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

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

June 1993

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/i 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 PCPs 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:

$$\text{Computer time, CPU} = 1754 + 5059 = 6814$$

$$\text{Number of time step, DT} = 12250 + 28307 = 40557$$

$$\text{Number of volume, C} = 181$$

$$\text{Transient real time, RT} = 8000 \text{ (sec)}$$

$$\text{Grind time} = \text{CPU} \times 1000 / (C * \text{DT}) = 0.9080 \text{ CPU} \text{ } \mu\text{sec/vol/step}$$

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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3. Guidelines and Procedures for the International Code Assessment and Applications Program, NUREG-1271, April 1987.
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.
7. CESSAR-80, Final Safety Analysis Report, Appendix 15B, Combustion Engineering Company.
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>RELAPS/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


```

*****
***** 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 mhi system components are removed and upper head
internals are modeled as modified to reflect non-mhi
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-scan-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  stdy-st
+
+      inp-ckt 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
+
+      noncondensible gas type
0000110      nitrogen
+
+      mass fractio.
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  nr
+0000201      2.  1.0-7  0.05  3  20  40  40
+0000202      10. 1.0-7  0.05  3  20  160 160
+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      1025. 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 **
** 460 pressure to open intact loop steam generator relief valve **
** 461 pressure to close intact loop steam generator relief valve **
** 462 upper limit on intact loop secondary pressure for steady state**
** 463 lower limit on intact loop secondary pressure for steady state**
** 464 rate to close main intact loop steam valve for steady state **
** 465 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 ctrlvar 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 ctrlvar 565 lt null 0 +184.0 n -1.
0000441 ctrlvar 564 lt null 0 +90.0 n -1.
0000442 ctrlvar 561 lt null 0 -62.0 n -1.
0000443 ctrlvar 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 ctrlrvar 631 gt null 0 -2500. n -1.
0000465 ctrlrvar 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 ctrlrvar 731 gt null 0 -2500. n -1.
0000475 ctrlrvar 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-1b (sp-1) - 414684
* 2.5pc-1b (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 .0396502 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
*
* hz 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 hy 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
*
* vcabs 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 jwn 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  c989  tmdpv01
*
*      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  tmd-prz  valve
*
*      from  to jwn 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  pzrlvlj  tmdpjwn
*
*      from  to jwn 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 pwr
*****
*
* for steady state - input for getting and maintaining desired level
* elev = 87,000 in.
*
*      name  type
9800000  pzrlvlv  tmdpv01
*
*      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    twdpjm
*
*          from      to    jun area
9100101    920000000 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    twdpvol
*
*          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    prscrv    valve * scrv
*
*          from      to    jun 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    prsdv    twdpvol
*
*          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 - prz assembly
*                416199 - prz installation
*                418126 - prz 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 2.093750 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 -2.093750 8
*
*      rough  hy 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
*
*      vcaks  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

```

```

9980000 j+998  sngljun
*
*      from  to  jun area  f loss  r loss  vcaks
9980101 999010000 997000000 6.1762e-3 0.0 0.0 100
*
*      ctl flow-f  flow-g  velj
9980201 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 7.4667e-4 2
9970103 7.4667e-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  hy 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')/(2m**2)
*
*      ctl flg  vol no
9971001 0 3
*
*      vcaks  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  .0246289    3 * 2.5 in sch-160
*
*      length  vol no
2030301  2.6542072    1 * spool pieces 4,5,6
2030302  2.3329167    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  2.3329167    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      singl jun
*
*
*      from  to  jun area  f loss  r loss  vcabs
2050101  203010000  210000000  0.024629  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      singl vol
*
*      area  length  volume  hz ang  vr ang  elv ch
2100101  0.0  0.6354167  0.0478680  +90.0  +90.0  0.6354167
*
*      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 jun  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  by 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  vchbs
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  sngljun
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  by 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      jun 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      +90.0      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
*
*      vchls      jun 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

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```

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      jun 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
* kdt
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      isglet      separatr
*
*      no jun      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      jun area      f loss      r loss      cabs      voidgf
6011101      601010000      612000000      .4690572      0.0      0.0      1002      0.50
6012101      601000000      602000000      .4690572      0.0      0.0      1002      0.15
6013101      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      singlvol
*
*      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      6030000000      .0819087      0.0      0.0      0
*
*      vel-f      vel-g      velj
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      isgsby      branch
*
*      no jun      ctl
6120001      2      0
*

```

```

*      area      length      volume      hz ang      vr ang      elv ch
6120101      0.0      1.5404167      .7816260      0.0      90.0      1.5404167
*
*      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      6110000000      0.3139546      0.0      0.0      3
6122101      602000000      6120000000      0.7880455      0.0      0.0      0
*
*      vel-f      vel-g      velj
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      isgsch      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  hy dia  vol no
6030801  6.667e-5 .0128227  1
6030802  6.667e-5 .0128381  3
6030803  6.667e-5 .0201639  4
*
*      ctl flg  vol no
6031001  0 4
*
*      vcabs  jnn 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  jnn 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  sngljnn
*
*      from  to  jnn 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  isgfwj  tmdpjnn
*
*      from  to  jnn 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  25.0  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  ctrlvar 610
*      table takes into account conversion of kg to lb
6100201  -10.0  0.0  0.0  0.0  * ejl
*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  isgfwj  tmdpvoll
*
*      area  length  volume  hz ang  vr ang  elv ch
6200101  .012  10.00  0.0  0.0  0.0  0.0
*
*      rough  hy dia  ctl
6200102  0.0  0.0  0
*
*      ctl flg
6200200  3
*
*      time pressure  temp
6200201  0.0  1250.0  405.0  *ejl
*
*****
* steam generator secondary - time dep aux feedwater junction *
*****
* elev = 0.0 in. above top of tube sheet
*
*      name  type
6150000  isgafwj  tmdpjnn
*
*      from  to  jnn 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  isgafv  tndpv01
*
*      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 jun area  f loss  r loss  vchgs
6340101  611010000  640000000  .0002532  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  tndpv01
*
*      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  qvale

```

```

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  isgdj  valve
*
*      from  to jun area  f loss  r loss  vchgs
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  mtrvlv
*
*      op trip  cl trip  slope  init pos  table
+6350301  403    410    .33333  0.29488  0
*
*input for steady state control systems (comment out cards 63503xx)
6350300  srvvlv
6350301  637
*
*****
* steam generator secondary - time dep discharge volume
*****
*
* elev = 455.360 in. above top of tube sheet
*
*      name      type
6500000  isgdv  tndpv01
*
*      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  qvale
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  ilcnj  snljjm
**
**      from  to jun area  f loss  r loss  vchgs

```

```

+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 bl 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 ilcp 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 jnn 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 jnn 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 ilbc valve
**
**      from to jnn 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 mtrvly
**
**      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 jnn ctl
2250001 2 1
*
**      area length volume hz 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 jnn 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  snglvol
*
*      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  sngljum
*
*      from  to  jun 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  0.0  0.0
*
*****
* pump suction 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  jun 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  jun 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 go
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  hz ang  vr ang  elv ch
2500101 0.0 2.26167 0.05584 +189.102 +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 261000000 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 -1 0 0 0 1
*
*   r-sp  isp/rsp  r-fl  r-bd  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  m-f-sp  m-r-sp
2500310 0.0 0.0 0.0
*
*card ccccd0-cccc99 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 0.349, 1.354 0.495, 1.317
2501102 0.700, 1.224 0.884, 1.093 1.000, 1.000
2501200 1 2
2501201 0.000, -0.650 0.250, -0.475 0.500, -0.194 0.624, 0.000
2501202 0.800, 0.400 0.900, 0.700 1.000, 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 -0.484, 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 0.325, 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 0.000, -0.650
*
* single phase 4 quadrant torque tables
*
2501900 2 1
2501901 0.000, 0.540 0.200, 0.530 0.400, 0.650 0.600, 0.770
2501902 0.800, 0.950 0.900, 0.980 0.950, 0.960 1.000, 0.870
2502000 2 2
2502001 0.000, -0.150 0.200, 0.020 0.400, 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 -0.600, -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, 0.960 0.400, 0.980 0.600, 0.970 0.800, 0.900
2503003 0.900, 0.800 0.960, 0.500 1.000, 0.000
2503100 0
2503101 0.000, -0.170 0.0001, -0.170 0.006, 0.000 0.100, 0.000
2503102 0.150, 0.150 0.240, 0.560 0.800, 0.560 0.960, 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, 0.630 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, -2.670 -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, 0.460
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, 0.460
2505102 -0.200, 0.490 0.000, 0.540
2505200 2 4
2505201 -1.000, 0.620 -0.800, 0.530 -0.600, 0.460 -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, 0.360 0.200, 0.320 0.400, 0.270 0.600, 0.190
2505402 0.800, 0.050 1.000, -0.130

```

```

2505500 2 7
2505501 -1.000, -1.440 -0.800, -1.250 -0.600, -1.080 -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      ctrivar 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      pzrspyt      twdpjrn
*
*      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      pzrspyl      twdpvol
*
*      area      length      volume      hz ang      vr ang      elev 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      hz 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
*
*****
* hpsis - time dep junction
*****
*
* elev = 0.0 in.
*
*      name      type
4100000  ilhpsij  tmdpjum
*
*      from      to  jun area
4100101  420000000 400000000 .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  0.02898  0.0  0.0
4100209      519.09  0.02371  0.0  0.0
4100210      561.93  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  0.01490  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
*
*****
* hpsis time dependent volume
*****
*
* inlet elev = outlet elev = 0.000 in.
*
*      name      type
4200000  ilhpsiv  tmdpvol
*
*      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  400000000 .004995 17227.44 17227.44 000
*
*      vliq liq lev  lalen  elev  thick htr-flg  tnkrho  tnkcp  nit-k
4302200  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
2630601  0.0  1
*
*      elv ch  vol no
2630701  0.0  1
*
*      rough  hy dia  vol no
2630801  6.667e-5  0.0  1
*

```

A. 19

```

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 vchgs
1301101 110010000 130000000 0.0762104 1.0 1.0 100
1302101 130000000 140000000 0.075189 0.0 0.0 100
1303101 130010000 120000000 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
*kkf
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 singlvol
*
* 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 singlvol
*
* area length volume hz ang vr ang elv ch
1400101 0.075189 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
*kkf
*****
* core inlet junction
*****
*
* elev = -195.140 in.
*
* name type
1450000 corein-j singljun
*
* from to jun area f loss r loss vchgs
1450101 140010000 150000000 0.026780 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 0.026780 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
+kkt
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
+kkt
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
1610000  up-core  branch
*
*      no jun     ctl
1610001      4      1
*
*      area   length   volume   hz ang   vr ang   elv ch
1610101  0.057859  1.000833    0.0      0.0     90.0  1.000833
*
*      rough   hy dia     ctl
1610102  6.667e-5  0.07561      0
*
*      ctl press   temp

```

```

1610200  3  2258.30  591.90
*
*      from     to jun area   f loss   r loss   vcabs
1611101  15010000  161000000  0.026780    0.8      0.8      000
1612101  161010000  162000000  0.017208    0.0      0.0      100
1613101  182010000  161010000  0.0016085    0.0      0.0      100
1614101  186010000  161010000  0.004606   .43613   .43613    100
*
*      flow-f   flow-g   velj
1611201    22.900      0.0      0.0
1612201    21.000      0.0      0.0
1613201      0.0      0.0      0.0
1614201    -1.900      0.0      0.0
+kkt
1612110  0.07651  1.0  1.0  1.0
1613110  0.07651  1.0  1.0  1.0
*
*****
* core outlet
*****
*
* inlet elev = bottom = - 39.130 in.
* outlet elev = top   = - 6.000 in.
*
*      name      type
1620000  coreout  branch
*
*      no jun     ctl
1620001      1      1
*
*      area   length   volume   hz ang   vr ang   elv ch
1620101  0.045640  2.760833    0.0      0.0     90.0  2.760833
*
*      rough   hy dia     ctl
1620102  6.667e-5  0.120892      0
*
*      ctl press   temp
1620200  3  2258.30  591.90
*
*      from     to jun area   f loss   r loss   vcabs
1621101  186000000  162000000  0.075341   .92664   .77720    00003
*
*      flow-f   flow-g   velj
1621201    0.500      0.0      0.0
+kkt
1621110  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
1630000  hotout  branch
*
*      no jun     ctl

```

```

1530001      4      1
*
*      area length volume hz ang vr ang elv ch
1530101  0.050621 2.416667 0.0 0.0 90.0 2.416667
*
*      rough by dia ctl
1530102  6.667e-5 0.143638 0
*
*      ctl press temp
1530200  3 2258.30 531.30
*
*      from to jvn area f loss r loss vcabs
1531101  153000000 201000000 0.045082 2.5 2.5 002
1532101  153000000 301000000 0.045082 2.5 2.5 002
1533101  152010000 153000000 0.037583 3.0 3.0 000
1534101  153010000 154000000 0.056700 0.0 0.0 000
*
*      flow-f flow-g velj
1531201  17.450 0.0 0.0
1532201  5.840 0.0 0.0
1533201  21.500 0.0 0.0
1534201  -2.360 0.0 0.0
* kkt
1532110  0.143638 1.0 1.0 1.0
1533110  0.143638 1.0 1.0 1.0
*
*****
* top of upper pleum
*****
* inlet elev = bottom = + 23.000 in.
* outlet elev = top = + 53.600 in.
*
*      name type
1540000  upplen sagivol
*
*      area length volume hz ang vr ang elv ch
1540101  0.056700 2.5500 0.0 0.0 90.0 2.5500
*
*      rough by dia ctl
1540102  6.667e-5 0.168707 0
*
*      ctl press temp zero
1540200  3 2258.30 538.00 0.0
*
*****
* upper head top volume
*****
* geometry with ubi
* inlet elev = top = +166.760 in.
* outlet elev = bottom = +132.190 in.
*
*      name type
1940000  uphupv branch
*
*      no jvn 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 by dia ctl
1940102  6.667e-5 0.280250 0
*
*      ctl press temp
1940200  3 2258.30 531.30
*
*      from to jvn area f loss r loss vcabs
1941101  194010000 183000000 2.1923e-3 0.0 0.0 100
1942101  194010000 193000000 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 ubi
* inlet elev = top = +132.190 in.
* outlet elev = bottom = + 90.750 in.
*****
*
*      name type
1930000  tumpbd branch
*
*      no jvn ctl
1930001  2 1
*
*      area length volume hz ang vr ang elv ch
1930101  .053694 3.453333 0.0 0.0 -90.0 -3.453333
*
*      rough by dia ctl
1930102  6.667e-5 0.206333 0
*
*      ctl press temp
1930200  3 2258.30 531.30
*
*      from to jvn area f loss r loss vcabs
1931101  193010000 192000000 0.052330 0.0 0.0 000
1932101  181016000 193010000 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 ubi
* inlet elev = top = + 90.750 in.
* outlet elev = bottom = + 67.160 in.
*****
*
*      name type
1920000  lo-plea branch
*
*      no jvn ctl

```

```

192001      2      1
*
*      area  length  volume  hz 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  592.30
*
*      from  to  jun area  f loss  r loss  vcabs
1921101  192010000  191000000  0.049603  0.0  0.0  000
1922101  192010000  182000000  0.0016085  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  uphlov  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  592.30  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
*
*      hz 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      suptub      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      hy 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      hy dia      vol no
1830801      5.000e-5      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 jrn      ctl
1840001      3      1
*
*      area      length      volume      hz ang      vr ang      elv ch
1840101      2.19233e-3      5.1000      0.0      0.0      -90.0      -5.1000
*
*      rough      hy dia      ctl
1840102      5.000e-6      0.0      0
*
*      ctl press      temp
1840200      3      2258.30      600.00
*
*      from      to      jrn area      f loss      r loss      vcaks
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 -2.416667 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 gnslot 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 vchhs
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-56) - 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-hi 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
*
* vchhs 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: 414272 sh.2
*
* elev = +71.969 in.
*
*      name      type
3050000      j305      sngljun
*
*      from      to jun area  f loss  r loss  vchgs
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. 414272 (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      blsgin      sngljun
*
*      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  vchgs
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 sngljun
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      bsgtub      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 +7.7916667  1
3200702 +7.5000000  3
3200703 +7.5000000  4
3200704 -7.5000000  5
3200705 -7.5000000  7
3200706 -7.7916667  8
*
*      rough  hy 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  velj  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 0.0242668 3 * baffle plates

```

```

7000202 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  hy dia  vol no
7000802 6.667e-5 0.0656845 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  velj  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 jum     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  by 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  vchls
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: $$$$$$
*
* inlet elev = 461.375 in. above top of tube sheet
* outlet elev = 465.875 in. above top of tube sheet
*
*          name      type
7030000    blsgsp    branch
*
*          no jum     ctl
7030001      1       0
*
*          area  length  volume  hz ang  vr ang  elv ch
7030101      0.0  0.375  .1534235  0.0    90.0  0.375
*
*          rough  by dia  ctl
7030102  6.667e-5  .2429779  0
*
*          ctl press  quals  zero
7030200  2  876.000  1.0
*
*          from      to  jun area  f loss  r loss  vchls
7031101  701010000  703000000  .3477297  0.0    0.0    100
*
*          vel-f  vel-g  velj
7031201  0.3500  0.3500  0.0
*
*****
* broken loop steam generator secondary separator
*****
*
* ref drawing: $$$$$$

```

```

* inlet elev = 461.375 in. above top of tube sheet
* outlet elev = 465.875 in. above top of tube sheet
*
*          name      type
7040000    bsgsep    separatr
*
*          no jum     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  by 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  cchls  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: $$$$$$
*
* inlet elev = 465.875 in. above top of tube sheet
* outlet elev = 476.125 in. above top of tube sheet
*
*          name      type
7050000    blsgsd    singlvol
*
*          area  length  volume  hz ang  vr ang  elv ch
7050101      0.0  .8541667  .0680664  0.0    90.0  .8541667
*
*          rough  by dia  ctl
7050102  6.667e-5  .3836702  0
*
*          ctl press  quals  zero
7050200  2  876.000  1.00  0.0
*
*****
* broken loop steam generator riser to downcomer pipe - muffler
*****
*
* ref drawing: assembly - $$$$$$
*
* inlet elev = 445.375 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet

```

```

*
*      name      type
7110600      bsgmf      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      hy dia      vol no
7110801      6.667e-5      .3983363      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 = 461.375 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet
*
*      name      type
7120000      bsgdrn      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      hy 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: $$$$$$
*
* inlet elev = 411.500 in. above top of tube sheet
* outlet elev = 411.500 in. above top of tube sheet
*
*      name      type
7130000      bsgbrn      branch
*
*      no jun      ctl
7130001      3      0
*
*      area      length     volume      hz ang      vr ang      elv ch
7130101      0.0      3.1426389      .0366917      0.0      0.0      0.0
*
*      rough      hy dia      ctl
7130102      6.667e-5      .1316182      0
*
*      ctl press      quals      zero
7130200      2 876.000      1.00
*
*      from      to      jun area      f loss      r loss      vcabs
7131101      711010000      713000000      .0120117      3.5      3.5      000
7132101      712010000      713000000      .0080362      50.0      50.0      000
7133101      713010000      714000000      .0103869      0.0      0.0      0
*
*      vel-f      vel-g      vel-j
7131201      0.3500      0.3300      0.0
7132201      0.0      0.0      0.0
7133201      0.3500      0.3300      0.0
*
*****
* broken loop steam generator secondary downcomer *
*****
*
* ref drawing: assembly - $$$$$$
*      fillers - $$$$$$
*
* inlet elev = 411.500 in. above top of tube sheet
* outlet elev = 6.500 in. above top of tube sheet
*
*      name      type
7140000      bsgdnc      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   hy 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      bsgdnb   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   hy 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   vcabs
7151101      714010000      715000000      .0103869      0.0      0.0      000
7152101      715010000      716000000      .0513379      50.0      50.0      00001
7153101      715000000      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: $$$$$$
*
* inlet elev = 0.000 in. above top of tube sheet
* outlet elev = 13.000 in. above top of tube sheet
*
*      name   type
7160000      bsgrsb   branch
*
*      no jun   ctl
7160001      1      0
*
*      area   length   volume   bz ang   vr ang   elv ch
7160101      0.0      1.083333      .0344994      0.0      90.0      1.083333
*
*      rough   hy dia   ctl
7160102      6.667e-5      .0659845      0
*
*      ctl press   quals   zero
7160200      2 876.000      0.00
*
*      from   to   jun area   f loss   r loss   vcabs
7161101      716010000      700000000      .0242668      0.0      0.0      100
*
*      vel-f   vel-g   velj
7161201      0.3500      0.3300      0.0
*
*****
* broken loop steam generator bottom feedwater pipe
*****
*
* ref drawing: assembly - $$$$$$
*
* 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
7201001      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
7220000    bsgfwj    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    ctrlrvar 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
7240000    bsgfw    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 *ejl
*
*****
* break valve
*****
*
* top feedline break connects from 727 inlet
* bottom feedline break connects from 720 inlet
*
**      name      type
7250000    brk-vlv    valve
**
**      from      to jmn area    f loss    r loss    vchls
7250101    720000000 790000000 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
**
*****
* confinement
*****
*
* elev = 0.000 in.
*
**      name      type
7900000    feedctr    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  bsgxfb  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 = 401.500 in. above top of tube sheet

```

```

*      name  type
7270000  bsgtblk  pipe

```

```

*      no vol

```

```

7270001      1

```

```

*      area  vol no
7270101      0.0103869  1

```

```

*      length  vol no
7270301      0.8333333  1

```

```

*      vr ang  vol no
7270601      +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  tmdpjum

```

```

*      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  bsgafvw  tmdpvul

```

```

*      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
7290200      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      trprlv
*
*      trip
7340301      671
*
*****
* steam generator secondary - time dep relief discharge volume
*****
*
* elev = 476.125 in. above top of tube sheet
*
*      name      type
7400000      bsgrdv      tmdprvl
*
*      area      length      volume      hz ang      vr ang      elv ch
7400101      10.0      10.00      0.0      0.0      0.0      0.0
*
*      rough      hy 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      bsplj      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      srprlv
7350301      737
*
*****
* steam generator secondary - time dep discharge volume
*****
*
* elev = 476.125 in. above top of tube sheet
*
*      name      type
7500000      bsgrdv      tmdprvl
*
*      area      length      volume      hz ang      vr ang      elv ch
7500101      10.0      10.00      0.0      0.0      0.0      0.0
*
*      rough      hy 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      sagljun
**
**      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      blcmp      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 flg     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      -1.7508333
*
*      rough      by dia      ctl
3250102      5.000e-6      .0620833      0
*
*      ctl press      temp      zero
3250200      3      2250.00      547.00
  
```

```

*
*      from      to      jun area      f loss      r loss      vcahs
3251101      320010000      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      snglvol
*
*      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      sngljun
  
```

```

*      from      to      jun area      f loss      r loss      vcahs
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 suction leg

* ref drawings: inlet plenum - 414272
 * 1.5abl-34 (sp-60) - 414675-1
 * 1.5abl-35 (sp-61) - 414676-1
 * 1.5abl-36 (sp-62) - 414672-2
 * 1.5abl-37 (sp-63) - 414673-2
 * 1.5abl-6a (sp-64) - 414677-1
 * 1.5abl-7 (sp-65) - 407384-1
 * 1.5abl-9 (sp-72) - 407380-1
 * 1.5abl-11 (sp-73) - 407673-1

```

*
* inlet elev = + 71.969 in.
* n-tube bottom elev = -110.155 in.
* outlet elev = - 10.640 in.
*
*      name      type
3400000      bl-ps      pipe
*
*      no vol
3400001      9
*
*      area      vol no
3400101      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 n
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      pump-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      vcabs
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  0.002695      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  228.30  531.30      0.0      0.0      0      1
*
*****
* hpis injection junction
*****
*      elev = 0.000 in.
*
*      name      type
5100000  blhpsij  tmpjmn
*
*      from      to      jun area
5100101  52000000  500000200  0.002695
*
*      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      1560.0      0.00      0.0      0.0
5100217      1600.0      0.00      0.0      0.0
*
*****
* hpis volume
*****
*      elev = 0.000 in.
*
*      name      type
5200000  blhpsiv  tmpvovl
*
*      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      vchgs
5301101      500000000  0.002695  50149.59  50149.59      000
*
*      vliq      liq lev      lnlen      elev      thick      htr-flg      tnkrho      tnkcp      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: 1.5abl-17 (sp-76) - 407875
* 1.5abl-15 (sp-79) - 407675
* cold leg nozzle - 407986
*
* name type
3630000 bl-ctl 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-vlv 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 trpvlv
*
* trip
*3750301 402
*
*****
* containment *
*****
* elev = 0.000 in.
*
* name type
*9000000 contain tmppvol
*
* 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      tndpvol
*
*      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      ibhl      tndpvol
*
*      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      tndpvol
*
*      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      tndpvol
*
*      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      tndpvol
*
*      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      vslenc      tndpvol
*
*      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      tndpvol
*
*      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      tmpvol
*
*      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      tmpvol
*
*      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      tmpvol
*
*      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      ibb1h      tmpvol
*
*      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      tmpvol
*
*      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      tmpvol
*
*      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      tmpvol
*
*      area      length      volume      hz ang      vr ang      elv ch
8140101      10.0      1.0      0.0      0.0      0.0      0.0
*

```



```

*
*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-mplr  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 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 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  frm 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  0.358375
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-mplr  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 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  frm 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  1.00000      1
*
*r-body  hy-vol  inc  b-cdt  a-code  cy-length  ht-str-no
11021601  101010000      0      1      1  1.00000      1
*
*source  type  is-mplr  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 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 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      hy-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      hy-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-mplr      l-dr-hl      r-dr-hl      ht-str-no
11100701      0      0      0      0      9
*
*l-h-st      chf-htr      hy-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      hy-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      .145933333      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      hy-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      hy-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-mplr      l-dr-hl      r-dr-hl      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 16.244581 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 16.244581 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 frm flg
11102100 0 1
*
*geometry no itv r-cor no itv r-cor no itv r-cor
11102101 1 .246541667 2 .256958333 1 .25862500
11102102 3 .411541667 2 .578208333
*
*materials comp no itv no comp no itv no comp 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-implr l-dr-ht r-dr-ht ht-str-no
11102701 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 frm 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 .426058333
11103103 2 .592725000
*
*material comp no itv no comp no itv no comp 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-implr 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 np 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 hy-vol inc b-cdt a-code cy-length ht-str-no
11140501 140010000 0 1 1 0.96250 1

*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11140601 110100000 0 1 1 0.96250 1

*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
11140701 0 0 0 0 1

*
*l-h-st chf-htr hy-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 hy-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 dmr cr an'ls) *

*
* left boundary = component 140
* right boundary = ambient volume (805)

*
*gl data nh np 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 547.5 1 494.2 2 459.0 3 432.7 4 328.3 5
11400402 232.4 6

*
*l-body hy-vol inc b-cdt a-code cy-length ht-str-no
11400501 140010000 0 1 1 0.6258333 1

*
*r-body hy-vol inc b-cdt a-code cy-length ht-str-no
11400601 805010000 0 4100 1 0.6258333 1

*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
11400701 0 0 0 0 1

*
*l-h-st chf-htr hy-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 hy-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 np 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 .414166667 2 .424583333 1 .426250000
11200102 2 .740416666 2 .907083333

*
*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    hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
11200501    120010000    0    1    1    0.466667    1
*
*r-body    hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
11200601    805010000    0    4100    1    0.466667    1
*
*source    type    is-mlr    l-dr-ht    r-dr-ht    ht-str-no
11200701    0    0    0    0    0    1
*
*l-h-st    chf-htr    hy-dia    h-eq-dia    ch-length    ht-str-no
*11200801    0    0.0    0.0    0.466667    1
11200901    0.0    10.0    10.0    0.0    1.0    1
*
*r-h-st    chf-htr    hy-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    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    hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
11300501    130010000    0    1    1    0.721917    1
*
*r-body    hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
11300601    805010000    0    4100    1    0.721917    1
*
*source    type    is-mlr    l-dr-ht    r-dr-ht    ht-str-no
11300701    0    0    0    0    0    1
*
*l-h-st    chf-htr    hy-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    1.0    1
*
*r-h-st    chf-htr    hy-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    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    0.009375    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
*
*!-body      by-vol      inc      b-cdt      a-code      surf-area      ht-str-no
11500501      0          0          0          0          0.0          12
*
*r-body      by-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 0.02584      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 0.02584      0          0         12
*
*!-b-st      chf-htr      by-dia      b-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-b-st      chf-htr      by-dia      b-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      nb      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      cmp no      itv no      cmp no      itv no      cmp no      itv no
11501201      1          2          2          3          1          5
11501202      1          8          1         10          8         12
*
*source dis      source      itv no
11501201      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
*
*!-body      by-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      by-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
*
*!-b-st      chf-htr      by-dia      b-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-b-st      chf-htr      by-dia      b-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      .272256      1      .272356
11502103      2      .2827727      2      .4494334
*
*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  646.7  646.5  646.2  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      by-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      by-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-mpir      l-dr-ht      r-dr-ht      ht-str-no
11502701  10225      .122878      0          0          1
11502702  10225      .122878      0          0          2
11502703  10225      .105342      0          0          3
11502704  10225      .105342      0          0          4
11502705  10225      .105342      0          0          5
11502706  10225      .122878      0          0          6
*
*l-h-st      chf-ht      by-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-ht      by-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      .7769227
*
*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      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11610501  161010000      0          1          1      0.764104      1
*
*r-body      by-vol      inc      b-cdt      a-code      cy-length      ht-str-no
11610601  805010000      0      4100      1      0.764104      1
*
*source      type      is-mpir      l-dr-ht      r-dr-ht      ht-str-no
11610701      0          0          0          0          1
*
*l-h-st      chf-ht      by-dia      h-eq-dia      ch-length      ht-str-no

```

```

*11610801      0      0.0      0.173513      1.00083      1
11610801 0.173513 10.0 10.0 0 0 0 1.0 1
*
*r-b-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      nb      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      0.142184      1      0.196351      3      0.200518
11611102      4      0.422392      2      0.589059
11611103      2      0.570777      2      0.7374394
*
*materials      cmp no      itv no      cmp no      itv no      cmp 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 3 376.7 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-mpir      l-dr-ht      r-dr-ht      ht-str-no
11611701 10225      .043539      0      0      1
*
*l-b-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-b-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      0.196351      3      0.200518
11600102      4      0.422392      2      0.589059
*
*materials      cmp no      itv no      cmp no      itv no      cmp 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 762010000      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-mpir      l-dr-ht      r-dr-ht      ht-str-no
11600701      0      0      0      0      3
*
*l-b-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-b-st      chf-htr      hy-dia      h-eq-dia      ch-length      ht-str-no
*11600901      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      nh      np      type      s-flg      l-cor
11601000      3      16      2      1      0.133854
*
*mesh      loc flg      frm 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      hy-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      hy-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-mplr      l-dr-bt      r-dr-bt      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-htr      hy-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      0.255926      2.559000      3
11601803      0.255926      10.0      10.0      0 0 0 0      1.0      3
*
*r-h-st      chf-htr      hy-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      nh      np      type      s-flg      l-cor
11690000      1      4      -1      1      0.0
*
*mesh      loc flg      frm 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      hy-vol      inc      b-cdt      a-code      surf-area      ht-str-no
11690501      164010000      0      1      1      0.1263155      1
*
*r-body      hy-vol      inc      b-cdt      a-code      surf-area      ht-str-no
11690601      191010000      0      1      1      0.1263155      1
*
*source      type      is-mplr      l-dr-bt      r-dr-bt      ht-str-no
11690701      0      0      0      0      1
*
*l-h-st      chf-htr      hy-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-htr      hy-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      nh      np      type      s-flg      l-cor
11901000      2      13      2      1      0.133854
*
*mesh      loc flg      frm 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      hy-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      hy-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-mplr  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  0.255470  8.776667      2
11901802  0.255470  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      1  0.274576      2  0.2849927
11902103      2  0.4516594
*
*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      hy-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      hy-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-mplr  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      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      hy-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      hy-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-wplr      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      hy-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 1.0 1
*11903802      0      0.0      0.228473      8.776667      2
11903802  0.228473  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
*11903901      0      0.0      0.0      0.0      2
11903901  0.0 10.0 10.0 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      nb      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      hy-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      hy-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-wplr      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      hy-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 1.0 1
*11904802      0      0.0      0.255470      8.776667      2
11904802  0.255470  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
*11904901      0      0.0      0.0      8.776667      2
11904901  0.0 10.0 10.0 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      nb      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 567.9 558.9 550.1 541.6 533.3
 12200403 561.0 553.5 546.3 541.6 533.3
 12200404 556.5 550.3 544.3 538.4 532.7

```
*
*l-body    hy-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    hy-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-implr    l-dr-ht    r-dr-ht    ht-str-no
12200701      0      0      0      0      4
```

```
*
*l-h-st    chf-btr    hy-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 0 1.0 4
```

```
*
*r-h-st    chf-btr    hy-dia    h-eq-dia    ch-length    ht-str-no
*12200901    0    .0887292    .3115210    29.5    3
12200901 0.3115210 10.0 10.0 0 0 0 0 1.0 3
*12200902    0    .1077433    .4104615    29.5    4
12200902 0.4104615 10.0 10.0 0 0 0 0 1.0 4
```

```
*
*****
* heat slab... steam generator tube bundle (intact loop) *
* (descending primary coolant...second 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
12201000      4      5      2      1    0.032375
```

```
*
*mesh      loc flg    frm flg
12201100      0      1
```

```
*
*geometry    no itv    r-cor
12201101      4    0.036458333
```

```
*
*materials    cmp no    itv no
12201201      5      4    * inonel 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    hy-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    hy-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-implr    l-dr-ht    r-dr-ht    ht-str-no
12201701      0      0      0      0      4
```

```
*
*l-h-st    chf-btr    hy-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 0 1.0 4
```

```
*
*r-h-st    chf-btr    hy-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 0 1.0 1
*12201902    0    .0887292    .3115210    29.5    4
12201902 0.3115210 10.0 10.0 0 0 0 0 1.0 4
```

```
*
*****
* heat slab... intact loop 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    frm 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 1 522.3 2 503.2 3 501.8 4 501.7 5
16000402 501.3 6
```

```
*
*l-body    hy-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 hy-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-mplr l-dr-ht r-dr-ht ht-str-no
16000701 0 0 0 0 5
*
*l-h-st chf-htr hy-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 .3379099 1.4054167 5
16000804 0.3379099 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
*16000901 0 .0201639 .0732836 7.9525000 1
16000901 0.0732836 10.0 10.0 0 0 0 1.0 1
*16000902 0 .0126581 .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 hy-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 hy-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-mplr l-dr-ht r-dr-ht ht-str-no
16100701 0 0 0 0 3
*
*l-h-st chf-htr hy-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 2.6896228 0.7487500 2
16100802 2.6896228 10.0 10.0 0 0 0 1.0 2
*16100803 0 .3369291 .5873578 5.5516667 3
16100803 0.5873578 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
*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
16001101 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 hy-vol inc b-cdt a-code cy-length ht-str-no

```

```

16001501 600050000 0 1 1 3.5802339 1
16001502 601010000 0 1 1 0.4375000 2
*
*r-body by-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 .7902365 .8251205 3.7504167 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 frm 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 by-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 by-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 frm 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 800020000 0 4100 1 7.9108334 3
16030603 800010000 0 4100 1 7.9525000 4
*
*source  type  is-mp/r  l-dr-bt  r-dr-bt  ht-str-no
16030701 0 0 0 0 4
*
*!l-b-st  chf-btr  by-dia  h-eq-dia  ch-length  ht-str-no
*16030801 0 .0128227 .0472456 7.4762500 1
16030801 0.0472456 10.0 10.0 0 0 0 1.9 1
*16030802 0 .0128981 .0467818 7.9108334 2
16030802 0.0467818 10.0 10.0 0 0 0 1.0 2
*16030803 0 .0128981 .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-b-st  chf-btr  by-dia  h-eq-dia  ch-length  ht-str-no
*16030901 0 0.0 0.0 0.0 0.0 4
16030901 0.0 10.0 10.0 0 0 0 1.9 4
*
*****
* heat slab... steam generator tube bundle (broken loop) *
* (rising primary coolant...first half of n-tubes) *
*****
*
* left boundary = steam generator primary coolant (component 320)
* right boundary = steam generator secondary coolant (component 700)
*
*gl data  mh  mp  type  s-flg  l-cor
13200000 5 5 2 1 0.0310417
*
*mesh  loc flg  frm flg
13201100 0 1
*
*geometry  no itv  r-cor
13201101 4 0.0364583
*
*materials  comp no  itv no
13201201 5 4 *incomel 600
*
*source dis  source  itv no
13201301 0.0 4
*
*init temp  flg
13201400 -1

```

```

*
*temp distribution
13200401 579.0 569.2 569.6 550.3 541.2
13200402 575.0 566.3 552.3 548.8 540.5
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 700020000 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-mp/r  l-dr-bt  r-dr-bt  ht-str-no
13200701 0 0 0 0 5
*
*!l-b-st  chf-btr  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-b-st  chf-btr  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) *
* (descending primary coolant...second half of n-tubes) *
*****
*
* left boundary = steam generator primary coolant (component 320)
* right boundary = steam generator secondary coolant (component 700)
*
*gl data  mh  mp  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  comp no  itv no
13201201 5 4 *incomel 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-mlr   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 .0653845 .290678 0.0         5
13201902 0.290678 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
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-mlr   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 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 6.8229167 5
17000604 809010000 0 4400 1 1.0833333 6
*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
17000701 0 0 0 0 6
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*17000801 0 .0659845 .1654559 0.0 3
17000801 0.1654559 10.0 10.0 0 0 0 1.0 3
*17000802 0 .0753070 .1759521 0.0 4
17000802 0.1759521 10.0 10.0 0 0 0 1.0 4
*17000803 0 .1934227 .2385353 0.0 5
17000803 0.2385353 10.0 10.0 0 0 0 1.0 5
*17000804 0 .0659845 .1654559 0.0 6
17000804 0.1654559 10.0 10.0 0 0 0 1.0 6
*
*r-h-st chf-htr hy-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 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 comp no itv no comp 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-mpir l-dr-ht r-dr-ht ht-str-no
17110701 0 0 0 0 1
*
*l-h-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*17110801 0 .3989363 .3989363 0.0 1
17110801 0.3989363 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
*17110901 0 0.0 0.0 0.0 1
17110901 0.0 10.0 10.0 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 comp no itv no comp 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 7.8734167 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 7.8734167 7
*
*source type is-mpir l-dr-ht r-dr-ht ht-str-no
17140701 0 0 0 0 7

```

```

*
*l-b-st chf-btr by-dia b-eq-dia ch-length ht-str-no
*17140801 0 .1316182 .1316182 0.0 1
17140801 0.1316182 10.0 10.0 0 0 0 1.0 1
*17140802 0 .1150000 .1150000 0.0 6
17140802 0.1150000 10.0 10.0 0 0 0 1.0 6
*17140803 0 .1303373 .1303373 0.0 7
17140803 0.1303373 10.0 10.0 0 0 0 1.0 7
*
*r-b-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*17140901 0 0.0 0.0 0.0 7
17140901 0.0 10.0 10.0 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
12100000 2 10 2 1 .329589
*
*mesh loc flg frm flg
12100100 0 1
*
*geometry no itv r-cor no itv r-cor
12100101 7 .958333 2 1.125
*
*materials cmp no itv no cmp no itv no
12100201 1 7 26 9
*
*source dis source itv no
12100301 0.0 9
*
*init temp flg
12100400 -1
*
*temp distribution
12100401 606.0 600.0 597.0 594.0 591.0 588.0 585.0 582.0 325.0
+ 68.0
12100402 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-bt r-dr-bt ht-str-no
12100701 0 0 0 0 2
*
*l-b-st chf-btr by-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 1.0 2

```

```

*
*r-b-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*12100901 0 0.0 0.0 0.156250 2
12100901 0.0 10.0 10.0 0 0 0 1.0 2
*
*****
* heat slab... il sg inlet-outlet plenum - middle trapezoidal section *
*****
*
* left boundary = components 210 & 230
* right boundary = ambient volume (808)
*
*gl data nh np type s-flg l-cor
12101000 2 11 2 1 .243773
*
*mesh loc flg frm flg
12101100 0 1
*
*geometry no itv r-cor no itv r-cor no itv r-cor
12101101 1 .333333 7 .958333 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-bt r-dr-bt ht-str-no
12101701 0 0 0 0 2
*
*l-b-st chf-btr by-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 1.0 2
*
*r-b-st chf-btr by-dia h-eq-dia ch-length ht-str-no
*12101901 0 0.0 0.0 0.145834 2
12101901 0.0 10.0 10.0 0 0 0 1.0 2
*
*****
* heat slab... il sg inlet-outlet plenum - bottom trapezoidal 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   frm 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        25        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 540.0 516.0 292.0 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-h-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-h-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   frm flg
12103100      0        1
*

```

```

*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-h-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-h-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   frm 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

```

```

12104401 606.0 584.0 562.0 540.0
*
* l-body   by-vol   inc   b-cdt   a-code   surf-area   ht-str-no
12104501  210010000   0     1     0     0.229152     1
*
* r-body   by-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-htr   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-htr   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 - np(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   fnt 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   .938333   2   1.12500
*
* materials    cmp no   itv no   cmp no   itv no   cmp 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
+ 584.0 582.0 580.0 579.0 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   by-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   by-vol   inc   b-cdt   a-code   cy-length   ht-str-no
12150601  808010000   0    4100     1     0.380208     1
12150601  808010000

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```

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-htr   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-htr   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 - np(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   fnt 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    cmp no   itv no   cmp no   itv no   cmp 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   by-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   by-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-htr   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 0 1.0 2
*
*****
* heat slabs... il sg tube sheet center section - np(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      .212831
*
*mesh      loc flg      fwt flg
12152100      0      1
*
*geomerty      no itv      r-cor      no itv      r-cor      no itv      r-cor
12152101      1      .216114      1      .216406      3      .447917
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-mipr      l-dr-ht      r-dr-ht      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      0.139652      1.75      1
12152801 0.139652 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
*12152901      0      0.064750      0.139652      1.75      1
12152901 0.139652 10.0 10.0 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      fwt flg
13100100      0      1
*
*geomerty      no itv      r-cor      no itv      r-cor
13100101      7      .958333      2      1.125
*

```

```

*
* 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      fwt 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-mipr      l-dr-ht      r-dr-ht      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 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 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      fwt 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-bndy      hy-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-bndy      hy-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      0      2
*
*l-h-st      chf-htr  hy-dia  h-eq-dia  ch-length  ht-str-no
*13100801    0      .3258603  .5192263  0.156250    2
13100801    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
*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  fnt flg
13101100    0      1
*
*geomerty    no itv  r-cor  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-bndy      hy-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-bndy      hy-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      0      2
*
*l-h-st      chf-htr  hy-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  hy-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  fnt flg
13102100    0      1
*
*geomerty    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-bndy      hy-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    hy-vol    inc    b-cdt    a-code    cy-length    ht-str-no
13102601   808010000    0    4100    1    0.250000    1
13102602   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-btr    hy-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-btr    hy-dia    h-eq-dia    ch-length    ht-str-no
*13102901    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     hy-vol    inc    b-cdt    a-code    surf-area    ht-str-no
13103501   310010000    0    1    0    0.102753    1
*
*r-body     hy-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-btr    hy-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-btr    hy-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

```

```

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     hy-vol    inc    b-cdt    a-code    surf-area    ht-str-no
13104501   310010000    0    1    0    0.228673    1
*
*r-body     hy-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-btr    hy-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-btr    hy-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
*
*geomerty      no itv      r-cor      no itv      r-cor      no itv      r-cor
13150101      1      .1331511      1      .1334427      1      .1958013
13150102      1      .2916667      2      .4634361      6      .9583333
13150103      2      1.1250000
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
13150201      5      1      13      2      25      12
13150202      26      14
*
*source dis      source      itv no
13150301      0.0      14
*
*init temp      flg
13150400      -1
*
*temp distribution
13150401      606.0      605.5      605.0      604.5      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
*
*geomerty      no itv      r-cor      no itv      r-cor      no itv      r-cor
13151101      1      .1331511      1      .1334427      1      .1958013
13151102      1      .2916667      2      .4634361      2      .6301027

```

```

*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
13151201      5      1      13      2      25      6
13151202      26      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
*
*geomerty      no itv      r-cor      no itv      r-cor      no itv      r-cor
13152101      1      .1331511      1      .1334427      1      .1958013
13152102      1      .2916667      2      .4634333
*
*materials      cmp no      itv no      cmp no      itv no      cmp no      itv no
13152201      5      1      13      2      25      4
13152202      26      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          2
*
*l-h-st      chf-htr    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      chf-htr    hy-dia    h-eq-dia    ch-length    ht-str-no
*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     26        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          2
*
*l-h-st      chf-htr    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-htr    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          1
*
*l-h-st      chf-htr    hy-dia    h-eq-dia    ch-length    ht-str-no
*13154801      0    .6020833    .1326376    1.751830      1
13154801  0.1326376  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
*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 .14583333 1 .14583333 2 .156350
12002102 2 .32301667
*
*materials cmp no itv no cmp no itv no cmp 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 3 590.2 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 811030000 0 4100 1 0.72757 7
12002608 813040000 0 4100 1 0.36378 8
*

```

```

*source type is-mp1r l-dr-hl r-dr-hl 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-htr 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-htr 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 cmp no itv no cmp 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
12003601   801010000    0    4100    1    2.46061    1
12003602   801010000    0    4100    1    0.75516    2
12003603   803010000    0    4100    1    1.04479    3
12003604   803010000    0    4100    1    1.28963    4
12003605   803010000    0    4100    1    1.34910    5
12003606   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      0      6

*
+l-h-st    chf-ht    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 0 1.0 6

*
+r-h-st    chf-ht    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 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    0.089542

*
*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    .086459    0      0     12
12004713      113    .086459    0      0     13
12004714      113    .199265    0      0     14
12004715      113    .171434    0      0     15

*
+l-h-st    chf-ht    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 0 1.0 15

*
+r-h-st    chf-ht    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 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	0.088542

*

*mesh	loc flg	frn 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	hy-vol	inc	b-cdt	a-code	cy-length	ht-str-no
12005501	20102000	0	1	1	0.28510	1
12005502	20201000	0	1	1	0.97187	2
12005503	20301000	0	1	1	0.66131	3
12005504	20302000	0	1	1	1.66862	4
12005505	20303000	0	1	1	1.30272	5
12005506	24001000	0	1	1	0.63605	6
12005507	24002000	0	1	1	2.11622	7
12005508	24003000	0	1	1	1.01174	8
12005509	24004000	0	1	1	0.68150	9
12005510	24005000	0	1	1	0.41907	10
12005511	24006000	0	1	1	0.18183	11
12005512	24007000	0	1	1	0.18183	12
12005513	24008000	0	1	1	0.41907	13
12005514	24009000	0	1	1	1.55114	14

*

*r-body	hy-vol	inc	b-cdt	a-code	cy-length	ht-str-no
12005601	80101000	0	4100	1	0.28510	1
12005602	80101000	0	4100	1	0.97187	2
12005603	80101000	0	4100	1	0.66131	3
12005604	80101000	0	4100	1	1.66862	4
12005605	80101000	0	4100	1	1.30272	5
12005606	80101000	0	4100	1	0.63605	6
12005607	80101000	0	4100	1	2.11622	7
12005608	80401000	0	4100	1	1.01174	8
12005609	80401000	0	4100	1	0.68150	9
12005610	80401000	0	4100	1	0.41907	10
12005611	80401000	0	4100	1	0.18183	11
12005612	80401000	0	4100	1	0.18183	12
12005613	80401000	0	4100	1	0.41907	13
12005614	80401000	0	4100	1	1.55114	14

*

*source	type	is-implr	l-dr-ht	r-dr-ht	ht-str-no
---------	------	----------	---------	---------	-----------

12005701	0	0	0	0	14
----------	---	---	---	---	----

*

*l-b-st	chf-htr	hy-dia	b-eg-dia	ch-length	ht-str-no
*12005801	0	0.0	0.0	0.177084	14

12005801	0.0	10.0	10.0	0 0 0 0	1.0	14
----------	-----	------	------	---------	-----	----

*

*r-b-st	chf-htr	hy-dia	b-eg-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	frn 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
			605.0	5
			640.0	6
13001402	652.8	7	648.0	9
			363.3	10
			145.0	11

*

*l-body	hy-vol	inc	b-cdt	a-code	cy-length	ht-str-no
13001501	34004000	0	1	1	2.29167	1
13001502	34005000	0	1	1	2.25000	2
13001504	34009000	0	1	1	0.20833	3

*

*r-body	hy-vol	inc	b-cdt	a-code	cy-length	ht-str-no
13001601	81201000	0	4100	1	2.29167	1
13001602	81201000	0	4100	1	2.25000	2
13001604	81201000	0	4100	1	0.20833	3

*

*source	type	is-implr	l-dr-ht	r-dr-ht	ht-str-no
13001701	111	.399475	0	0	1
13001702	111	.392056	0	0	2
13001704	111	.035122	0	0	3

*

```

*l-b-st chf-btr hy-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-b-st chf-btr hy-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 mp 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
13002201 2 .07916667 1 .07920000
13002202 2 .0895840 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 5 531.5 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 1.34026 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 811020000 0 4100 1 0.67013 2
13002603 811030000 0 4100 1 1.34025 3
13002604 811040000 0 4100 1 1.34025 4
13002605 811050000 0 4100 1 0.67013 5
13002606 811060000 0 4100 1 1.00519 6
13002607 811070000 0 4100 1 0.67013 7
13002608 811080000 0 4100 1 0.67013 8
13002609 811090000 0 4100 1 0.67013 9
13002610 811010000 0 4100 1 1.34026 10
13002611 812010000 0 4100 1 0.33506 11
13002612 812020000 0 4100 1 0.67013 12
13002613 812030000 0 4100 1 0.67013 13
13002614 812040000 0 4100 1 4.35581 14
13002615 813010000 0 4100 1 0.33506 15
13002616 813020000 0 4100 1 0.67013 16
13002617 813030000 0 4100 1 0.33506 17
*
*source type is-mpir l-dr-ht r-dr-ht 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-b-st chf-btr hy-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-b-st chf-btr hy-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 mp type s-flg l-cor
13003000 18 5 2 1 0.0557500

```

```

*
*mesh      loc flg  frm flg
13003100    0      1
*
*      actual wall thk. mult 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  544.8  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  0.34565     12
13003513  340070000    0      1      1  0.34565     13
13003514  340080000    0      1      1  0.99377     14
13003515  340090000    0      1      1  2.08834     15
13003516  361010000    0      1      1  1.63494     16
13003517  362010000    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  0.34565     12
13003613  802010000    0  4100      1  0.34565     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-bt  r-dr-bt  ht-str-no
13003701    0      0      0      0      18
*
*l-h-st      chf-btr  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-h-st      chf-btr  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      nb      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  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  0.91229      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  0.91229      2
*
*source      type  is-mlpr  l-dr-bt  r-dr-bt  ht-str-no
13004701    0      0      0      0      2
*
*l-h-st      chf-btr  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 0 1.0 2
*
*r-h-st chf-htr 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 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 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 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-mlr l-dr-ht r-dr-ht ht-str-no
12500701 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 1.9635 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
*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
*

```

```

*
* 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-mlr l-dr-ht r-dr-ht ht-str-no
13500701 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      .272167      4      .270833      1      .272167
19990102      1      .272267      2      .282683      2      .449350
*
*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      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-mplr      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      by-dia      h-eq-dia      ch-length      ht-str-no
*19990801      0      .285833      .2914500      2.500000      1
19990801      0.29145      10.0      10.0      0 0 0 0      1.0      1
*19990802      0      .302583      .3025833      2.562500      6
19990802      0.30258      10.0      10.0      0 0 0 0      1.0      6
*19990803      0      .302583      .3025833      2.583333      7
19990803      0.30258      10.0      10.0      0 0 0 0      1.0      7
*19990804      0      .1005325      .2251253      2.093750      8
19990804      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
*19990901      0      0.0      0.0      2.500000      1
19990901      0.0      10.0      10.0      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 0      1.0      6
*19990903      0      0.0      0.0      2.583333      7
19990903      0.0      10.0      10.0      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 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      3      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      cmp no      itv no      cmp no      itv no      cmp 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      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
19992601      999080000      0      1      1      12.0      1
*
*source      type      is-mplr      l-dr-ht      r-dr-ht      ht-str-no
19992701      10999      1.0      0      0      1
*
*l-h-st      chf-htr      by-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 0      1.0      1
*
*r-h-st      chf-htr      by-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 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      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      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      806010000      0      4100      1      2.093750      8
*
*source      type      is-mplr      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      .2858333      .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      .1005325      .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      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      frm flg
19970100      0      1
*
*geometry      no itv      r-cor      no itv      r-cor
19970101      2      .035000      2      .054460
*
*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      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-mplr      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      ca flg      ca flg
*3161 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

```

*
 *incone1 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
 *
 *incone1 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
 *
 *cesium 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
 *
 *no2 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	4000.00	.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.fineman..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	.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
*incone1 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		
*						
*incone1 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 sils 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	3.0256e-5	500.00	3.3233e-5
20101703	600.00	3.6596e-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 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
*						
* 0.35% 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				
*						
*mo2 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	1.6960e-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	2.8028e-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)

* temp cap temp cap temp cap

*316l 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				
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*

*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
----------	---------	-------	---------	-------	---------	-------

*

*incomel 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		
----------	------	-------	---------	-------	--	--

*

*incomel 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	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		
----------	------	-------	---------	-------	--	--

*

*mo2 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	60.056	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 8.051de-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 31.0870 .04263

20215009 51.4130 .03880

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 * 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 btu = 1055.056 joules (international table)

***** table trip time coef rate coef *****

*20225100 htrrate 412 1.0 8.8931 * btu/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 htrrate 412 1.0 1.9120 * btu/s/ft2

***** time norm h.t.rate *****

```

20225101      0.0      1.000
20225102    3000.0      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 btu = 1055.056 joules (international table)
**
**      table      trip      time coef      rate coef
*20225100  btmrates  413      1.0      9.1631  * btu/s-ft2
**
**      time      norm h.t.rate
*20225101     -1.0      1.000
*20225102      0.0      1.000
*20225103      9.6      0.590
*20225104     13.6      0.498
*20225105     20.8      0.407
*20225106     30.4      0.385
*20225107     50.0      0.385
*20225108     64.8      0.000
*20225109    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
20225100  btmrates  413      1.0      2.6804  * btu/s-ft2
*
*      time      norm h.t.rate
20225101      0.0      1.000
20225102    20000.0      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 islg 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

```

```

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 dinside delta p 926 to -57x **
** 509 intact loop pump suction downside delta p -57x to i14 **
** 510 intact loop pump suction 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 dinside delta p 925 to -57x **
** 513 broken loop pump suction downside delta p -57x to b65 **
** 514 broken loop pump suction 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 suction downside collapsed level ref i16 cm **
** 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 dncmr hor 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 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 dncmr hor 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 0.16667 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 1.465667 voidf 110080000
20500310 1.207667 voidf 110090000
20500311 0.962500 voidf 110100000
20500312 0.721917 voidf 130010000
20500313 0.466667 voidf 120010000
*

```



```

20500400  oplmvl  sum  30.48  136.144  1  * op plenum lvl (cm)
*
20500401  -0.426509  2.550000  voidf  164010000
20500402  2.343176  voidf  163010000
*
20500500  whlvl  sum  30.48  423.570  1  * op. head lvl (cm)
*
20500501  +5.120  2.880833  voidf  194010000
20500502  3.453333  voidf  193010000
20500503  1.965833  voidf  192010000
20500504  0.476667  voidf  191010000
*
20500600  parlvl  sum  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  ilrtu  sum  30.48  925.830  1  * il n-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  6.5999883  voidf  220040000  * n-tube
*
20500800  ilrtd  sum  30.48  925.830  1  * il n-tube down
*
20500801  -1.75  1.750000  voidf  225010000  * (cm) - from
20500802  6.5999883  voidf  220050000  * -57 cm below
20500803  7.9108334  voidf  220060000  * top of tube sheet
20500804  7.9108334  voidf  220070000  * to top of model
20500805  7.9525000  voidf  220080000  * n-tube
*
20500900  ilpsd  sum  30.48  151.803  1  * il p-s down (cm)
*
20500901  -9.229167  0.6354167  voidf  230010000  * (dpi-57x14)
*
*****
* 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  nb  np  type  s-flg  l-cor
13004000  2  5  2  1  0.109333333
*
*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  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  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-wlpr  l-dr-ht  r-dr-ht  ht-str-no
13004701  0  0  0  0  2
*
*l-h-st  chf-htr  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 0 1.0 2
*
*r-h-st  chf-htr  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 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  nb  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  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  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-mlr  l-dr-ht  r-dr-ht  ht-str-no
12500701      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-mlr  l-dr-ht  r-dr-ht  ht-str-no
13500701      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  .449340
*
*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 2.553333 7
19990604 816010000 0 4100 1 2.093750 8
*
*source type is-mlr l-dr-bt r-dr-bt ht-str-no
19990701 117 .125165 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-btr 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-btr 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 cmp no itv no cmp no itv no cmp 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 531.0 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 999080000 0 1 1 12.0 1
*
*source type is-mlr l-dr-bt r-dr-bt ht-str-no
19992701 10999 1.0 0 0 1
*
*l-h-st chf-btr 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-btr 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 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 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 806010000 0 4100 1 2.093750 8
*
*source type is-mpir l-dr-hr r-dr-hr ht-str-no
19993701 0 0 0 0 8
*
*l-b-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19993801 0 .2858333 .2914500 2.500000 1
19993801 0.29145 10.0 10.0 0 0 0 1.0 1
*19993802 0 .3025833 .3025833 2.562500 6
19993802 0.30258 10.0 10.0 0 0 0 1.0 6
*19993803 0 .3025833 .3025833 2.583333 7
19993803 0.30258 10.0 10.0 0 0 0 1.0 7
*19993804 0 .1005325 .2251253 2.093750 8
19993804 0.22512 10.0 10.0 0 0 0 1.0 8
*
*r-b-st chf-htr hy-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 1.0 1
*19993902 0 0.0 0.0 2.562500 6
19993902 0.0 10.0 10.0 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 1.0 7
*19993904 0 0.0 0.0 2.093750 8
19993904 0.0 10.0 10.0 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 comp no itv no comp 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

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```

19970601 807010000 0 4100 1 5.6458333 1
19970602 807010000 0 4100 1 4.0625000 2
*
*source type is-mpir l-dr-hr r-dr-hr ht-str-no
19970701 0 0 0 0 2
*
*l-b-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19970801 0 0.0 0.0 0.0 2
19970801 0.0 10.0 10.0 0 0 0 1.0 2
*
*r-b-st chf-htr hy-dia h-eq-dia ch-length ht-str-no
*19970901 0 0.0 0.0 0.0 2
19970901 0.0 10.0 10.0 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
*
*incomel 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
*
*incomel 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
*
*no2 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  4000.00 .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.finem..in 1/30/79 by dmh)
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 .00389  3000.00 .00389  4000.00 .00389
*
*inconel 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
*
*inconel 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 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 3.3233e-5
 20101703 600.00 3.6596e-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 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
 *
 * 0.35% 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 1.6960e-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 2.8028e-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) ·
 * 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
*
*inconel 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
*
*inconel 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

```

```

*
*aluminum (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    60.086    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    8.0514e-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
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     31.0870      .04253
20215009     51.4130      .03880
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 * 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      0.23498
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
*
*      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      69.3473      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 btu = 1055.056 joules (international table)
**
**      table      trip      time coef      rate coef
*20225100      htrrate      412      1.0      8.8931 * btu/s/ft2
**
**      time      norm h.t.rate
*20225101      -1.0      1.000
*20225102      0.0      1.000
*20225103      19.1      0.505
*20225104      30.5      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      htrrate      412      1.0      1.9120 * btu/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 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 20000.0 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
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 suction) *****
*
*      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 suction down side interface level **
** 10 intact loop pump suction 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 suction down side interface level **
** 14 broken loop pump suction 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 suction downside delta p -57x to i14 **
** 510 intact loop pump suction 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 suction downside delta p -57x to b65 **
** 514 broken loop pump suction 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 horis **
** 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 suction downside collapsed level ref i16 cm **

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** 540 intact loop pump suction upside collapsed level ref il6 cm **
** 541 blsg n-tube upside collapsed level 925 to -57e(ref) cm **
** 542 blsg n-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 dncmr hor 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 n-tube upside collapsed level 925 to -57e ref tube sheet **
** 568 ilsg n-tube downside collapsed level 925 to -57x ref tub sht **
** 569 intact loop pump suction downside collapsed level ref cold leg**
** 570 intact loop pump suction upside collapsed level ref cold leg **
** 571 blsg n-tube upside collapsed level 925 to -57e ref tube sheet **
** 572 blsg n-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 collapsd lvl ref tub sht **
** 577 broken loop steam generator riser collapsed level ref tub sht **
** 578 broken loop steam generator downcomer collapsd lvl ref tub sht **
** 579 broken loop steam generator dncmr hor collapsd 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

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```

20500109 2.0 voidf 150010000
20500110 1.635833 voidf 140010000
20500111 0.721917 voidf 130010000
20500112 0.466667 voidf 120010000
*
20500300 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 upnlvl 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 pzrlvl sum 30.48 625.793 1 * pwr 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 ilatu sum 30.48 925.830 1 * il n-tube up

```

				* (cm) - from	
20500701	-1.75	1.750000	voidf	21501000	* -57 cm below
20500702		7.952500	voidf	22001000	* top of tube sheet
20500703		7.910833	voidf	22002000	* to top of model
20500704		7.910833	voidf	22003000	* u-tube
20500705		6.599983	voidf	22004000	
*					
20500800	ilstd	sum 30.48	925.830	1	* il -tube down
				* (cm) - from	
20500801	-1.75	1.750000	voidf	22501000	* -57 cm below
20500802		6.599983	voidf	22005000	* top of tube sheet
20500803		7.910833	voidf	22006000	* to top of model
20500804		7.910833	voidf	22007000	* u-tube
20500805		7.952500	voidf	22008000	
*					
20500900	ilpsd	sum 30.48	151.803	1	* il p-s down (cm)
				* (dpi=57x+14)	
20500901	-9.229167	0.6354167	voidf	23001000	
20500902		1.1836602	voidf	24001000	
20500903		3.6662500	voidf	24002000	
20500904		3.4475000	voidf	24003000	
20500905		2.8958333	voidf	24004000	
20500906		3.4733333	voidf	24005000	
20500907		9.7266667	voidf	24006000	
*					
20501000	ilpsa	sum 30.48	-25.019	1	* il p-s up (cm)
				* (dpi=14x+16)	
20501001	-9.229167	0.7266667	voidf	24007000	
20501002		3.4733333	voidf	24008000	
20501003		4.2083333	voidf	24009000	
*					
20501100	blsta	sum 30.48	923.290	1	* bl u-tube up
				* (cm) - from	
20501101	-1.7508333	1.7508333	voidf	31501000	* -57 cm below
20501102		7.7916667	voidf	32001000	* top of tube sheet
20501103		7.5000000	voidf	32002000	* to top of model
20501104		7.5000000	voidf	32003000	* u-tube
20501105		7.5000000	voidf	32004000	
*					
20501200	blstd	sum 30.48	923.290	1	* bl -tube down
				* (cm) - from	
20501201	-1.7508333	1.7508333	voidf	32501000	* -57 cm below
20501202		7.5000000	voidf	32005000	* top of tube sheet
20501203		7.5000000	voidf	32006000	* to top of model
20501204		7.5000000	voidf	32007000	* u-tube
20501205		7.7916667	voidf	32008000	
*					
20501300	blpsd	sum 30.48	142.944	1	* bl p-s down (cm)
				* (dpi=57x+65a)	
20501301	-9.179583	0.8020833	voidf	33001000	
20501302		1.3076602	voidf	34001000	
20501303		2.3393333	voidf	34002000	
20501304		1.6437500	voidf	34003000	
20501305		4.9401250	voidf	34004000	
20501306		4.2964583	voidf	34005000	
20501307		0.6466667	voidf	34006000	

20501400	blpsa	sum 30.48	-27.026	1	* bl p-s up (cm)
				* (dpi=65x+73a)	
20501401	-9.179583	0.6466667	voidf	34007000	
20501402		5.3495833	voidf	34008000	
20501403		2.7966667	voidf	34009000	
*					
20501500	ilsgsl	sum 30.48	1130.780	1	* i.l. s.g. lvl (cm)
				* (top of tube	
20501501	0.0	7.9525000	voidf	60001000	* sheet to top of
20501502		7.9108334	voidf	60002000	* cent. separator)
20501503		7.9108334	voidf	60003000	* (0 to +1130)
20501504		7.4762500	voidf	60004000	* riser side
20501505		5.1558333	voidf	60005000	
*					
20501600	ilsgdcl	sum 30.48	1130.780	1	* i.l. s.g. lvl (cm)
				* (top of tube	
20501601	0.0	7.4762500	voidf	60301000	* sheet to top of
20501602		7.9108334	voidf	60302000	* cent. separator
20501603		7.9108334	voidf	60303000	* (0 to +1130)
20501604		7.9525000	voidf	60304000	* downcomer side
20501605		5.5516667	voidf	60201000	
20501606		1.5404167	voidf	61201000	
*					
20501700	blsgsl	sum 30.48	1120.150	1	* b.l.s.g. lvl (cm)
				* (top of tube	
20501701	0.0	1.0833333	voidf	71601000	* sheet to top of
20501702		6.7083333	voidf	70001000	* grav. separator)
20501703		7.5000000	voidf	70002000	* (0.0 to 1172)
20501704		7.5000000	voidf	70003000	* riser side
20501705		7.5000000	voidf	70004000	
20501706		6.8229167	voidf	70005000	
20501707		1.3333333	voidf	70101000	
*					
20501800	blsgdcl	sum 30.48	1120.140	1	* b.l.s.g. lvl (cm)
				* (top of tube	
20501801	.5416667	4.0000000	voidf	71401000	* sheet to bot of
20501802		7.5000000	voidf	71402000	* grav. separator)
20501803		7.5000000	voidf	71403000	* (0.0 to 1131)
20501804		7.5000000	voidf	71404000	* downcomer side
20501805		7.2500000	voidf	71405000	
20501806		2.8229167	voidf	71101000	
*					
20501900	ilsgmr	sum .028316846	0.0	1	* il s.g. secondary
				* riser mass (kg)	
20501901	0.0	1.0038417	rho	60001000	
20501902		0.9402046	rho	60002000	
20501903		0.8926058	rho	60003000	
20501904		1.0017945	rho	60004000	
20501905		2.2709806	rho	60005000	
20501906		0.4508175	rho	60101000	
20501907		0.4249623	rho	61101000	
*					
20502000	ilsgmd	sum .028316846	0.0	1	* il s.g. secondary
				* downcomer mass(kg)	
20502001	0.0	3.0085308	rho	60201000	

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20502002      0.7316280 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 cctrlvar 19
20502102      1.00 cctrlvar 20
*
*
20502200      blsgm sum .028316846 0.0 1 * bl s.g. secondary
*                               * riser mass (kg)
20502201      0.0 0.0344894 rho 716010000
20502202      0.2213819 rho 700010000
20502203      0.2476839 rho 700020000
20502204      0.2461911 rho 700030000
20502205      0.2549840 rho 700040000
20502206      0.3268035 rho 700050000
20502207      0.5794774 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 cctrlvar 22
20502402      1.00 cctrlvar 23
*
*
20502500      totsgm sum 1.0 0.0 1 * total secondary
*                               * liquid mass (kg)
20502501      0.0 1.00 cctrlvar 21
20502502      1.00 cctrlvar 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

```

```

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 .23607e-3 0.0 1 * core power (kw)
*
20502801      0.0 1.00 htrnr 150000101
20502802      1.00 htrnr 150000201
20502803      1.00 htrnr 150000301
20502804      1.00 htrnr 150000401
20502805      1.00 htrnr 150000501
20502806      1.00 htrnr 150000601
20502807      1.00 htrnr 150000701
20502808      1.00 htrnr 150000801
20502809      1.00 htrnr 150000901
20502810      1.00 htrnr 150001001
20502811      1.00 htrnr 150001101
20502812      1.00 htrnr 150001201
*
*
*
20502900      maxrod stdfactn 1.0 0.0 1 * max rod temp
*
20502901      max htemp 150000118
20502902      htemp 150000218
20502903      htemp 150000318
20502904      htemp 150000418
20502905      htemp 150000518
20502906      htemp 150000618
20502907      htemp 150000718
20502908      htemp 150000818
20502909      htemp 150000918
20502910      htemp 150001018
20502911      htemp 150001118
20502912      htemp 150001218
*
*****
*                               control block for primary coolant system mass
*****
*
205040000      dnrcmas sum .028316846 0.0 1 * downcomer mass
*                               * (kg)
205040001      0.0 0.2113940 rho 101010000
205040002      0.0700293 rho 110010000
205040003      0.0260607 rho 110020000
205040004      0.0520780 rho 110030000
205040005      0.0520780 rho 110040000
205040006      0.0520780 rho 110050000

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20540007	0.0520780	rho	110060000
20540008	0.0520780	rho	110070000
20540009	0.0381645	rho	110080000
20540010	0.0451975	rho	110090000
20540011	0.0733525	rho	110100000
* lower plenum			
20540100	lplmass	sum .028316846	0.0 1 * mass (kg)
20540101	0.0	0.2381304	rho 120010000
20540102		0.2328024	rho 130010000
20540103		0.1229966	rho 140010000
* core mass (kg)			
20540200	coremas	sum .028316846	0.0 1 * 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
* upper plenum			
20540300	uplmas	sum .028316846	0.0 1 * mass (kg)
20540301	0.0	0.0579072	rho 161010000
20540302		0.1260044	rho 162010000
20540303		0.1223341	rho 163010000
20540304		0.1445850	rho 164010000
* upper head			
20540400	uphdmas	sum .028316846	0.0 1 * mass (kg)
20540401	0.0	0.0236441	rho 191010000
20540402		0.1028720	rho 192010000
20540403		0.1854233	rho 193010000
20540404		0.1777042	rho 194010000
* bypass line, support columns, and guide tube			
20540500	byscgt	sum .028316846	0.0 1 * mass (kg)
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
* pressurizer			
20540600	pzmass	sum .028316846	0.0 1 * 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 .028316846	0.0 1 * intact loop
* hot leg			
20540701	0.0	0.1047757	rho 201010000 * mass (kg)
20540702		0.0776879	rho 201020000
20540703		0.0675653	rho 202010000
20540704		0.0653702	rho 203010000
20540705		0.0574572	rho 203020000
20540706		0.0538994	rho 203030000
20540707		0.0478680	rho 210010000
20540708		0.0345748	rho 215010000
* u-tube			
20540800	itubmas	sum .028316846	0.0 1 * intact loop
* mass (kg)			
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
* intact loop			
20540900	icldmas	sum .028316846	0.0 1 * mass (kg)
* 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		0.0849081	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		0.1036466	rho 240090000
20540912		0.0558400	rho 250010000
20540913		0.0779669	rho 261010000
20540914		0.0779669	rho 261020000
20540915		0.0779669	rho 262010000
20540916		0.0854513	rho 263010000
* broken loop			
20541000	bhotmas	sum .028316846	0.0 1 * mass (kg)
* hot leg			
20541001	0.0	0.0584279	rho 301010000
20541002		0.0215803	rho 301020000
20541003		0.0215803	rho 301030000
20541004		0.0256031	rho 301040000
20541005		0.0230250	rho 301050000
20541006		0.0192876	rho 301060000
20541007		0.0495847	rho 310010000
20541008		0.0115250	rho 315010000
* broken loop			
20541100	btubmas	sum .028316846	0.0 1 * mass (kg)
* u-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	0.0454080	rho	320060000
20541107	0.0454080	rho	320070000
20541108	0.0471739	rho	320080000

*
20541200 belmas sum .028316846 0.0 1 * broken loop
* cold leg

20541201	0.0	0.0115250	rho	325010000	* mass (kg)
20541202		0.0495847	rho	330010000	
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
* coolant system
* mass (kg)

20541301	0.0	1.00	cntrlvar	400
20541302		1.00	cntrlvar	401
20541303		1.00	cntrlvar	402
20541304		1.00	cntrlvar	403
20541305		1.00	cntrlvar	404
20541306		1.00	cntrlvar	405
20541307		1.00	cntrlvar	406
20541308		1.00	cntrlvar	407
20541309		1.00	cntrlvar	408
20541310		1.00	cntrlvar	409
20541311		1.00	cntrlvar	410
20541312		1.00	cntrlvar	411
20541313		1.00	cntrlvar	412

cntrlvar delta p (kpa)

*
20550100 name type scale init val flg
vesdp sum 1.0e-3 100.0 1 * vessel level dp
* -13 to -578 cm

20550101	0.0	1.0	p	120010000	0.3303	rho	120010000
20550102		-1.0	p	163010000	-3.3898	rho	163010000

*
20550200 name type scale init val flg
coredp sum 1.0e-3 100.0 1 * core level dp
* -105 to -501 cm

20550201	0.0	1.0	p	140010000	-1.9198	rho	140010000
20550202		-1.0	p	161010000	0.9447	rho	161010000

*
name type scale init val flg

20550300 dwncmdp sum 1.0e-3 100.0 1 * dwnc level dp
* 29 to -578 cm

20550301	0.0	1.0	p	130010000	0.3303	rho	130010000
20550302		-1.0	p	101010000	2.8420	rho	101010000

*
20550400 name type scale init val flg
vescpdp sum 1.0e-3 100.0 1 * vessel upper
* plenum dp
* 135 to -13 cm

20550401	0.0	1.0	p	163010000	3.3898	rho	163010000
20550402		-1.0	p	164010000	3.5964	rho	164010000

*
20550500 name type scale init val flg
veshdp sum 1.0e-3 100.0 1 * vessel upper
* head dp
* 421 to 160 cm

20550501	0.0	1.0	p	191010000	0.3256	rho	191010000
20550502		-1.0	p	194010000	4.0503	rho	194010000

*
20550600 name type scale init val flg
przdp sum 1.0e-3 100.0 1 * pressurizer
* 632 to 30 cm

20550601	0.0	1.0	p	999080000	1.8327	rho	999080000
20550602		-1.0	p	999010000	4.3145	rho	999010000

*
20550700 name type scale init val flg
isgdpdp sum 1.0e-3 100.0 1 * ilsg upside
* 926 to -57e cm

20550701	0.0	1.0	p	210010000	-0.5900	rho	210010000
20550702		-1.0	p	220040000	9.8588	rho	220040000

*
20550800 name type scale init val flg
isgndp sum 1.0e-3 100.0 1 * ilsg downside
* 926 to -57x cm

20550801	0.0	1.0	p	230010000	-0.5900	rho	230010000
20550802		-1.0	p	220050000	9.8588	rho	220050000

*
20550900 name type scale init val flg
ipsdndp sum 1.0e-3 100.0 1 * il pump section
* downside
* -57x to il4

20550901	0.0	0.5	p	240060000	0.5115	rho	240060000
20550902		0.5	p	240070000	0.5115	rho	240070000
20550903		-1.0	p	230010000	0.5900	rho	230010000

*
20551000 name type scale init val flg
ipsdpdp sum 1.0e-3 100.0 1 * il pump section
* upside
* il4 to il6

20551001	0.0	0.5	p	240060000	0.5115	rho	240060000
20551002		0.5	p	240070000	0.5115	rho	240070000
20551003		-1.0	p	240090000	4.3006	rho	240090000

*
20551100 name type scale init val flg
bsgdpdp sum 1.0e-3 100.0 1 * blsg upside
* 925 to -57e

20551101	0.0	1.0	p	310010000	-0.8393	rho	310010000
20551102		-1.0	p	320040000	10.0822	rho	320040000

```

*
*      name      type      scale  init val  flg
20551300  bsgnddp  sum      1.0e-3  100.0  1  * blsg downside
*
20551301  0.0  1.0  p  330010000  -0.8393  rho  330010000
20551302  -1.0  p  320050000  10.0822  rho  320050000
*
*      name      type      scale  init val  flg
20551300  bpsnddp  sum      1.0e-3  100.0  1  * bl pump section
*
*      * downside
*      * -57x to b65
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  bpsnddp  sum      1.0e-3  100.0  1  * bl pump section
*
*      * upside
*      * b65 to b73
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  ilsgndp  sum      1.0e-3  100.0  1  * ilsg riser
*
*      * 1117 to 89 cm
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  ilsgndp  sum      1.0e-3  100.0  1  * ilsg downcomer
*
*      * 1117 to 51 cm
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  blsgndp  sum      1.0e-3  100.0  1  * blsg riser
*
*      * 1186 to -7 cm
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  blsgndp  sum      1.0e-3  100.0  1  * blsg downcomer
*
*      * 1186 to 18 cm
20551801  0.0  1.0  p  715010000
20551802  -1.0  p  703010000  0.5601  rho  703010000
*
*      name      type      scale  init val  flg
20551900  blsgndp  sum      1.0e-3  100.0  1  * blsg dwn horiz
*
*      * 1036 to 18 cm
20551901  0.0  1.0  p  715010000
20551902  -1.0  p  713010000
*
*
*****
*      ctrlvar collapsed liquid level cm
*****
*

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*      name      type      scale  val0  flg  * vessel clspd
20553100  vescl  div  10204.082  100.  1  * level -13 to
*      * -578 ref -578
*
20553101  rhof  163010000  ctrlvar  501
*
*
*      name      type      scale  val0  flg  * core clspi
20553200  corecl  div  10204.082  100.  1  * level -105 to
*      * -501 ref -501
20553201  rhof  161010000  ctrlvar  502
*
*
*      name      type      scale  val0  flg  * dwmc clspd
20553300  dwmccl  div  10204.082  100.  1  * level 29 to
*      * -578 ref -578
20553301  rhof  101010000  ctrlvar  503
*
*
*      name      type      scale  val0  flg  * ves up clspd
20553400  vesupcl  div  10204.082  100.  1  * level 135 to
*      * -13 ref -13
20553401  rhof  164010000  ctrlvar  504
*
*
*      name      type      scale  val0  flg  * ves mh clspd
20553500  vesmhcl  div  10204.082  100.  1  * level 421 to
*      * 160 ref 160
20553501  rhof  194010000  ctrlvar  505
*
*
*      name      type      scale  val0  flg  * prz clspd
20553600  przel  div  10204.082  100.  1  * level 632 to
*      * 30 ref 30
20553601  rhof  999010000  ctrlvar  506
*
*
*      name      type      scale  val0  flg  * ilsg up clspd
20553700  isgupcl  div  10204.082  100.  1  * level 926 to
*      * -57e ref -57
20553701  rhof  220040000  ctrlvar  507
*
*
*      name      type      scale  val0  flg  * ilsg dn clspd
20553800  isgdnccl  div  10204.082  100.  1  * level 926 to
*      * -57x ref -57
20553801  rhof  220050000  ctrlvar  508
*
*
*      name      type      scale  val0  flg  * ilps dn clspd
20553900  ipsdnccl  div  10204.082  100.  1  * level -57x to
*      * i14 ref i14
20553901  rhof  230010000  ctrlvar  509
*
*
*      name      type      scale  val0  flg  * ilps up clspd
20554000  ipsupcl  div  10204.082  100.  1  * level i14 to
*      * i16 ref i14
20554001  rhof  240090000  ctrlvar  510

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	name	type	scale	val0	flg	
20554100	bsgpc1	div	10204.082	100.	1	* blsg up clspd * level 925 to * -57e ref -57
20554101	rhof	320040000		cntrlvar	511	
20554200	bsgpc1	div	10204.082	100.	1	* blsg dn clspd * level 925 to * -57x ref -57
20554201	rhof	320050000		cntrlvar	512	
20554300	bpsdnc1	div	10204.082	100.	1	* blps dn clspd * level -57x to * b65 ref b65
20554301	rhof	330010000		cntrlvar	513	
20554400	bpspc1	div	10204.082	100.	1	* blps up clspd * level b65 to * b73 ref b65
20554401	rhof	340090000		cntrlvar	514	
20554500	ilsgcl	div	10204.082	100.	1	* ilsg ris clspd * level 1117 to * 89 ref 89
20554501	rhof	611010000		cntrlvar	515	
20554600	ilsgcl	div	10204.082	100.	1	* ilsg dn clspd * level 1117 to * 51 ref 51
20554601	rhof	611010000		cntrlvar	516	
20554700	blsgcl	div	10204.082	100.	1	* blsg ris clspd * level 1186 to * -7 ref -7
20554701	rhof	703010000		cntrlvar	517	
20554800	blsgcl	div	10204.082	100.	1	* blsg dn clspd * level 1186 to * 18 ref 18
20554801	rhof	703010000		cntrlvar	518	
20554900	blsgcl	div	10204.082	100.	1	* blsg dn clspd * level 1036 to * 18 ref 18
20554901	rhof	703010000		cntrlvar	519	

	name	type	scale	val0	flg	
						* vessel clspd

20556100	vesclr	sum	1.0	-13.0	1	* level -13 to * -57 ref zero
20556101			-578.0	1.0	cntrlvar	531
20556200	coreclr	sum	1.0	-105.0	1	* core clspd * level -105 to * -501 ref zero
20556201			-501.0	1.0	cntrlvar	532
20556300	dwacmc1r	sum	1.0	+29.0	1	* dwacmc clspd * level 29 to * -578 ref zero
20556301			-578.0	1.0	cntrlvar	533
20556400	vesupclr	sum	1.0	+135.0	1	* ves up clspd * level 135 to * -13 ref zero
20556401			-13.0	1.0	cntrlvar	534
20556500	vesubclr	sum	1.0	+421.0	1	* ves ub clspd * level 421 to * 160 ref zero
20556501			160.0	1.0	cntrlvar	535
20556600	przclr	sum	1.0	+632.0	1	* prz clspd * level 632 to * 30 ref zero
20556601			30.0	1.0	cntrlvar	536
20556700	isgpc1r	sum	1.0	+926.0	1	* ilsg up clspd * level 926 to * -57e ref zero
20556701			-57.0	1.0	cntrlvar	537
20556800	ipnc1r	sum	1.0	+926.0	1	* ilsg dn clspd * level 926 to * -57x ref zero
20556801			-57.0	1.0	cntrlvar	538
20556900	ipsdnc1r	sum	1.0	203.6	1	* ilps dn clspd * level -57x to * i14 ref zero
20556901			-281.3	1.0	cntrlvar	539
20557000	ipspc1r	sum	1.0	0.0	1	* ilps up clspd * 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
*
*      -57.0 1.0      cntrlvar 541
*
*
*      name type      scale val0 flg * blsg dn clspd
20557200 bsgdnclr sum      1.0 +925.0 1 * level 925 to
*
*      -57.0 1.0      cntrlvar 542
*
*
*      name type      scale val0 flg * blsg dn clspd
20557300 bpsdnclr sum      1.0 203.6 1 * level -57x to
*
*      -279.8 1.0      cntrlvar 543
*
*
*      name type      scale val0 flg * blps up clspd
20557400 bpsupclr sum      1.0 0.0 1 * level 665 to
*
*      -279.8 1.0      cntrlvar 544
*
*
*      name type      scale val0 flg * ilsg ris clspd
20557500 ilsgclr sum      1.0 +1117.0 1 * level 1117 to
*
*      89.2 1.0      cntrlvar 545
*
*
*      name type      scale val0 flg * ilsg dwn clspd
20557600 ilsgdclr sum      1.0 +1117.0 1 * level 1117 to
*
*      50.5 1.0      cntrlvar 546
*
*
*      name type      scale val0 flg * blsg ris clspd
20557700 blsgclr sum      1.0 +1186.0 1 * level 1186 to
*
*      -7.0 1.0      cntrlvar 547
*
*
*      name type      scale val0 flg * blsg dwn clspd
20557800 blsgdclr sum      1.0 +1186.0 1 * level 1186 to
*
*      16.51 1.0      cntrlvar 548
*
*
*      name type      scale val0 flg * blsg dmbz clspd
20557900 blsgbclr sum      1.0 0.0 1 * level 1036 to
*
*      16.51 1.0      cntrlvar 549
*
*
*****
*
*      control block for core power
*
*****

```

```

20515000 dcypower function 2.1800000 0.0 1 * mw
20515001 time 0 150
*
*
20515100 actpower sum 1.0 0.0 1
20515101 0.0 1.0      cntrlvar 150 * watts
*
*
*****
*
*      control block for pressurizer heater rods
*
*****
*
20599500 varpower function 1.0 0.0 1 * mw
20599501 time 0 999
*
20599900 pzppower sum 1.0 0.0 1
20599901 0.0 1.0      cntrlvar 995 * watts
*
*****
*
*      internal pzs heater controls ( ref gvj-9-82)
*
*****
**
*20599000 t698 tripunit 1.0 0.0 1
*20599001 698
**
*20599100 onoffhtrs sum 875.0 0.0 1
*20599101 0.0 1.0      cntrlvar 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      cntrlvar 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 cntrlvar 994 cntrlvar 996 cntrlvar 992
**
*20599800 pzsinthts sum 1.0 0.0 1
*20599801 0. 1.0 cntrlvar 995 1.0 cntrlvar 997 1.0 cntrlvar 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 cntrlvar 6
*20598101 132.3 -1.0 cntrlvar 6 * level in cm
*
20598200 pzcorr mult 1.0 0.0 0 * correct level in
20598201 cntrlvar 980 cntrlvar 981 * pwr until t529
*
20598500 pzrfw mult .0066805 0.0 0 * pressurizer
20598501 rho 999070000 cntrlvar 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 cntrlvar 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 cntrlvar 350
*
*
* ***** transient *****
*
* intact loop
*
* 20525100 ilpmpsd function 1873.37 0.0 1 * from cntrlvar 251
* 20525101 time 0 250 * in steady-state
*
* broken loop
*
* 20535100 blpmpsd function 1492.32 0.0 1 * from cntrlvar 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 tripunit 1.0 0.0 1
20560601 419
*
20560700 ilmerr sum 1.0 0.0 1 * input desired ilsg
20560701 103.0 -1.0 cntrlvar 21 * liquid mass in kg
*
20560800 ilmcrr mult 1.0 0.0 0 * correct mass in
20560801 cntrlvar 606 cntrlvar 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 cntrlvar 608 * feed flow rate
20561002 1.0 cntrlvar 609
*
20562000 irrerr div 1.0 0.0 1 * recirc ratio
20562001 mflowj 601010000 mflowj 601020000
*
20562500 icrrr div 1.0 0.0 1 * circulation ratio
20562501 mflowj 601010000 mflowj 601030000
*
*
20570600 t419 tripunit 1.0 0.0 1
20570601 419
*
20570700 blmerr sum 1.0 0.0 1 * input desired blsg
20570701 26.0 -1.0 cntrlvar 24 * liquid mass in kg
*
20570800 blmcrr mult 1.0 0.0 0 * correct mass in
20570801 cntrlvar 706 cntrlvar 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 cntrlvar 708 * feed flow rate
20571002 1.0 cntrlvar 709
*
20572000 brerr div 1.0 0.0 1 * recirc ratio
20572001 mflowj 704010000 mflowj 713030000
*
20572500 brerr 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 diffread 1.0 0.0 1
20563101 cntrlvar 630
*
20563200 posdpdt tripunit 1.0 0.0 1
20563201 662
*
20563300 negdpdt tripunit 1.0 0.0 1
20563301 663
*
20563400 open mult 1.0 0.0 1

```

```

20563401  cntrlvar  630  cntrlvar  632
*
20563500  close  mult  1.0  0.0  1
20563501  cntrlvar  630  cntrlvar  633
*
20563600  rate  sum  1.e-8  0.0  0
20563601  0.0  1.0  cntrlvar  634
20563602  1.0  cntrlvar  635
*
20563700  posn  integral  1.0  0.294088  0
20563701  cntrlvar  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  6.23e6  -1.0  p  705010000  * pascals - mid band
*
20573100  dperr  diffrend  1.0  0.0  1
20573101  cntrlvar  730
*
20573200  posdpdt  tripunit  1.0  0.0  1
20573201  672
*
20573300  negdpdt  tripunit  1.0  0.0  1
20573301  673
*
20573400  open  mult  1.0  0.0  1
20573401  cntrlvar  730  cntrlvar  732
*
20573500  close  mult  1.0  0.0  1
20573501  cntrlvar  730  cntrlvar  733
*
20573600  rate  sum  4.e-9  0.0  0
20573601  0.0  1.0  cntrlvar  734
20573602  1.0  cntrlvar  735
*
20573700  posn  integral  1.0  0.04367422  0
20573701  cntrlvar  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  cntrlvar  200
*
20520200  abtrip  tripunit  1.0  0.0  1
20520201  640
*
20520300  vttrip  tripunit  1.0  0.0  1
20520301  641

```

```

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

```

```

20522200 vspwr sum 1.0 1.0 1
20522201 0.0 1.0 cntrlvar 218
*20522202 1.0 cntrlvar 219
*20522203 1.0 cntrlvar 220
*20522204 1.0 cntrlvar 221

```

```

*
*
20522300 vtrip tripunit 1.0 0.0 1
20522301 643

```

```

*
20522400 invvt sum 1.0 1.0 1
20522401 1.0 -1.0 cntrlvar 223

```

```

*
20522500 vspwr mult 1.0 1.0 1
20522501 cntrlvar 222 cntrlvar 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 811010000
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 inthrkl integral 1.0 0.0 0
20505101 mflowj 725000000

```

```

*
* run statistics

```

```

*
20507800 oldtime sum 1.0 0.0 0
20507801 0.0 1.0 cntrlvar 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 -1.0 cntrlvar 78
20508102 1.0 cntrlvar 79

```

```

*
* minor edit

```

```

*
0000301 mflowj 725000000 * mbrk (kg/s) (mdot*break)

```

```

0000302 p 162010000 * pwp (MPa) (ps+op-13)
0000303 cntrlvar 6 * pwr level (lprz+process)
0000304 p 999010000 * pwr pressure (p+prz+632)
0000305 cntrlvar 150 * deacy power (dcypower)
0000306 mflowj 262010000 * ilhl flowrate (qi+1)
0000307 mflowj 362010000 * blhl 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 cntrlvar 15 * il sg level (lip+971-57e)
0000313 cntrlvar 17 * bl sg level (lbp+993-57e)
0000314 mflowj 634000000 * il sg adv rate (mdot+il*adv)
0000315 mflowj 734000000 * bl sg adv rate (mdot+bl*adv)
0000316 mflowj 430010000 * il acc rate (mdot+il*acum)
0000317 mflowj 530010000 * bl acc rate (mdot+bl*acum)
0000318 cntrlvar 510 * il pump up dp (dpi+14b+16)
0000319 cntrlvar 514 * bl pump up dp (dps+65+73a)
0000320 rho 363020000 * density blcl (rb+79m)
0000321 mflowj 110010000 * downcomer rate (qv+dc-423)
0000322 cntrlvar 1 * core level (lv+13m-57b)
0000323 httemp 150000612 * pct (thv+peak)
0000324 dt 0 * time step
*0000324 cntrlvar 81 * time step
0000325 cptime * cptime
0000326 cntrlvar 51 * int brk mass
0000327 mflowj 610000000 * il sg2i
0000328 mflowj 722000000 * bl sg2i
0000329 mflowj 615000000 * il sg2 aux
0000330 mflowj 728000000 * bl sg2 aux
0000331 voidf 220010000 * il sg1
0000332 voidf 220020000
0000333 voidf 220030000
0000334 voidf 220040000
0000335 voidf 320010000 * bl sg1
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 pmpvel 250 * il pump vel
0000350 pmpvel 350 * bl pump vel
0000351 httemp 150000118 * core btm temp
0000352 httemp 150001218 * core top temp
0000353 tempf 162010000 * core up l temp
0000354 tempf 140010000 * core dn l temp
0000355 httemp 150000618
0000356 httemp 150000718
0000357 httemp 150000818
0000358 httemp 150000918

```

```
0000359 http 150001018
0000360 http 150001118
0000361 voidf 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  transnt
*
*      inp-chk or  run
0000101      run
*
*nmits      input  output  (si or british)
0000102      british  si
*
0000103 3592 * sfsb.out & sfsb.rst
*
*      t end  min st  max st  st cl  nr  mj  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-vlv valve
7250101 72000000 79000000 0.00314159 0.0 0.0 0100 * ejl
7250102 0.90 0.80 * ejl
7250201 1 0.0 0.0 0.0
7250300 trpvlv
7250301 602
*
* cross valve
*
6370000 ilcnj sngljm
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 ilblc valve
6700101 647010000 746010000 0.000661 0.0 0.0 100
6700201 1 0.0 0.0 0.0
6700300 mtrvlv
6700301 624 625 1.0 0.0 0
*
7370000 blcnj sngljm
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 ie null 0 635.5 n -1.
* hpis
0000450 time 0 ge timeof 407 25.0 1 -1.
0000451 cntrlvar 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 cntrlvar 16 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 cntrlvar 30 ge null 0 33.0 n -1.
0000455 cntrlvar 6 ge null 0 255.0 n -1. * open ldm vv EOS
0000456 cntrlvar 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 twdpjun
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 ilchgy 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 twdpjun
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 blchgy 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 999080000
20503002 -1.0 tempf 201010000
*
2450000 letdown twdpjun
2450101 261010000 246000000 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 letdnsk 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 600010000 ge null 0 1000.0 n -1.
0000454 cntrlvar 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 twdpjun
*
* from to jun area
4100101 420000000 400000000 :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 0.056986 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 1440.0 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 0.02539 0.0 0.0
4100207 471.88 0.02500 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 652.46 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 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 0.00460 0.0 0.0
4100221 1560.0 0.0 0.0 0.0
4100222 1600.0 0.0 0.0 0.0

```

```

*
5100000 blhpsj tndpjun

```

```

*
*      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

```

```

* sfill trip changes
*
0000401 time 0 ge null 0 8000.0 1 -1.0
0000406 time 0 ge null 0 0.0 1 -1.0 * ejl

```

```

*
20505100 intbrk integral 1.0 0.0 0
20505101 mflowj 725000000

```

```

*
* add pump transient controller
*
20525100 ilpmpsd function 1873.37 0.0 1
20525101 time 0 250
20535100 blpmpsd function 1492.32 0.0 1
20535101 time 0 350

```

```

*
* restart pump
*
0000423 time 0 ge null 0 4400.00 1 -1.0

```

```

*
20525200 ilpmps 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 4000.0 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 pzrpower sum 1.0 0.0 1
20599901 0.0 1.0 cntrlvar 995
20299900 power 439 1.0 1.0e-3
20299901 0.0 1.0
20299901 -1.0 0.0
20299902 0.0 1.0
20299903 300.0 1.0
20299904 301.0 0.0

```

```

*
* delete pwr level controller
*
20598000 t419 delete 0.0 0.0 0.0 0.0 0.0 0.0
20598100 pzrerr delete 0.0 0.0 0.0 0.0 0.0 0.0
20598200 pzrcorr delete 0.0 0.0 0.0 0.0 0.0 0.0
20598500 pzrfv delete 0.0 0.0 0.0 0.0 0.0 0.0
* delete pwr component
+9100000 pzrspry delete
+9200000 pzrsprv delete
*
0000418 p 999010000 ge null 0 2250.0 n -1.
9100000 pzrspry tndpjun

```

```

9100101 920000000 999000000 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 prsvrv tmdpvol
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
*
9340000 prsvr delete
9400000 prsdv delete
9800000 pzrlvlv delete
9850000 pzrlvlj delete
9890000 c989 delete
9910000 tmd-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 ilmcrr 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 blmcrr 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 brrcr delete 0.0 0.0 0.0 0.0 0.0 0.0
20572500 brrcr delete 0.0 0.0 0.0 0.0 0.0 0.0
20563000 perr delete 0.0 0.0 0.0 0.0 0.0 0.0
20563100 dperr delete 0.0 0.0 0.0 0.0 0.0 0.0
20563200 posdpdt delete 0.0 0.0 0.0 0.0 0.0 0.0
20563300 negdpdt delete 0.0 0.0 0.0 0.0 0.0 0.0
20563400 open delete 0.0 0.0 0.0 0.0 0.0 0.0
20563500 close delete 0.0 0.0 0.0 0.0 0.0 0.0
20563600 rate delete 0.0 0.0 0.0 0.0 0.0 0.0
20563700 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 cntrlvar 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 -1.0 cntrlvar 78
20508102 1.0 cntrlvar 79
*
6150000 isgafwj tmdpjen
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 4900.0 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 bsgafwj tmdpjen
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 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 htrnrate 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 htrnrate 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 tmdpjn
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 tmdpjn
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 isgij tmdpjn
*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 isgij valve
6350101 611010000 650000000 0.007 204.67 204.67 100
6350201 1 0.0 1.78476 0.0
6350300 mtrvlv
6350301 403 410 .01 0.24367 0

*
7350000 bsgij valve
7350101 705010000 750000000 0.007 1022.36 1022.36 100
7350201 1 0.0 0.51964 0.0
7350300 mtrvlv
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 rossoverline 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 * misg2 out
0000312 mflowj 735000000 * mbsg2 out
0000313 mflowj 610000000 * misg2 in
0000314 mflowj 722000000 * mbsg2 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 * p2r level
0000342 p 999080000 * p2r pressure
0000343 cntrlvar 999 * p2r heater power
0000344 mflowj 415000000 * il chg
0000345 mflowj 515000000 * bl chg
0000346 mflowj 245000000 * letdown flowrate
0000347 sattemp 999080000 * p2r 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 pmvvel 250 * il pump velocity

```

0000358 pmpvel 350 * bl pump velocity
0000359 tempf 162010000 * upper plenum temp
0000360 tempf 140010000 * lower plenum temp
0000361 ctrlvar 29 * pct
0000362 voidf 162010000 * upper plenum void
0000363 ctrlvar 81 * time step size
0000364 cputime 0 * cpu time
0000365 ctrlvar 999 * pwr 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  mj  wt
*
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 l -1.0
0000617 427 and 428 n -1.
*
6150000 isgafwj tmpjpm
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 bsgafwj tmpjpm
7280101 728000000 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 blpmpsd function 425.0 0.0 1
20535101 time 0 252
0000423 time 0 ge null 0 4400.0 n -1.
20525200 ilpmpsr 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

```

END

**DATE
FILMED**

8 / 11 / 93