.0 0.0 0.0
20570800 blmcorr delete 0.0 0.0 0.0 0.0 0.0 0.0
20570900 blsgls delete 0.0 0.0 0.0 0.0 0.0 0.0
20571000 blsgfv delete 0.0 0.0 0.0 0.0 0.0 0.0
20572000 bcrrcr delete 0.0 0.0 0.0 0.0 0.0 0.0
20572500 bcrrcr delete 0.0 0.0 0.0 0.0 0.0 0.0
20553000 perr delete 0.0 0.0 0.0 0.0 0.0 0.0
20553100 dperr delete 0.0 0.0 0.0 0.0 0.0 0.0
20553200 posdpdt delete 0.0 0.0 0.0 0.0 0.0 0.0
20553300 negdpdt delete 0.0 0.0 0.0 0.0 0.0 0.0
20553400 open delete 0.0 0.0 0.0 0.0 0.0 0.0
20553500 close delete 0.0 0.0 0.0 0.0 0.0 0.0
20553600 rate delete 0.0 0.0 0.0 0.0 0.0 0.0
20553700 posn delete 0.0 0.0 0.0 0.0 0.0 0.0
20573000 perr delete 0.0 0.0 0.0 0.0 0.0 0.0
20573100 dperr delete 0.0 0.0 0.0 0.0 0.0 0.0
20573200 posdpdt delete 0.0 0.0 0.0 0.0 0.0 0.0
20573300 negdpdt delete 0.0 0.0 0.0 0.0 0.0 0.0
20573400 open delete 0.0 0.0 0.0 0.0 0.0 0.0
20573500 close delete 0.0 0.0 0.0 0.0 0.0 0.0
20573600 rate delete 0.0 0.0 0.0 0.0 0.0 0.0
20573700 posn delete 0.0 0.0 0.0 0.0 0.0 0.0
*
* run statistics
*
20507800 oldtime sum 1.0 0.0 0
20507801 0.0 1.0 ctrlvar 79
20507900 newtime sum 1.0 0.0 0
20507901 0.0 1.0 time 0.0

```

```

20508100 timestep sum 1.0 0.0 0
20508101 0.0 -1.0 ctrlvar 78
20508102 1.0 ctrlvar 79
*
6150000 isgafwj tndpjen
6150101 625000000 603010000 0.012
6150200 1 616
6150201 -1.0 0.0 0.0 0.0
6150202 0.0 0.0510 0.0 0.0
6150203 4800.0 0.051 0.0 0.0
6150204 4801.0 0.0 0.0 0.0
*
6340000 isgrv valve * simulated adv
6340101 611010000 640000000 0.0002592 0.0 0.0 100
6340201 1 0.0 0.0 0.0
6340300 trpvlv
6340301 661
*
7280000 bsafwj tndpjen
7280101 725000000 726000000 0.004
7280200 1 617
7280201 -1.0 0.0 0.0 0.0
7280202 0.0 0.030 0.0 0.0
7280203 390.0 0.030 0.0 0.0
7280204 391.0 0.0 0.0 0.0
7280205 4000.0 0.0 0.0 0.0
7280206 4001.0 0.030 0.0 0.0
7280207 6800.0 0.030 0.0 0.0
*
7340000 bsgrv valve * simulated b adv
7340101 705010000 740000000 0.007 0.0 0.0 100
7340201 1 0.0 0.0 0.0
7340300 trpvlv
7340301 671
*
20225100 htrrate 412 1.0 8.8931
20225101 -1.0 1.000
20225102 0.0 1.000
20225103 10.4 0.505
20225104 20.8 0.325
20225105 32.0 0.227
20225106 42.4 0.181
20225107 62.4 0.150
20225108 64.0 0.000
20225109 4000.0 0.000
*
20235100 htrrate 413 1.0 9.1631
20235101 -1.0 1.000
20235102 0.0 1.000
20235103 9.6 0.590
20235104 13.6 0.498
20235105 20.8 0.407
20235106 30.4 0.385
20235107 60.0 0.385
20235108 64.8 0.000
20235109 4000.0 0.000
*

```

```

* lps set point time
0000499 p 999010000 lt null 0 200.0 1 -1.
*
* add sg main fw component
*
6100000 isgfwj tmdpjm
6100101 620000000 603010000 0.012
6100200 1 414
6100201 -1.0 1.80 0.0 0.0 * 91.05.08 ejl
6100202 0.0 1.8078 0.0 0.0
*6100203 24.0 1.8078 0.0 0.0
6100204 26.0 0.0 0.0 0.0
*
7220000 bsgfwj tmdpjm
7220101 724000000 720000000 0.004
7220200 1 415
7220201 -1.0 0.56 0.0 0.0
7220202 0.0 0.56119 0.0 0.0
*7220203 24.0 0.56119 0.0 0.0
7220204 26.0 0.0 0.0 0.0
*
*6350000 isgdj tmdpjm
*6350101 611010000 650000000 0.007
*6350200 1 410
*6350201 -1.0 0.0 0.0 0.0
*6350202 0.0 0.0 1.8 0.0
*6350203 50.0 0.0 1.8 0.0
*6350204 51.0 0.0 0.5 0.0
*6350205 230.0 0.0 0.5 0.0
*6350206 231.0 0.0 0.0 0.0
*
6350000 isgdj valve
6350101 611010000 650000000 0.007 204.67 204.67 100
6350201 1 0.0 1.78476 0.0
6350300 mtrlv
6350301 403 410 .01 0.24367 0
*
7350000 bsgdj valve
7350101 705010000 750000000 0.007 1022.36 1022.36 100
7350201 1 0.0 0.51964 0.0
7350300 mtrlv
7350301 403 411 .2 0.04367 0
*
** trips -- trip cancellation card 400 variable trip cards 401-599 **
** -- trip stop card 600 logical trip cards 601-699 **
0000462 discard
0000463 discard
0000464 discard
0000465 discard
0000662 409 discard
0000663 409 discard
*
0000472 discard
0000473 discard
0000474 discard
0000475 discard
0000672 409 discard

```

```

0000673 409 discard
*
*
* minor edit variables
*
*
0000301 mflowj 725000000 * break flowrate
0000302 p 701010000 * bl sg2 pressure
0000303 p 601010000 * il sg2 pressure
0000304 mflowj 670000000 * sg2 crossoverline flowrate
0000305 cntrlvar 51 * integrated break flow
0000306 cntrlvar 21 * il sg2 mass
0000307 cntrlvar 24 * bl sg2 mass
0000308 rho 720010000 * density before break
0000309 cntrlvar 16 * il sg2dn level
0000310 cntrlvar 18 * bl sg2dn level
0000311 mflowj 635000000 * mlsq2 out
0000312 mflowj 735000000 * nbsq2 out
0000313 mflowj 610000000 * mlsq2 in
0000314 mflowj 722000000 * nbsq2 in
0000315 mflowj 615000000 * il auxfeed
0000316 mflowj 728000000 * bl auxfeed
0000317 mflowj 634000000 * il sg2 adv
0000318 mflowj 734000000 * bl sg2 sdv
0000319 tempf 620010000 * il sg2 fw temp
0000320 tempf 720010000 * bl sg2 fw temp
0000321 voidf 600010000 * il sg2 voidf
0000322 voidf 600020000
0000323 voidf 600030000
0000324 voidf 600040000
0000325 voidf 600050000
0000326 voidf 700010000
0000327 voidf 700020000
0000328 voidf 700030000
0000329 voidf 700040000
0000330 voidf 700050000
0000331 cntrlvar 26 * il sg heat
0000332 cntrlvar 27 * bl sg heat
0000333 cntrlvar 150 * decay power
*
0000341 cntrlvar 6 * pwr level
0000342 p 999080000 * pwr pressure
0000343 cntrlvar 999 * pwr heater power
0000344 mflowj 415000000 * il chg
0000345 mflowj 515000000 * bl chg
0000346 mflowj 245000000 * letdown flowrate
0000347 sattemp 999080000 * pwr sat temp
0000348 tempf 201010000 * ilhl temp
0000349 cntrlvar 30 * subcooled margin
0000350 p 162010000 * upper plenum pressure
0000351 mflowj 410000000 * il hpis
0000352 mflowj 430010000 * il acc
0000353 mflowj 510000000 * bl hpis
0000354 mflowj 530010000 * bl acc
0000355 mflowj 262010000 * il flowrate
0000356 mflowj 362010000 * bl flowrate
0000357 pswvel 250 * il pump velocity

```

```

0000358 pcpvel 350      * bl pcp velocity
0000359 tempf 162010000 * upper plenum temp
0000360 tempf 140010000 * lower plenum temp
0000361 cntrlvar 29      * pct
0000362 voidf 162010000 * upper plenum void
0000363 cntrlvar 81      * time step size
0000364 cptime 0         * cpo time
0000365 cntrlvar 999    * prr power
. $$$$$$$$ ***** end of relap5 input ***** $$$$$$$$

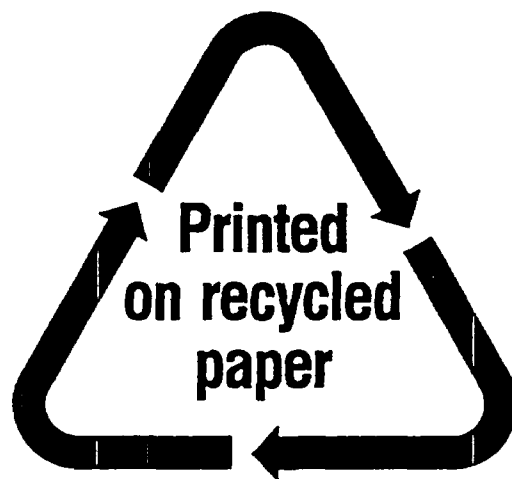
```

```

= relap5 model for the semiscale nh-i posttest - restart run
*
*problem      type  option
0000100      restart transnt
*
*           inp-chk or run
0000101           run
*
*units      input  output (si or british)
0000102    british    si
*
0000103 12658 * sftl.out & sftl.rst
*
0000200 1000.0
*           t end  min st  max st  st cl  pr  nj  vr
*
0000201 4000.0 1.0e-7 5.0 3 40 800 8000 * recovery
0000202 8000.0 1.0e-7 5.0 3 40 800 8000 * refill
*
0000616 426 and 426 n -1. * aux on sgl le 955
0000427 time 0 ge null 0 4100.0 n -1.0
0000428 time 0 le null 0 7700.0 1 -1.0
0000617 427 and 428 n -1.
*
6150000 isgafwj twdpjrn
6150101 625000000 603010000 0.012
6150200 1 616
6150201 -1.0 0.0 0.0 0.0
6150202 0.0 0.0510 0.0 0.0
6150203 7000.0 0.0510 0.0 0.0
*
7280000 hsgafwj twdpjrn
7280101 729000000 726000000 0.004
7280200 1 617
7280201 -1.0 0.0 0.0 0.0
7280202 0.0 0.030 0.0 0.0
7280203 7000.0 0.030 0.0 0.0
*
20535100 blpmpspd function 425.0 0.0 1
20535101 time 0 252
0000423 time 0 ge null 0 4400.0 n -1.
20525200 ilpmprrs function 425.0 0.0 1
20525201 time 0 252
20225200 reac-t 423
20225201 -1.0 0.0
20225202 0.0 1.0
20225203 400.0 1.0
20225204 401.0 0.0
20225205 499.0 0.0
20225206 500.0 1.0
20225207 5000.0 1.0

```

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11. ABSTRACT (200 words or less) The RELAP5/MOD3 5m5 code was assessed using the 1/1705 volume scaled Semiscale 50% Feed Line Break (FLB) test S-FS-11. Test S-FS-11 was designed in three phases: (a) blowdown phase, (b) stabilization phase, and (c) refill phase. The first objective was to assess the code applicability to 50% FLB situation, the second was to evaluate the FSAR conservatisms regarding SG heat transfer degradation, steam line check valve failure, break flow state, and peak primary system pressure, and the third was to validate the EOP effectiveness. The code was able to simulate the major T/H parameters except for the two-phase break flow and the secondary convective heat transfer rate. The two-phase break flow had still deficiencies. The current boiling heat transfer rate was developed from the data for flow inside of a heated tube, not for flow around heated tubes in a tube bundle. Results indicated that the assumption of 100% heat transfer until the liquid inventory depletion was not conservative, the failed affected steam generator main steam line check valve assumption was not either conservative, the measured break flow experienced all types of flow conditions, the relative proximity to the 110% design pressure limit was conservative. The automatic actions during the blowdown phase were effective in mitigating the consequences. The stabilization operation performed by operator actions were effective to permit natural circulation cooldown and depressurization. The voided secondary refill operations also verified the effectiveness of the operations while recovering the inventory in a voided steam generator.						
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