SMSAB-02-01

ANALYSIS REPORT

Comparison Between TRAC-M Version 3782 and RELAP5 MOD 3.2.2 Gamma Calculations of Selected Pressurized Thermal Shock Scenarios of the Oconee Unit 1 Plant

Gene S. Rhee

March 2002

Office of
Nuclear Regulatory Research

SAFETY MARGINS AND SYSTEM ANALYSIS
BRANCH

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ABSTRACT

RELAP5 MOD 3.2.2 Gamma Version is used to provide thermal hydraulic conditions of the downcomer of the Oconee Unit 1 Plant for fracture mechanics code calculations of the vessel wall for a number of postulated accident scenarios which may pose a significant risk with respect to pressurized thermal shock concerns. As a measure of confirming RELAP5 calculation results, TRAC-M Version 3782 calculations were performed on four scenarios, and the results are compared with those obtained from RELAP5 calculations. The selected scenarios are two on turbine bypass valve "A" stuck open, one on the main steam line break off Steam Generator "A," and one on overfeed to steam generators to 96 percent of their operating ranges. Detailed comparisons between TRAC-M and RELAP5 calculation results show that the two code results are consistent for the same scenarios.

A TRAC-M calculation of a main steam line "A" break scenario suggests that this transient with the continuous emergency feedwater flow to the affected steam generator leads to the condition of pressurized thermal shock concerns (i.e., high pressure and low-temperature). The calculated pressure is 15.3 MPa (2219 psia) while the calculated minimum downcomer temperature is 380K (224 °F) which is less than the pressurized thermal shock screening criteria of 422K (300 °F) for circumferential welds and 405K (270 °F) for axial welds, forgings, and plate materials. However, it should be pointed out that this scenario has a very low probability of actual occurrence because the operator is expected to isolate the affected steam generator (i.e., terminate the emergency feedwater flow to minimize cooldown) as soon as a main steam line break is recognized. When the operator isolates the affected steam generator, the primary system cooldown would be minimal. For example, in RELAP5 Case 61, where the operator isolated the affected steam generator in 10 minutes, the cooldown was only about 10K (18 °F), and the minimum downcomer temperature was 557K (543 °F).

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EXECUTIVE SUMMARY

The pressurized thermal shock issue was investigated in the early 1980's for three plants; Oconee Unit 1 of Babcock & Wilcox Co. design, Calvert Cliffs Unit 1 of Combustion Engineering, Inc. design, and H.B. Robinson Unit 2 of Westinghouse Electric Corp. design. This investigation led to establishment of pressurized thermal shock screening criteria which are described in Title 10 of the Code of Federal Regulations Section 50.61 and further discussed in Regulatory Guide 1.154. The screening criteria established then may be too restrictive now in view of the developments that have been made since the 1980's in many important areas such as the flaw estimate in the vessel wall, the probabilistic fracture mechanics code, and the prediction of the thermal hydraulic condition in the downcomer. Therefore, the Nuclear Regulatory Commission has decided to re-examine the pressurized thermal shock concerns for selected plants. The Oconee Unit 1 plant was selected again for this re-examination.

The Reactor Leak and Analysis Program (RELAP5) code was chosen for thermal hydraulic calculations which were needed for determining thermal hydraulic conditions in the downcomer for selected scenarios. Transient Reactor Analysis Code – Modernized (TRAC-M) code calculations were used as a confirmation of RELAP5 results.

In this report, RELAP5 and TRAC-M calculations are compared for four different scenarios, namely, two scenarios on turbine bypass valve stuck open, one scenario on main steam line break, and one scenario on steam generator overfeed case. These scenarios were selected by the Probabilistic Risk Analysis Branch based on risk significance.

Generally speaking, TRAC-M results are consistent with RELAP5 results for comparable scenarios, and thus RELAP5 results may be considered to have passed an independent check at least for the selected scenarios.

Out of four scenarios selected for comparisons between TRAC-M and RELAP5 results, a TRAC-M calculation of one scenario of the main steam line "A" break with the continuous emergency feedwater flow to the affected steam generator leads to the minimum downcomer temperature of 380K (224 °F) to be less than the pressurized thermal shock screening criteria of 422K (300 °F) for circumferential welds and 405K (270 °F) for axial welds, forgings, and plate materials while the pressure is high, a nearly normal level of 15.3 MPa (2219 psia). However, it should be pointed out that this scenario has a very low probability of actual occurrence because the operator is expected to isolate the affected steam generator (i.e., terminate the emergency feedwater flow to minimize cooldown) as soon as a main steam line break is recognized. When the operator isolates the affected steam generator, the primary system cooldown would be minimal. For example, in RELAP5 Case 61 where the operator isolated the affected steam generator in 10 minutes, the cooldown was only about 10K (18 °F), and the minimum downcomer temperature was 557K (543 ° F).

ACKNOWLEDGMENTS

The author thanks James F. Lime and Dr. James L. Steiner of the Los Alamos National Laboratory for their assistance in modifying and debugging the TRAC-M input deck which was developed by the Los Alamos National Laboratory but had to be modified to include some comments received from the Oconee Plant and to develop an input model for main steam line break calculations. The author also thanks Robert Beaton and Vesselin Palazov of Information Systems Laboratories for their assistance in modifying a plotting script which was developed by Information Systems Laboratories.

ABBREVIATIONS

B&W	Babcock & Wilcox Co. (now Framatome)
CE	Combustion Engineering, Inc.
CFR	*Code of Federal Register*
EFW	emergency feedwater
HPI	high-pressure injection
ICS	integrated control system
ISL	Information Systems Laboratories, Inc.
LANL	Los Alamos National Laboratory
LOCA	loss-of-coolant accident
LPCI	low-pressure coolant injection
MSLB	main steam line break
MFW	main feedwater
NRC	Nuclear Regulatory Commission, U.S.
OTSG	once-through steam generator
PTS	pressurized thermal shock
PWR	pressurized-water reactor
RCP	reactor coolant pump
RELAP	reactor leak and analysis program (code)
SG	steam generator
SRV	safety-relief valve
TRAC-M	transient reactor analysis code – modernized (code)
W	Westinghouse Electric Corp.

1 INTRODUCTION

The pressurized thermal shock (PTS) issue was investigated in the early 1980's for three plants; Oconee Unit 1 of Babcock & Wilcox Co. (B&W) design, Calvert Cliffs Unit 1 of Combustion Engineering, Inc. (CE) design, and H.B. Robinson Unit 2 of Westinghouse Electric Corp. (W) design. This investigation led to establishment of PTS screening criteria which are described in Title 10 of the Code of Federal Regulations (CFR) Section 50.61 (10 CFR 50.61) and further discussed in Regulatory Guide 1.154. The screening criteria established then may be too restrictive now in view of the developments that have been made since the 1980's in many important areas such as the flaw estimate in the vessel wall, the probabilistic fracture mechanics code, and the prediction of the thermal hydraulic condition in the downcomer. Therefore, the Nuclear Regulatory Commission (NRC) has decided to re-examine the PTS concerns for selected plants. The Oconee Unit 1 plant was selected again for this re-examination.

Reactor Leak and Analysis Program (RELAP5) code Mod 3.2.2 Gamma Version was chosen for thermal hydraulic calculations which were needed for determining thermal hydraulic conditions in the downcomer for selected scenarios. Transient Reactor Analysis Code – Modernized (TRAC-M) code V3782 Version calculations were used as a confirmation of RELAP5 results.

In this report, RELAP5 and TRAC-M calculations are compared for four different scenarios, namely, two scenarios on turbine bypass valve stuck open, one scenario on main steam line break (MSLB), and one scenario on steam generator overfeed case. These scenarios were selected by the Probabilistic Risk Analysis Branch based on risk significance.

Main characteristics of the Oconee Unit 1 plant are briefly discussed in Section 2, and TRAC-M and RELAP5 input decks are briefly described in Section 3 and 4, respectively. Detailed comparisons between TRAC-M and RELAP5 calculations are made in Section 5, and comparisons are summarized in Section 6 followed by conclusions in Section 7. TRAC-M input deck listings are given in Appendix A for steady state calculations and in Appendix B for transient calculations.

2 MAIN CHARACTERISTICS OF OCONEE UNIT 1 PLANT

The Oconee Unit 1 plant uses a B&W pressurized-water reactor (PWR) with a rated power of 2568 MWt. The reactor coolant system consists of two hot legs and four cold legs (2x4 arrangement), two once-through steam generators (SGs), four reactor coolant pumps (RCPs), and a pressurizer. The Oconee plant uses a lower loop design, meaning that the bases of the steam generators lie below the horizontal plane through the top of the reactor core. As a B&W unique feature, the Oconee plant uses eight vent valves which are designed to relieve the upper plenum pressure to the downcomer if it is higher than the downcomer pressure by more than a threshold value. Vent valves may have a mitigating effect with respect to PTS concerns. They allow the cold high-pressure injection (HPI) fluid delivered to the downcomer to be warmed up by the flow coming from the upper plenum when the upper plenum pressure becomes higher than the downcomer pressure under a stagnant or very low loop flow condition.

Another distinguishing feature of a B&W plant is the once-through steam generator (OTSG) which has the capability of producing superheated steam. The primary coolant enters the top on the tube side while the secondary side feedwater enters the midsection of the shell side, flows downward, turns around at the bottom, and flows upward in counter current manner with the downflowing primary coolant. The feedwater boils in the lower part of the SG, the saturated steam is heated up as it flows upward, and steam becomes superheated in the upper part of the SG.

The integrated control system (ICS) is also unique to B&W plants. It is used to generate power to be consistent with demand. It provides control for the main operation of the entire plant and encompasses the reactor, turbine-generator, and the feedwater flow control.

3 TRAC-M VERSION V3782 INPUT MODEL AND CALCULATIONS

An input model used for TRAC-M Version V3782 calculations was developed by the Los Alamos National Laboratory (LANL) and is shown in Figures 3.1 through 3.12 which are taken from "An Updated Oconee Plant Model for Pressurized Thermal Shock Analyses" (Ref. 1). To be consistent with the RELAP5 modeling of the downcomer which is important for PTS evaluations, the TRAC-M input model of the downcomer uses eight axial nodes and six azimuthal nodes. Input decks for steady state calculations and most of the transient calculations were developed by LANL. However, minor modifications to the steady-state deck were necessary to include some comments received from the Oconee plant. In addition, a transient deck for the MSLB simulation was developed by the author.

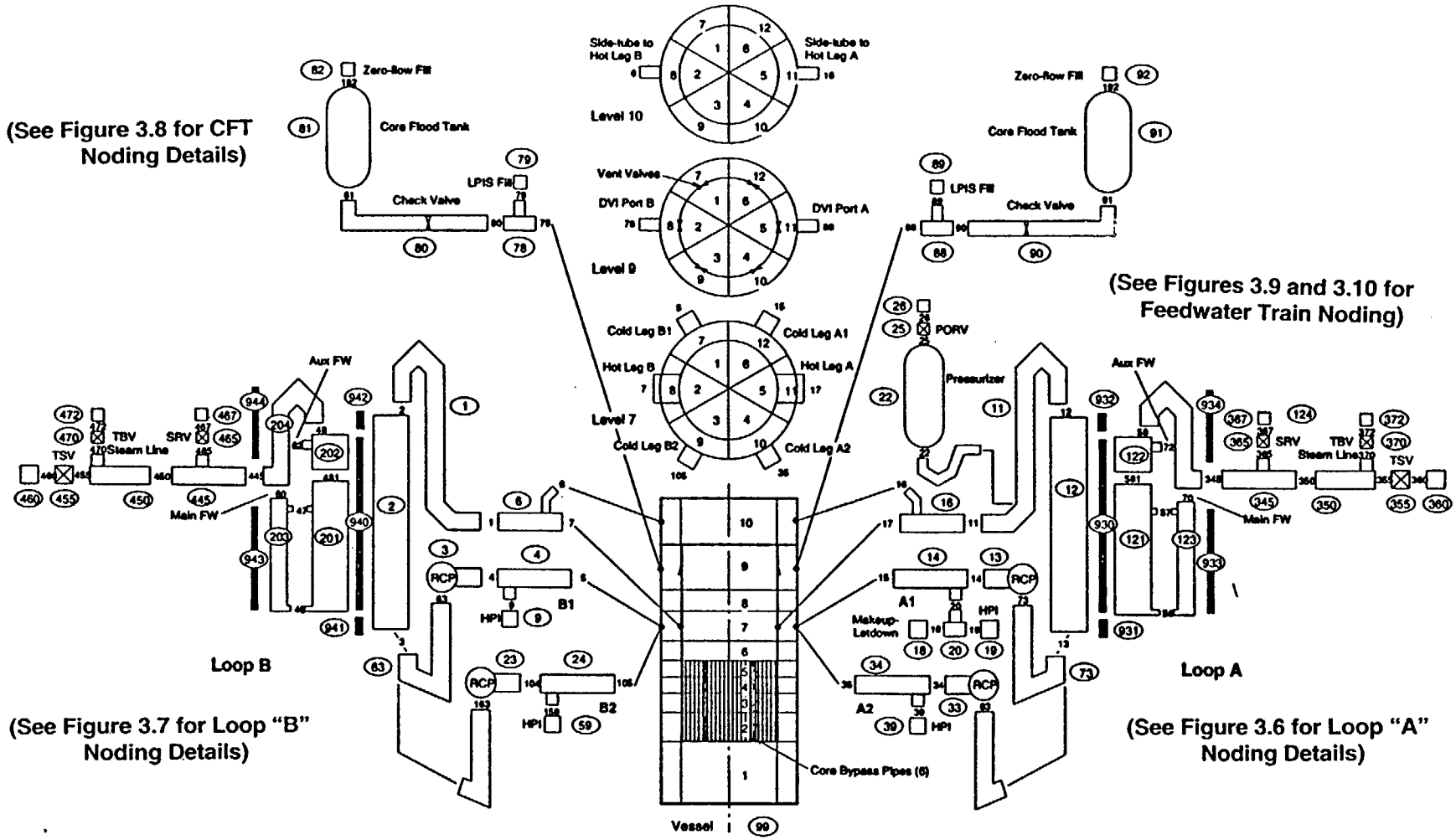
All of the transient calculations were performed by the author usually by repeatedly reducing the maximum allowed time step size several times whenever the calculations were stopped because of failure in finding an iterative solution. Eventually the calculations were completed to 10,000 seconds. Some of the calculations took about 2 weeks for completing 10,000 seconds of transient time.

4 RELAP5 MOD 3.2.2 GAMMA INPUT MODEL AND CALCULATIONS

An input model used for RELAP5 MOD 3.2.2 Gamma calculations was developed by Information Systems Laboratories (ISL) and is shown in Figures 4.1 through 4.5 which are taken from "RELAP5 Thermal Hydraulic Analysis to Support PTS Evaluations for the Oconee-1 Nuclear Power Plant" (Ref. 2). Since PTS concerns focus on downcomer conditions, the downcomer model is of greatest interest. The downcomer is divided into eight axial nodes including the upper annulus above the accumulator injection port and six azimuthal nodes as shown in Figure 4.1.

All of the RELAP5 calculations were performed by ISL and provided to the author electronically for comparison with TRAC-M. Details on the RELAP5 calculation results of selected parameters of interest are shown in Reference 2.

Text continues on page 18.



(See Figures 3.2–3.5 for Vessel Noding Details)

Figure 3.1 Oconee Primary System Model Overview

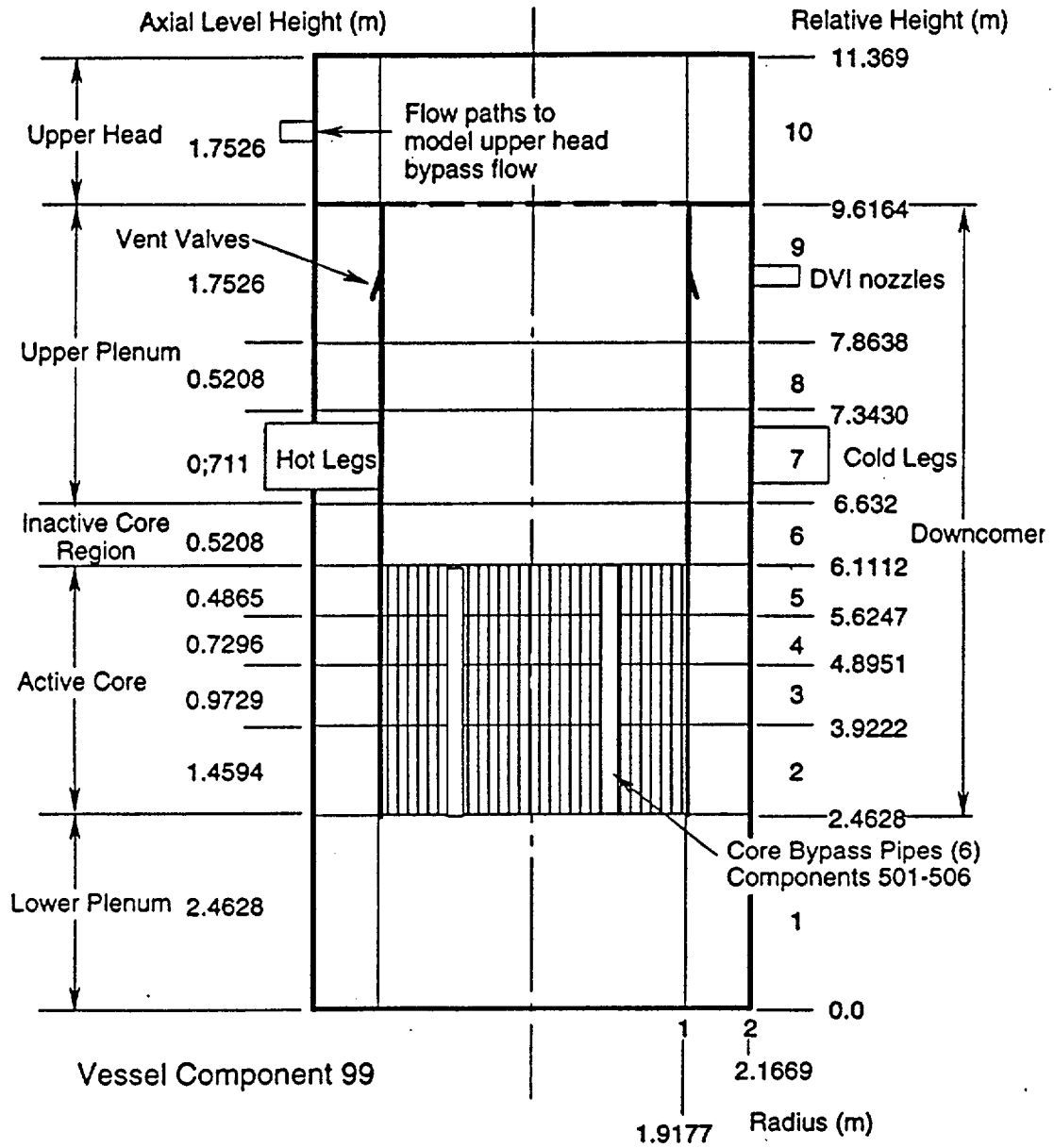


Figure 3.2 Vessel Model Elevation View

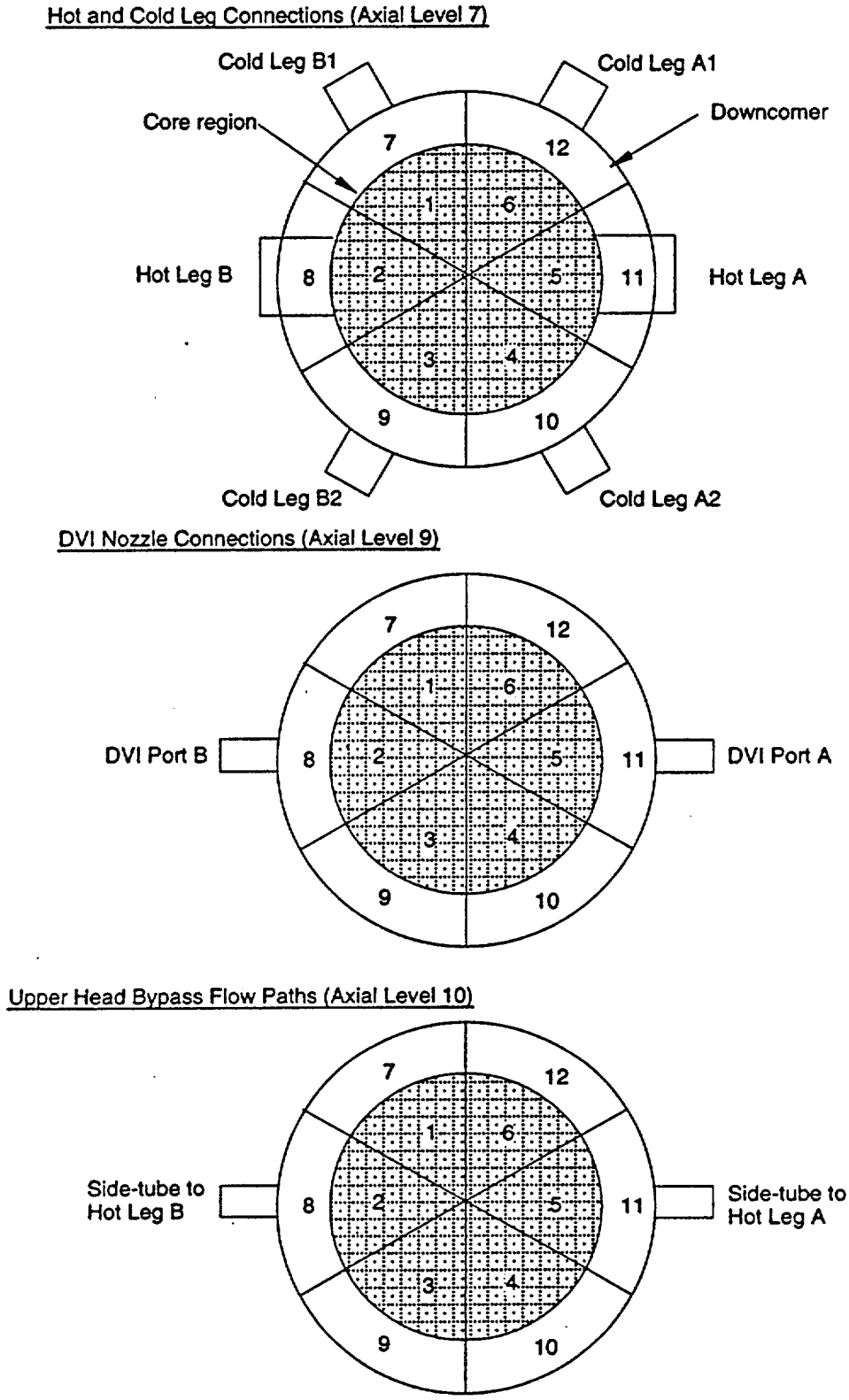


Figure 3.3 Vessel Model Plan Views

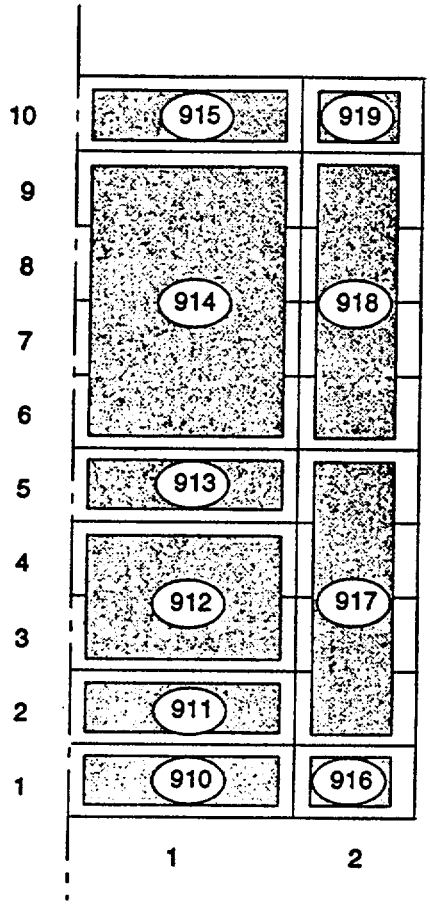


Figure 3.4 Vessel Heat-structure Components

Rod Component 900

Node	Node radius (m)
1	0.0
2	1.5e-03
3	3.0e-03
4	4.0e-03
5	4.657e-03
6	4.785e-03
7	5.0e-03
8	5.46e-03

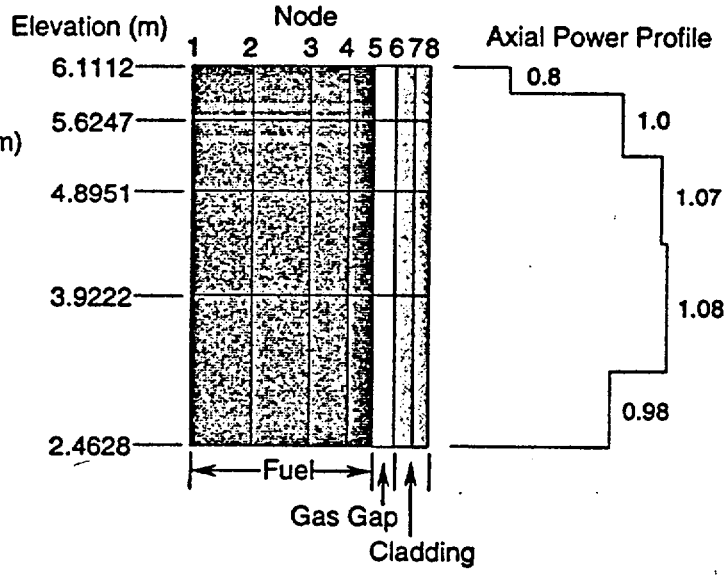


Figure 3.5 Fuel-rod Component Noding Diagram

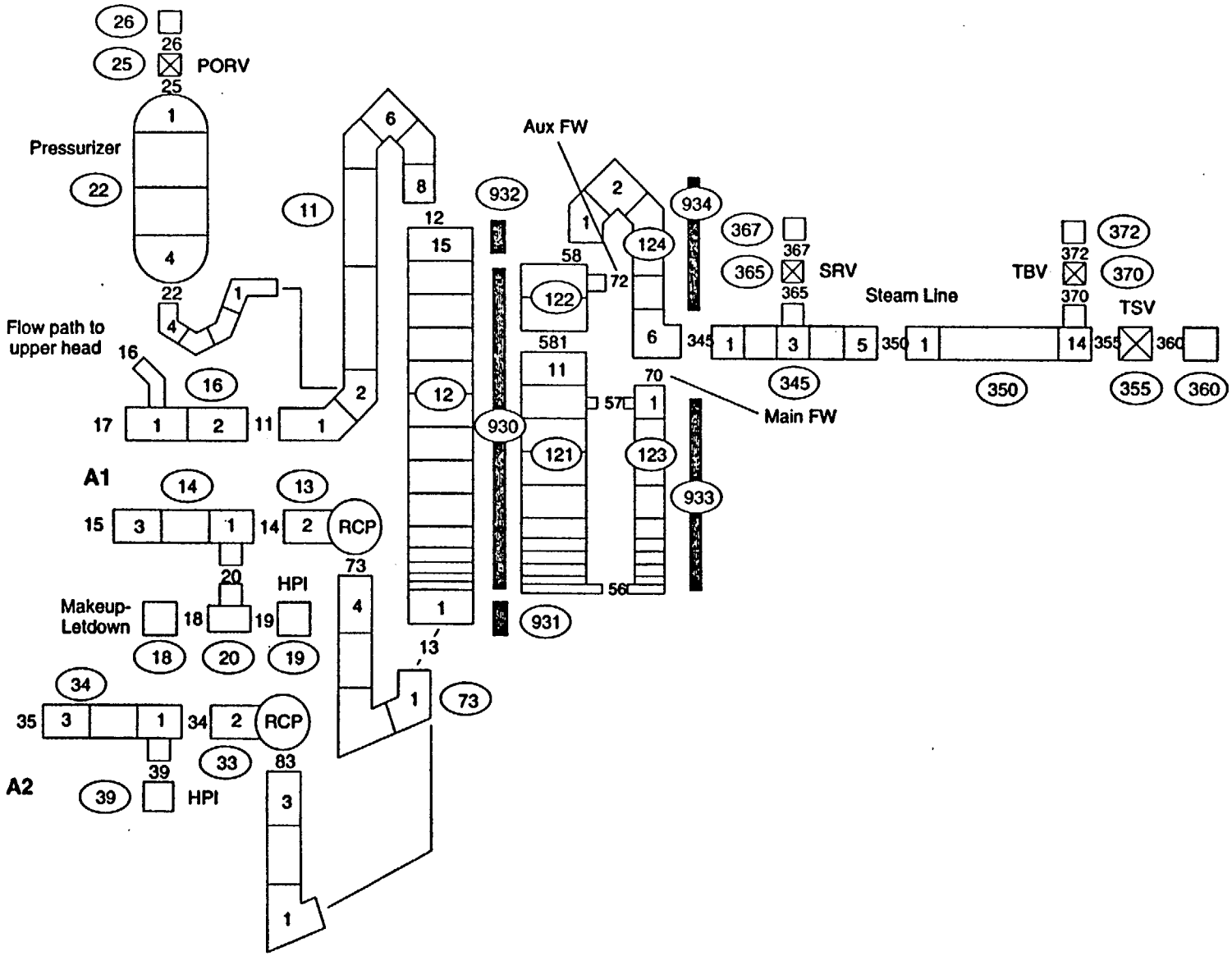


Figure 3.6 Loop "A" Noding Diagram

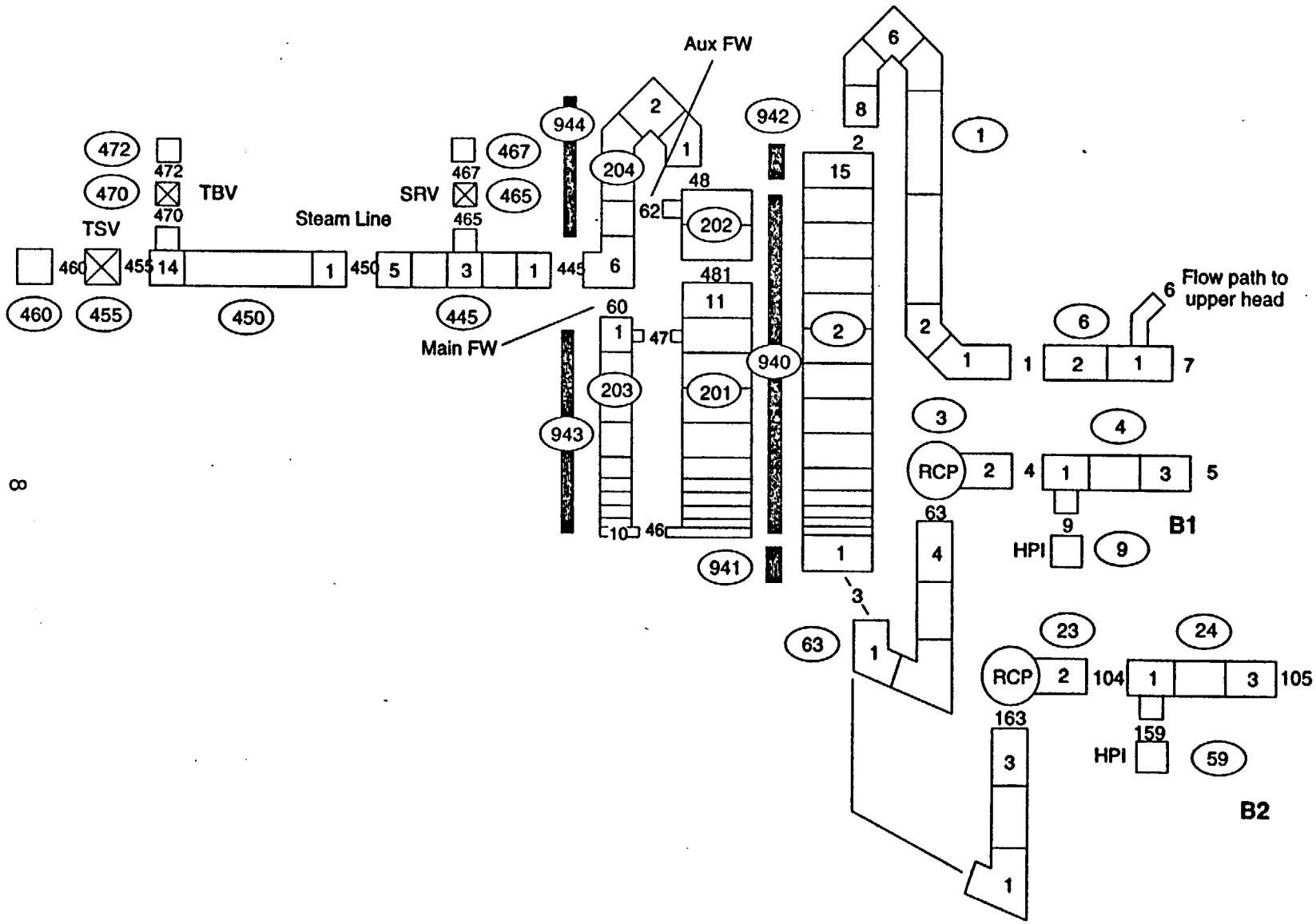


Figure 3.7 Loop "B" Noding Diagram

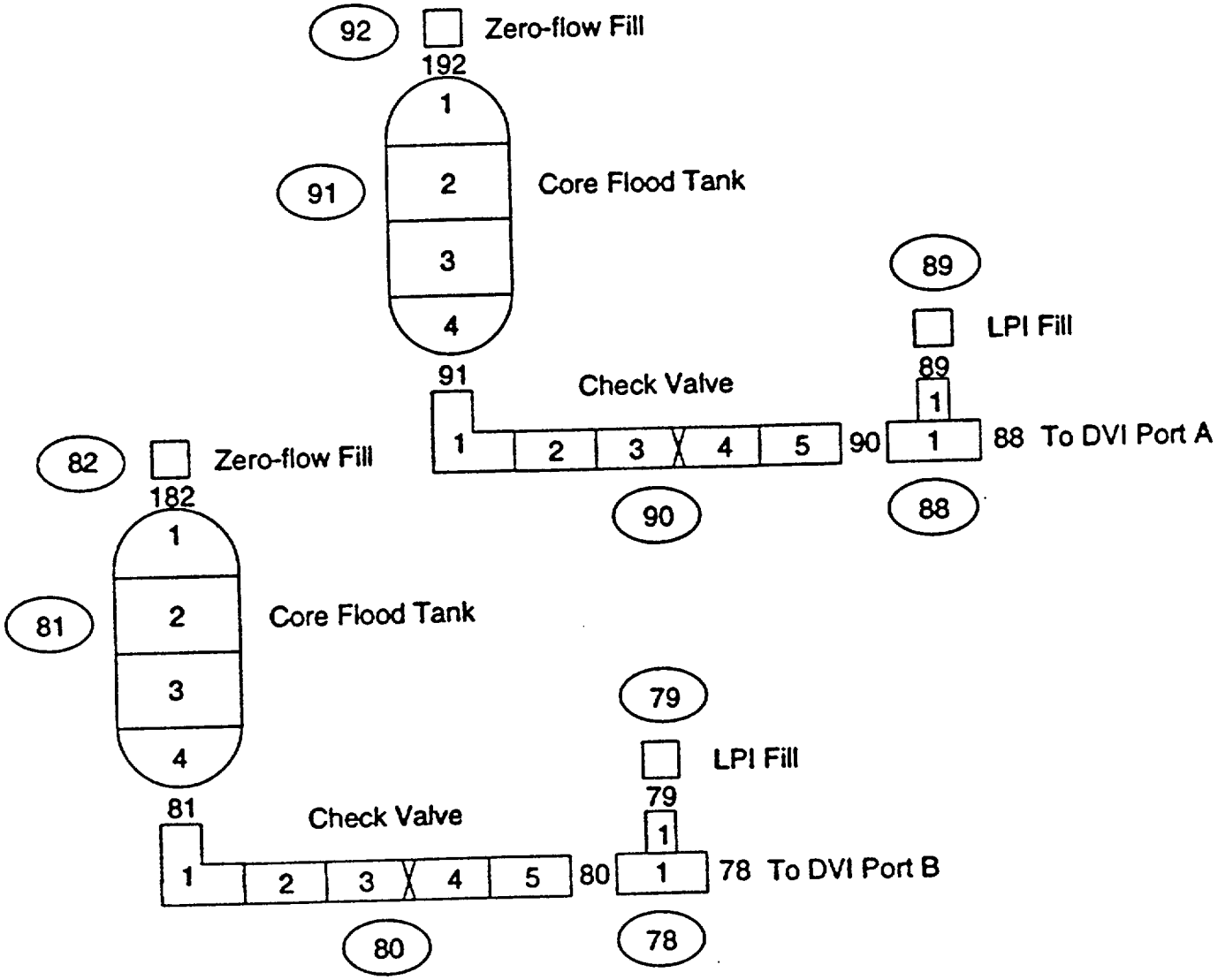


Figure 3.8 Core Flood Tanks and Low-Pressure Coolant Injection Noding Diagrams

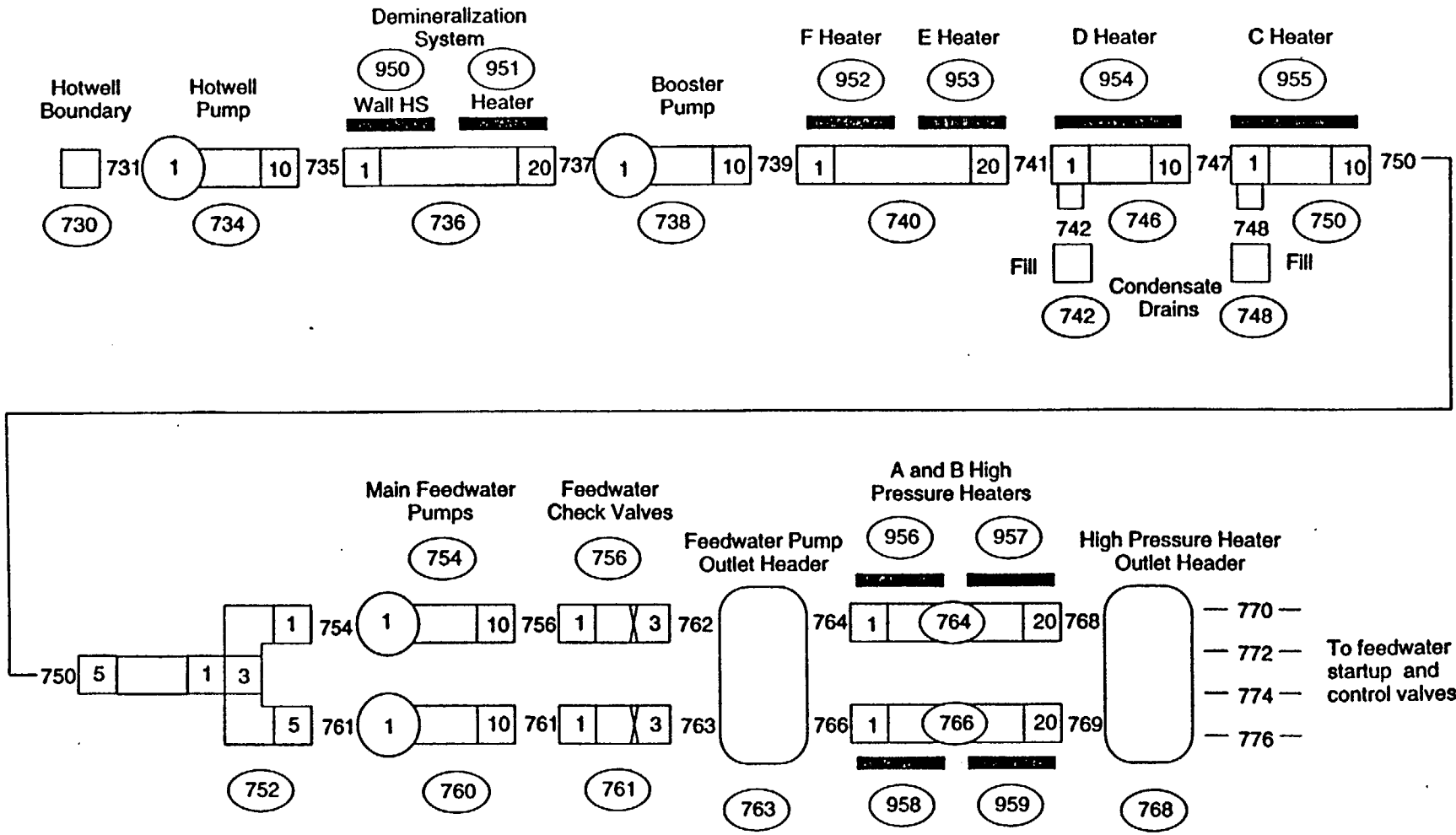


Figure 3.9 Feedwater-Train Noding Diagram–Hotwell Boundary to High-Pressure Heater Outlet Header

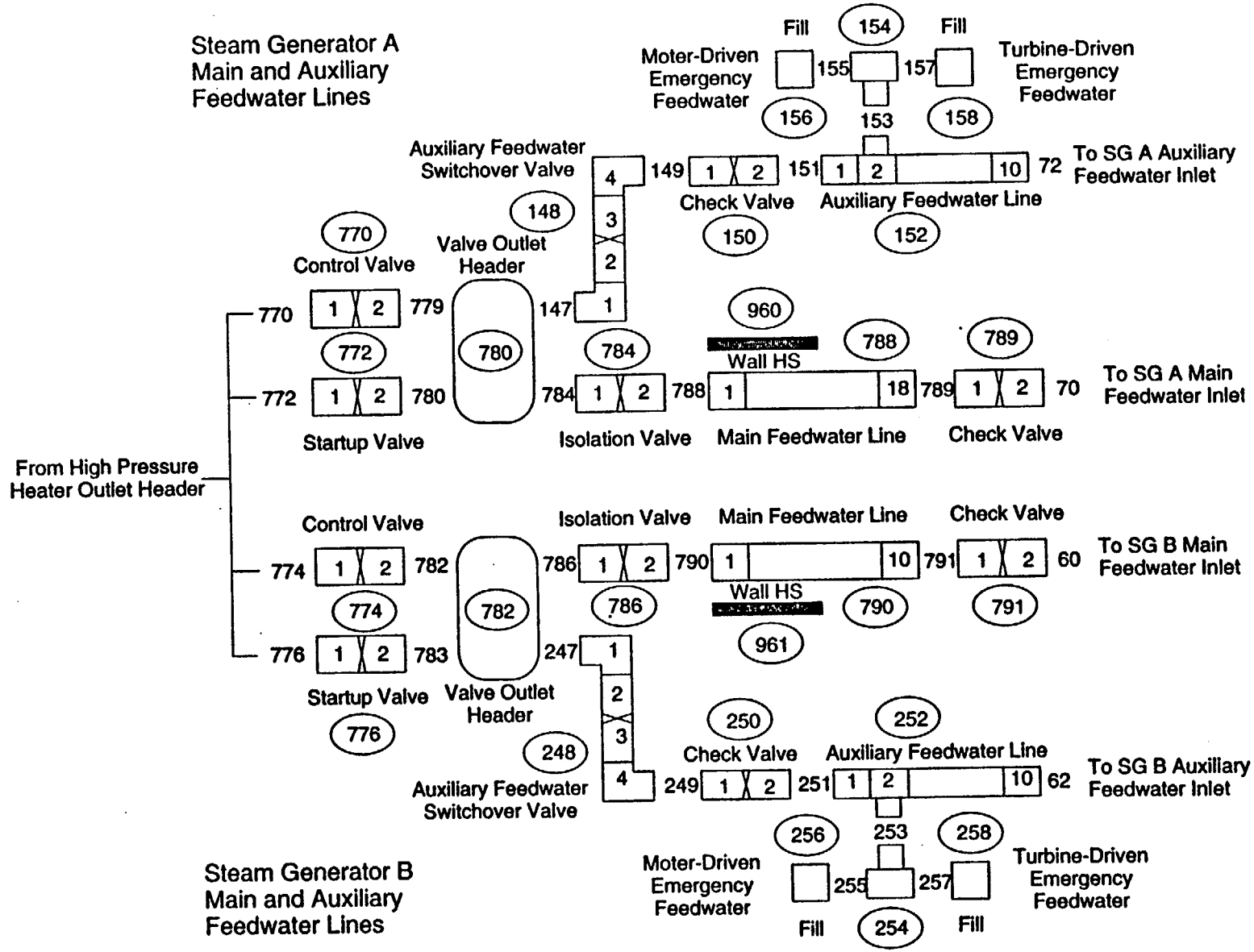


Figure 3.10 Feedwater-Train Noding Diagram–Feedwater Valves, Main Feedwater Inlet Lines, and Auxiliary Feedwater Inlet Valves

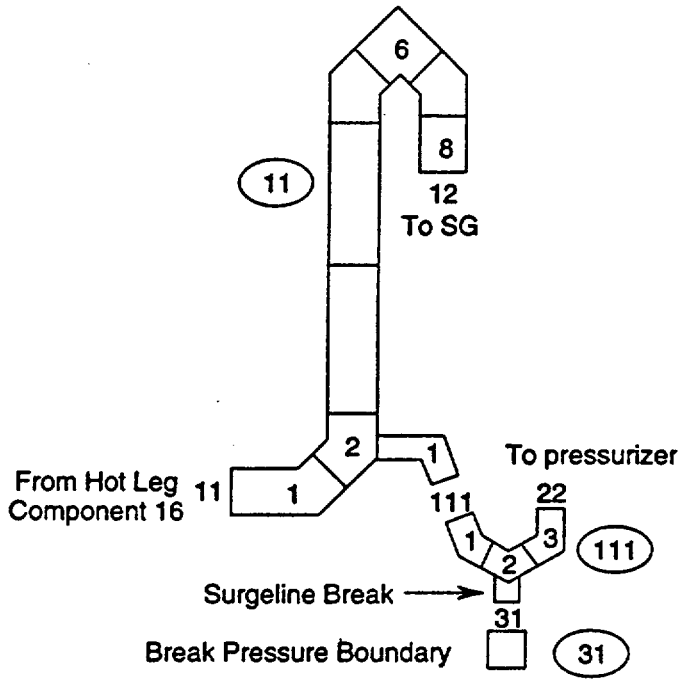


Figure 3.11 Pressurizer Surge-Line Break Noding Diagram

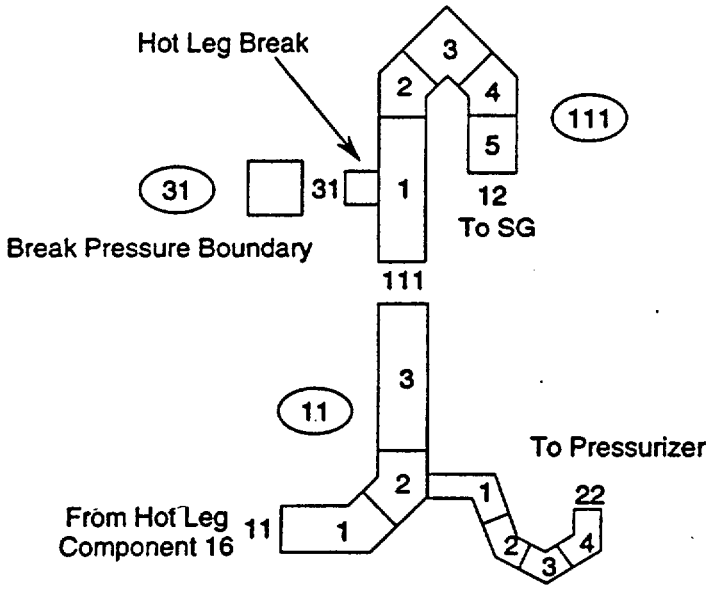


Figure 3.12 Hot-Leg Break Noding Diagram

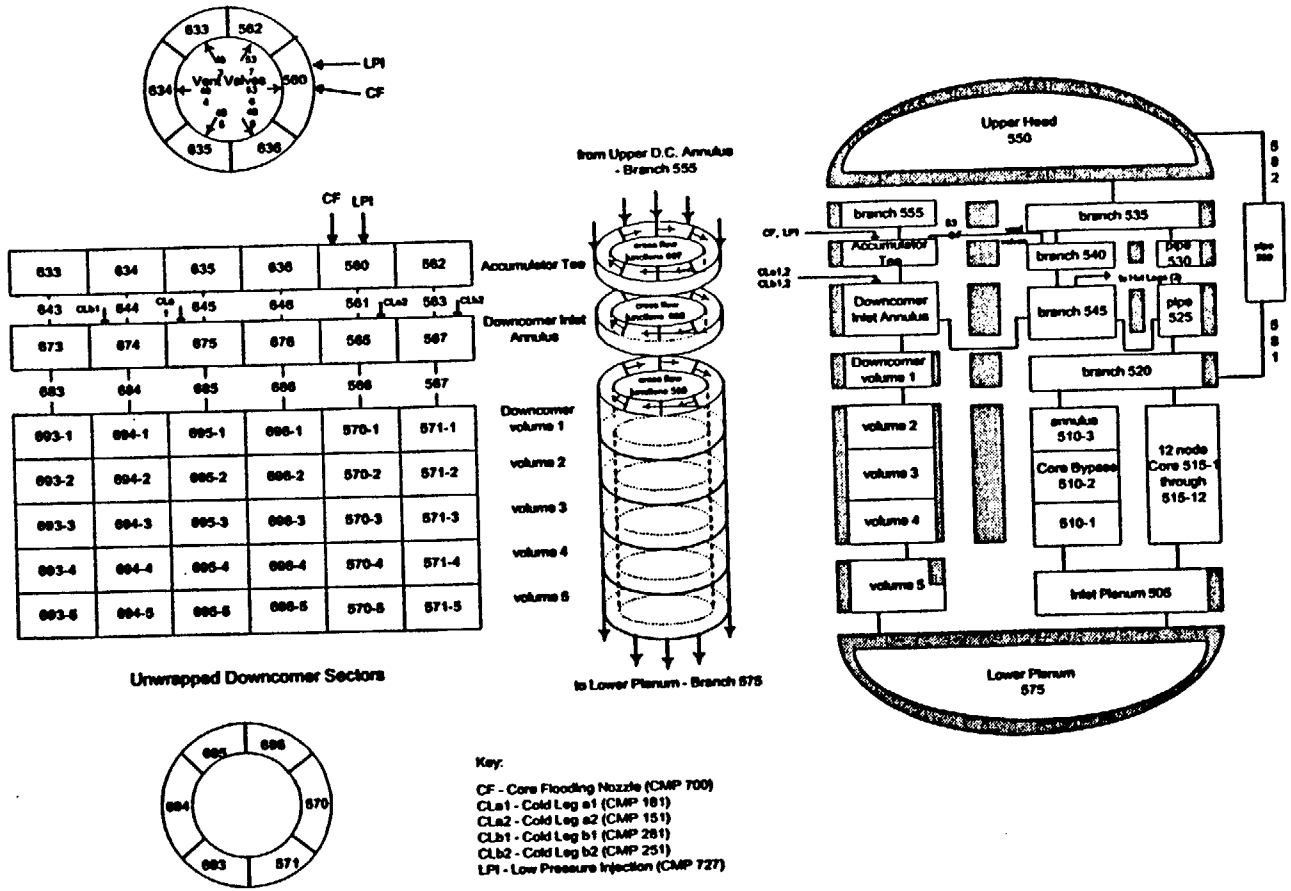


Figure 4.1 Reactor Vessel RELAP5 Nodalization

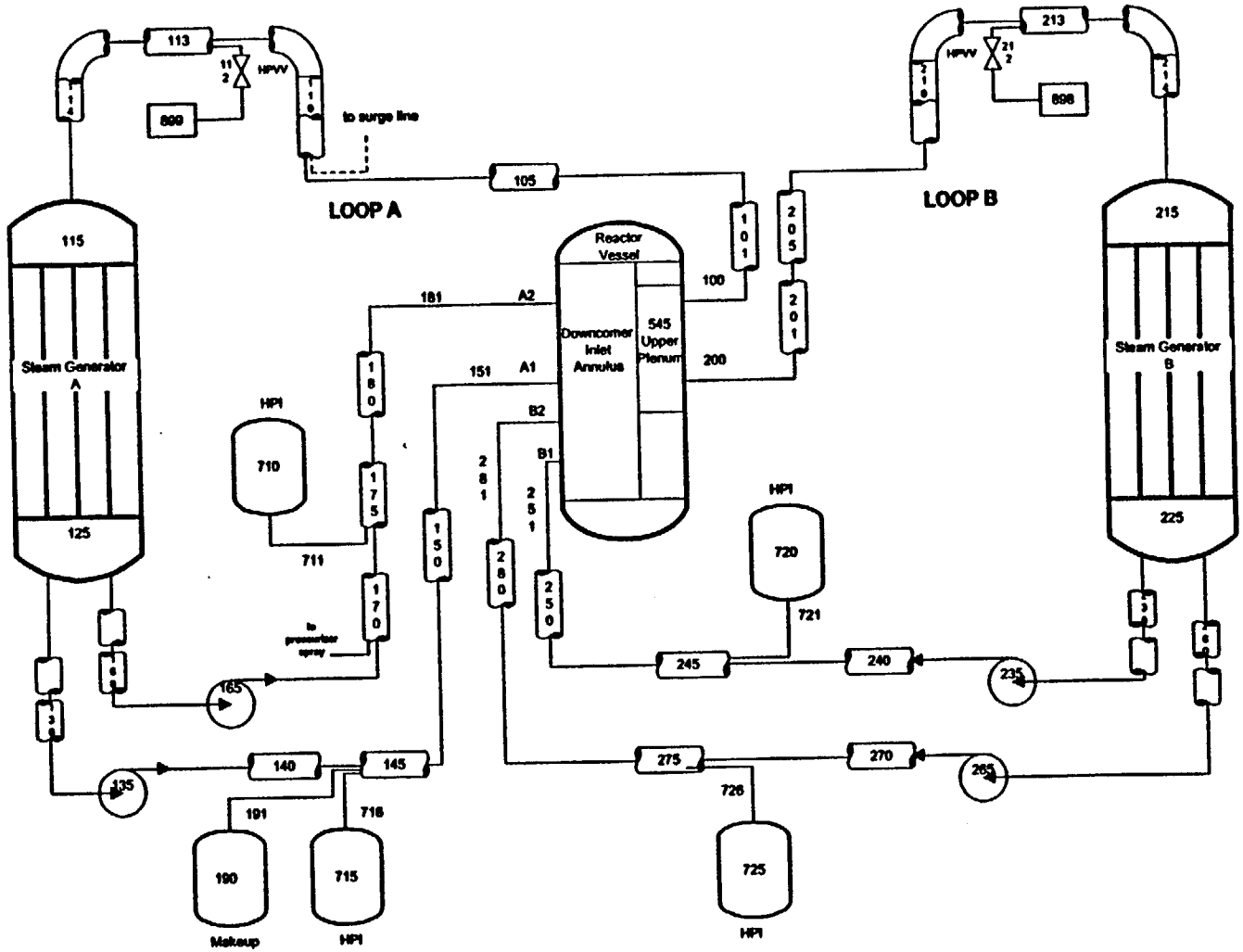


Figure 4.2 Reactor Coolant System RELAP5 Nodalization

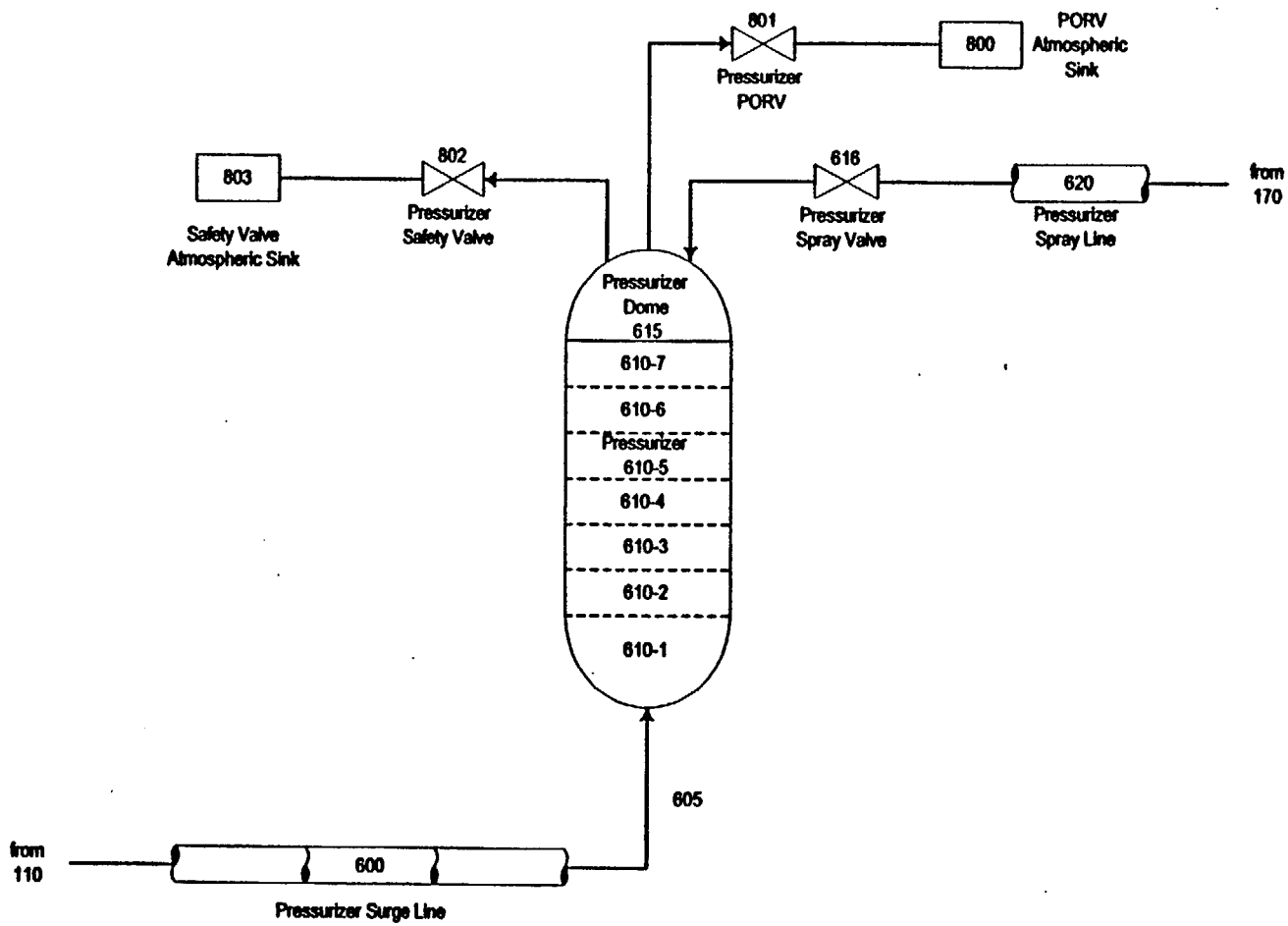


Figure 4.3 Pressurizer System Nodalization

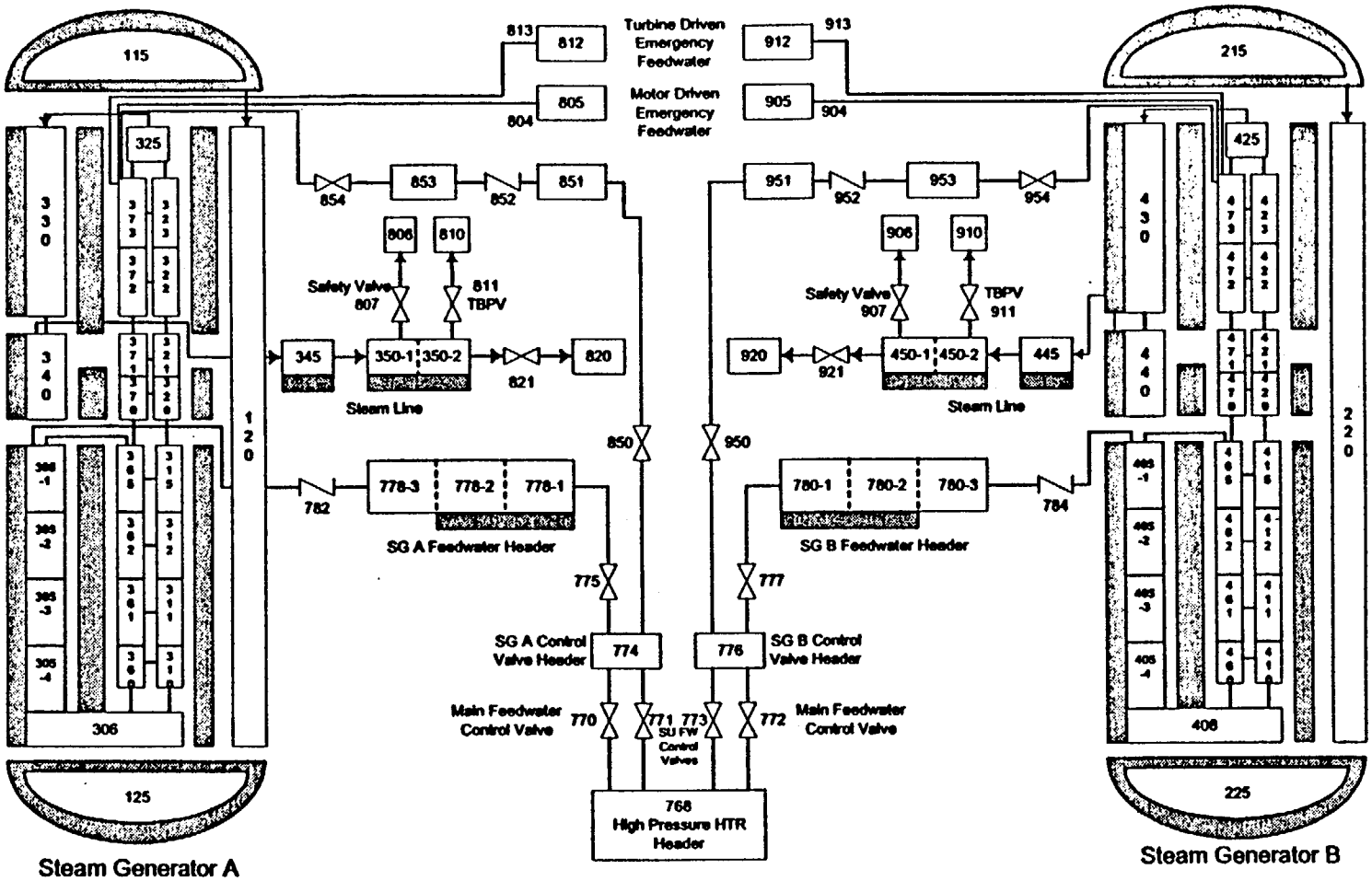


Figure 4.4 Steam Generator Secondary Side Nodalization

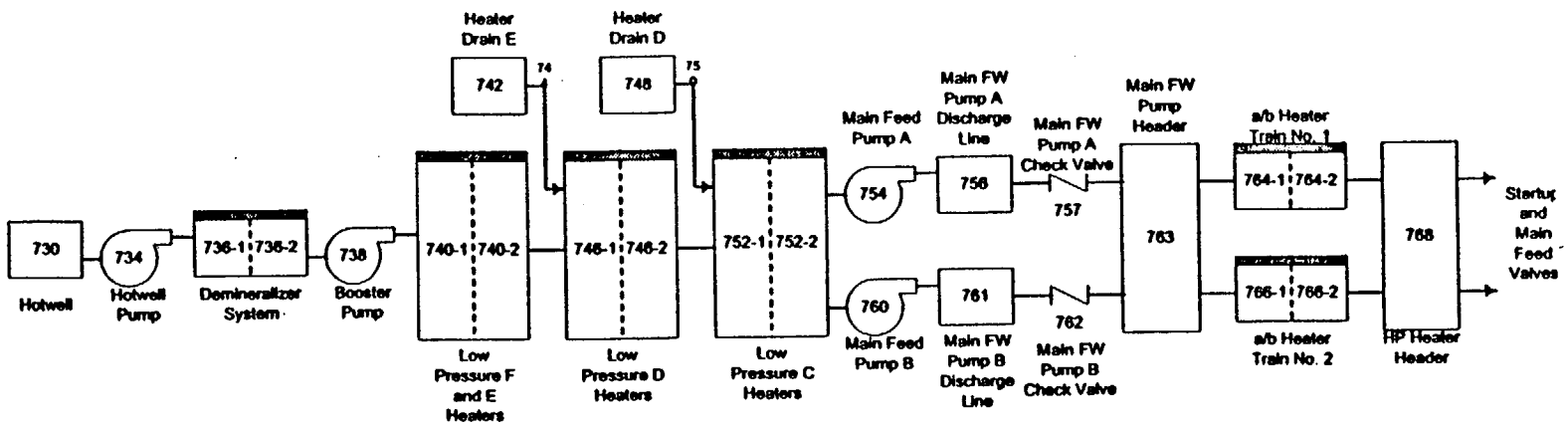


Figure 4.5 Main Feedwater Train RELAP5 Nodalization
From Hotwell to Startup and Main Feedwater Valves)

5 COMPARISONS BETWEEN TRAC-M VERSION V3782 AND RELAP5 MOD 3.2.2 GAMMA CALCULATION RESULTS

Three types of scenarios discussed in this report were selected based on input from the Probabilistic Risk Analysis Branch, Division of Risk Analysis and Applications, Office of Nuclear Regulatory Research.

5.1 Turbine Bypass Valve "A" Stuck Open

5.1.1 Sequence of Events

This transient was initiated with reactor scram which caused a turbine trip which in turn caused all four turbine bypass valves to open. The main steam line from each SG has two turbine bypass valves, and one of the two from SG "A" stuck open throughout the transient in TRAC-M cases. In RELAP5 calculation, however, one of the eight safety-relief valves (SRV) in SG "A" main steam line was assumed to stick open instead of a turbine bypass valve sticking open. As discussed later in Section 5.1.3, the steam flow through a turbine bypass valve and that through an SRV were about the same, and thus the effect of the valve malfunction was almost identical even though two different types of valves were involved.

Timing of major events is listed in Table 5.1.1 for two TRAC-M calculations and RELAP5 (Case 35) calculation. TRAC-M Case 1 calculation refers to a case where the HPI flow was throttled even if the pressurizer level was less than 3.05m (120") as long as the subcooling was greater than 27.7K (50°F). TRAC-M Case 2 calculation refers to a case where HPI flow was not throttled unless the pressurizer level was higher than 3.05m (120") and the subcooling was greater than 27.7K (50°F).

The core flood tank, or accumulator, injected coolant at various times in TRAC-M Case 1 but not in TRAC-M Case 2 nor in RELAP5. However, even in TRAC-M Case 1, the accumulator flow was negligible because the system pressure decreased to nearly the same level as the accumulator pressure, resulting in only a few flow spikes as shown in Figure 5.1.1A. In all cases, the low-pressure coolant injection (LPCI) was not actuated, and the vent valves remained shut.

The pressurizer nearly drained but refilled to 0.55m in TRAC-M Case 1, to 6.4m in TRAC-M Case 2, and to 3 m in RELAP5, as shown in Figure 5.1.1B. In TRAC-M Case 1 the pressurizer refilling stopped when the system pressure fell below 11.13 MPa (1600 psig) since no makeup flow was allowed when the system pressure fell below 11.13 MPa (1600 psig). In TRAC-M the makeup flow and the letdown flow were modeled as one component (i.e., if positive, the flow became a makeup, and if negative, the flow became a letdown), and the letdown flow was isolated when the pressure dropped to 11.13 MPa (1600 psig), per information from Oconee (Ref. 3). TRAC-M and RELAP5 used a different set point of the pressurizer level for makeup flow control; 6.4 m for TRAC-M and 3.0 m for RELAP5. The Oconee Plant indicated in Reference 3 that after a reactor trip, the makeup flow should be used to restore the pressurizer level to 5.6m (220") in the level indicator or to 6.4m from the bottom of the pressurizer.

The main feedwater (MFW) was terminated when the reactor tripped, and the emergency feedwater (EFW) was initiated in 120 seconds for TRAC-M Case 1 and Case 2 and in 140 seconds in RELAP5 as shown in Figures 5.1.1C and 5.1.1D. The EFW flows were highly

oscillatory and thus were integrated and plotted in Figures 5.1.1D1 and 5.1.1D2 for comparison in terms of integrated values. The integrated flow plots clearly show that the RELAP5-calculated EFW flows were a half of the TRAC-M values. On the other hand, since the total steam flows leaving SG "A" was about the same between TRAC-M and RELAP5 as shown in Figure 5.1.1.D3, the total feedwater flow to SG "A" should have been approximately the same between TRAC-M and RELAP5. The difference between TRAC-M and RELAP5 in EFW flows was made up by MFW flows as shown in Figure 5.1.1D4. There should not have been much MFW flows since the MFW valves should have been closed very soon after the reactor scram. However, in RELAP5 there were occasional MFW flow spikes throughout the transient as shown in Figure 5.1.1D5. TRAC-M also showed some MFW flow spikes, but the extent was much less as shown in Figure 5.1.1D6. SG "B" was isolated, and thus both EFW flows and steam flows were essentially zero as shown in Figures 5.1.1.D1, 5.1.1D2, and 5.1.1D3. No voids appeared in the upper head of the reactor vessel, nor in the upper downcomer, nor at the highest elevation of the hot legs.

5.1.2 Main Pressurized Thermal Shock Parameters

There are three parameters of greatest interest in PTS evaluations, namely, the minimum liquid temperature in the downcomer as a function of time, the pressure in the downcomer at the time of the minimum temperature, and the heat transfer coefficient between the downcomer liquid and the vessel wall.

Figures 5.1.2 through 5.1.5 show these parameters as a function of time for comparison between RELAP5 Case 35 and TRAC-M Case 1 in which the HPI flow was throttled even though the pressurizer level was less than 3.05m (120") as long as the subcooling was greater than 27.7K (50 °F). In RELAP5 case one SRV in the main steam line off SG "A" stuck open instead of a turbine bypass valve. The minimum downcomer temperature calculated by TRAC-M Case 1 is found at 9,300 seconds to be 474K while that calculated by RELAP5 is 473K at 9,630 seconds. The downcomer pressure at the time of the minimum temperature is 3.5 MPa in TRAC-M Case 1 versus 11.1 MPa in RELAP5. The maximum and the minimum heat transfer coefficients between the downcomer fluid and the vessel wall at the time of the minimum downcomer temperature are 28,000 W/(m*m K) and 22,100 W/(m*m K) , respectively, in TRAC-M Case 1 while those in RELAP5 are 30,400 W/(m*m K) and 24,500 W/(m*m K). In both TRAC-M Case 1 and Case 2, the maximum heat transfer coefficient is found at the bottom of a downcomer sector located between cold leg "B1" and "B2" and the minimum is found at the bottom of a downcomer sector below cold leg "A1". On the other hand, in RELAP5 case, the maximum is found at the bottom of a downcomer sector below cold leg "A1" and the minimum is found at the upper plenum elevation node of a sector between cold leg "A1" and "A2."

Figures 5.1.6 through 5.1.8 show the same parameters for comparison between RELAP5 Case 35 and TRAC-M Case 2 in which the HPI flow was not throttled if the pressurizer level was less than 3.05m (120") even though the subcooling was greater than 27.7K (50 °F). In TRAC-M Case 2, the minimum downcomer temperature is found at 10,000 seconds to be 474K, the downcomer pressure at 10,000 seconds 15.4 MPa, and the maximum and the minimum heat transfer coefficients 28,000 w/(m*m K) and 22,100 W/(m*m K).

All of these parameters show a similar behavior between TRAC-M and RELAP5 predictions except the downcomer pressure. The primary reason for a fairly rapid decrease in downcomer pressure in TRAC-M Case 1 was a rapid cooldown of the primary system caused by the heat

extraction in SG "A" due to a continuous steam flow through a stuck-open turbine bypass valve while the liquid volume shrinkage was not made up for by neither HPI (because of throttling) nor the makeup flow (because of pressure being less than the set point). In contrast, either in RELAP5 or in TRAC-M Case 2, the pressure did not decrease much because the unthrottled HPI flow and the makeup flow prevented the pressure from decreasing too rapidly. In addition, the pressurizer heater was turned on if the pressure fell below the set point as long as the pressurizer liquid level stayed above a set point of 2.033m. Once the pressure fell below 11.13 MPa (1600 psig), the makeup flow could not be turned on and thus the pressure could not be recovered. The reason for a small increase in pressure at about 4000 and 7600 seconds in TRAC-M Case 1 calculation, as shown in Figure 5.1.3, was that the HPI flow had a large spike at about 4000 and 7600 seconds as shown in Figure 5.1.8A. The integrated HPI flows are shown in Figure 5.1.8B.

A primary reason of why TRAC-M Case 2 calculated a higher pressurizer pressure than RELAP5 Case 35 was that TRAC-M used a higher pressurizer level set point; 6.4m versus 3.0m used in RELAP5. Figures 5.1.1B and 5.1.7 show that pressure increases closely reflected the liquid level increases in the pressurizer. The rate of increase in level was controlled by the HPI and the makeup flow rates. The reason of why TRAC-M Case 2 pressure started increasing at 9000 seconds was that the pressurizer heater input finally overcame the heat loss through the SG (Figure 5.1.9).

5.1.3 Other Plant Parameters

PTS concerns arise when the primary system loop flow becomes very low or stagnates since under very low or no loop flow conditions, mixing between the cold HPI fluid and the hot fluid existing in the primary system is not very good and thus the vessel wall would come in contact with the cold HPI plume, and the vessel wall that comes in contact with the cold plume may cool excessively down to below the PTS screening criterion temperature. Therefore, it would be most appropriate to examine the loop flow rates and their temperatures.

Figures 5.1.10 through 5.1.13 show comparisons between TRAC-M Case 1 and RELAP5 Case 35 calculations for core flow, hot leg "A" and "B" mass flows, and cold leg "A" and "B" mass flows. Similarly Figures 5.1.14 through 5.1.17 show comparisons between TRAC-M Case 2 and RELAP5 Case 35 for the same core, hot leg, and cold leg mass flows. In all cases, the differences between TRAC-M and RELAP5 results are less than about 2 percent (200 Kg/s for hot legs and 100 KG/s for cold legs). As shown in Figures 5.1.11 and 5.1.15, TRAC-M calculated hot leg "A" mass flows to be about 2 percent higher than hot leg "B" mass flow rates. The reason for this difference is that the hot leg "A" flow was cooled down significantly in SG "A" while the hot leg "B" flow was not cooled down in SG "B", as shown in Figure 5.1.17A for instantaneous heat exchange rates and in Figure 5.1.17B for integrated heat exchange rates. When flows were cooled down in SGs, the density of liquid and thus the driving force for the flow would increase. RELAP5 showed such a trend also, but the extent was much less.

Hot leg and cold leg temperature comparisons between TRAC-M Case 1 and RELAP5 Case 35 calculations are shown in Figures 5.1.18 through 5.1.20. Differences are less than about 2 percent (10K). Similarly, the same temperature comparisons between TRAC-M Case 2 and RELAP5 Case 35 calculations are shown in Figures 5.1.21 through 5.1.23. The differences for the latter case are also less than 2 percent (10K). TRAC-M calculated about two percent imbalance between the hot leg "A" and "B" temperatures because the hot leg "A" flow was

calculated to be higher than the hot leg "B" flow as a result of cooldown in SG "A" but not in SG "B", as discussed above, and thus the hot leg "A" temperature was lower than the hot leg "B" temperature by about 2 percent because the hot leg "A" and "B" flows would remove approximately the same amount of heat from the core.

Figure 5.1.24 shows steam flow rates through a stuck-open turbine bypass valve "A" as calculated by TRAC-M Case 1 and steam flow rates through a stuck-open main steam SRV "A" as calculated by RELAP5 Case 35. Both steam flow rates are nearly the same, and thus the heat transfer rates in SGs are also nearly the same as shown in Figure 5.1.25 even though the heat transfer rates calculated by RELAP5 are more oscillatory. Similar comparisons between TRAC-M Case 2 and RELAP5 Case 35 are shown in Figures 5.1.26 and 5.1.27. Even though TRAC-M and RELAP5 used slightly different assumptions (i.e., a stuck-open turbine bypass valve "A" for TRAC-M versus a stuck-open main steam SRV "A" for RELAP5), their effects are nearly the same.

5.1.4 Pressurized Thermal Shock Implications

Both TRAC-M and RELAP5 calculations suggest that neither a turbine bypass valve stuck-open malfunction nor an SRV stuck-open malfunction would lead to PTS concerns as the predicted downcomer temperatures of 472–474K are well above the PTS screening temperature of 422K. Since RCPs do not trip under these scenarios, a large flow is maintained in the loop and the HPI fluid mixes well with the existing hot primary liquid, and thus the downcomer wall does not see a cold plume.

Text continues on page 64.

Table 5.1.1 Comparison of Sequence of Events Between TRAC-M and RELAP5 Calculations for Scenarios of Turbine Bypass Valve "A" Stuck Open

	TRAC-M Case 1 Seconds	TRAC-M Case 2 Seconds	RELAP5* Case 35 Seconds
Failed Components	**Turbine Bypass Valve "A"**	**Turbine Bypass Valve "A"**	**One Safety Valve in Steam Generator "A" Steam line**
1. Reactor scram (initiating event)	0	0	0
2. RCP trip on loss of subcooling	Did not trip	Did not trip	Did not trip
3. HPI actuation	260	260	190
4. HPI throttle initiation – if subcooling .GE. 28K (50 °F) – if subcooling .GE. 28K (50 °F) and Pzr level .GE. 3.05m (120")	 340 N/A	 N/A 431	 N/A 710
5. Core flood tank actuation	Actuated at various times but flow negligible because the system pressure stayed nearly the same as the core flood tank pressure	Did not start	Did not start
6. LPCI actuation	Did not start	Did not start	Did not start
7. Vent Valve Opening time	Did not open	Did not open	Did not open

Table 5.1.1 Comparison of Sequence of Events Between TRAC-M and RELAP5 Calculations for Scenarios of Turbine Bypass Valve "A" Stuck Open (Cont.)

	TRAC-M Case 1 Seconds	TRAC-M Case 2 Seconds	RELAP5* Case 35 Seconds
Failed Components	**Turbine Bypass Valve "A"**	**Turbine Bypass Valve "A"**	**One Safety Valve in Steam Generator "A" Steam line**
8. Pressurizer refill initiation	280 Refilled to 0.55m but the level decreased again because the makeup flow terminated as the pressure fell below 11.13 MPa (1600 psig)	280 Refilled to 6.4m	240 Refilled to 3m
9. EFW initiation – flow to SG "A" – flow to SG "B"	 120 Did not start	 120 Did not start	 140 Did not start
10. Upper head voiding initiation	Did not void	Did not void	Did not void
11. Upper downcomer void initiation	Did not void	Did not void	Did not void
12. Hot leg top void initiation	Did not void	Did not void	Did not void

* In RELAP5 Case 35, a main steam line "A" SRV stuck open instead of a turbine bypass valve "A" sticking open as in TRAC-M cases.

Figure 5.1.1A Core Flood Tank Flow Rates

Calculated by TRACM for Turbine Bypass Valve Stuck Open Case 1

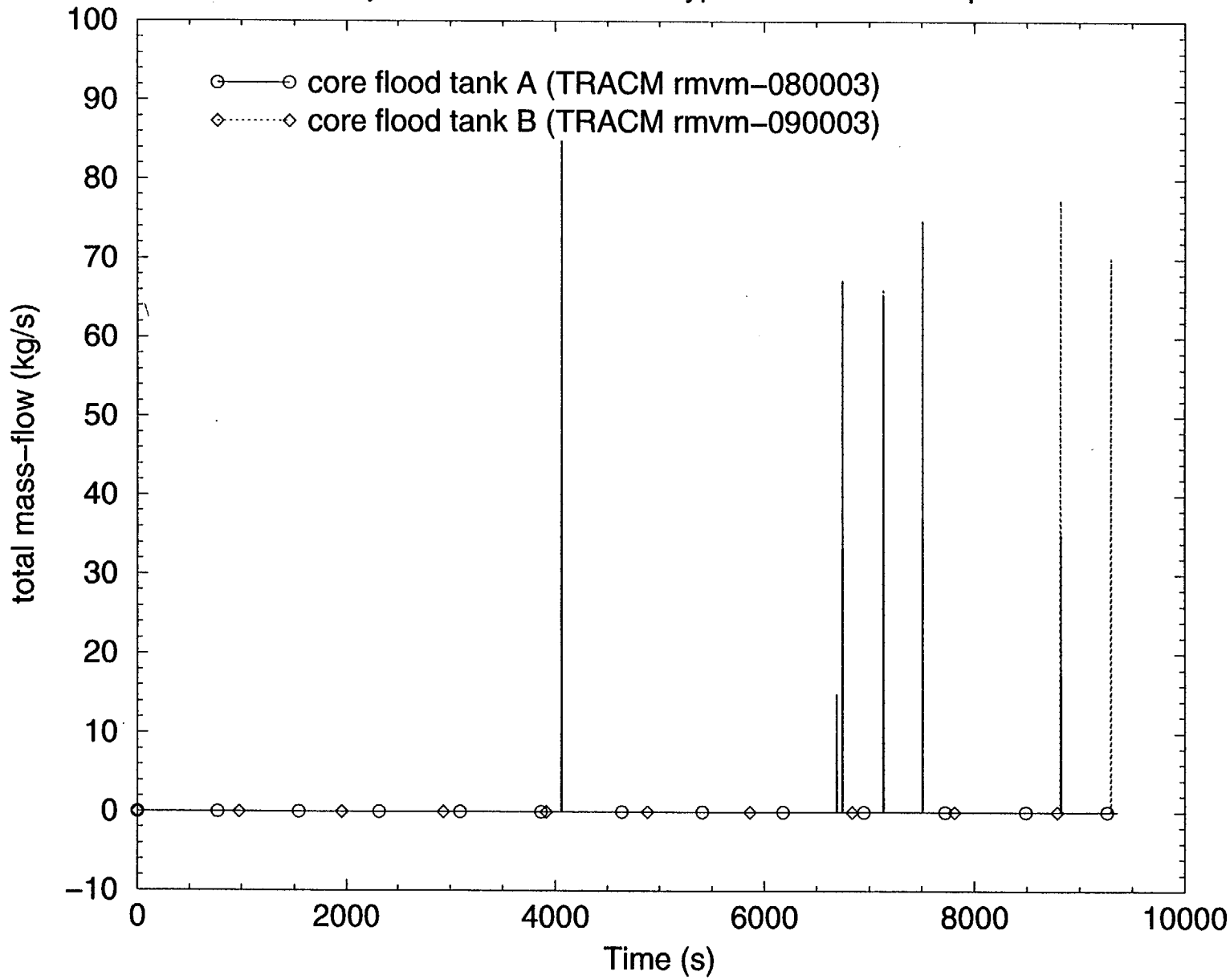


Figure 5.1.1B Pressurizer Water Level

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Cases

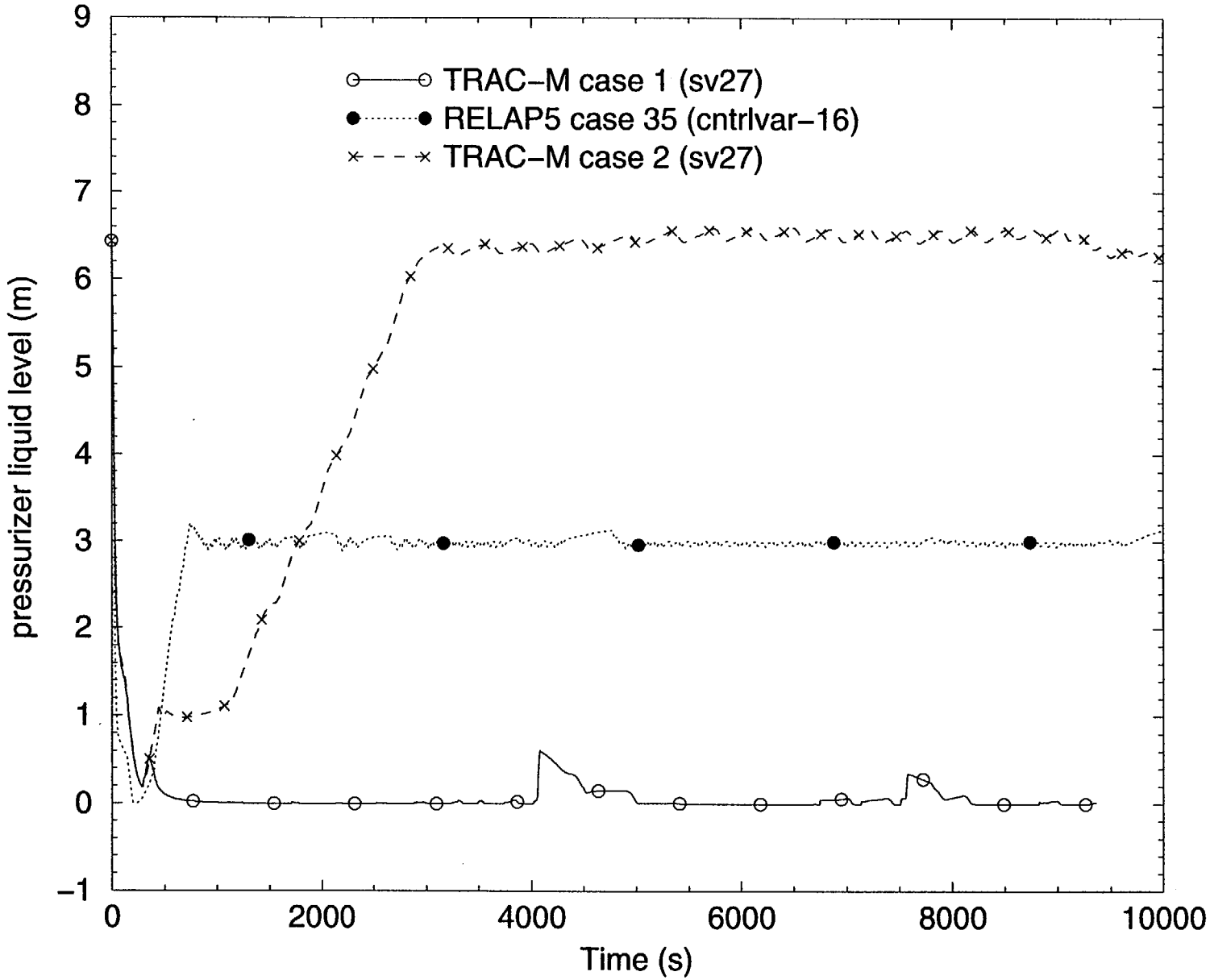


Figure 5.1.1C Total Emergency Feedwater Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

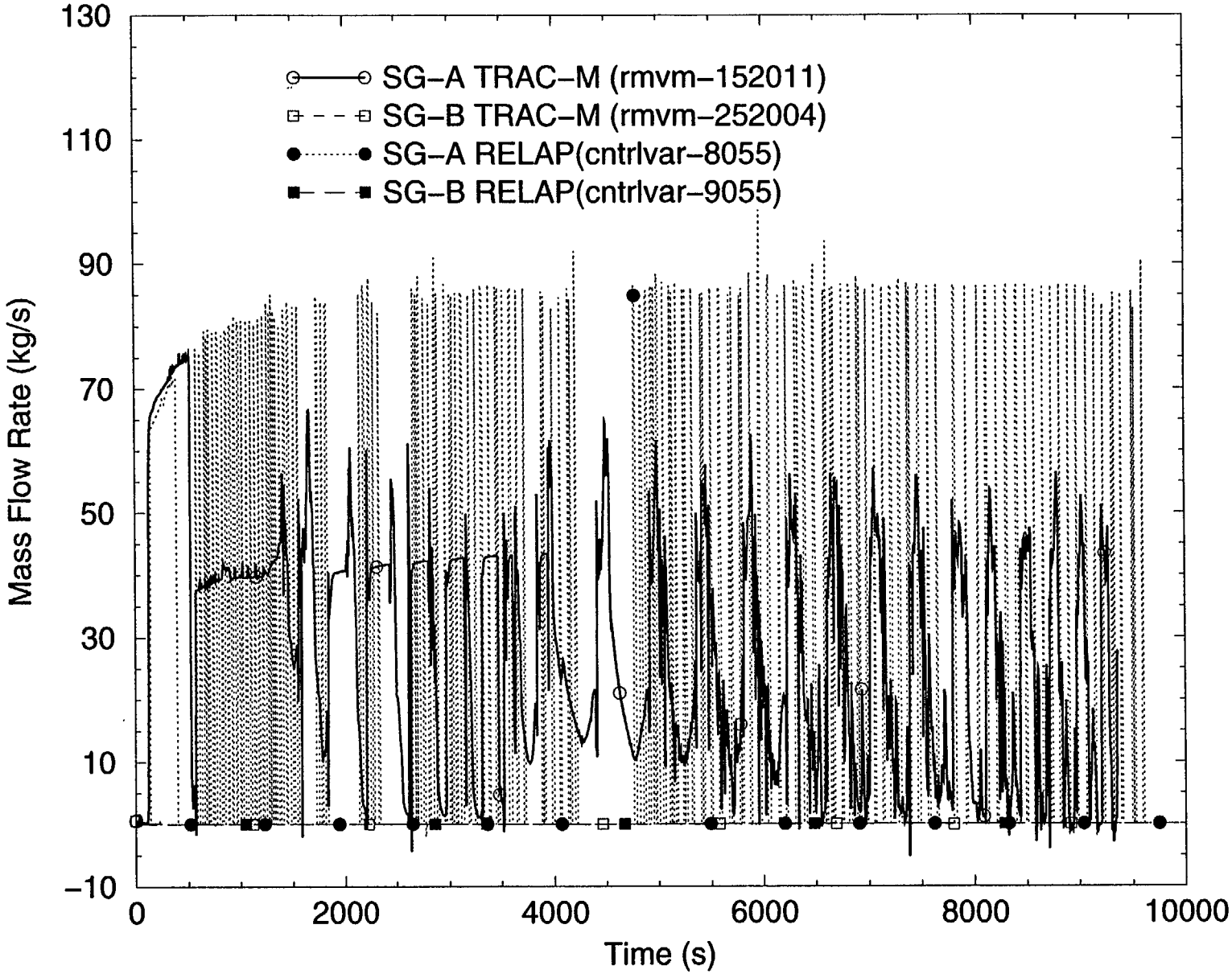


Figure 5.1.1D Total Emergency Feedwater Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

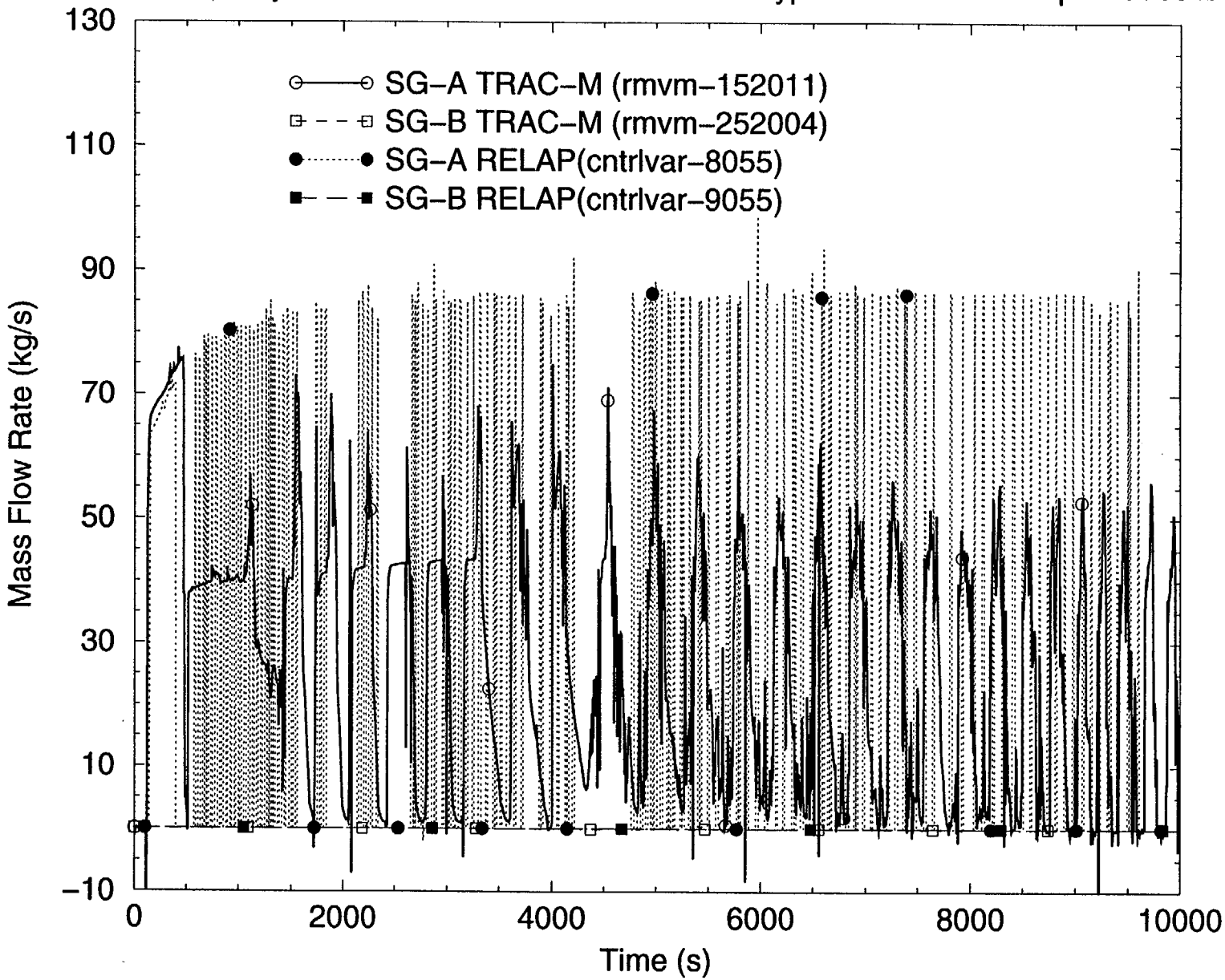


Figure 5.1.1D1 Total Integrated Emergency Feedwater Flow

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

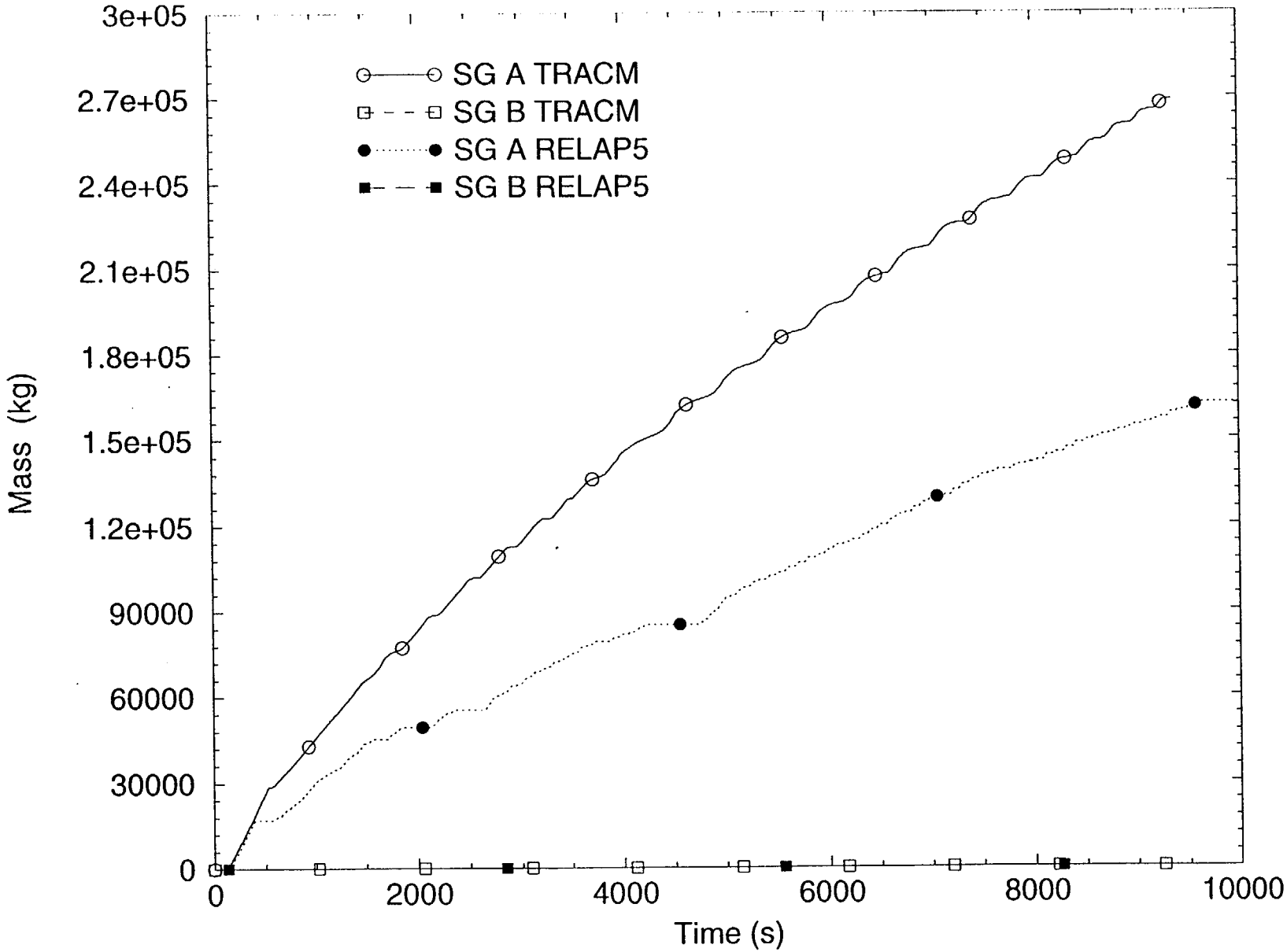


Figure 5.1.1D2 Total Emergency Feedwater Delivered

Calc. by TRACM Case 2 and RELAP5 CASE 35 for Turb. Bypass Valve Stuck Open Scenario

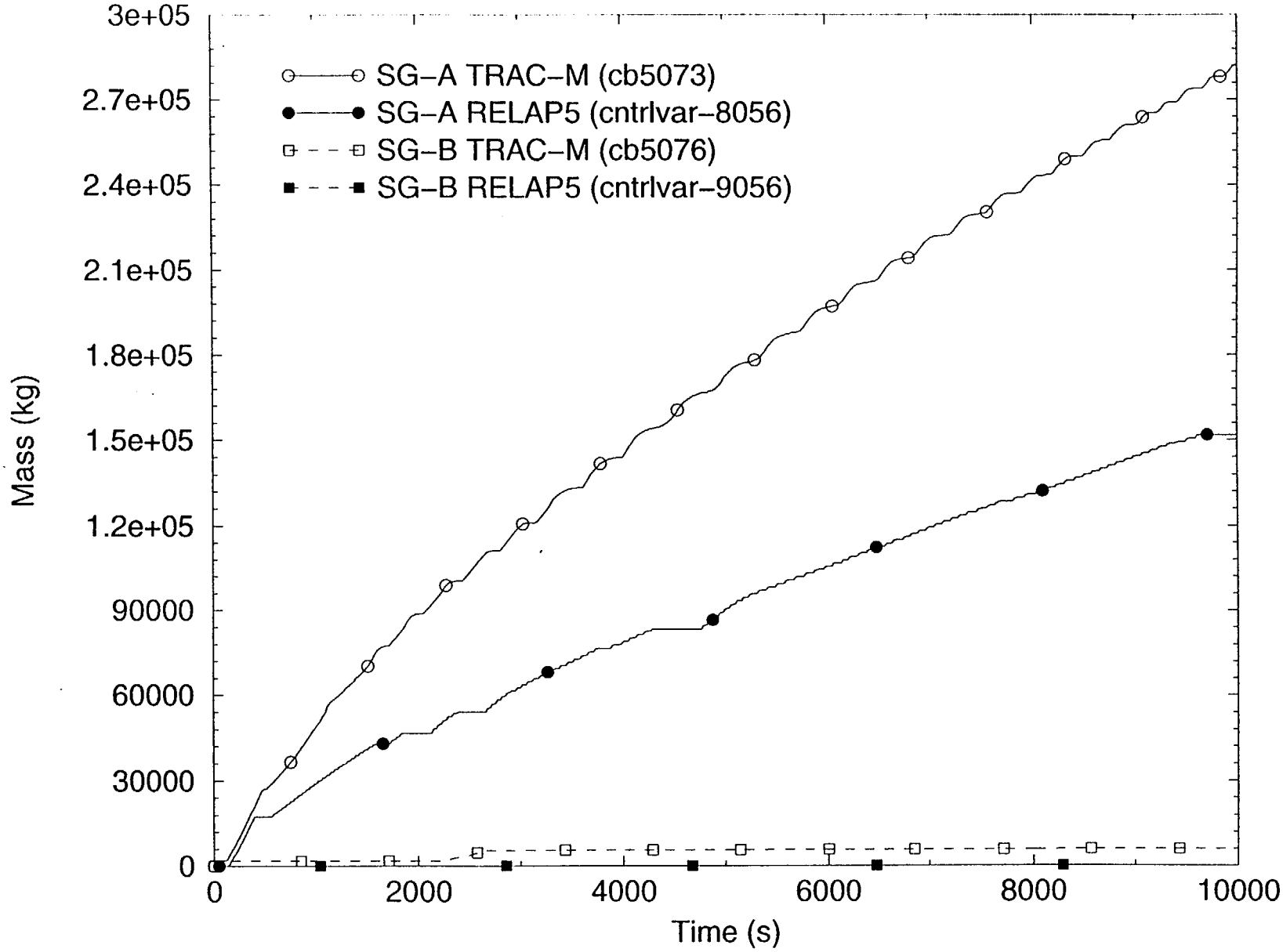


Figure 5.1.1D3 Main Steam Line Flow Rates

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

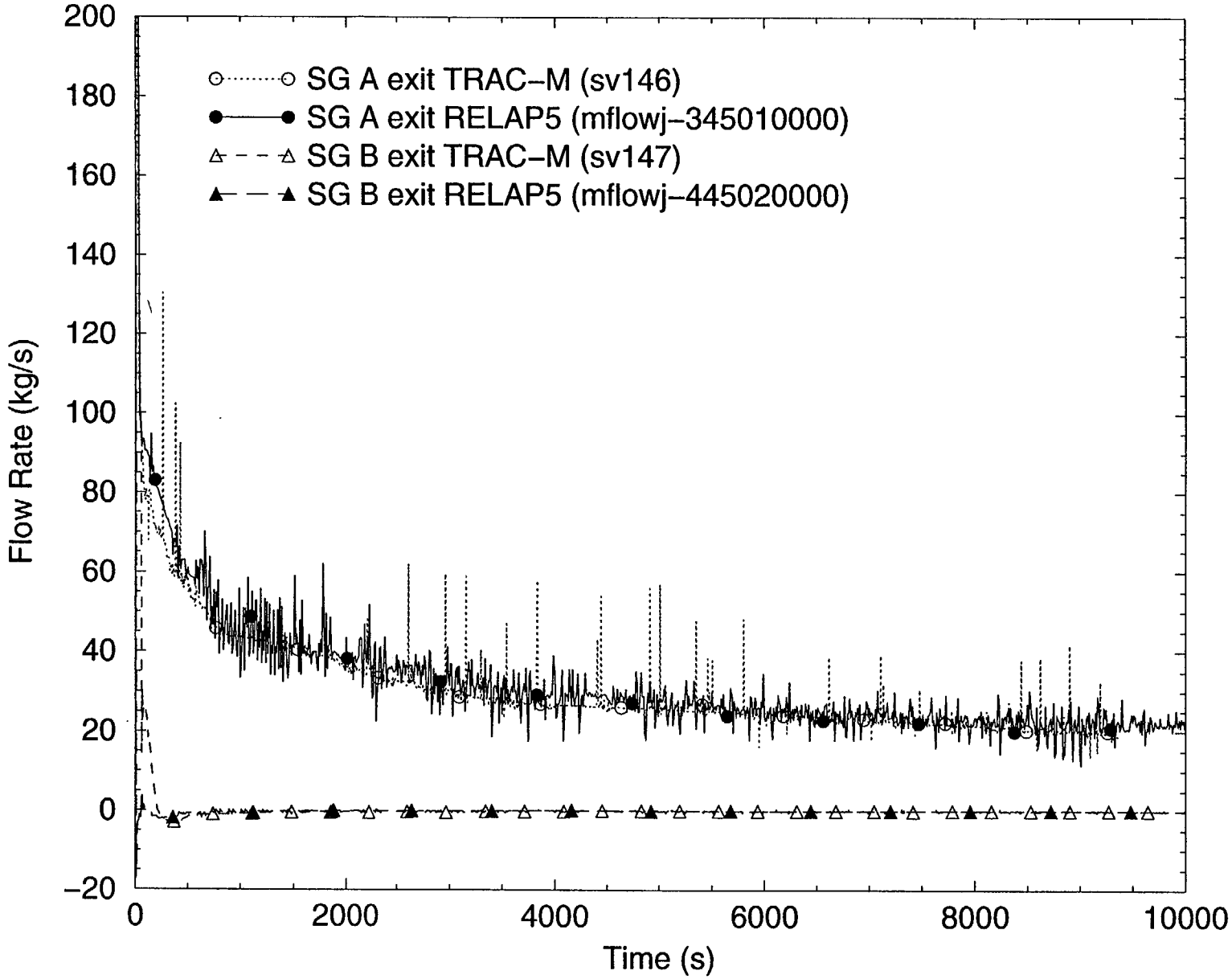


Figure 5.1.1D4 Total Main Feedwater Flow Delivered

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

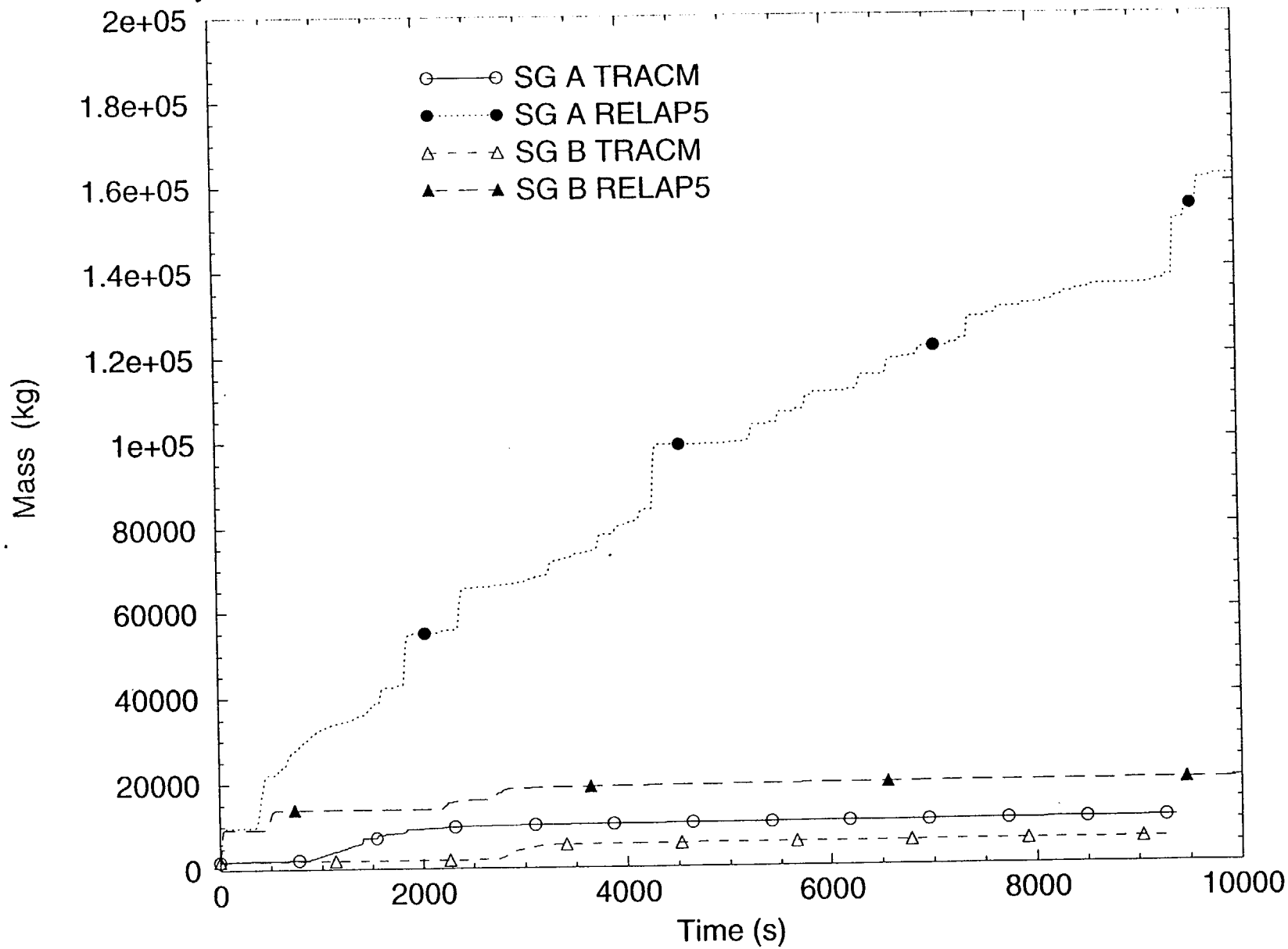


Figure 5.1.1D5 Main Feedwater Flow Rates

Calculated by RELAP5 Case 35 for Turbine Bypass Valve Stuck Open Scenario

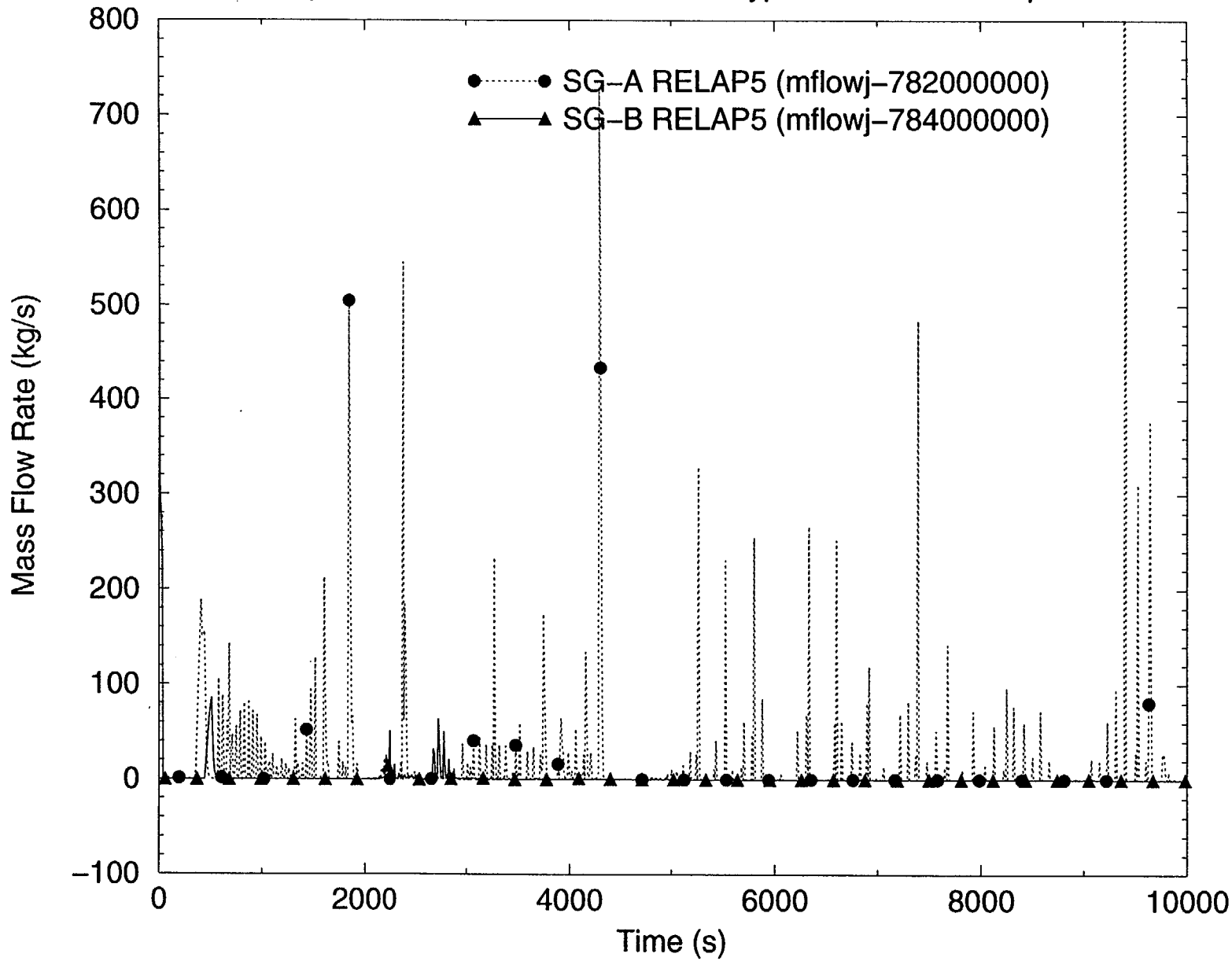


Figure 5.1.1D6 Main Feedwater Flow Rates

Calculated by TRACM Case 1 for Turbine Bypass Valve Stuck Open Scenario

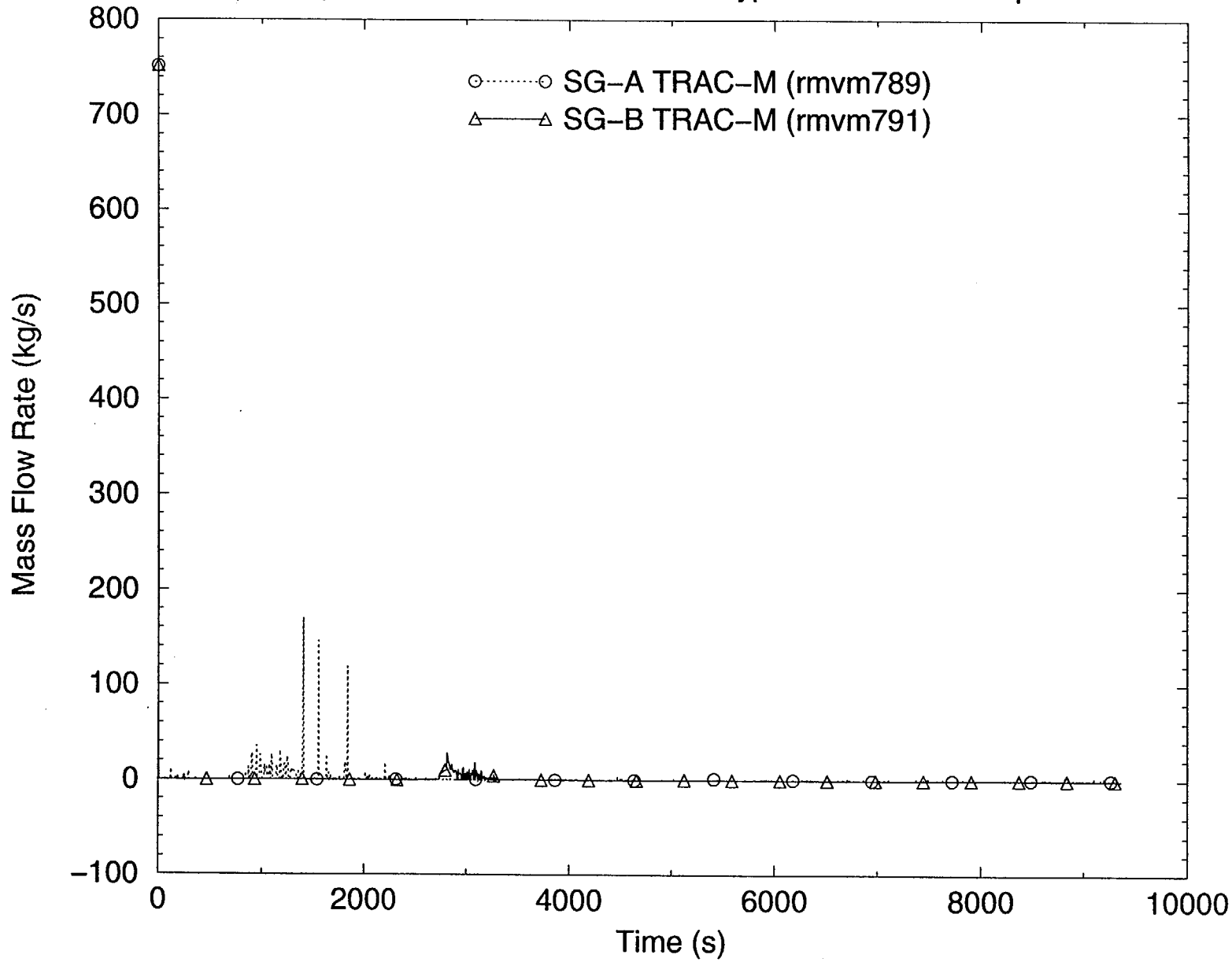


Figure 5.1.2 Downcomer Liquid Temperatures

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

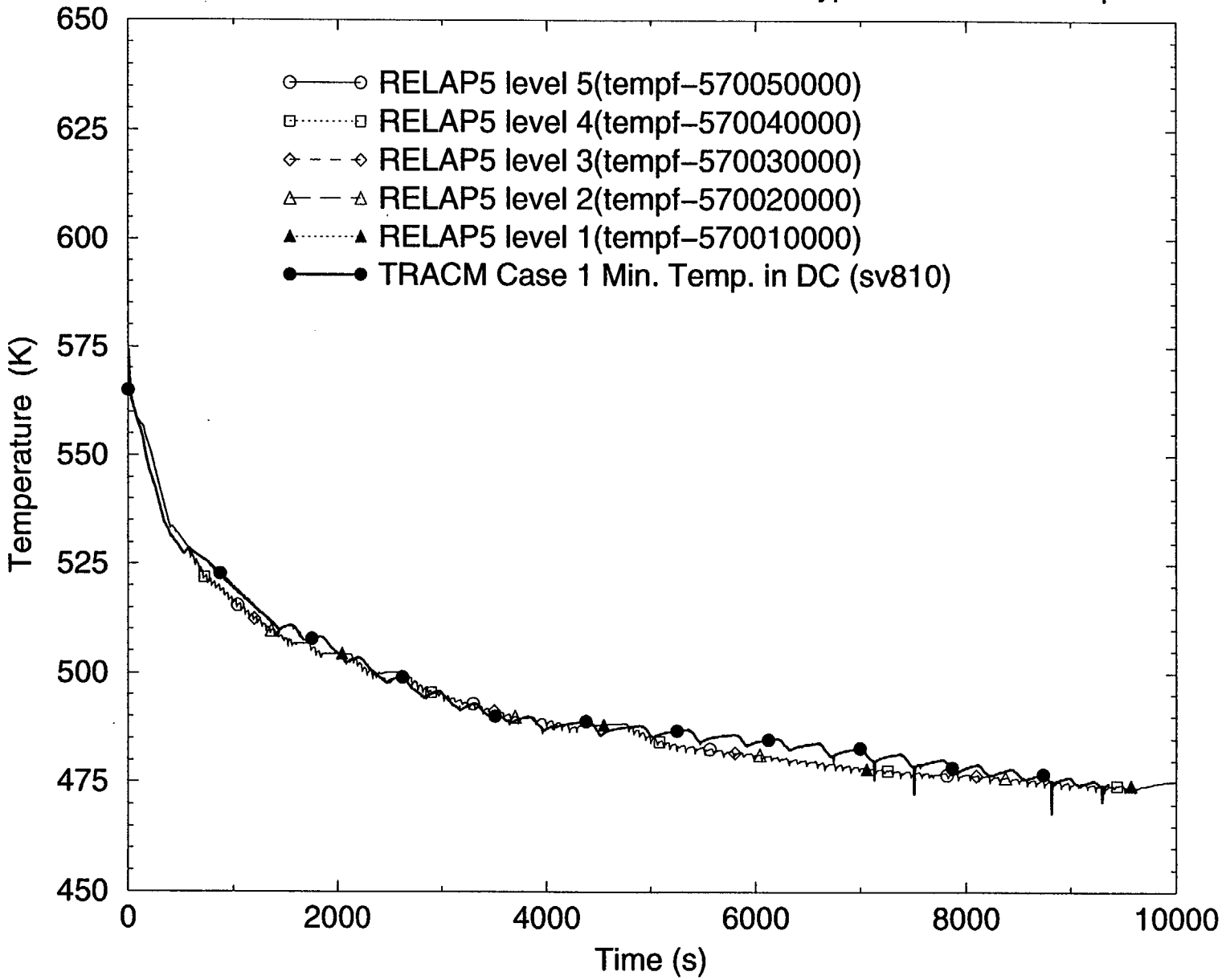


Figure 5.1.3 Downcomer Mid–Elevation Pressure

Calculated by TRAC–M(Case 1) and RELAP5(Case 35) for Turbine Bypass Valve Stuck Open Scenario

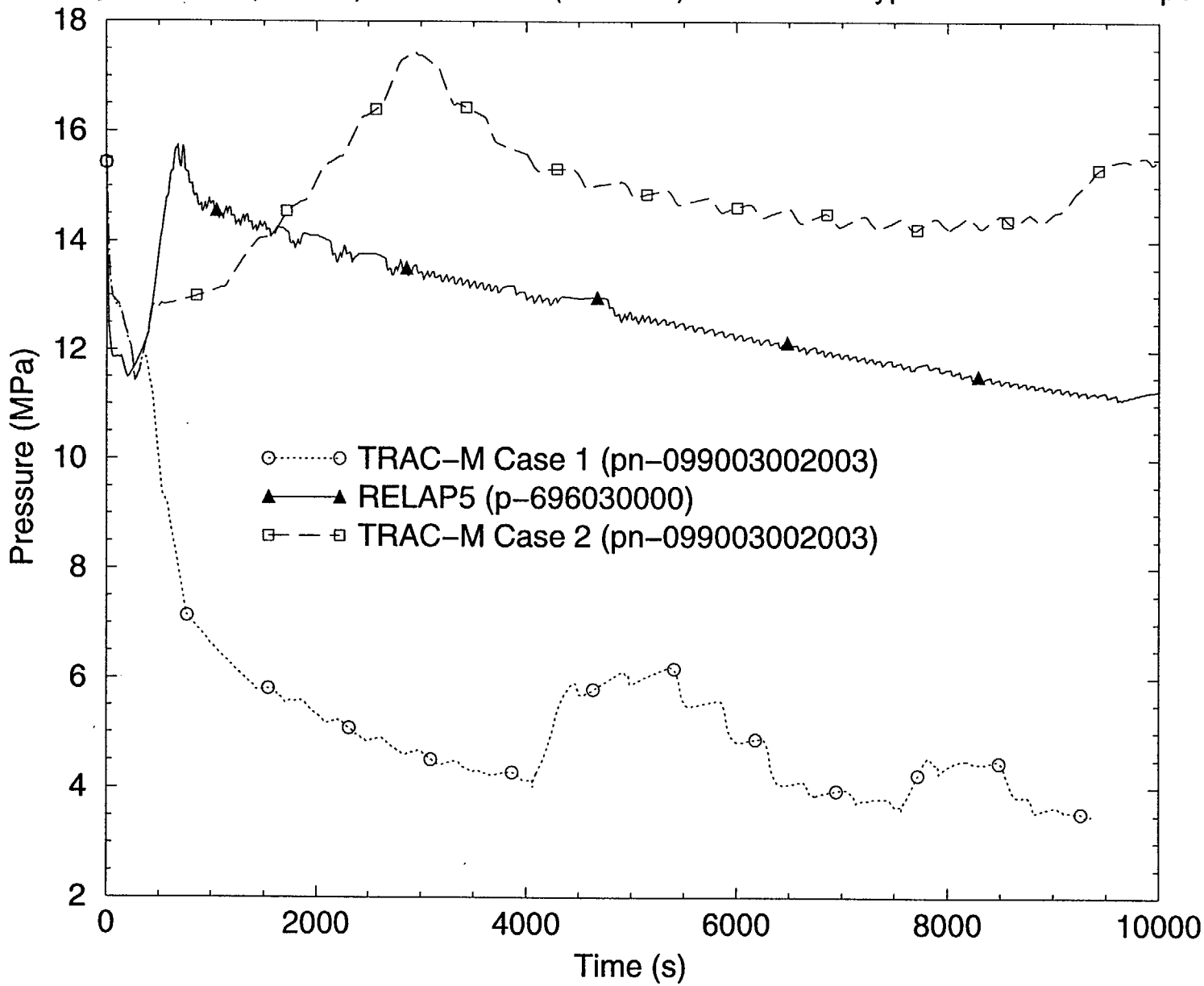


Figure 5.1.4 Max. and Min. Downcomer Wall Heat Transfer Coefficients

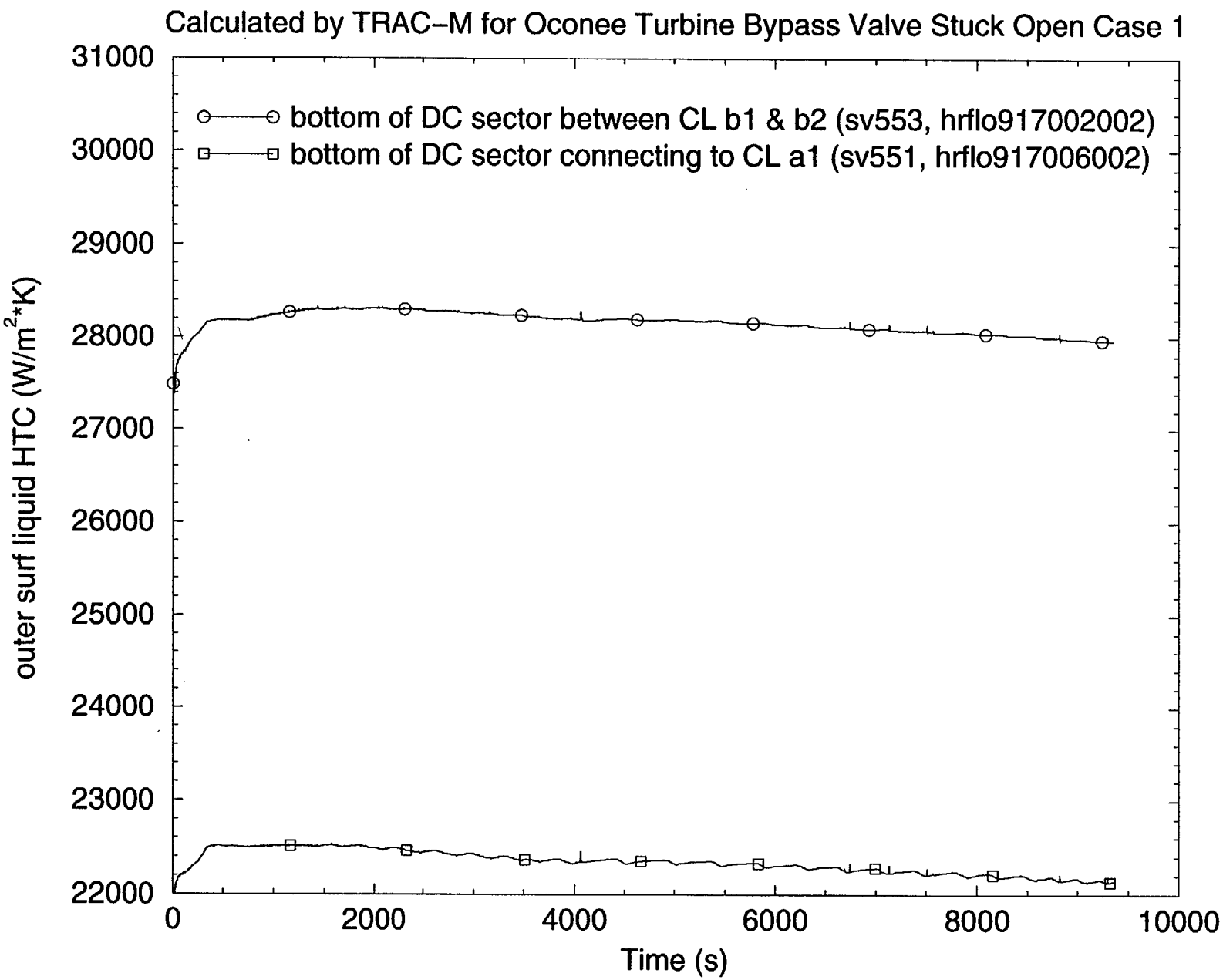


Figure 5.1.5 Max. and Min. Downcomer Wall Heat Transfer Coefficients

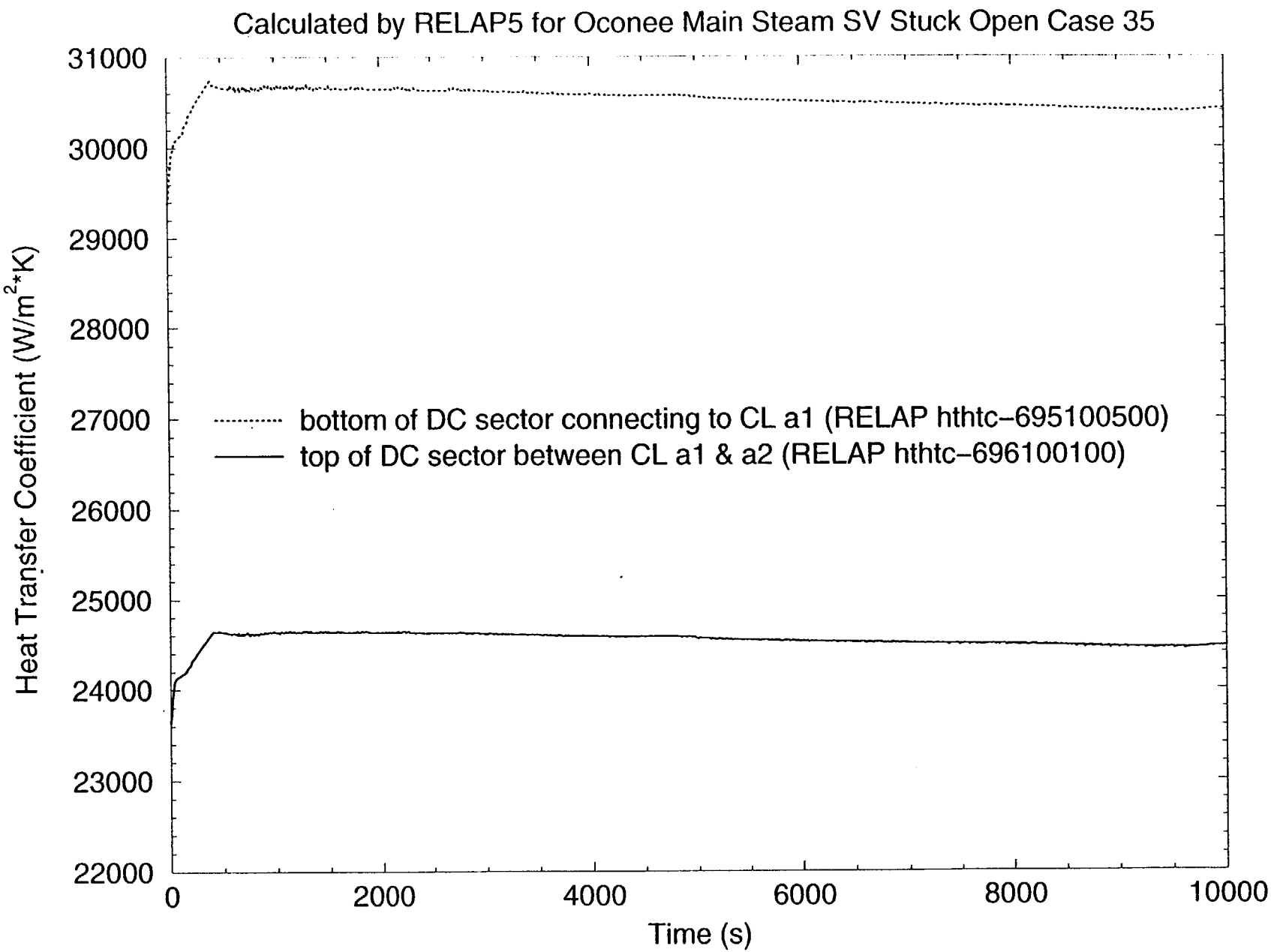


Figure 5.1.6 Downcomer Liquid Temperatures

Calc. by TRACM Case 2 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

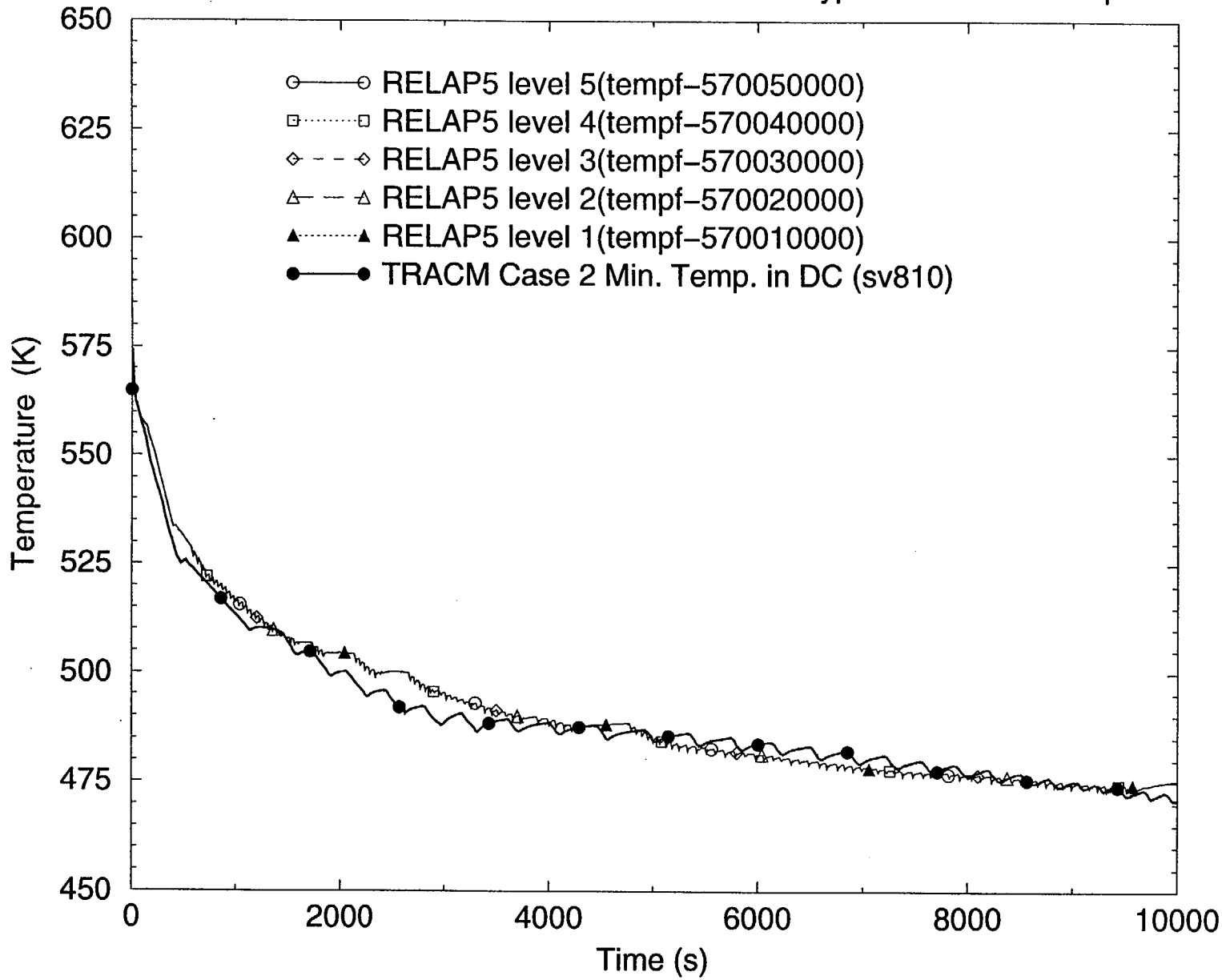


Figure 5.1.7 Downcomer Mid–Elevation Pressure

Calculated by TRAC–M(Case 2) and RELAP5(Case 35) for Turbine Bypass Valve Stuck Open Scenario

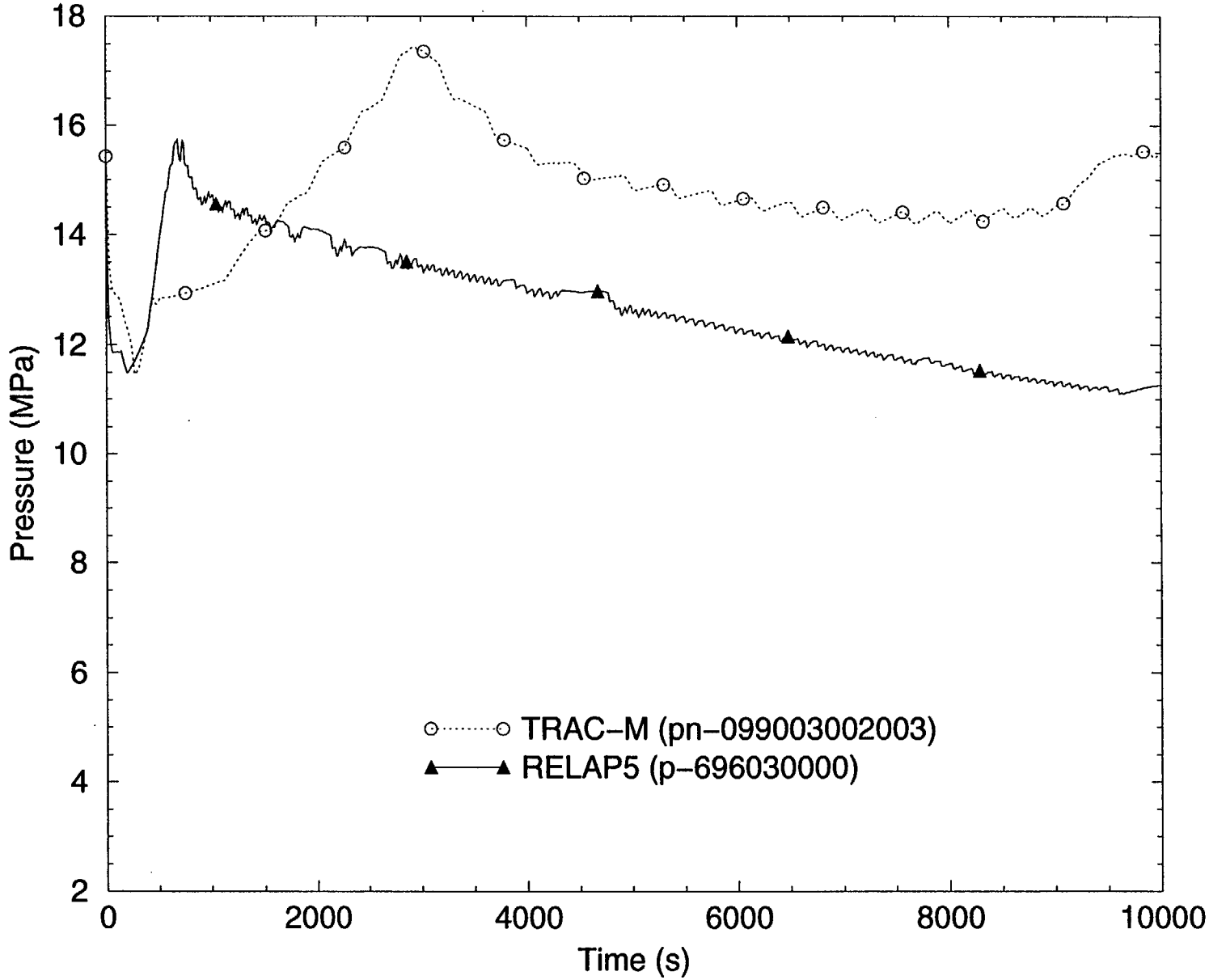


Figure 5.1.8 Max. and Min. Downcomer Wall Heat Transfer Coefficient

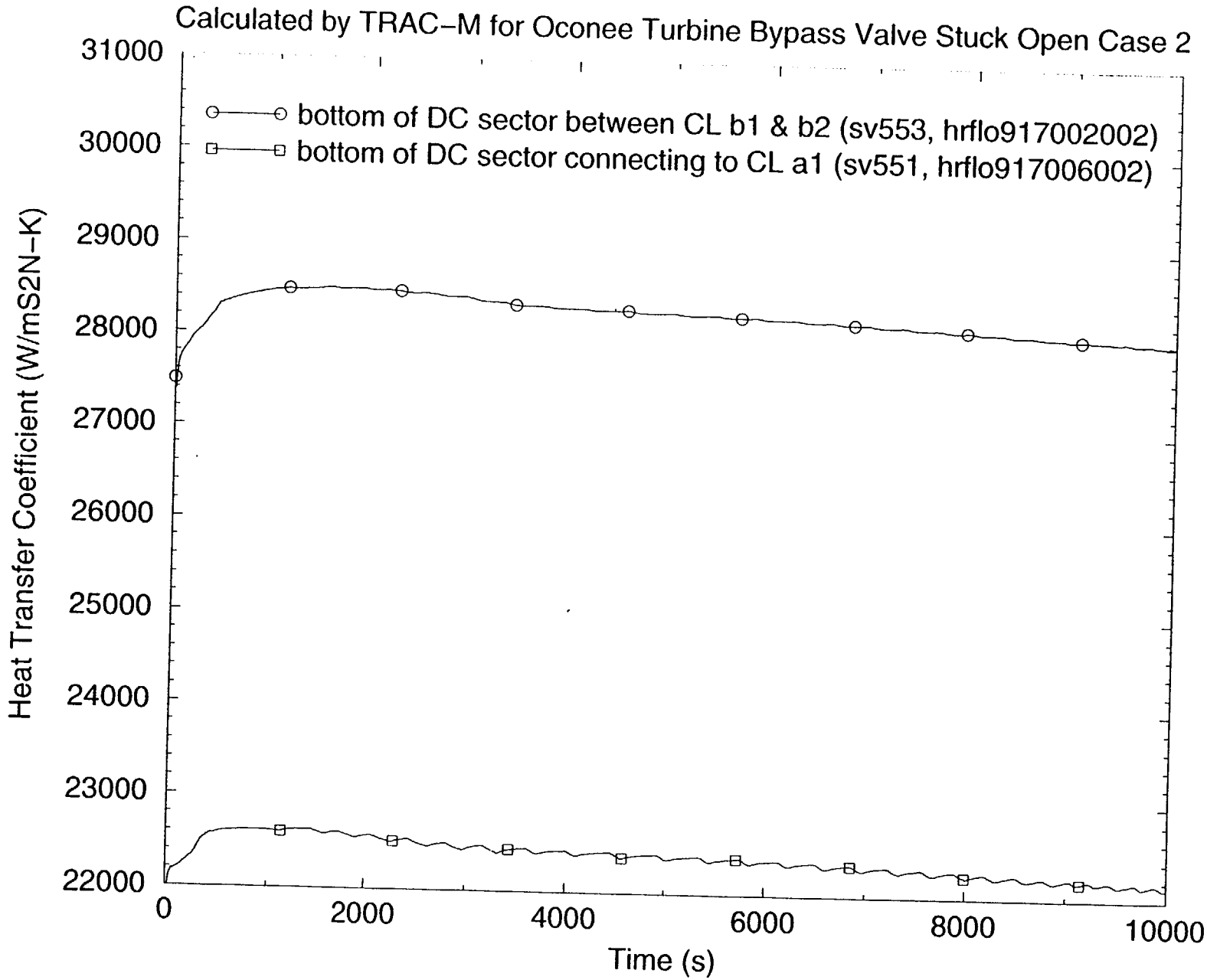


Figure 5.1.8A Total HPI Flow Rates

Calculated by TRACM and RELAP5 for Oconee Turbine Bypass Valve Stuck Open Case 1

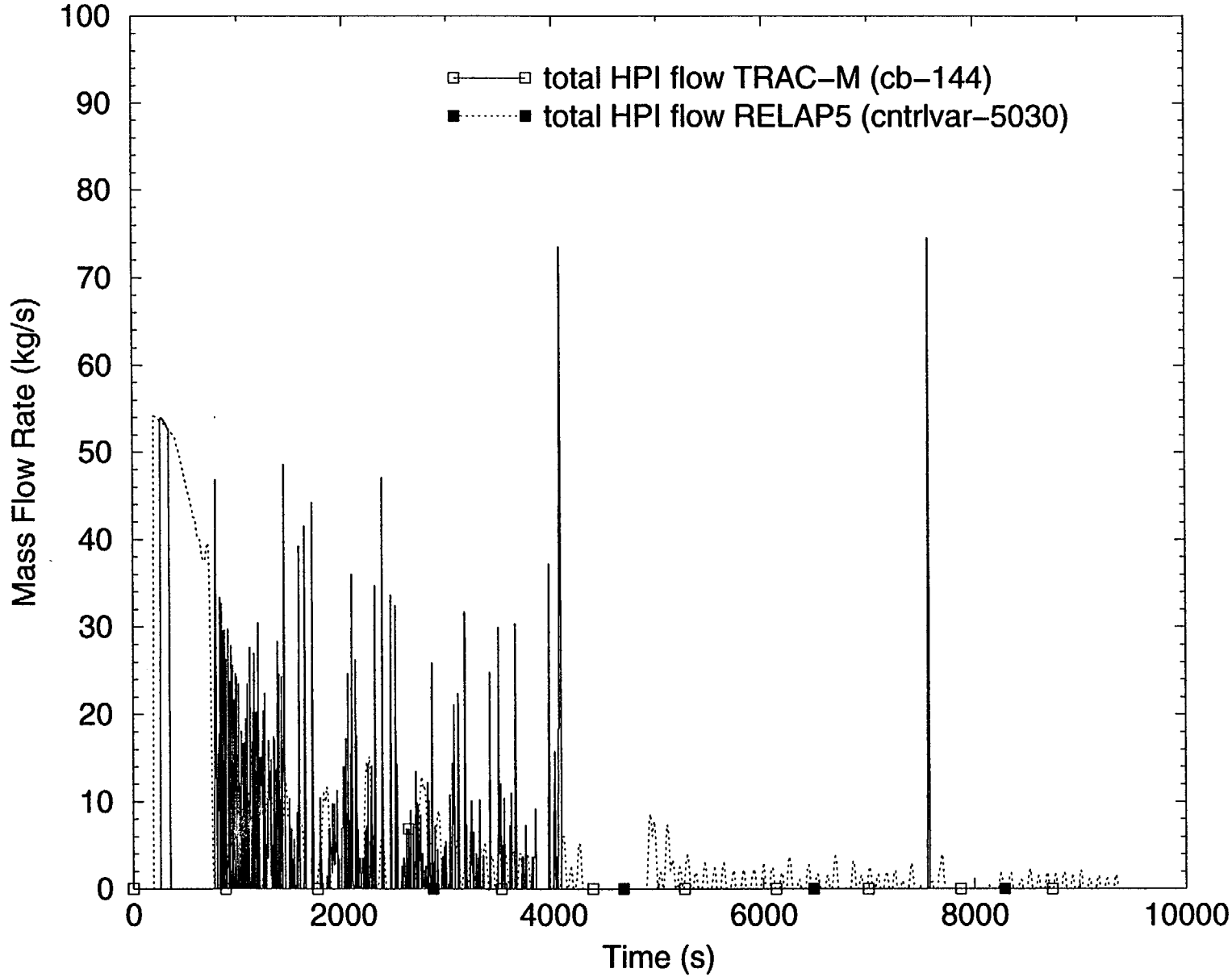


Figure 5.1.8B Total HPI Flow Delivered

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

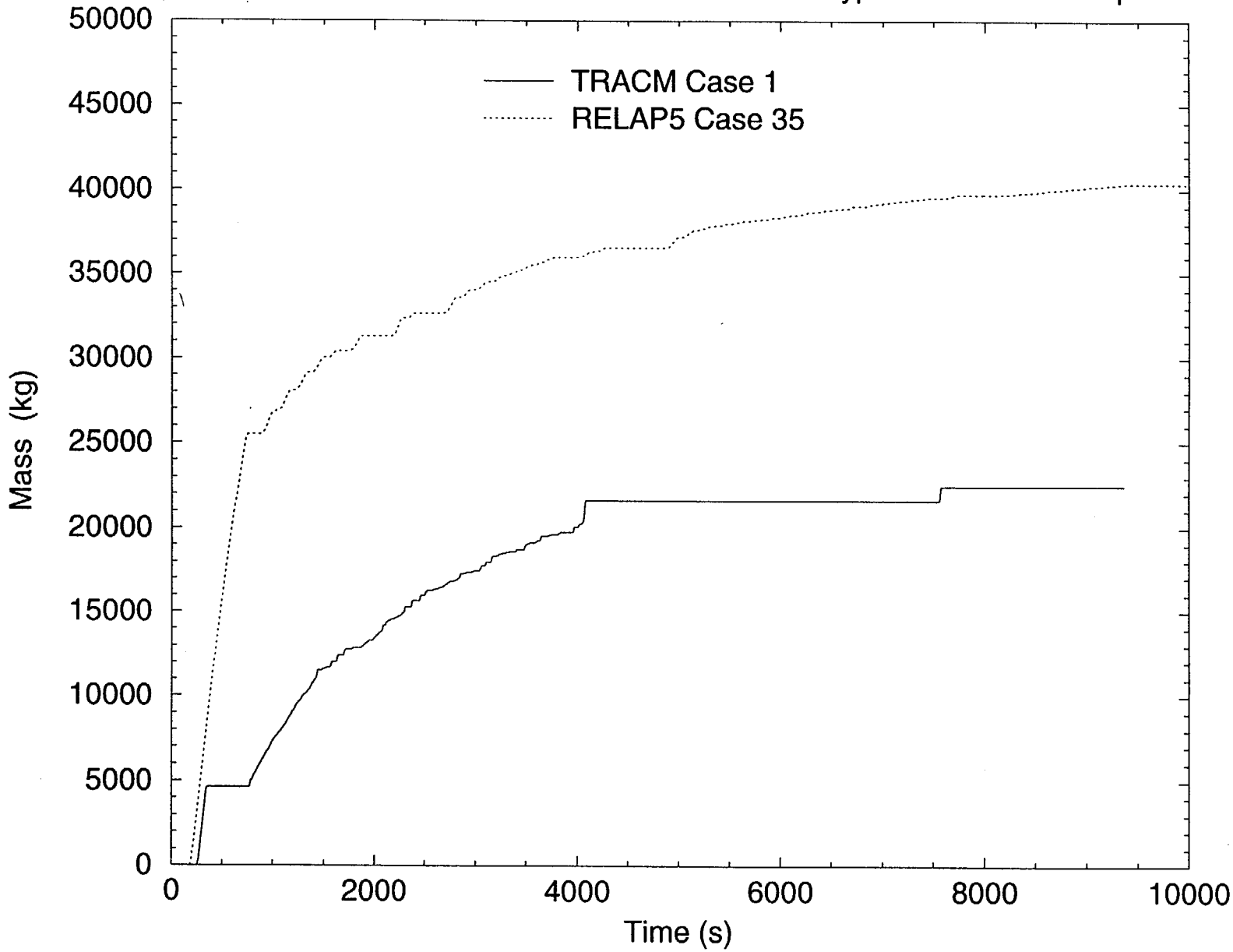


Figure 5.1.9 Heater/Sprayer Power Input to Pressurizer

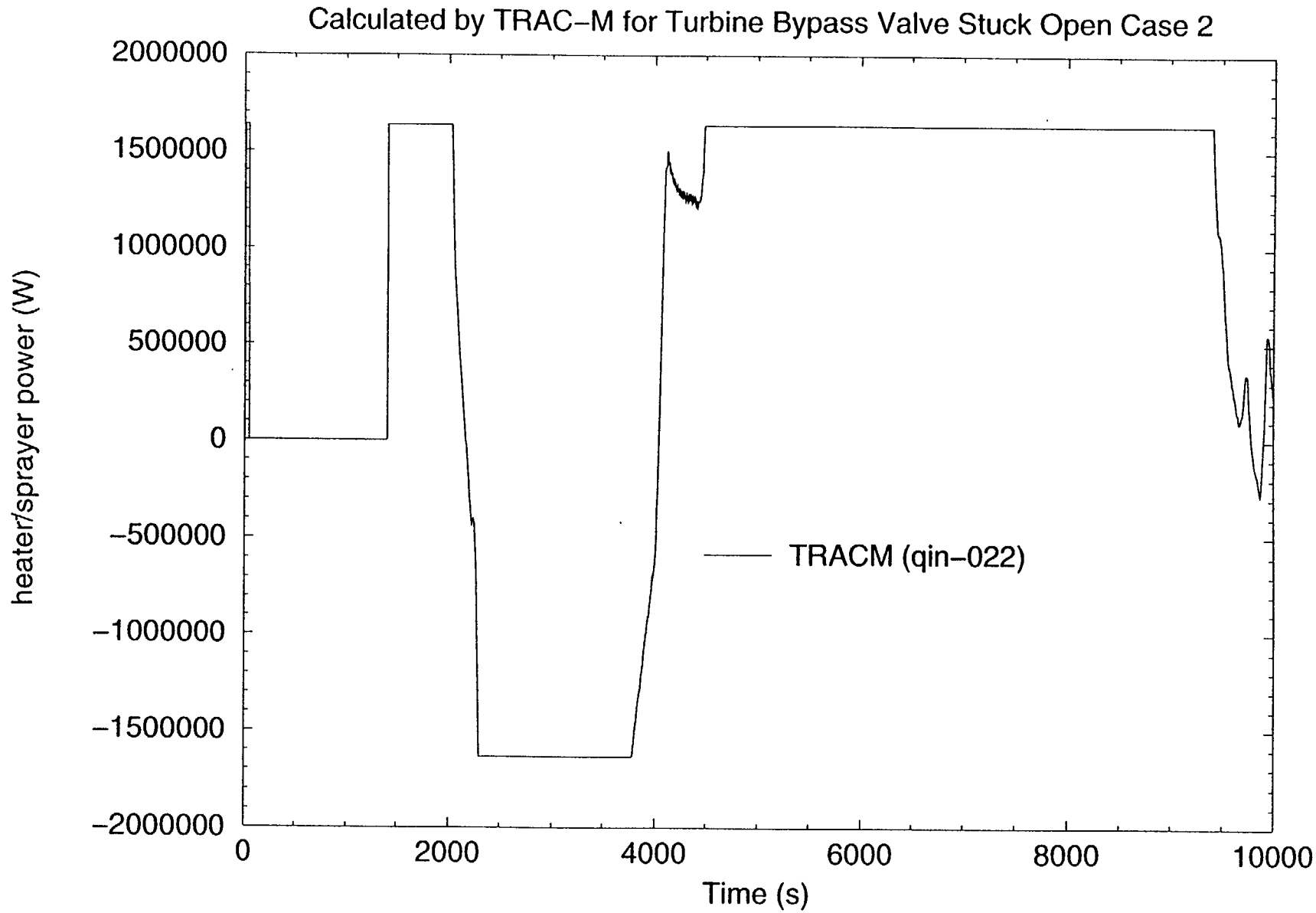


Figure 5.1.10 Core Exit and Core Bypass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

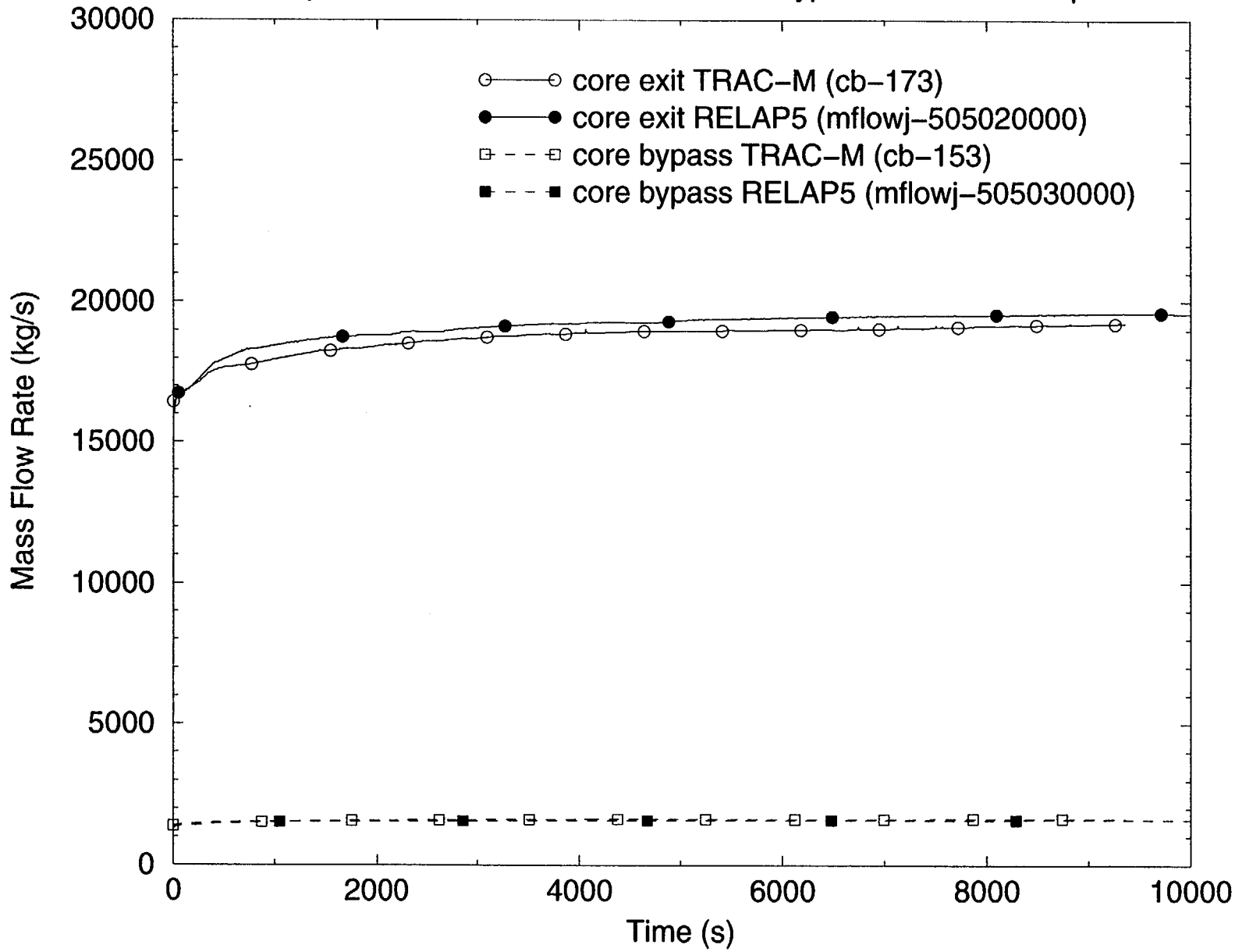


Figure 5.1.11 Hot Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

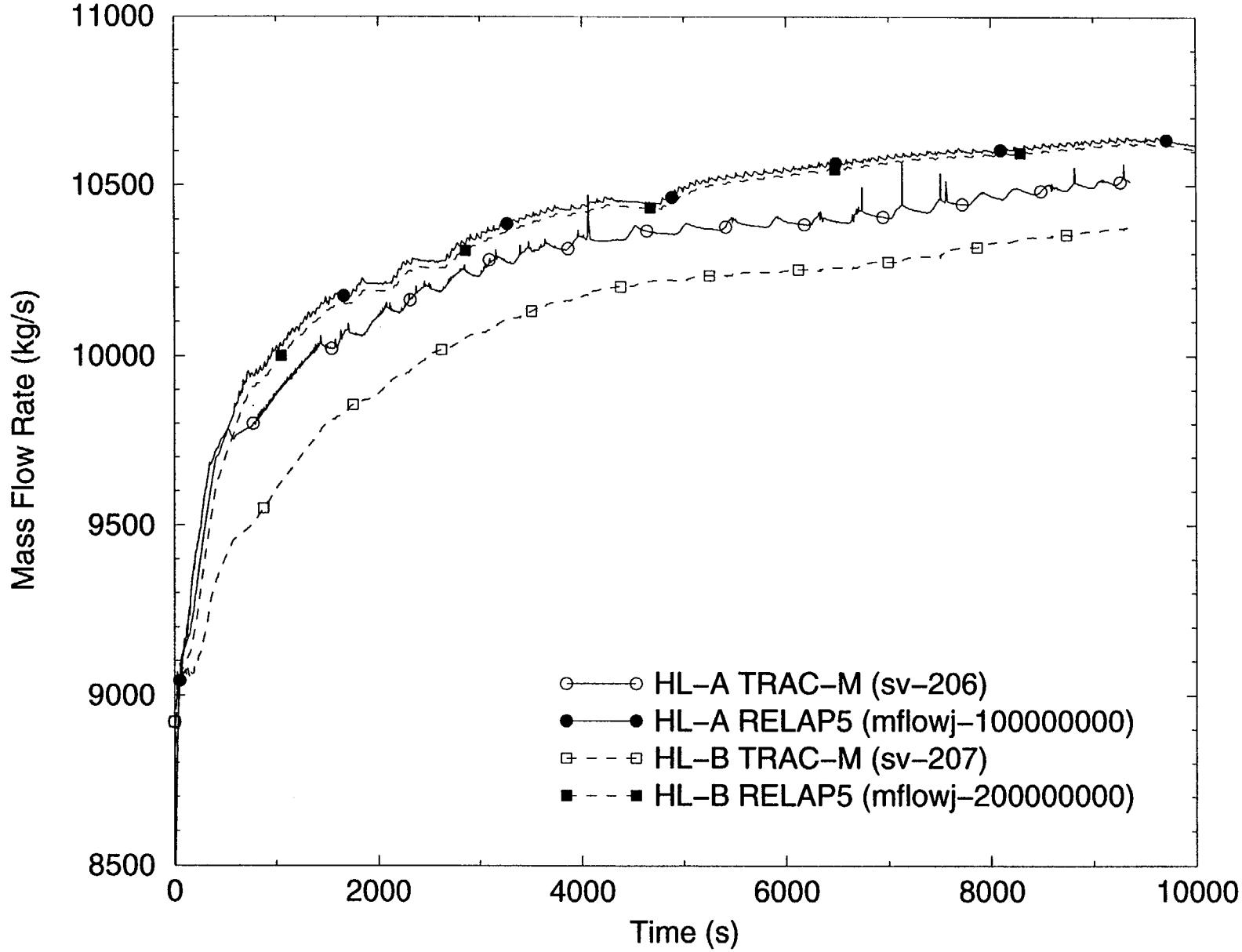


Figure 5.1.12 Loop A Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

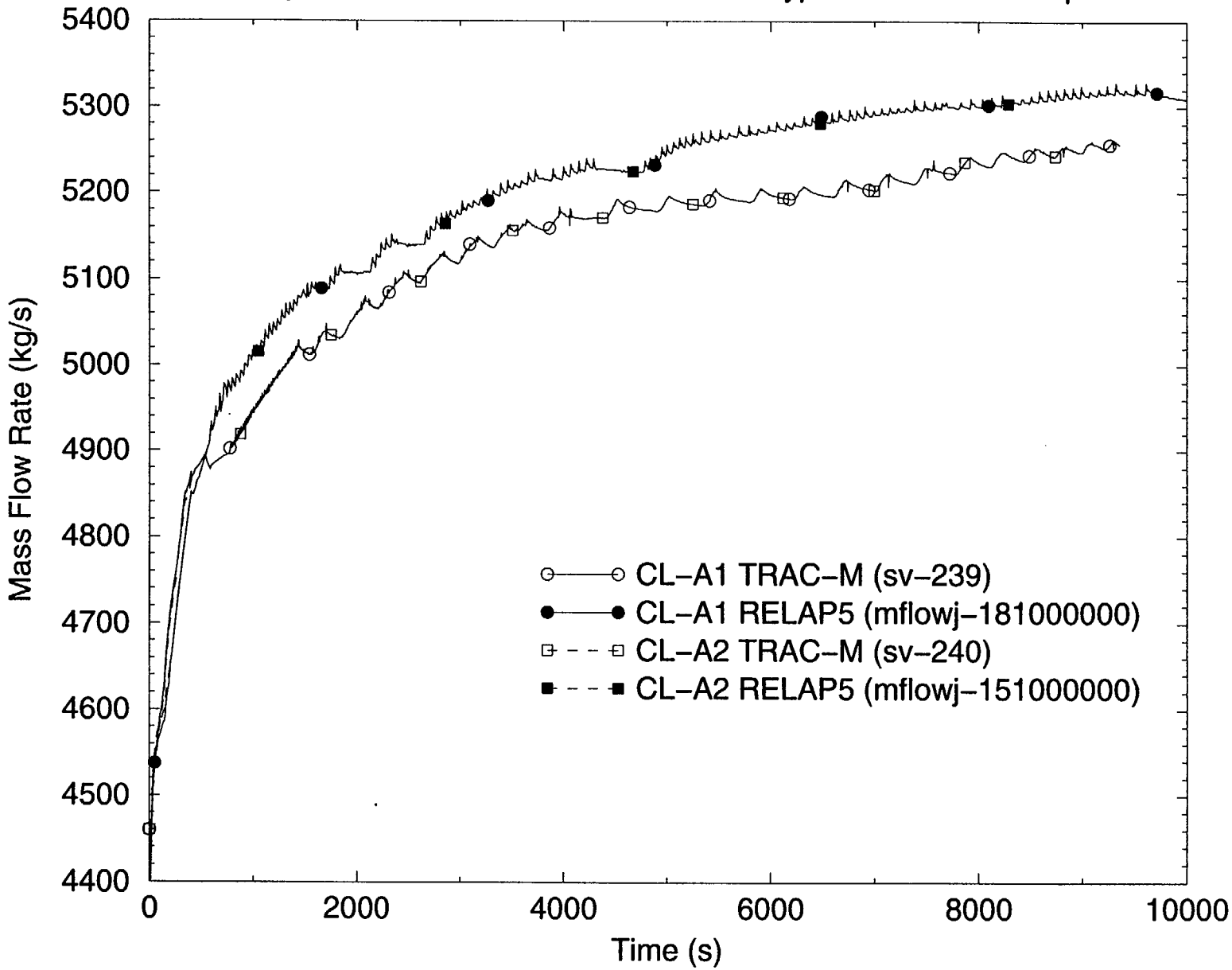


Figure 5.1.13 Loop B Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

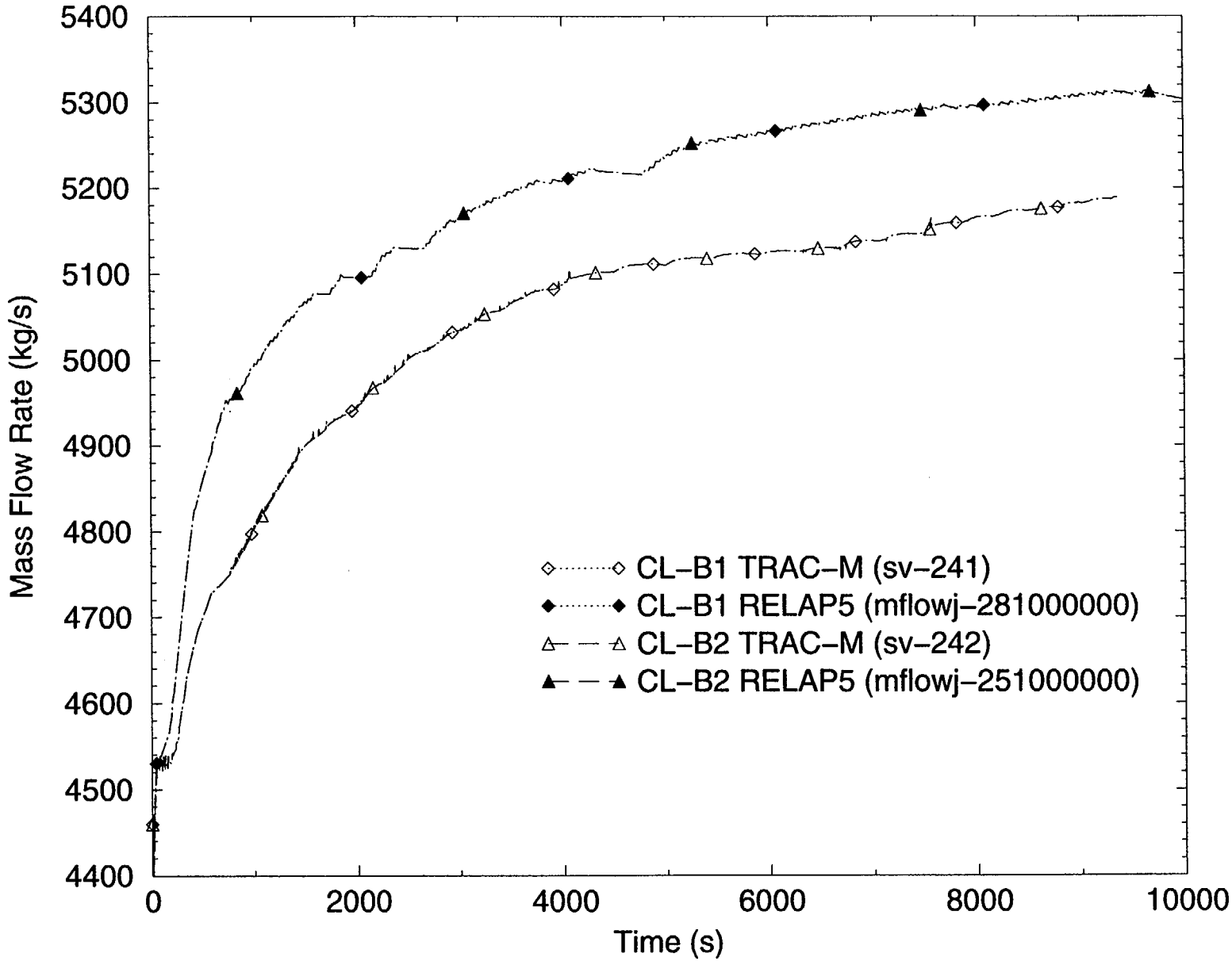


Figure 5.1.14 Core Exit and Core Bypass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

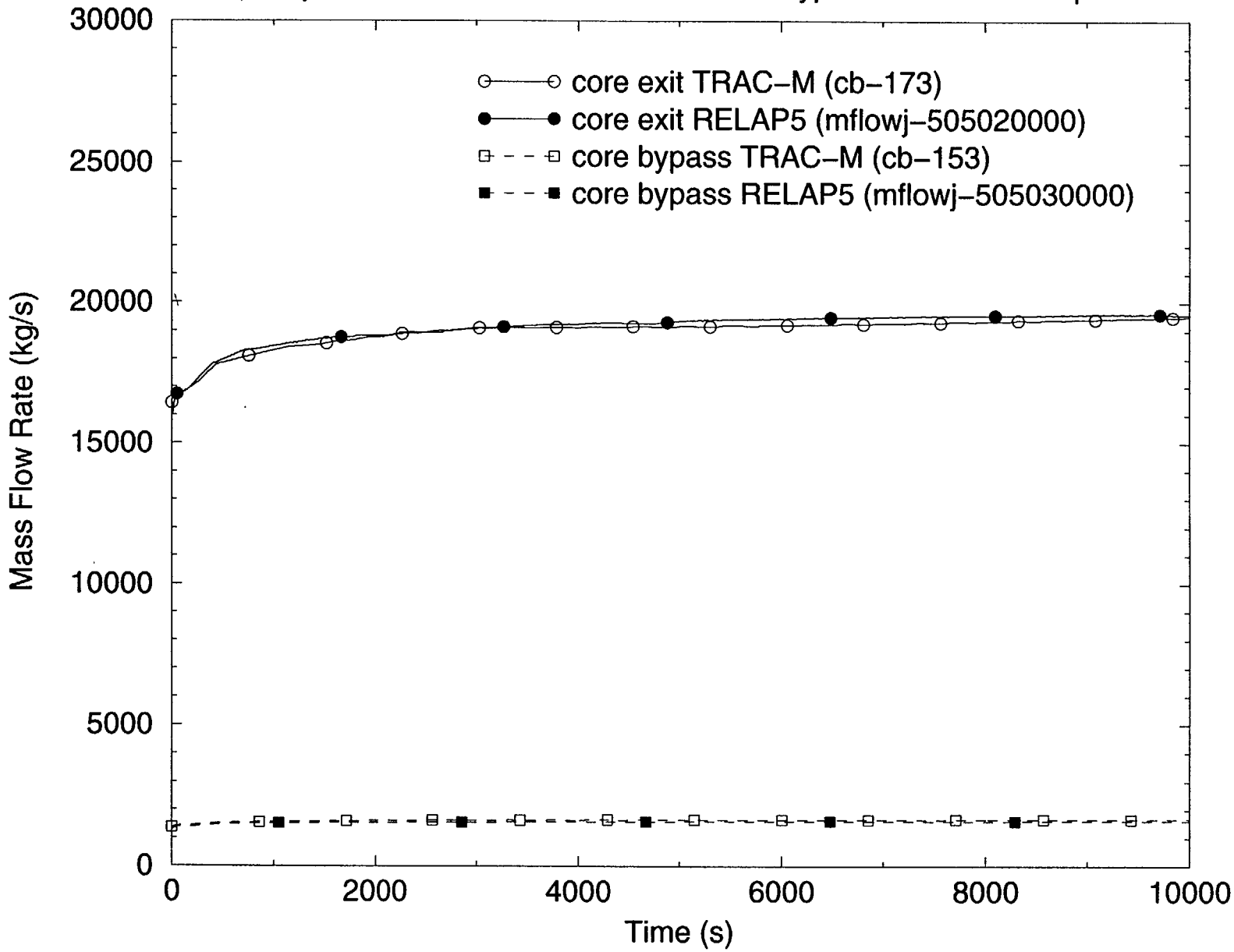


Figure 5.1.15 Hot Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

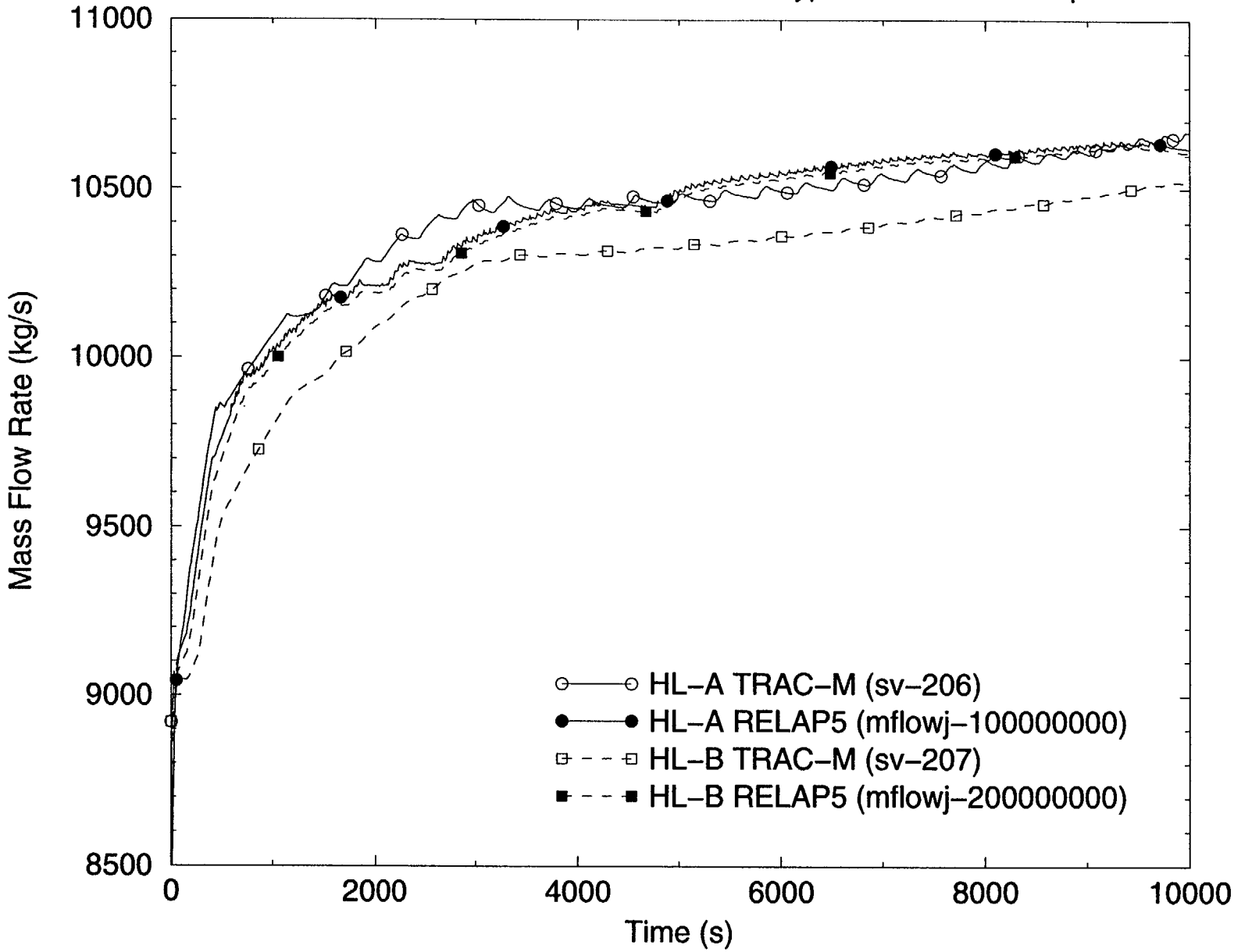


Figure 5.1.16 Loop A Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

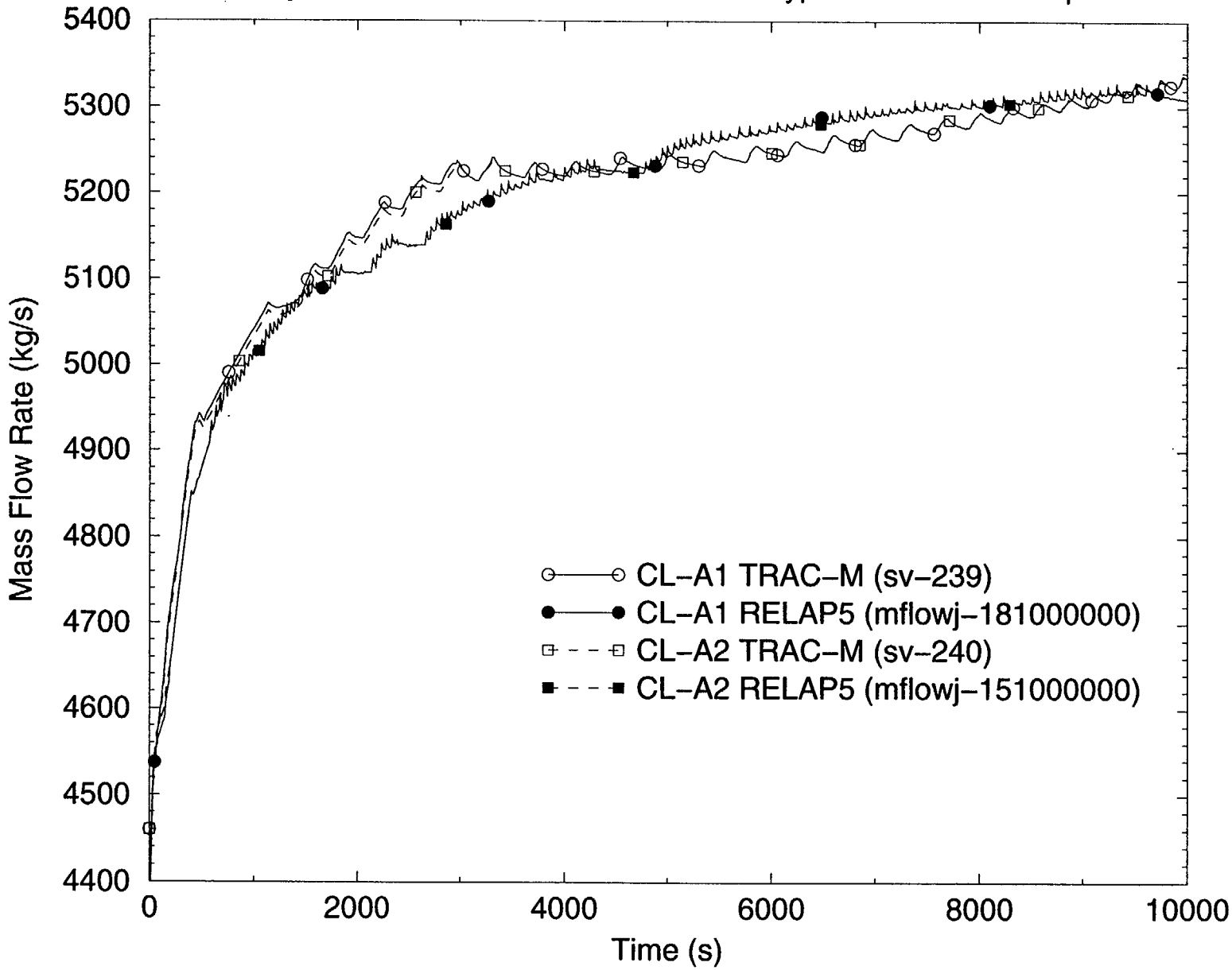


Figure 5.1.17 Loop B Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

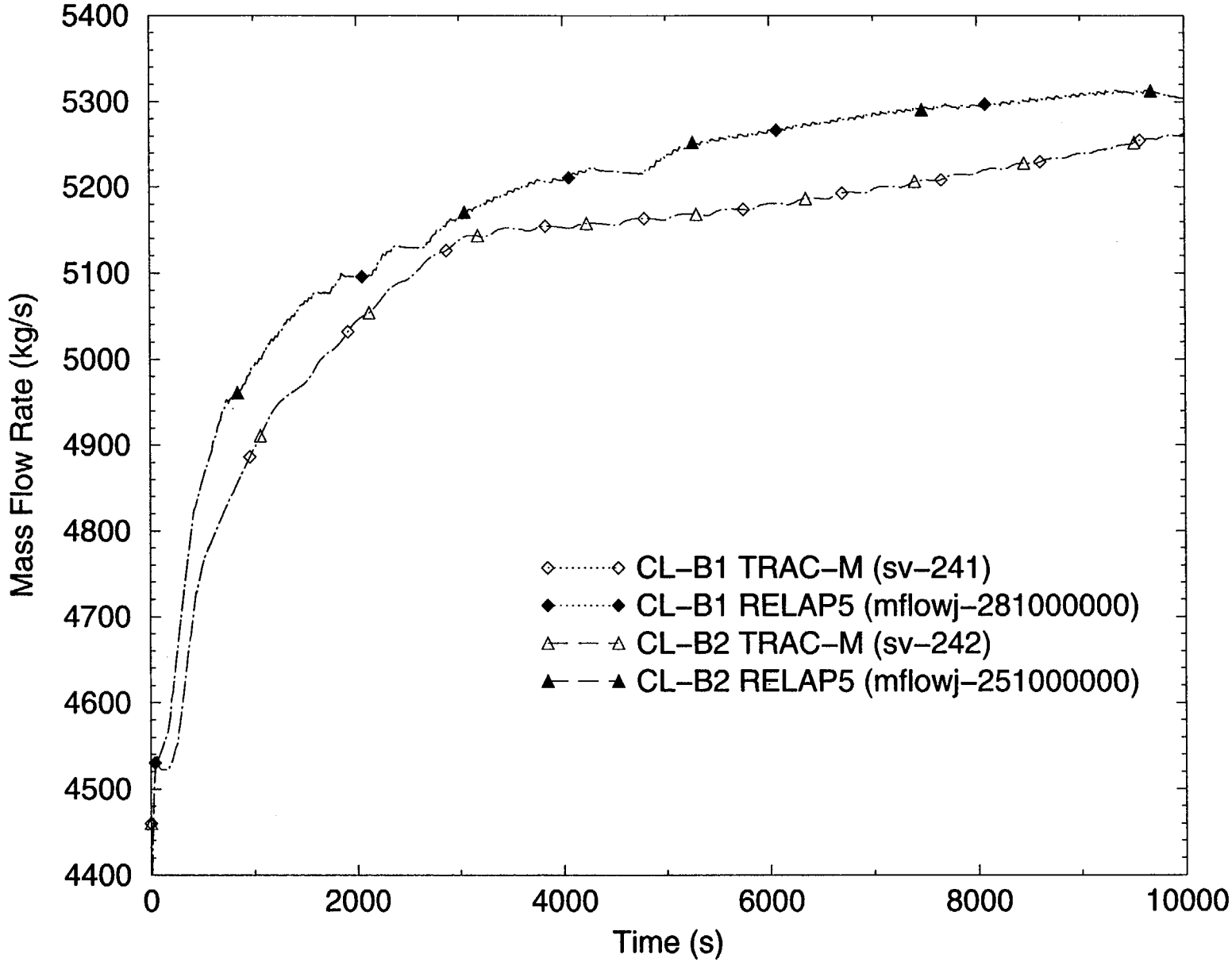


Figure 5.1.17A Heat Transfer Rates in SGs

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

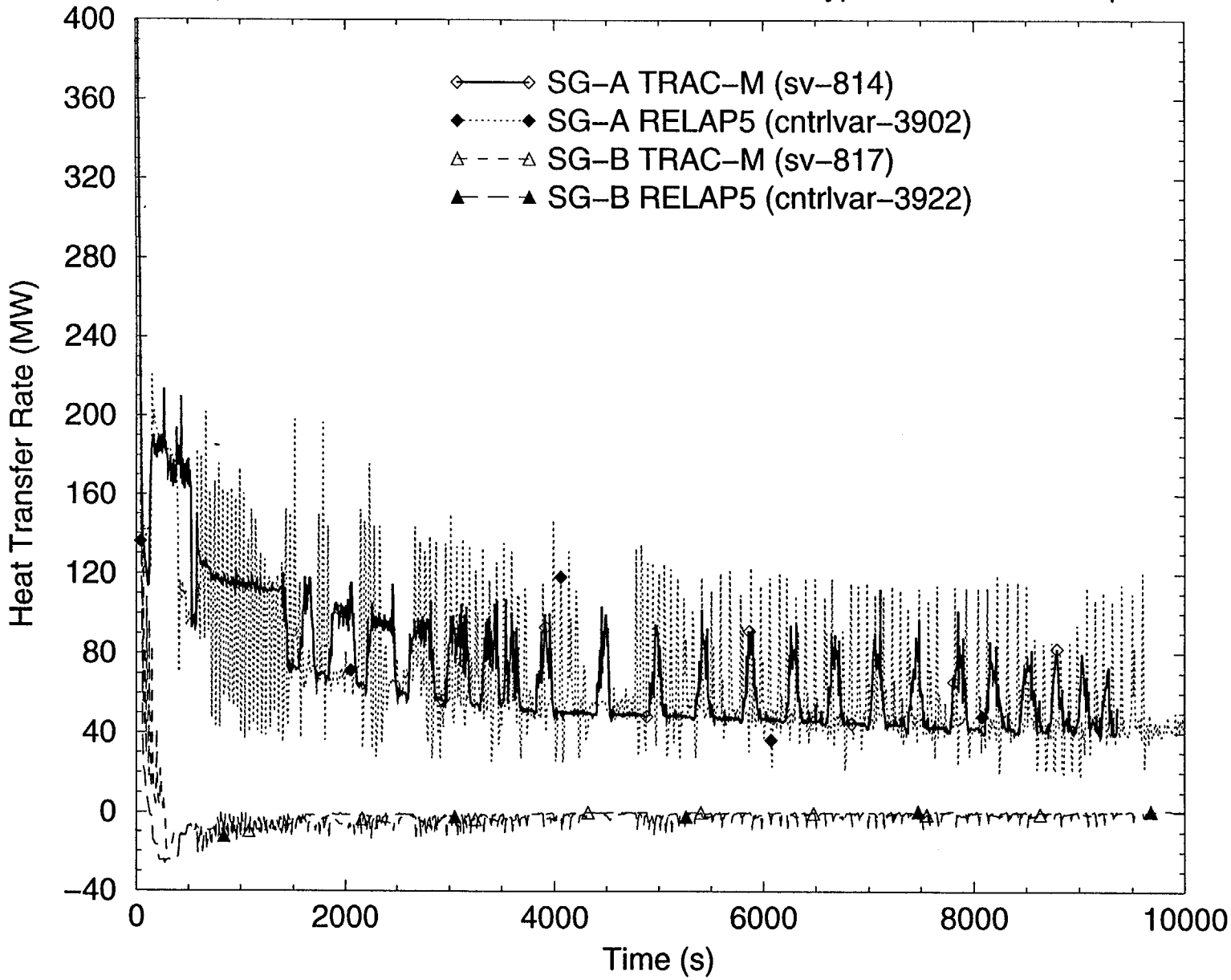


Figure 5.1.17B Integrated Heat Transfer in SGs

Calc. by TRACM Case 1 and RELAP5 Case 35 for Turb. Bypass Valve Stuck Open Scenario

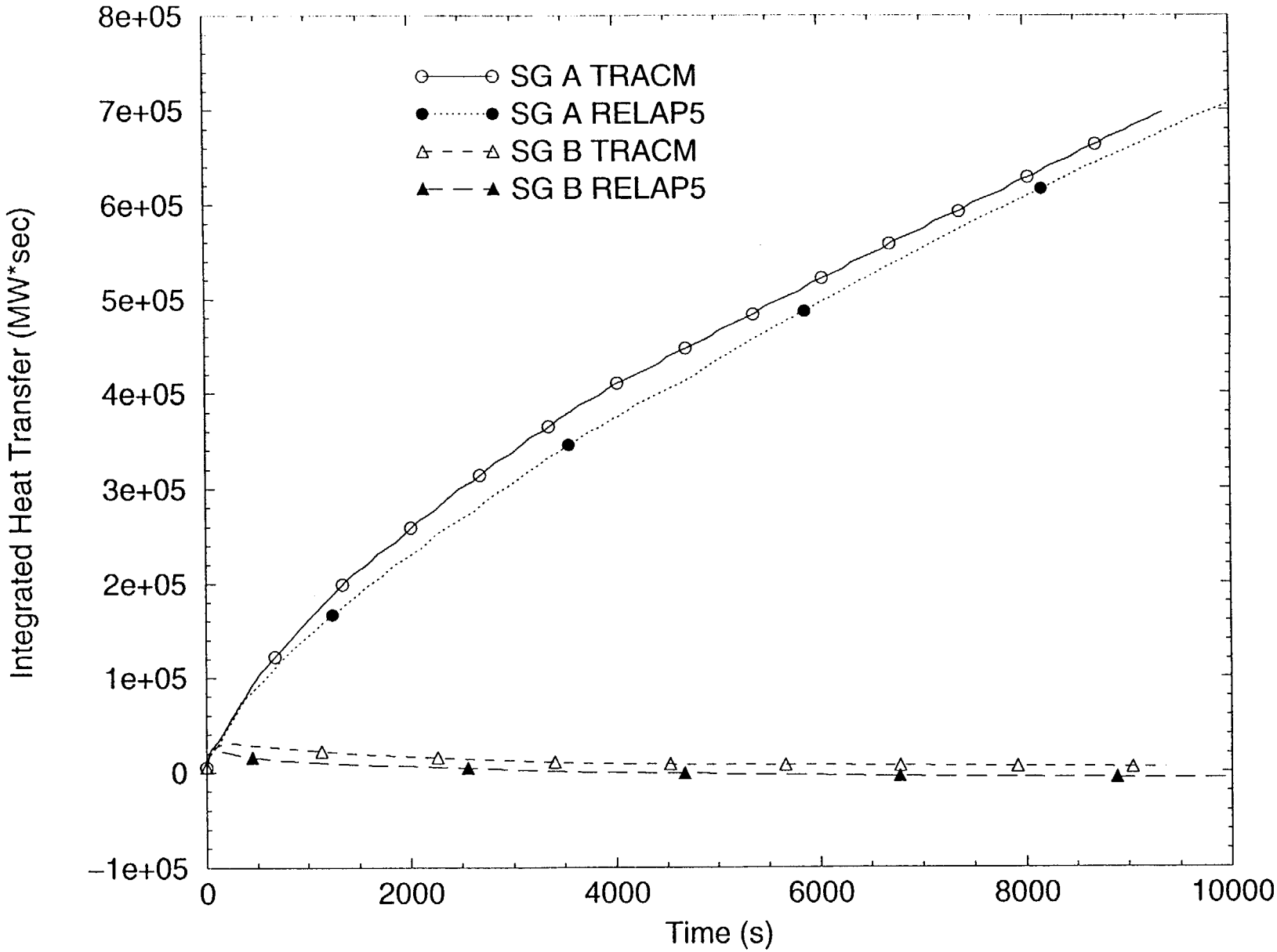


Figure 5.1.18 Hot Leg Temperatures

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

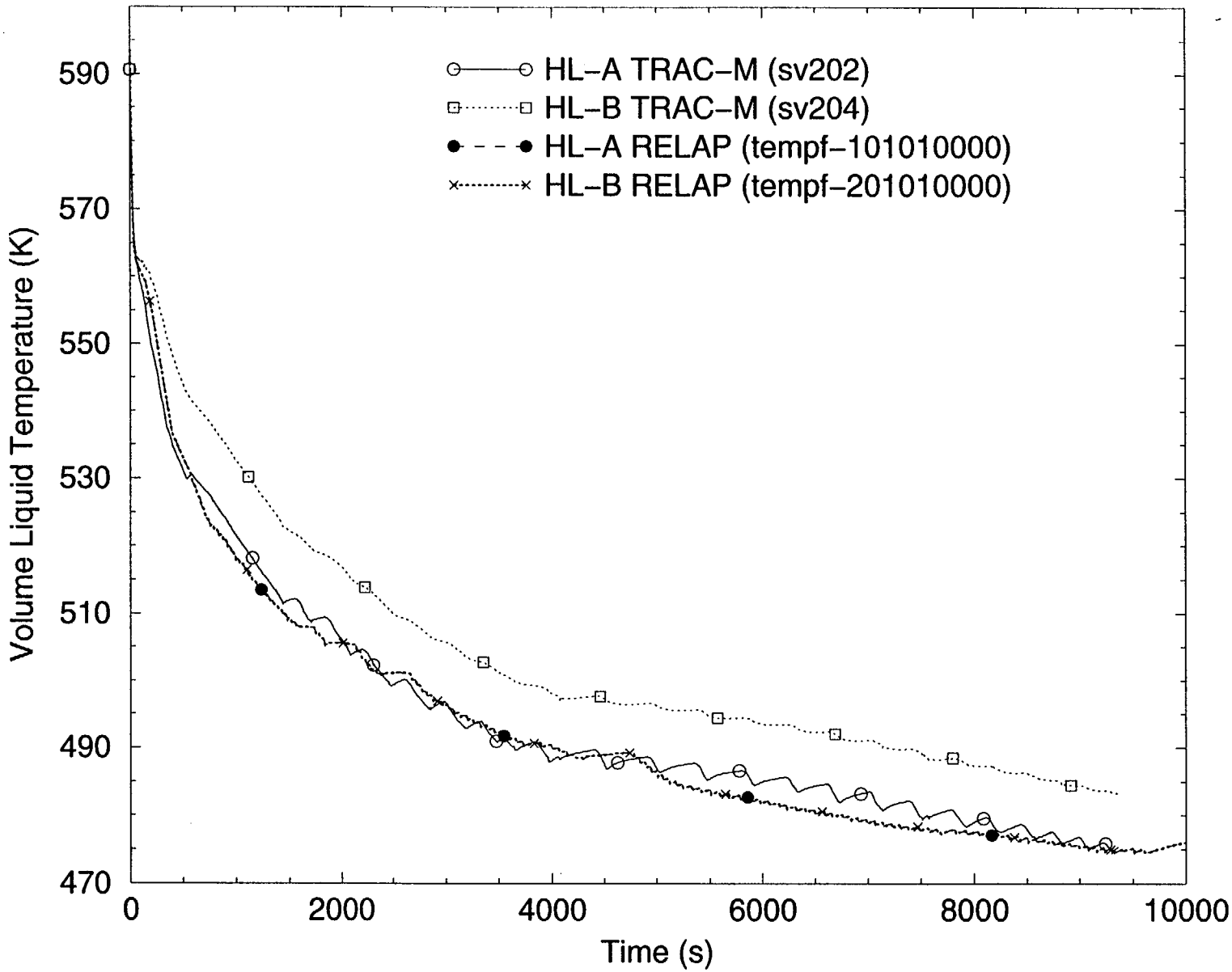


Figure 5.1.19 Cold Leg Temperatures

Calculated by TRACM for Turbine Bypass Valve Stuck Open Case 1

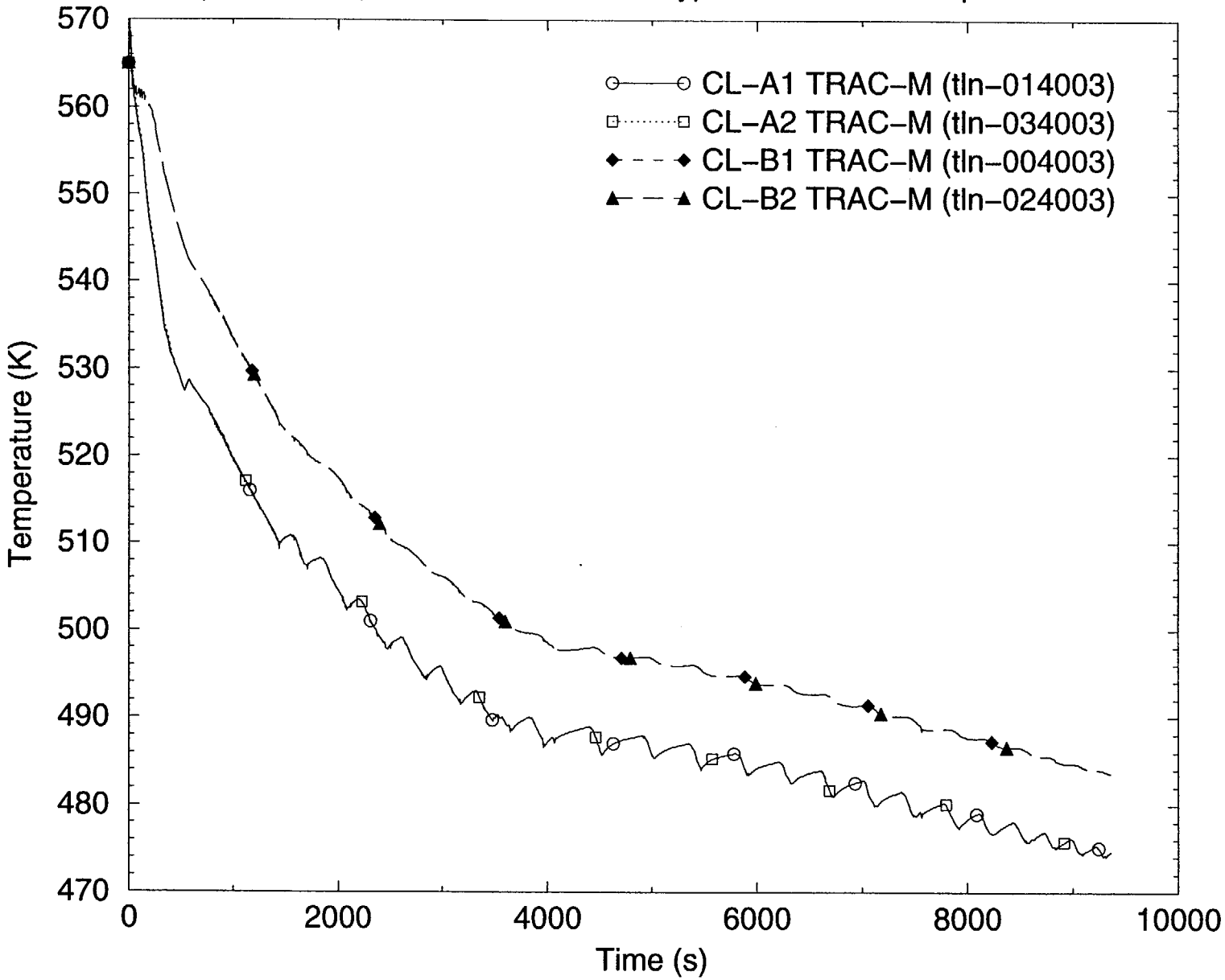


Figure 5.1.20 Cold Leg Temperatures

Calculated by RELAP5 for Main Steam Line A Safety Valve Stuck Open Case 35

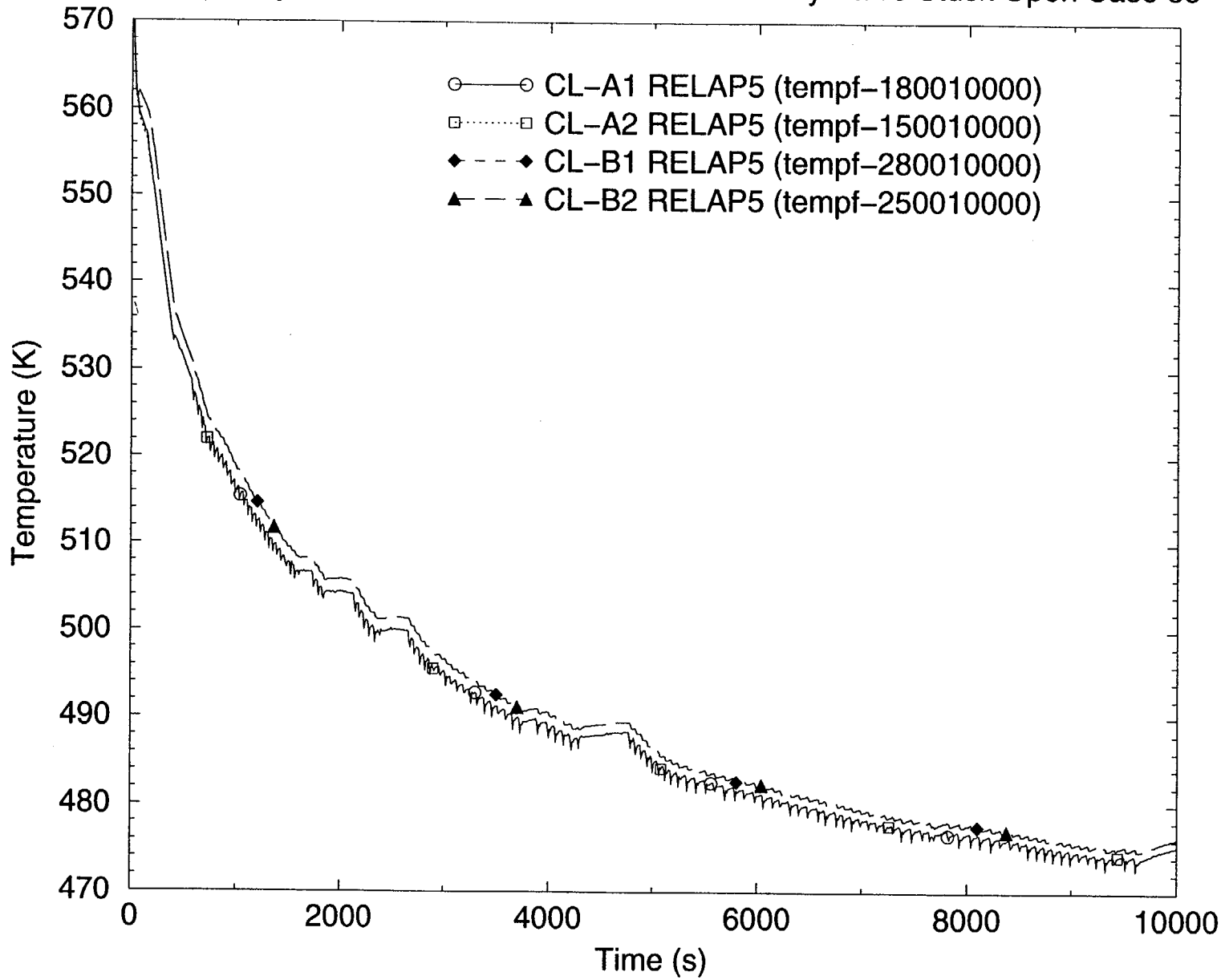


Figure 5.1.21 Hot Leg Temperatures

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

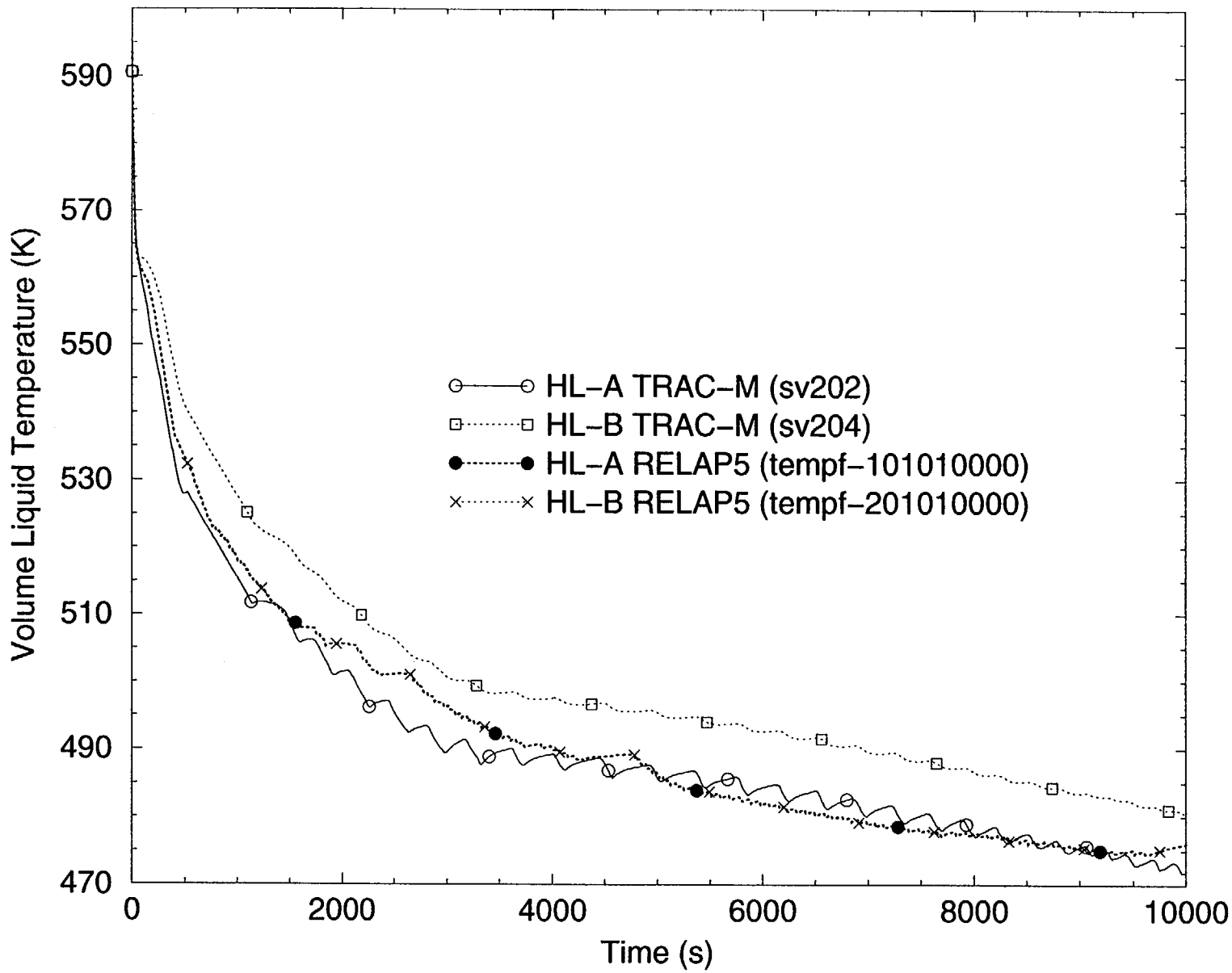


Figure 5.1.22 Cold Leg Temperatures

Calculated by TRACM for Turbine Bypass Valve Stuck Open Case 2

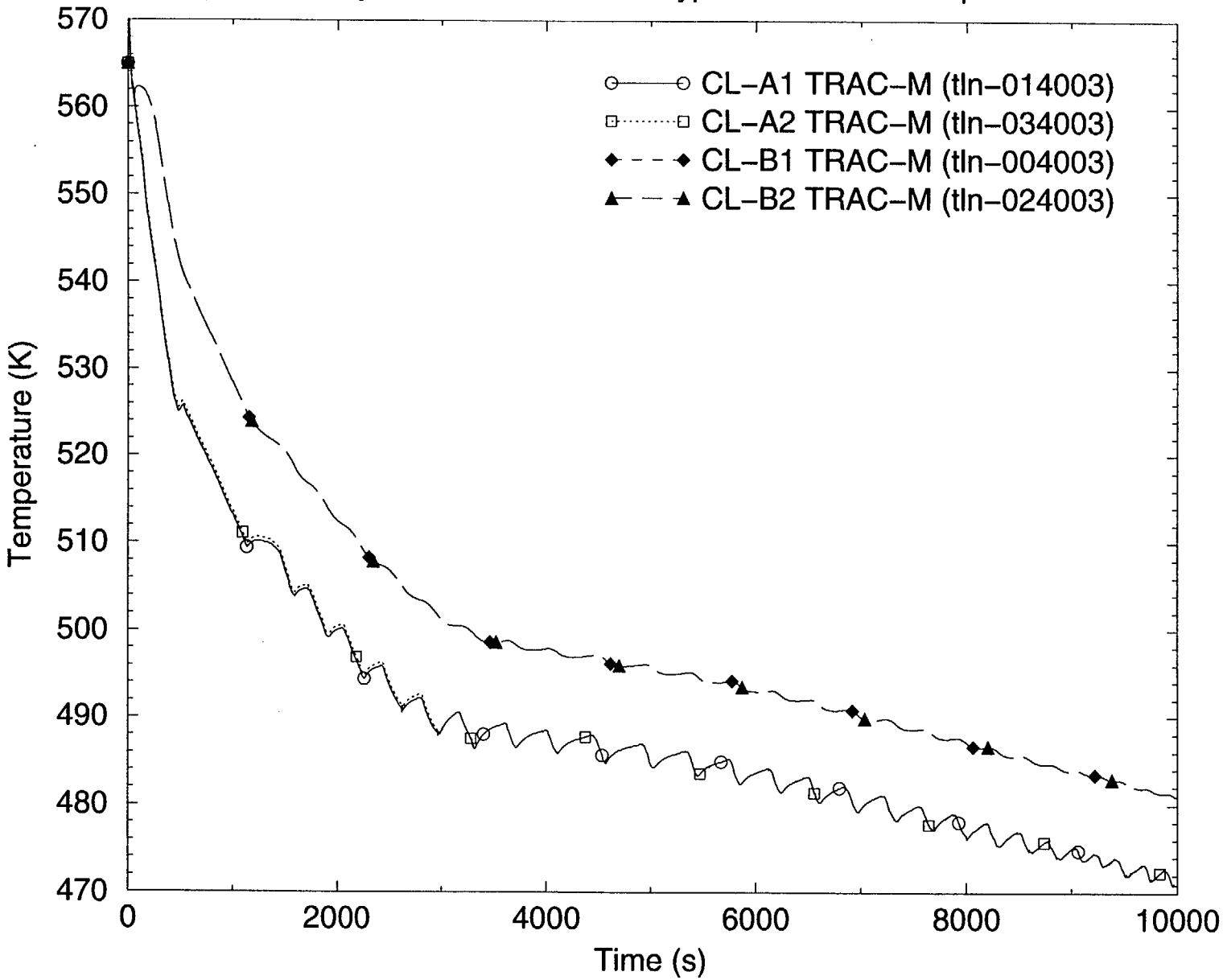


Figure 5.1.23 Cold Leg Temperatures

Calculated by RELAP5 for Main Steam Line A Safety Valve Stuck Open Case 35

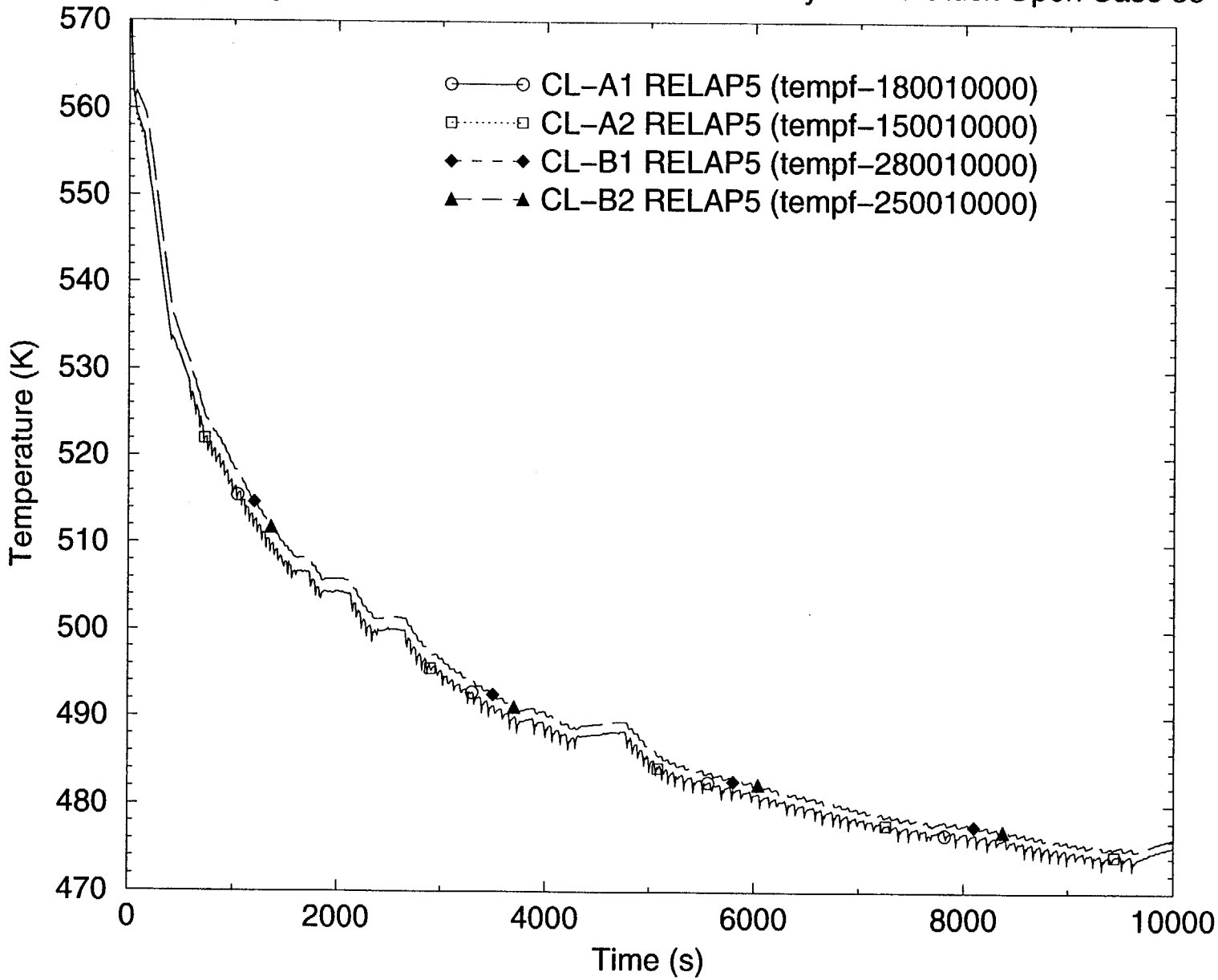


Figure 5.1.24 Main Steam Line Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

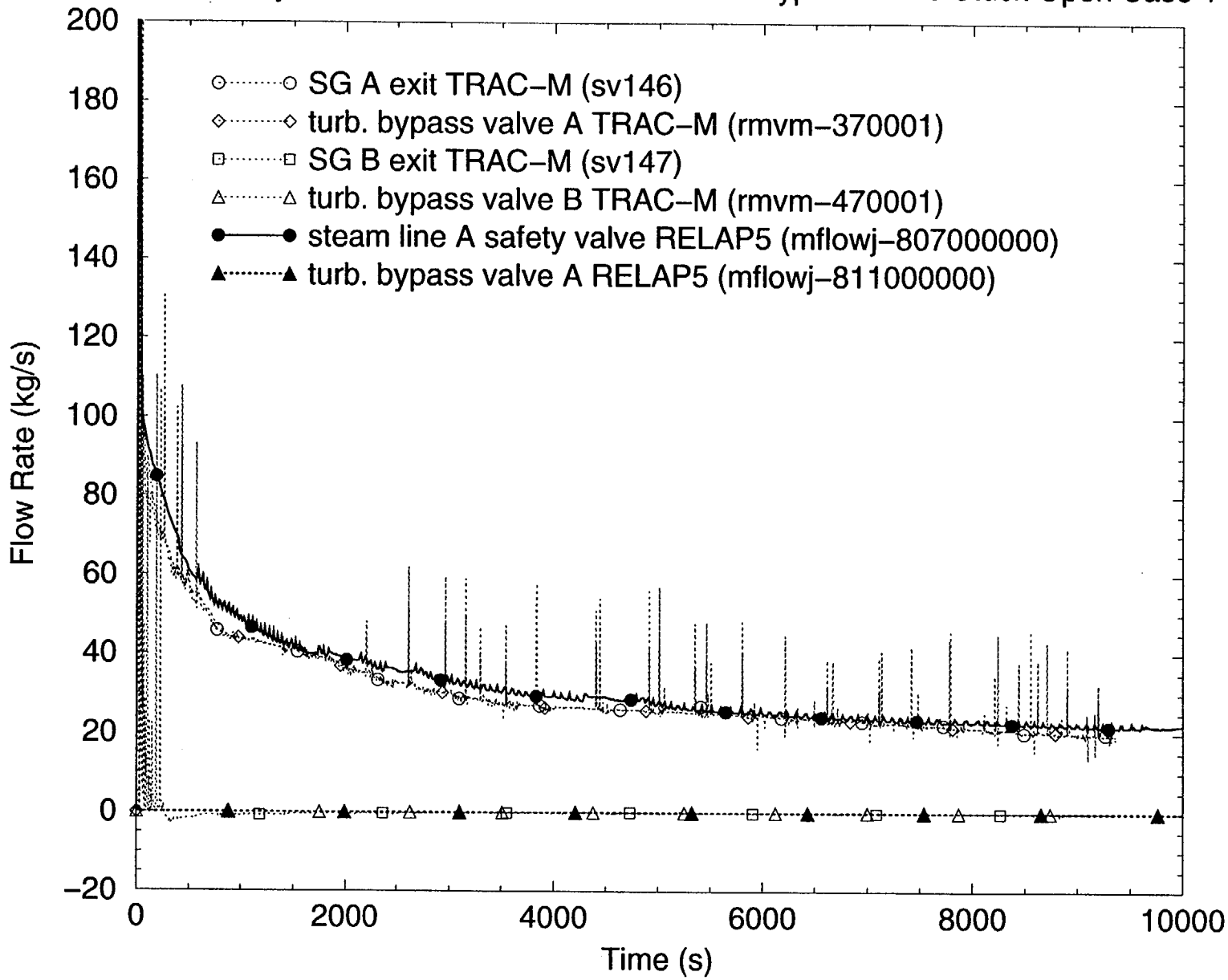


Figure 5.1.25 Heat Transfer Rates in Steam Generators

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 1

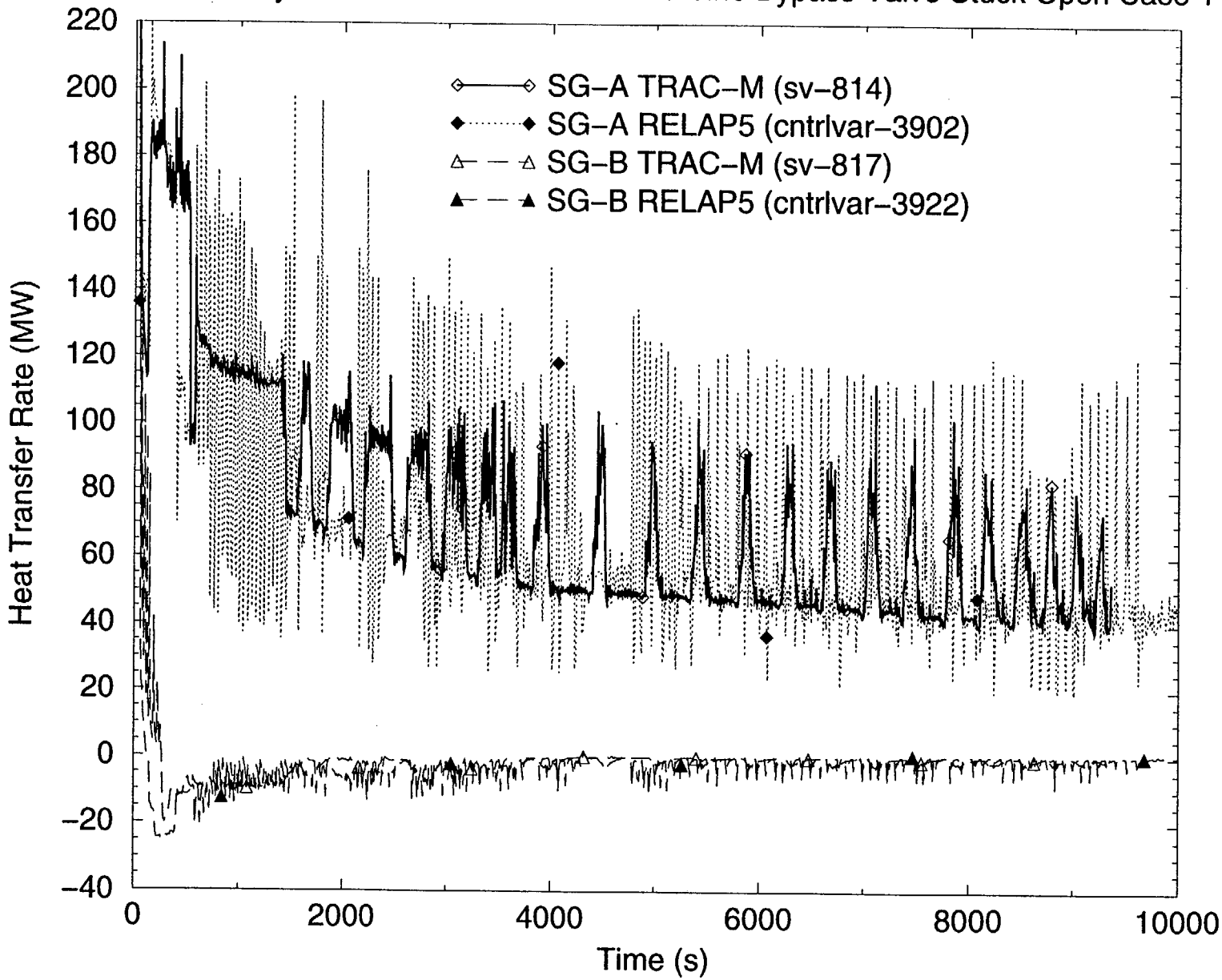


Figure 5.1.26 Main Steam Line Flow Rates

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2

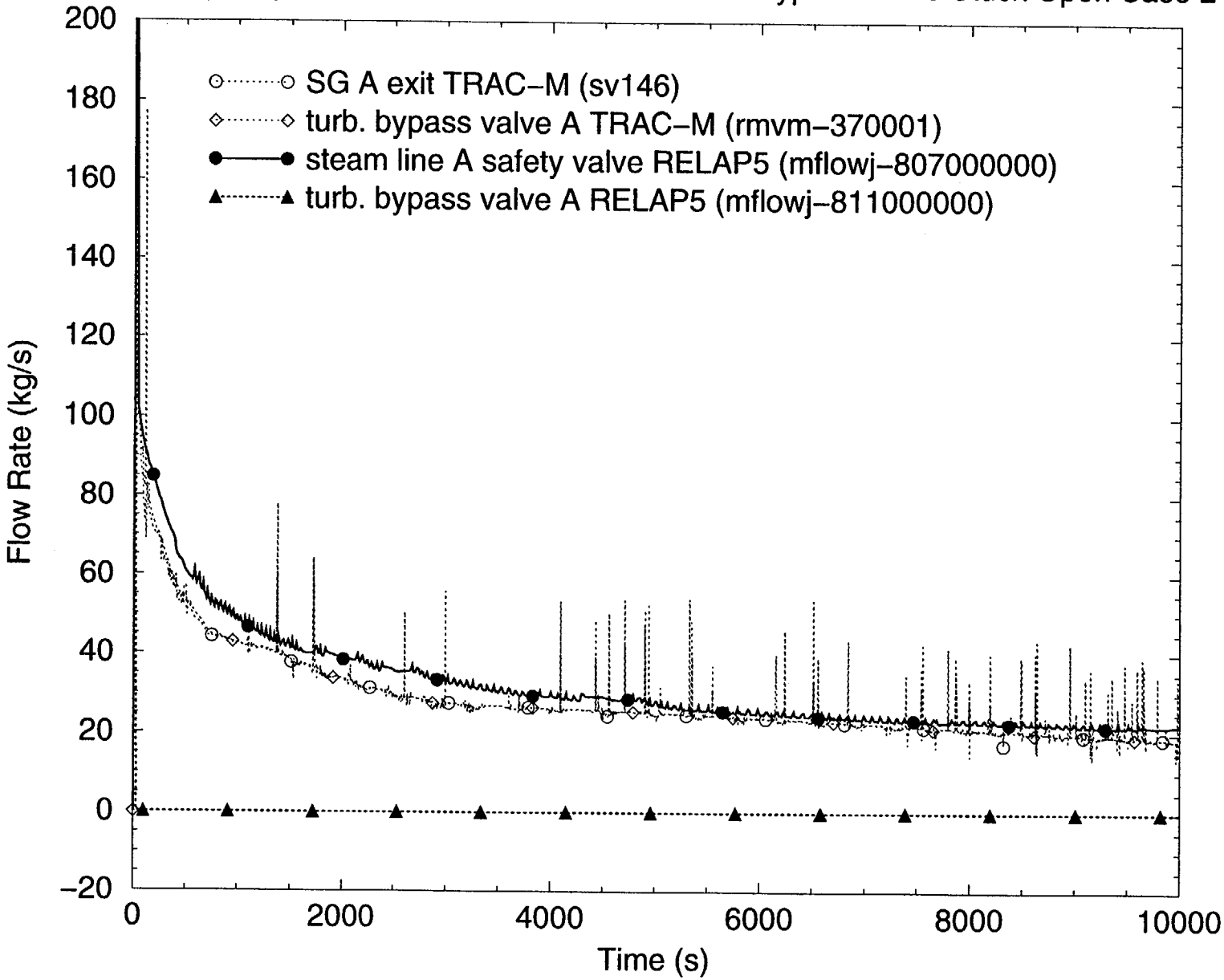
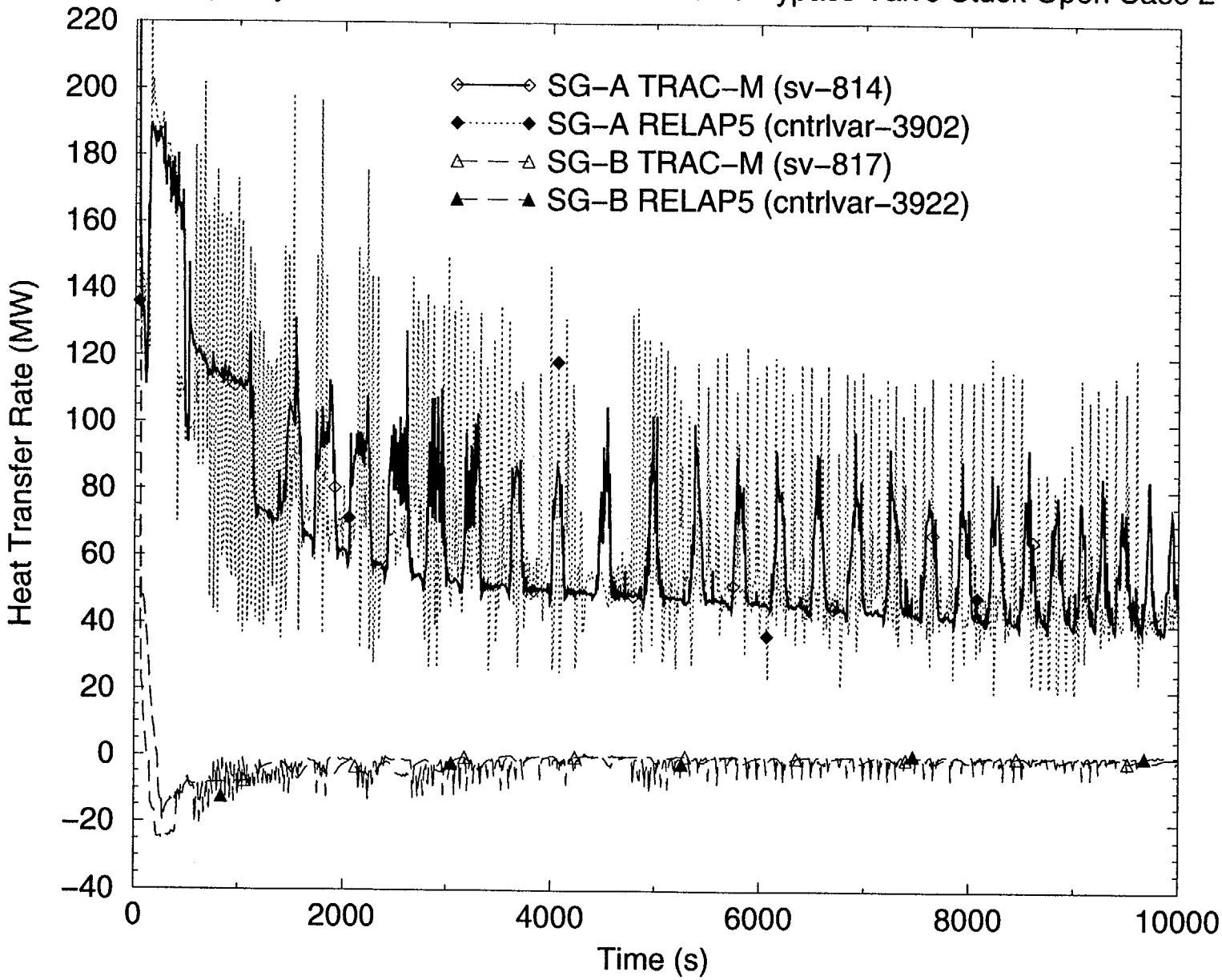


Figure 5.1.27 Heat Transfer Rates in Steam Generators

Calculated by TRACM and RELAP5 for Turbine Bypass Valve Stuck Open Case 2



5.2 Main Steam Line Break in Steam Generator "A"

5.2.1 Sequence of Events

The sequence of major events is compared in Table 5.2.1 between TRAC-M and RELAP5 Case 27 in which the HPI flow was throttled if subcooling was greater than 28K (50 °F) even though the pressurizer liquid level was less than 3.05m (10 ft.). In TRAC-M case the HPI flow quickly raised the primary system pressure, as shown in Figure 5.2.1, to a level above the HPI actuation point, 11.06 MPa (1590 psig), and thus the HPI flow was terminated at 650 seconds and never actuated again as shown in Figure 5.2.2, since the pressure always stayed above the HPI actuation point as a result of influx of a makeup flow as shown in Figure 5.2.3. On the other hand, in RELAP5 Case 27 the primary system pressure steadily decreased to 1.5 MPa after an initial dip followed by a momentary increase between 19 and 280 seconds. This momentary increase in pressure was due to the flow into the pressurizer from the surge line which was probably caused by the dynamic effect of an initial large negative flow (i.e., flow out of the pressurizer [Figure 5.2.4]). In RELAP5 case the HPI flow was quickly terminated as subcooling exceeded 28K (50 °F), and thus could not contribute much toward repressurizing the system for the first 1000 seconds. Afterwards, in RELAP5 the HPI flow came on and off between 1000 and 2200 seconds as subcooling dropped below 28K (50 °F) periodically as shown in Figures 5.2.2 and 5.2.5. However, the system was never repressurized because there was not enough HPI flow nor makeup flow. The makeup flow was terminated at 20 seconds (Figure 5.2.5A) because it was not allowed when the pressure was less than 11.13 MPa (1600 psig), and the pressure steadily decreased to 1.5 MPa. The faster cooldown of the system calculated by RELAP5 is corroborated by the fact that RELAP5 calculated the higher heat transfer rates from the primary side to the secondary side in SG "A" as shown in Figure 5.2.5B.

The SG pressure comparison between TRAC-M and RELAP5 is shown in Figure 5.2.5C. Since a large break occurred in SG line "A", the pressure in SG "A" decreased very rapidly while the pressure in SG "B" decreased gradually as the primary system cooled down. The SG level is shown in Figure 5.2.5D. In both TRAC-M and RELAP5, the level in SG "A" was controlled to be about 1m (3.28 ft.) although the level was very low up to 8000 seconds in TRAC-M because most of the liquid was evaporated and blown out the break as shown in Figures 5.2.5B, 5.2.5E, and 5.2.5F. SG "B" was bottled up, and thus its liquid level was not controlled. The EFW flows to SGs are shown in Figure 5.2.5G for instantaneous values and in Figure 5.2.5H for integrated values. Figure 5.2.5H of integrated EFW flows clearly shows that the EFW flows calculated by RELAP5 were much less than those by TRAC-M even though RELAP5 calculated higher integrated steam flows leaving SG "A" as shown in Figure 5.2.5F. This inconsistency resulted from the fact that RELAP5 calculated a large amount of MFW flows feeding to SG "A", as shown in Figures 5.2.5I and 5.2.5J.

The core flood tank flow was actuated in 2190 seconds in RELAP5 case because of a large reduction in system pressure whereas it was not actuated in TRAC-M since the pressure stayed above the core flood tank flow setpoint. Even in RELAP5 case the core flood tank flow was not substantial, and thus the tank inventory decreased only to about 24 percent of the total tank volume (Figure 5.2.6).

In both TRAC-M and RELAP5, the low-pressure coolant injection was not actuated and the vent valves stayed shut. However, a turbine bypass valve and a steam line SRV off the intact SG "B" were open for a brief period (30 seconds) right after the turbine trip in RELAP5 even though

both valves stayed shut in TRAC-M case. In both TRAC-M and RELAP5, the MFW pumps tripped and the EFW flow was initiated in 40 seconds in TRAC-M and 270 seconds in RELAP5. In both calculations, the upper head, upper downcomer, and the top of the hot legs were all full of liquid and no voids developed.

5.2.2 Main Pressurized Thermal Shock Parameters

The minimum downcomer liquid temperatures are shown in Figures 5.2.7 for TRAC-M along with the saturation temperature and 5.2.8 for TRAC-M and RELAP5 Case 27. Even though the downcomer pressure is quite different between TRAC-M and RELAP5 as previously discussed and as shown in Figure 5.2.1, the minimum temperatures are the same (i.e., 380K [224 °F] for TRAC-M and 380K [224 °F] for RELAP5). This means that the primary system pressure does not affect the minimum temperature very much. The minimum temperature occurs at 9,030 seconds in TRAC-M and at 8,300 seconds in RELAP5. The downcomer pressure at the time of the minimum downcomer temperature is 15.3 MPa in TRAC-M and 1.5 MPa in RELAP5.

The minimum and the maximum heat transfer coefficients between the vessel wall and the fluid in the downcomer are shown in Figures 5.2.9 and 5.2.10, respectively, for TRAC-M and RELAP5 calculations. In both TRAC-M and RELAP5, the maximum heat transfer coefficients are found at the bottom node of the downcomer sector located between the cold leg "B1" and "B2" although the TRAC-M-computed values are a little lower (about 6 percent) than the RELAP5-computed values. At the time of the minimum downcomer temperature occurrence, the maximum heat transfer coefficient is 23,700 W/(m*m K) for TRAC-M and 25,300 W/(m*m K) for RELAP5. The minimum heat transfer coefficients are also different by about the same magnitude between TRAC-M and RELAP5 (i.e., 18,000 W/(m*m K) for TRAC-M and 20,000 W/(m*m K) for RELAP5). The location of the minimum heat transfer coefficient is quite different between TRAC-M and RELAP5 (i.e., the bottom of downcomer sector connected to the cold leg "A1" for TRAC-M versus mid-elevation node of either the downcomer sector located between the cold leg "A1" and "A2" or that between the cold leg "B1" and "B2" for RELAP5).

5.2.3 Other Plant Parameters

Among many different plant parameters, the hot leg and cold leg flow rates and temperatures are of greatest interest since they would have greatest effects on the downcomer temperatures. Figure 5.2.11 shows the hot leg mass flow rates computed by TRAC-M and RELAP5. The initial and the final flow rates after 8000 seconds are fairly close to each other between TRAC-M and RELAP5. However, between 2000 and 8000 seconds RELAP5 showed much higher flow rates than TRAC-M; the largest deviation (about 1000 Kg/seconds or about 10 percent) occurring at about 4000 seconds. The reason for this difference is that in RELAP5 the hot leg liquid had much higher density than in TRAC-M starting at about 2000 seconds because the system cooled down much more quickly in RELAP5 where at about 4000 seconds the hot leg temperatures reached nearly the final temperature of 380K whereas in TRAC-M the same final temperature of 380K was reached in 8000 seconds.

The mass flow rates in cold leg "A1" and "A2" are shown in Figure 5.2.12 and those in cold leg "B1" and "B2" in Figure 5.2.12A. Similar differences between TRAC-M and RELAP5 are shown in the cold leg mass flow rates as in the hot leg mass flow rates. The reasons for the differences are the same as discussed above.

Hot leg temperatures are shown in Figure 5.2.13 for TRAC-M and in Figure 5.2.13A for RELAP5. Again RELAP5 shows much faster cooldown than TRAC-M. Cold leg temperatures are shown in Figure 5.2.14 for TRAC-M and in Figure 5.2.15 for RELAP5. A much faster cooldown in RELAP5 calculations is also manifested in the cold leg temperatures.

5.2.4 Comparison Between TRAC-M and RELAP5 Main Steam Line Scenario Case 61

Since RELAP5 MSLB Case 27 calculation showed a much different pressure behavior as compared to TRAC-M (i.e., the system pressure rapidly came down to 1.5 MPa in RELAP5 as compared to TRAC-M where the system pressure recovered, after an initial decrease, to a normal level of 15.3 MPa), another MSLB scenario (Case 61) which did not have a significant pressure reduction was selected for RELAP5 comparison with TRAC-M. In Case 61, the EFW flow to SG "A" which had a MSLB was terminated at 10 minutes after the MSLB initiation, as shown in Figure 5.2.16, and therefore the pressure did not come down much at all, as shown in Figure 5.2.17. In RELAP5 Case 61, the EFW flow was fed to SG "B" periodically throughout the transient, but the cooling effect was negligible because it was highly oscillatory and not much in terms of average flow.

In TRAC-M Case, the EFW flow was continuously fed to SG "A" as demanded by the level controller. The final pressures computed by TRAC-M and RELAP5 were close to each other. The initial pressure reduction computed by RELAP5 was fairly quickly recovered by the makeup flow as shown in Figure 5.2.18.

Even though the system pressures are close between TRAC-M and RELAP5, the temperatures are quite different as shown in Figure 5.2.7 for TRAC-M and in Figure 5.2.19 for RELAP5. Since the minimum fluid temperature in the downcomer is most important for PTS evaluations, the RELAP5 results obtained from the Case 61 MSLB scenario are not appropriate for comparison with TRAC-M, and thus no additional comparisons are made between TRAC-M and RELAP5 Case 61.

5.2.5 Pressurized Thermal Shock Implications

A TRAC-M calculation suggests that a double-ended MSLB with the continuous EFW flow to the broken loop steam generator would lead to the PTS concerns because the minimum downcomer temperature of 380K (224 °F) falls below the PTS screening criterion of 405K (270 °F) while the pressure remains high, a nearly normal level of 15.3 MPa (2219 psia). However, it should be pointed out that this scenario has a very low probability of actual occurrence because the operator is expected to isolate the affected steam generator (i.e., terminate the emergency feedwater flow to minimize cooldown) as soon as a main steam line break is recognized. When the operator isolates the affected steam generator, the primary system cooldown would be minimal. For example, in RELAP5 Case 61, where the operator isolated the affected steam generator in 10 minutes, the cooldown was only about 10K (18 °F), and the minimum downcomer temperature was 557K (543 °F).

Text continues on page 99.

Table 5.2.1 Comparison of Sequence of Events Between TRAC-M and RELAP5 Calculations for a Main Steam Line Break Scenario

	TRAC-M Seconds	RELAP5 Case 27 Seconds
1. Reactor trip	5	~ 1 second on variable P, T trip
2. RCP trip	Did not trip	Did not trip
3. HPI actuation	20	19
4. Core flood tank discharge	Did not come on	2190
5. LPCI actuation	Did not come on	Did not come on
6. Vent valve opening/closing	Did not open	Did not open
7. Pressurizer refilling	100 – 600 Refilled again in 1900 seconds	70 – 280 Refilled again in 7250 seconds
8. Turbine bypass valve opening	Did not open	Loop "A" closed Loop "B" 1–30 seconds
9. Safety-relief valve opening	Did not open	Loop "A" closed Loop "B" 1–30 seconds
10. MFW "A" and "B" trip time	5	1
11. EFW to loop "A" start time	40	270
12. EFW to loop "B" start time	Did not start	Did not start
13. Upper lead voiding start time	Did not void	Did not void
14. Upper downcomer voiding start time	Did not void	Did not void
15. Hot leg top voiding start time	Did not void	Did not void

Figure 5.2.1 Downcomer Mid–Elevation Pressure

Calculated by TRACM and RELAP5 Case 27 for Main Steam Line A Break Scenario

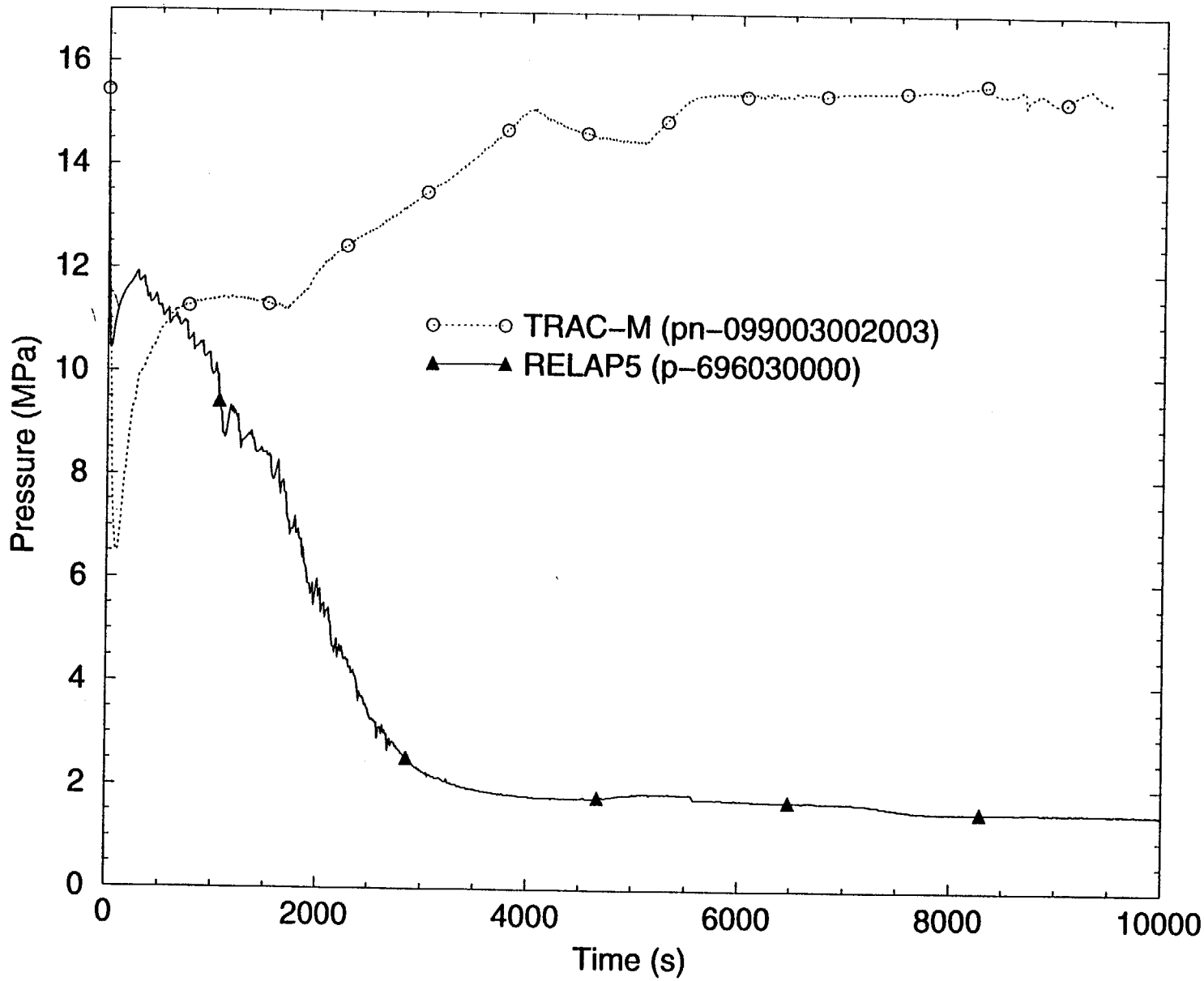


Figure 5.2.2 Total HPI Flow Rates

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

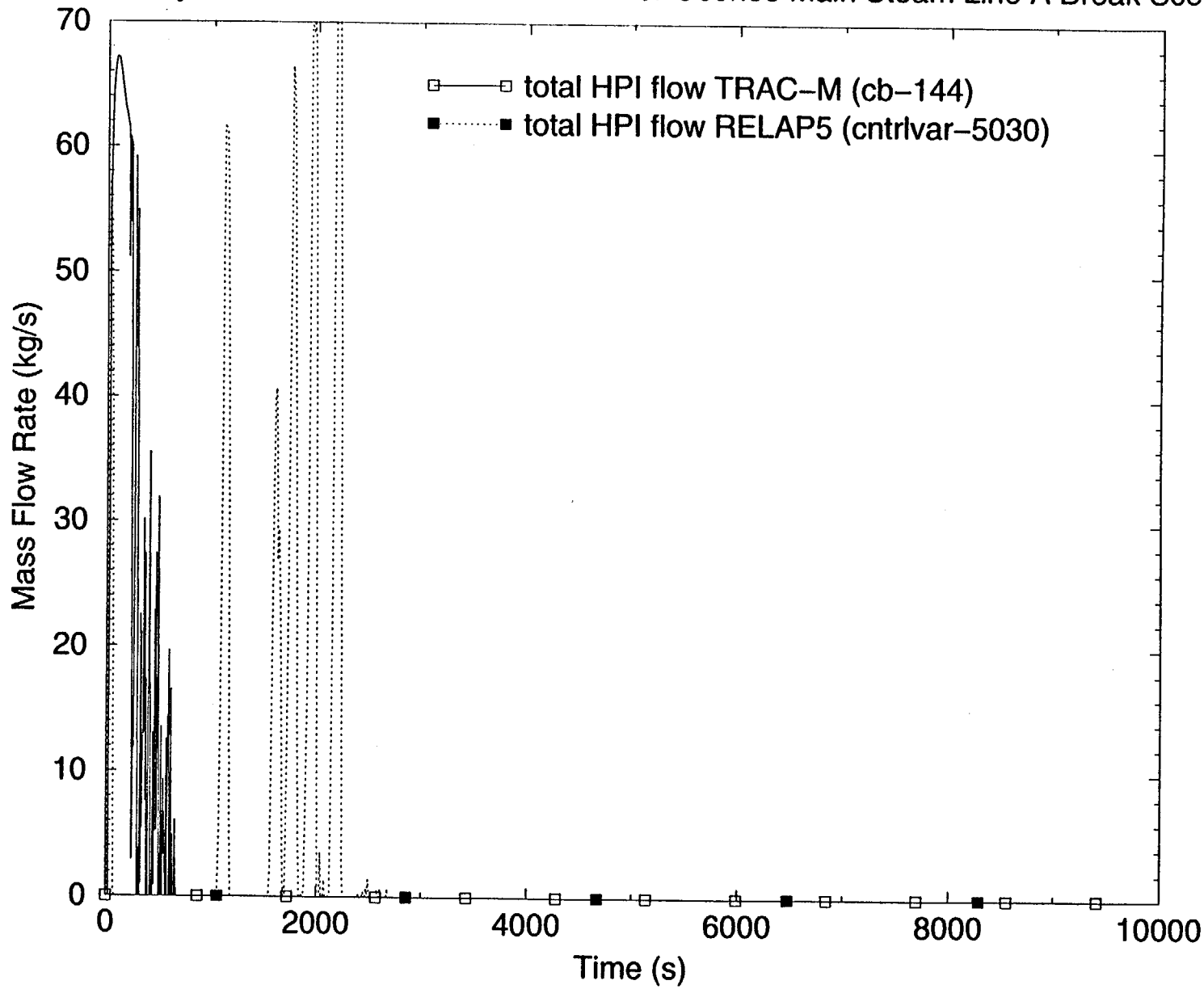


Figure 5.2.3 Makeup/Letdown Flow

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

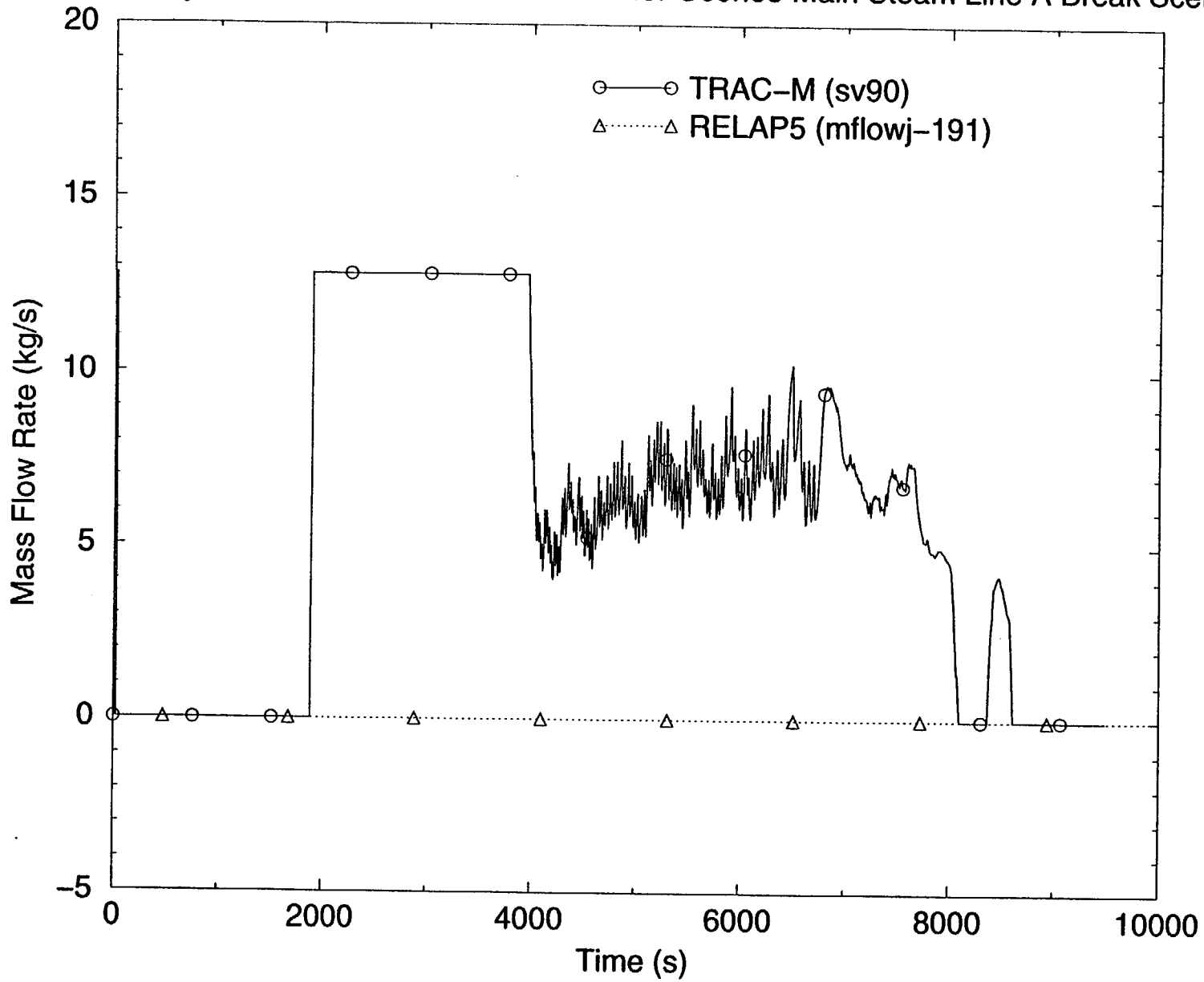


Figure 5.2.4 Pressurizer Surge Line Flow

Calculated by RELAP5 Case 27 for Oconee Main Steam Line Break Scenario

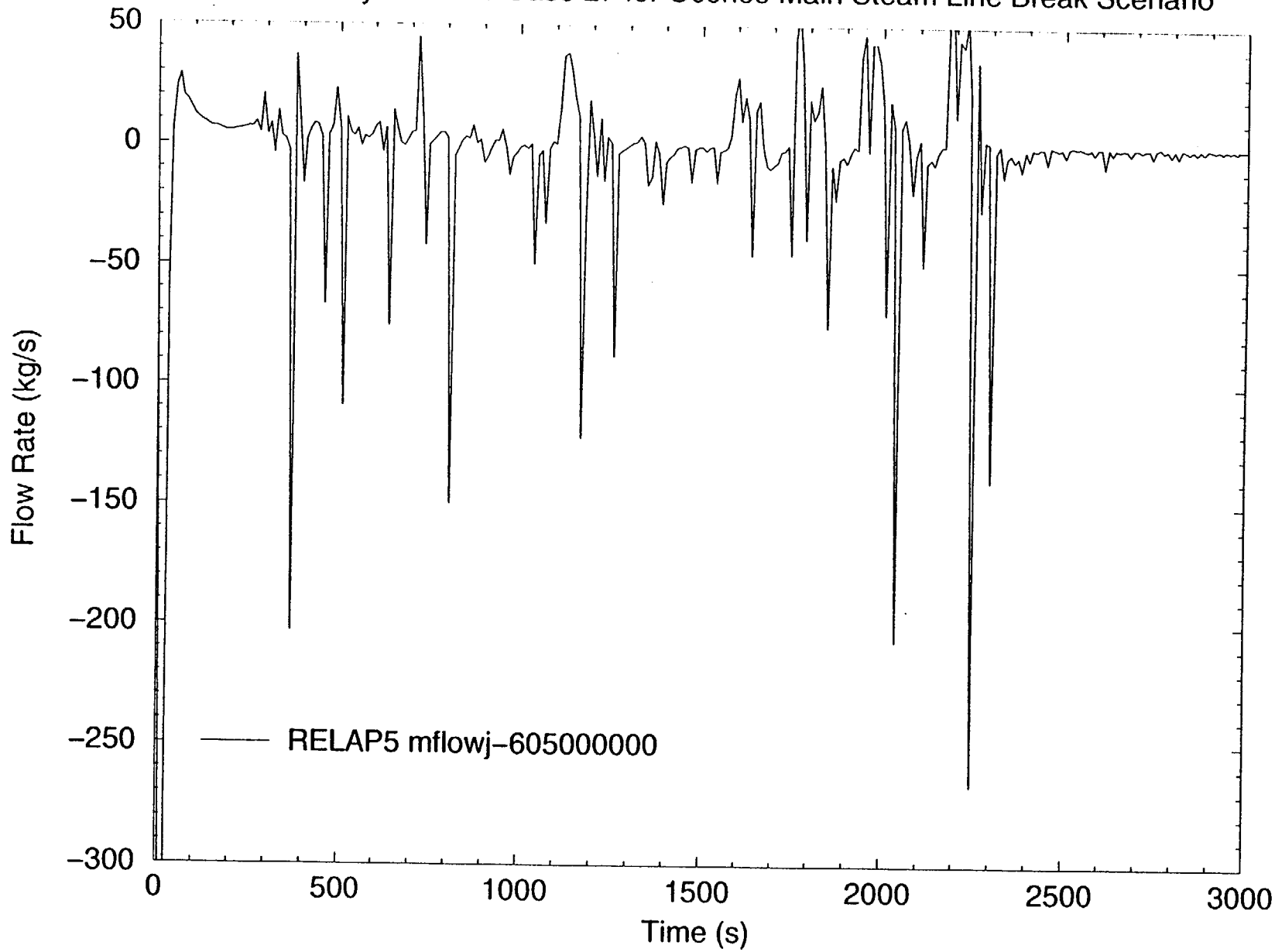


Figure 5.2.5 Subcooling Margins at Top of Hot Legs

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

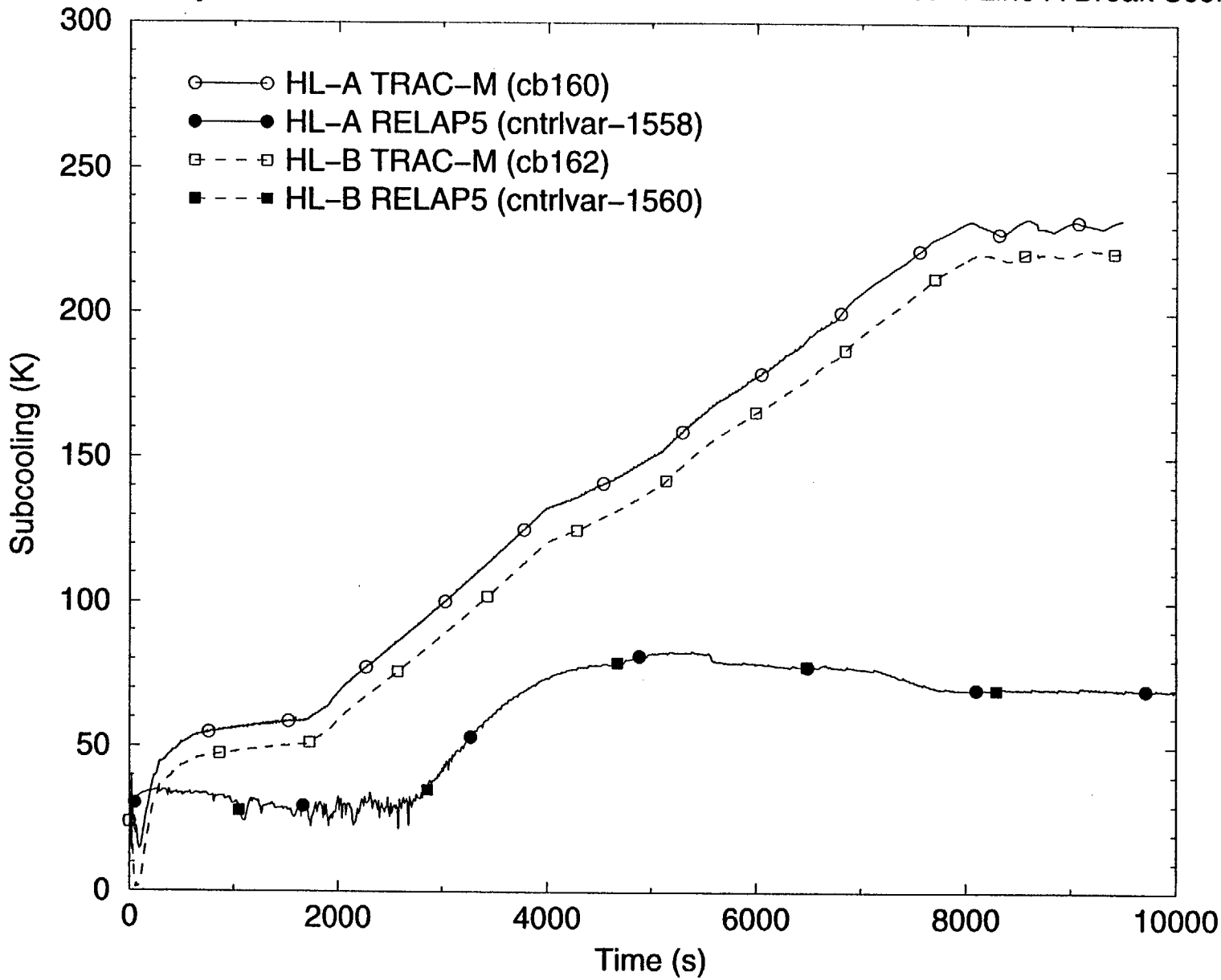


Figure 5.2.5A Makeup/Letdown Flow for First 50 Seconds

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

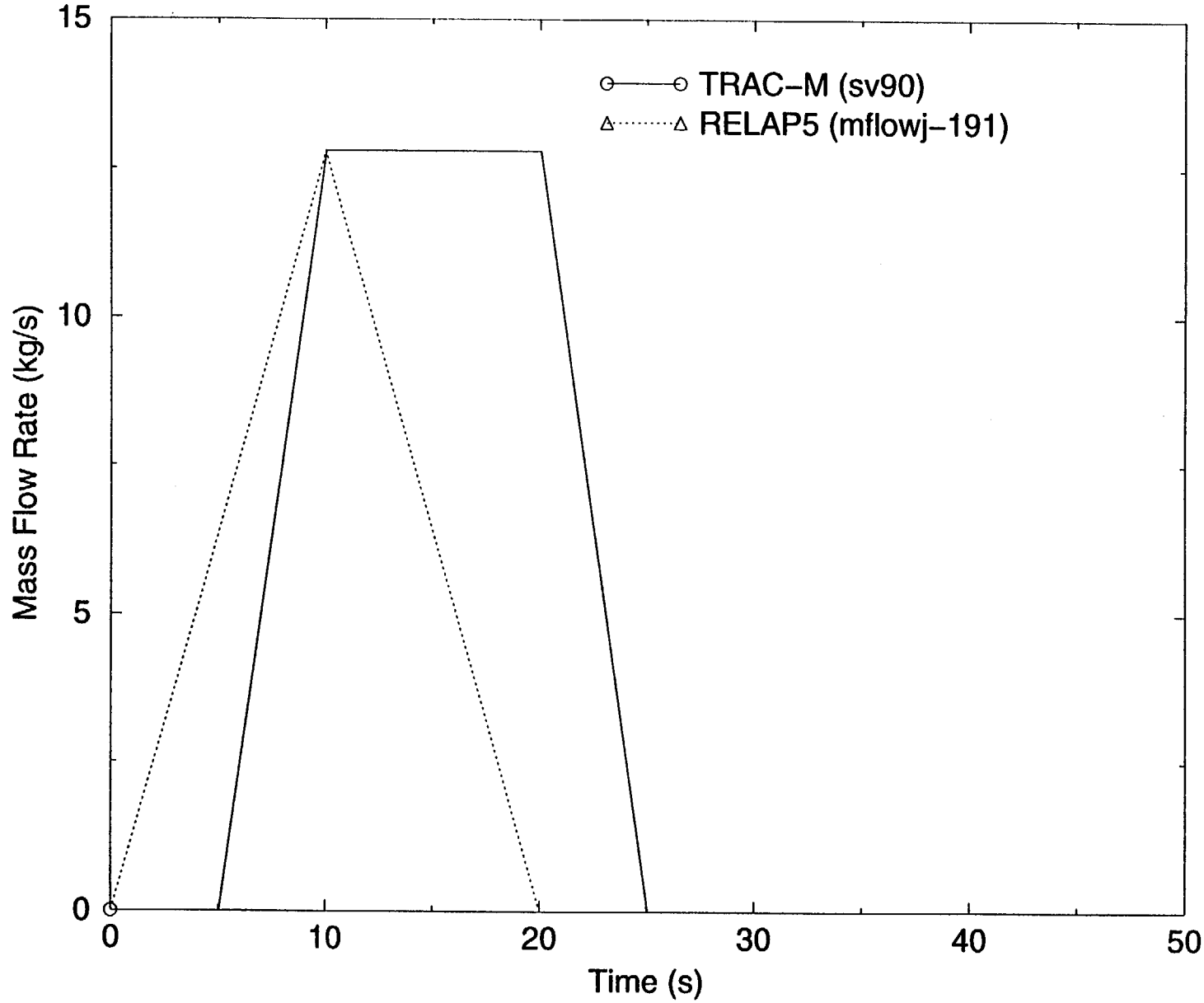


Figure 5.2.5B Heat Transfer Rates Through SGs

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

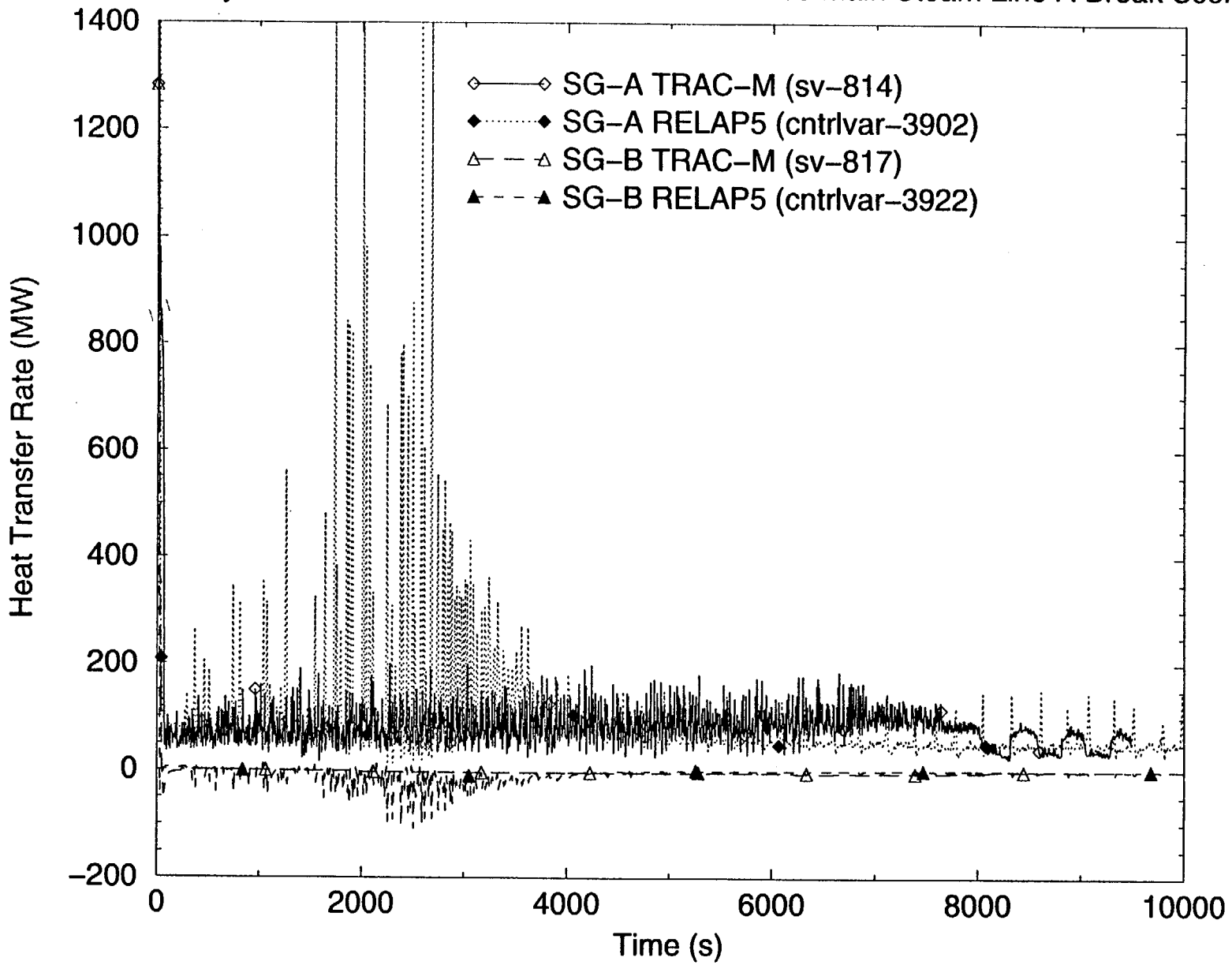


Figure 5.2.5C SG Secondary System Pressures

Calc. by TRACM and RELAP5 Case 27 for Main Steam Line A Break Scenario

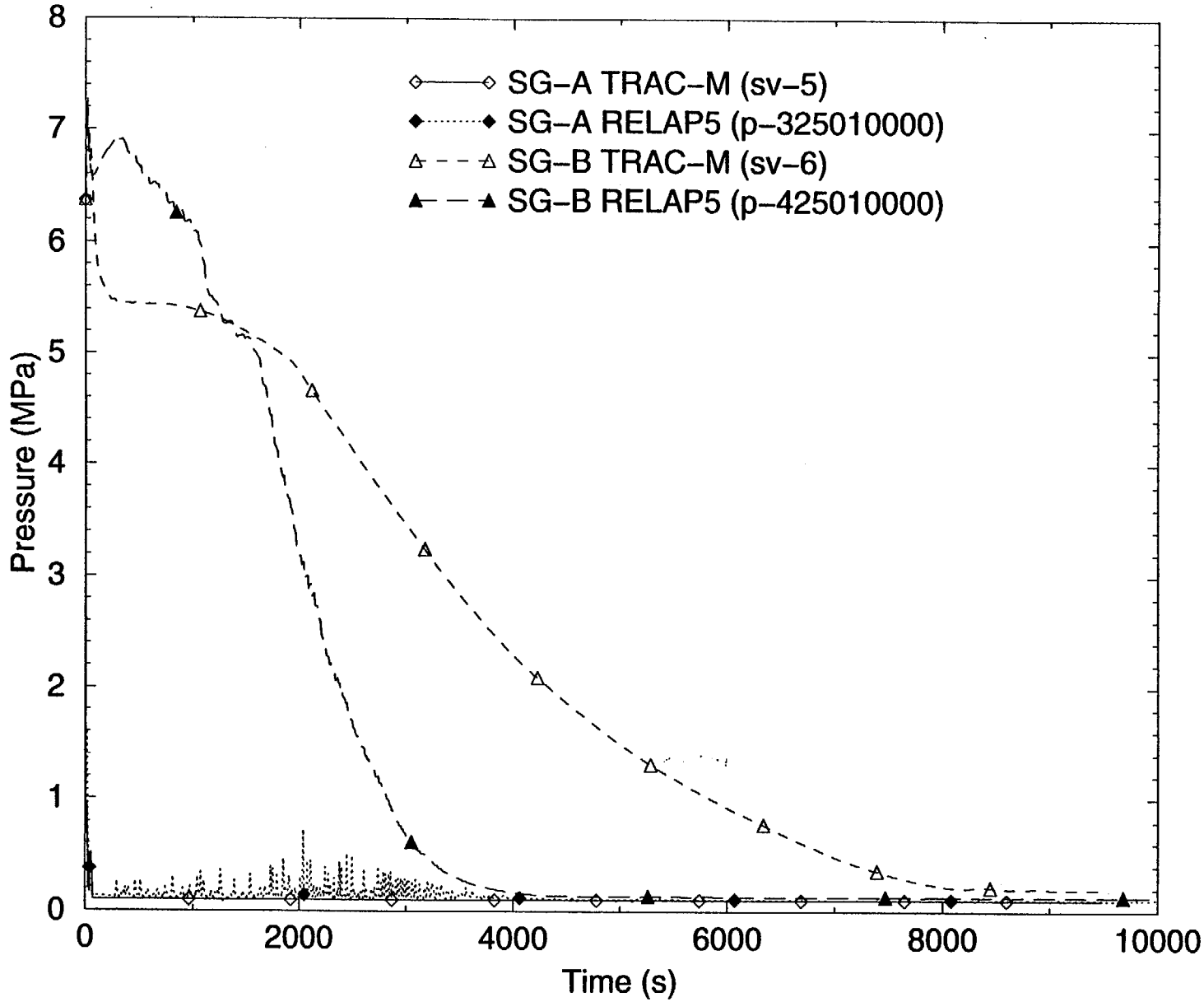


Figure 5.2.5D Steam Generator Startup Range Levels

Calculated by TRACM and RELAP5 for Main Steam Line A Break Scenario

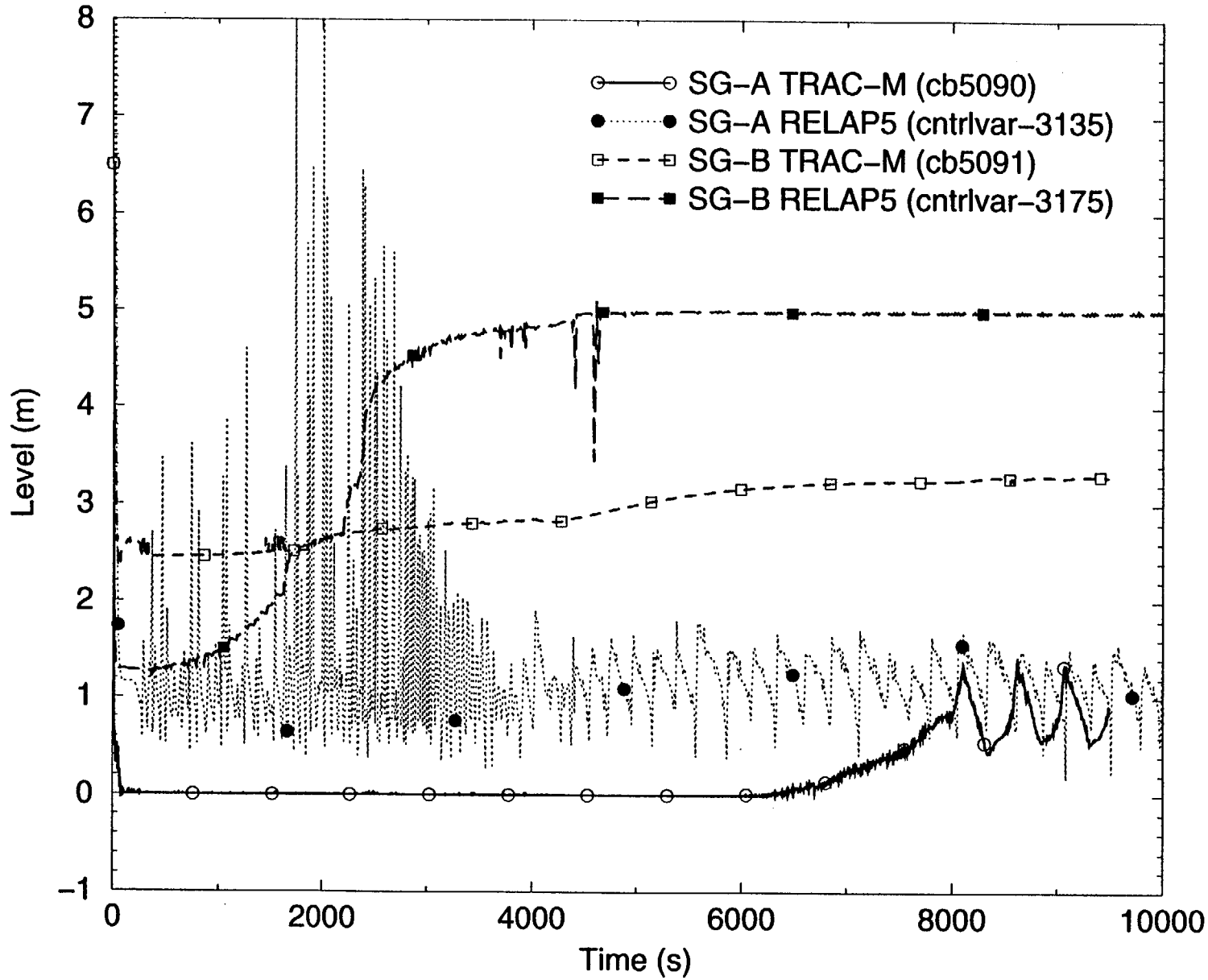


Figure 5.2.5E SG–A Steam Line Flow Rates

Calculated by TRACM and RELAP5 Case 27 for Main Steam Line A Break

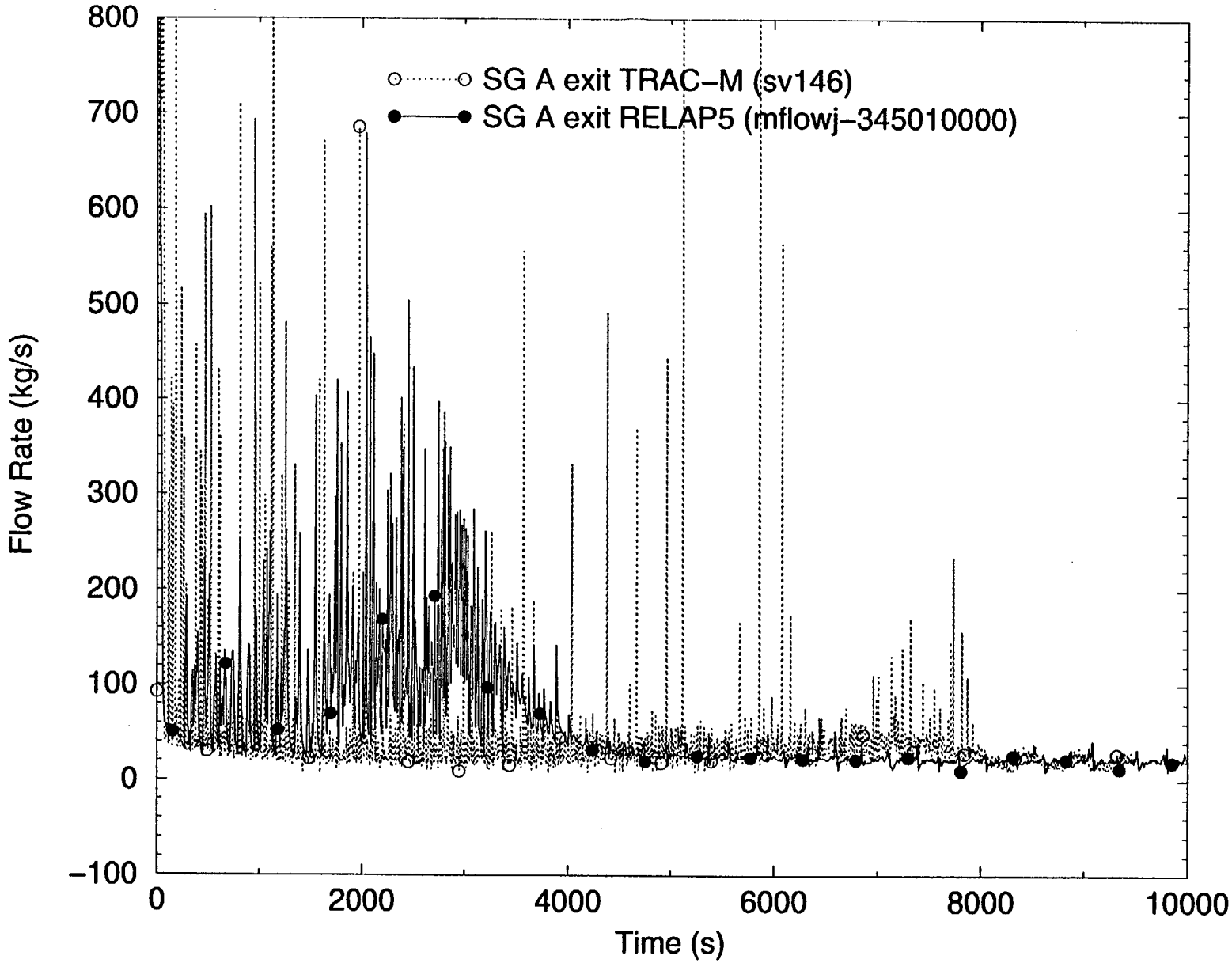


Figure 5.2.5F Integrated SG–A Steam Line Flow

Calculated by TRACM and RELAP5 Case 27 for Main Steam Line A Break

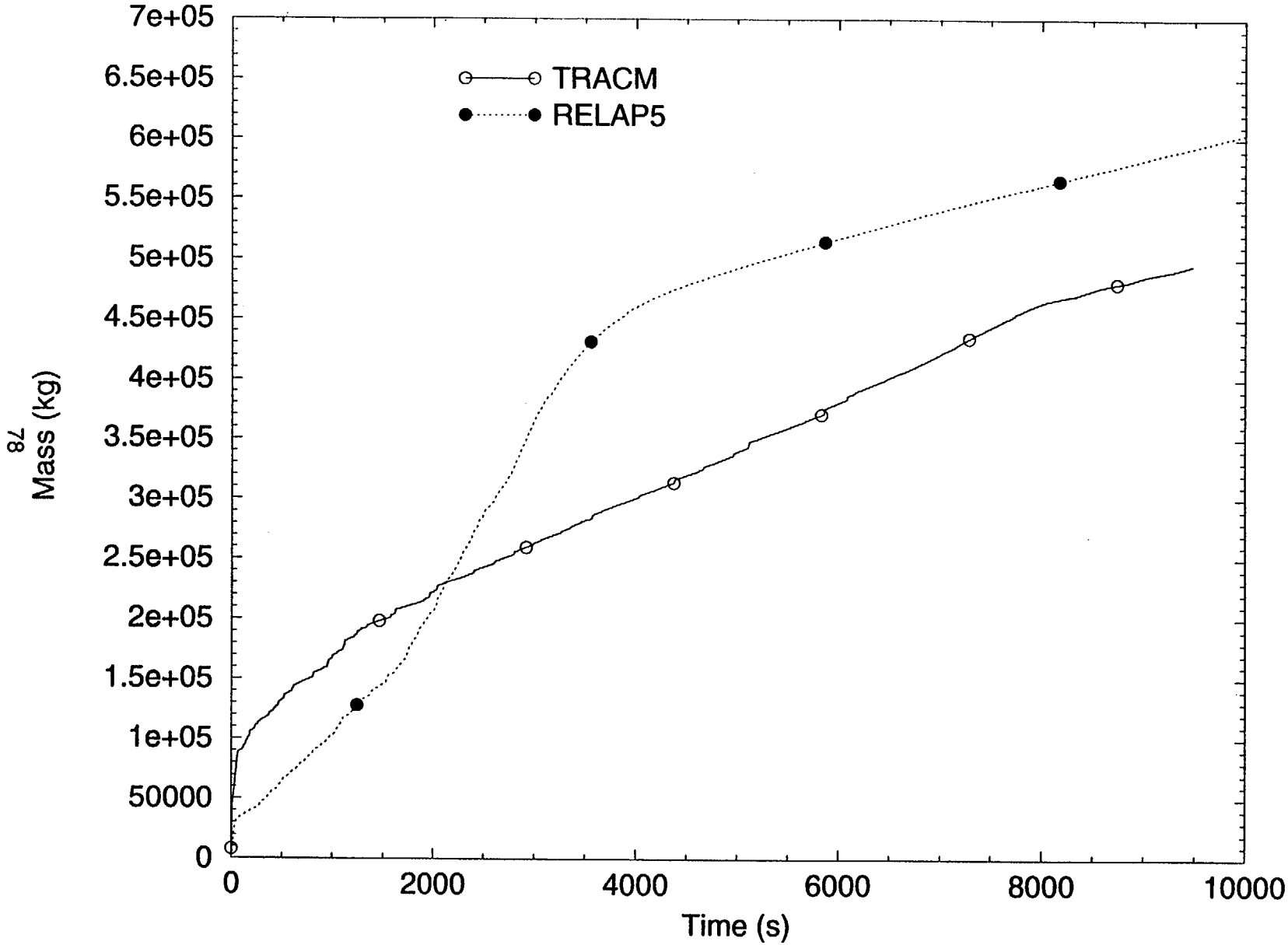


Figure 5.2.5G Total Emergency Feedwater Flow Rates

Calculated by TRACM and RELAP5 Case 27 for Main Steam Line A Break Scenario

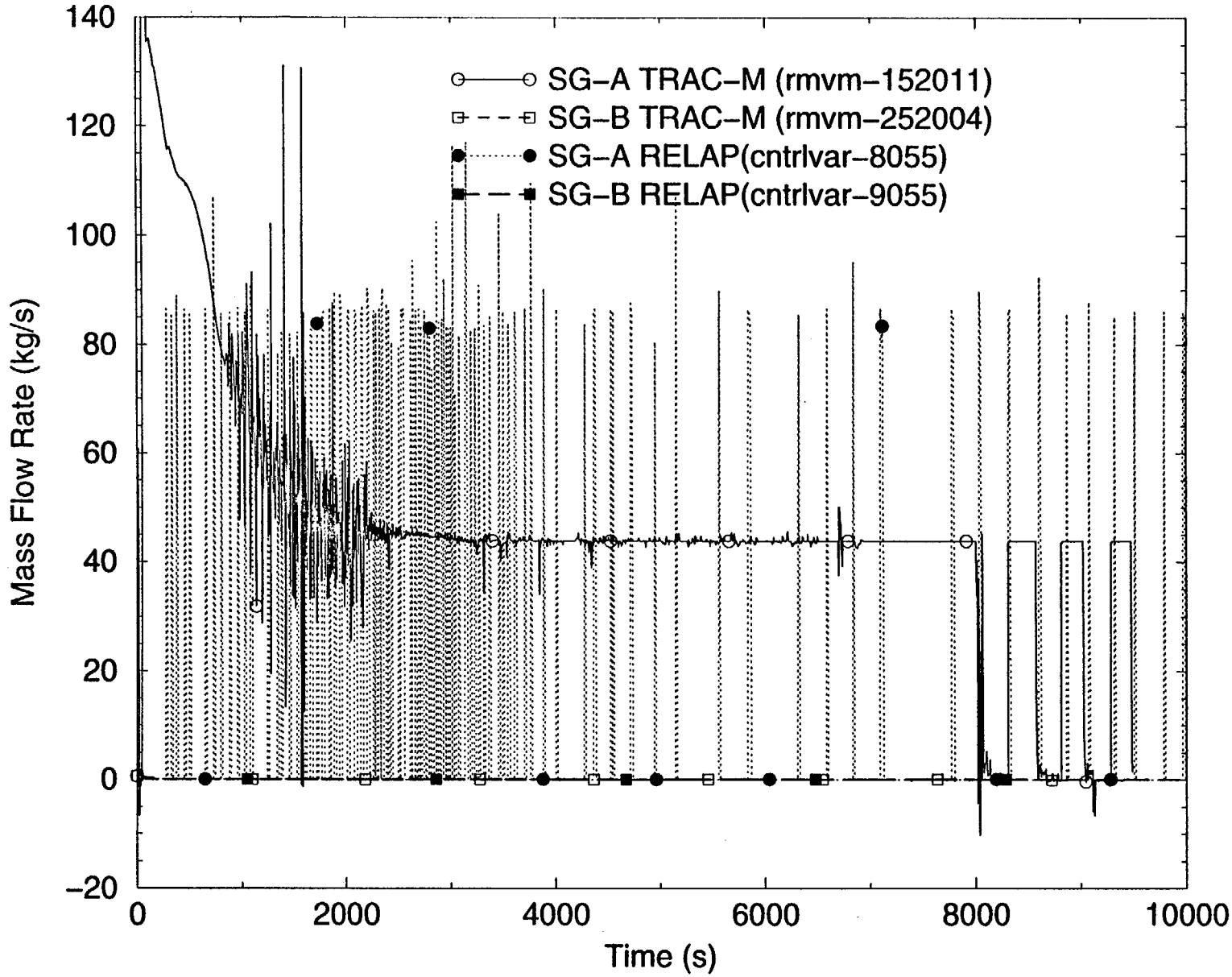


Figure 5.2.5H. Total Emergency Feedwater Delivered

Calculated by TRACM and RELAP5 Case 27 for Main Steam Line A Break Scenario

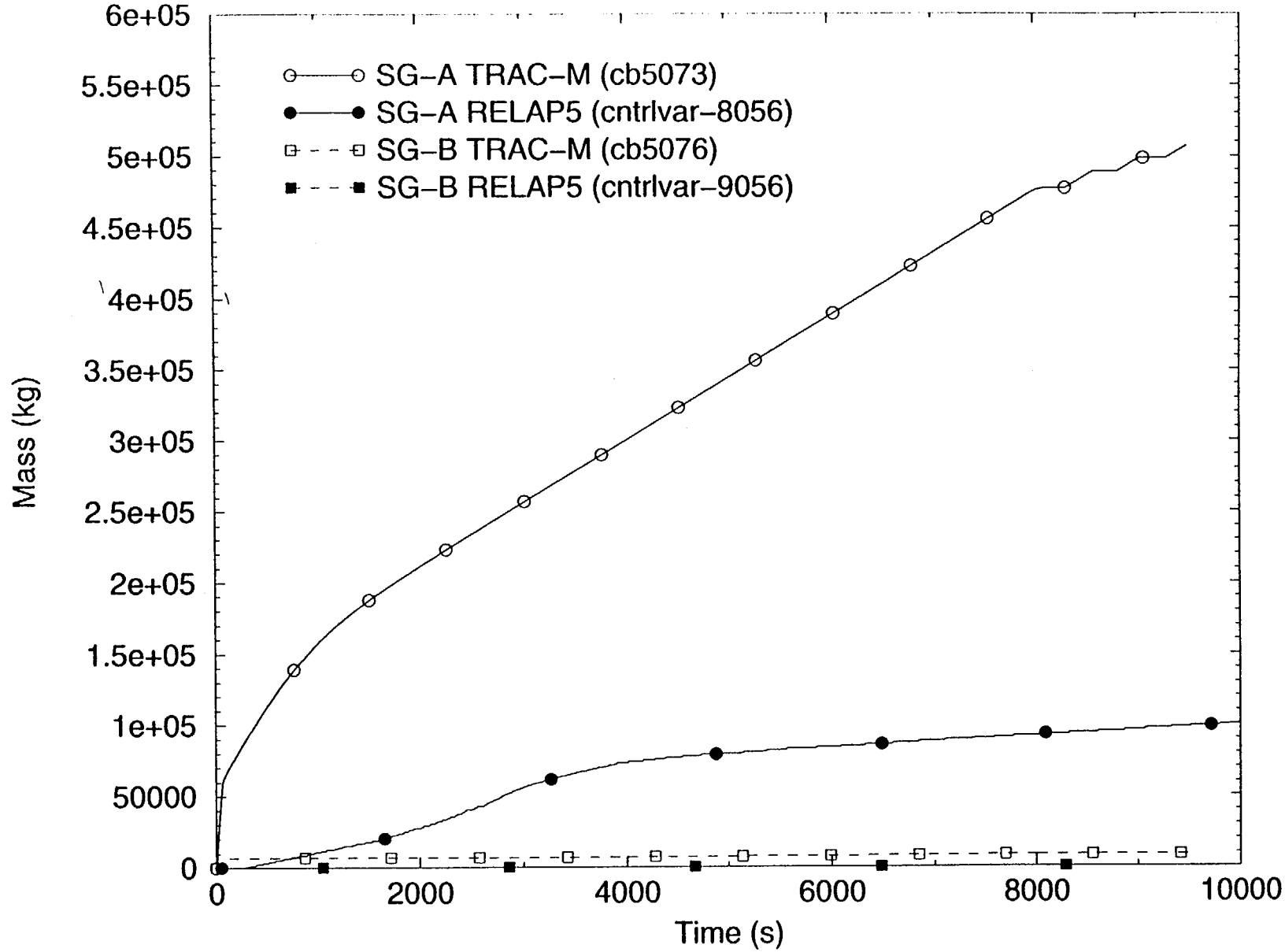


Figure 5.2.5l Main Feedwater Flow Rates

Calculated by TRACM and RELAP Case 27 for Main Steam Line A Break Scenario

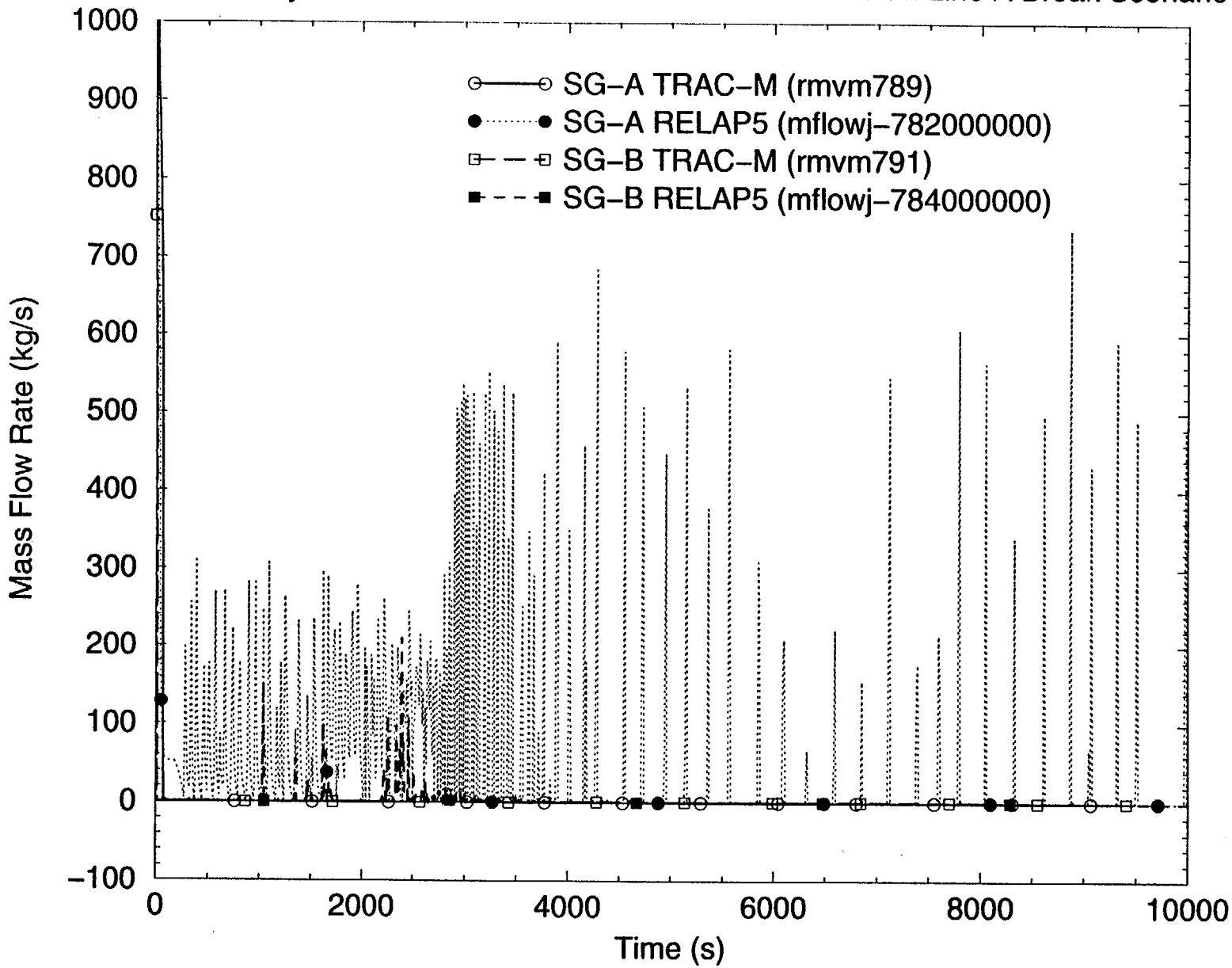


Figure 5.2.5J Total Main Feedwater Flow Delivered

Calculated by TRACM and RELAP Case 27 for Main Steam Line A Break Scenario

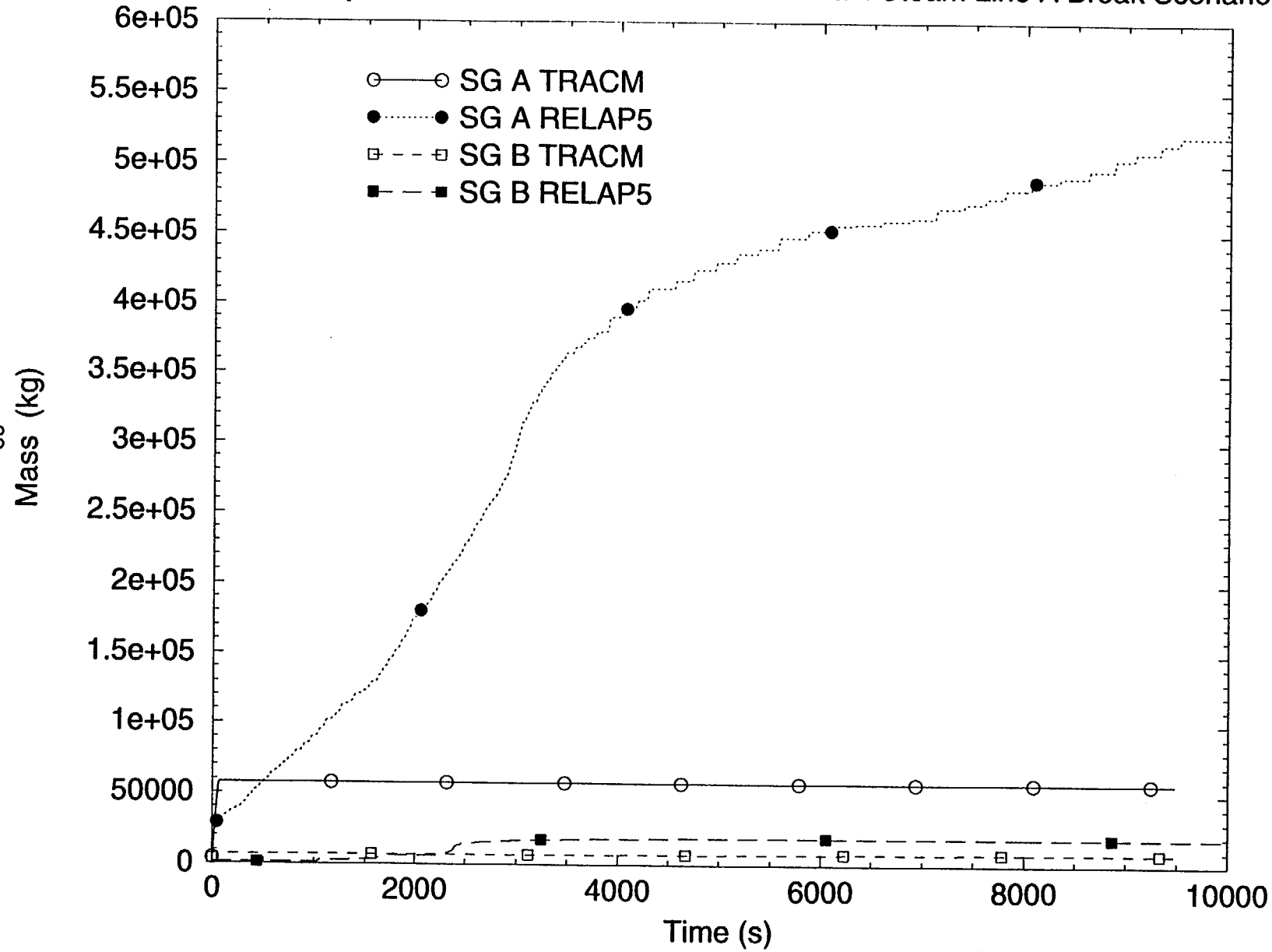


Figure 5.2.6 Accumulator Liquid Volume

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

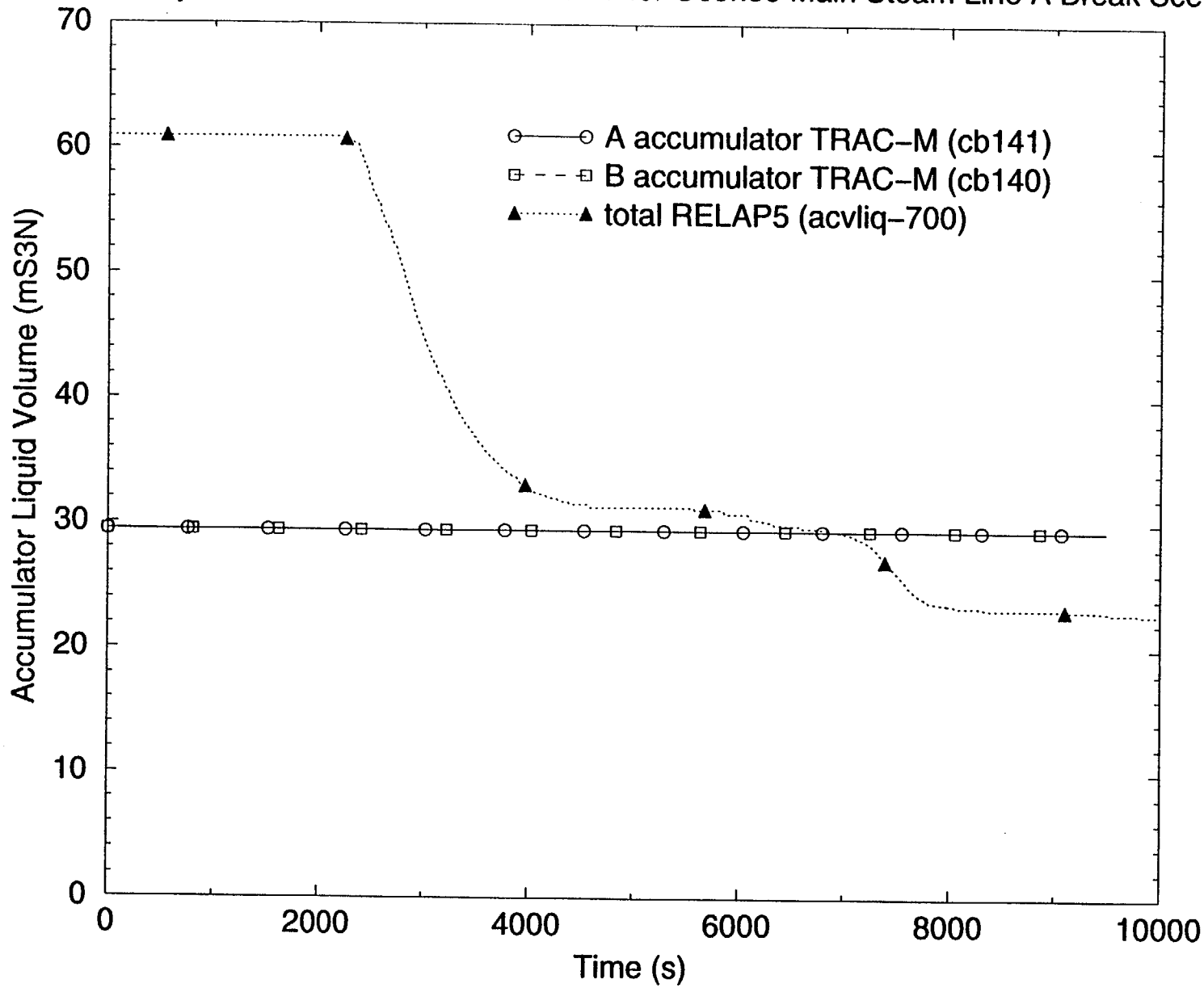


Figure 5.2.7 Minimum Downcomer Liquid Temperatures

Calculated by TRACM for Oconee Main Steam Line A Break Scenario

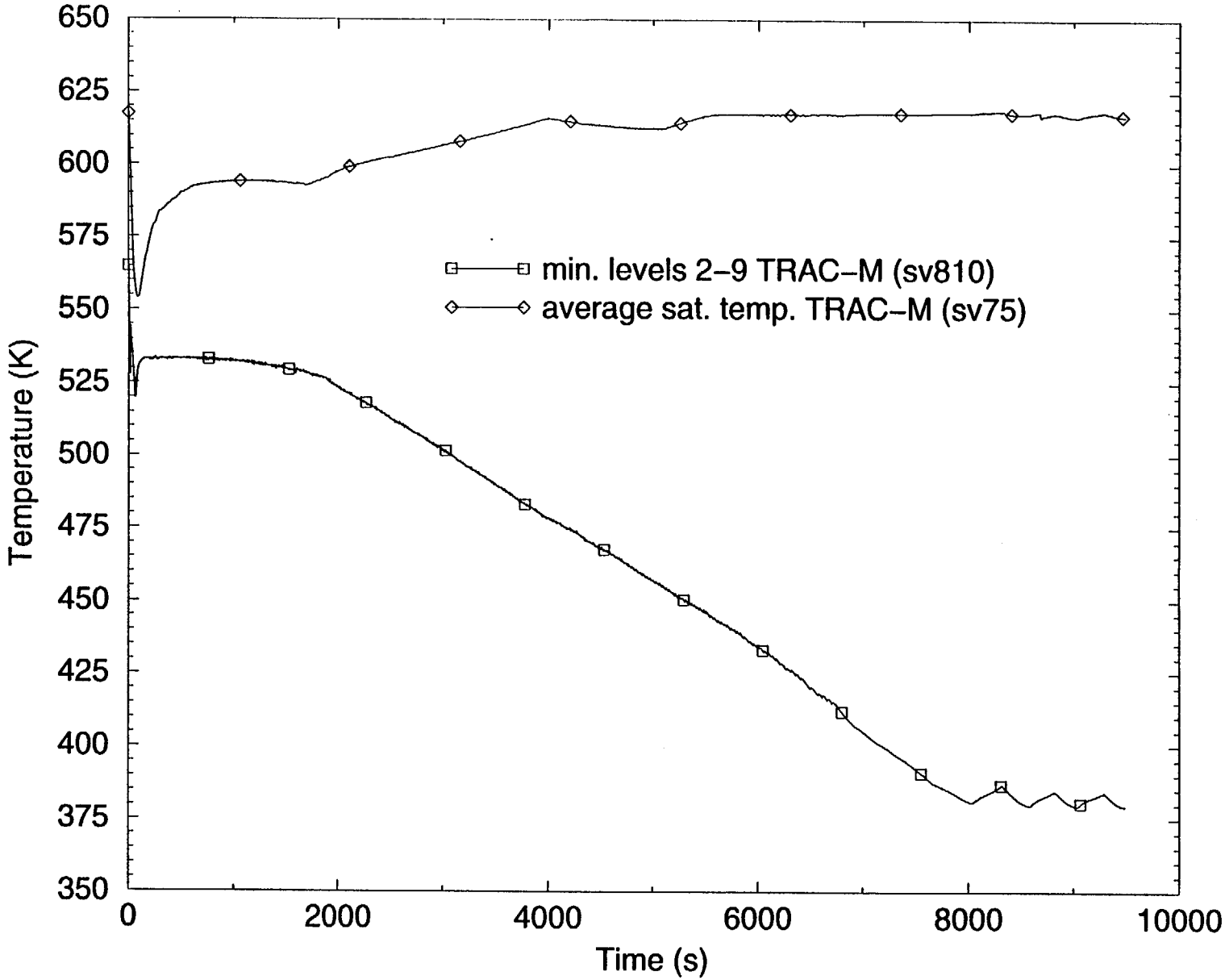


Figure 5.2.8 Downcomer Liquid Temperatures

Calculated by TRACM and RELAP5 Case 27 for Main Steam Line A Break Scenario

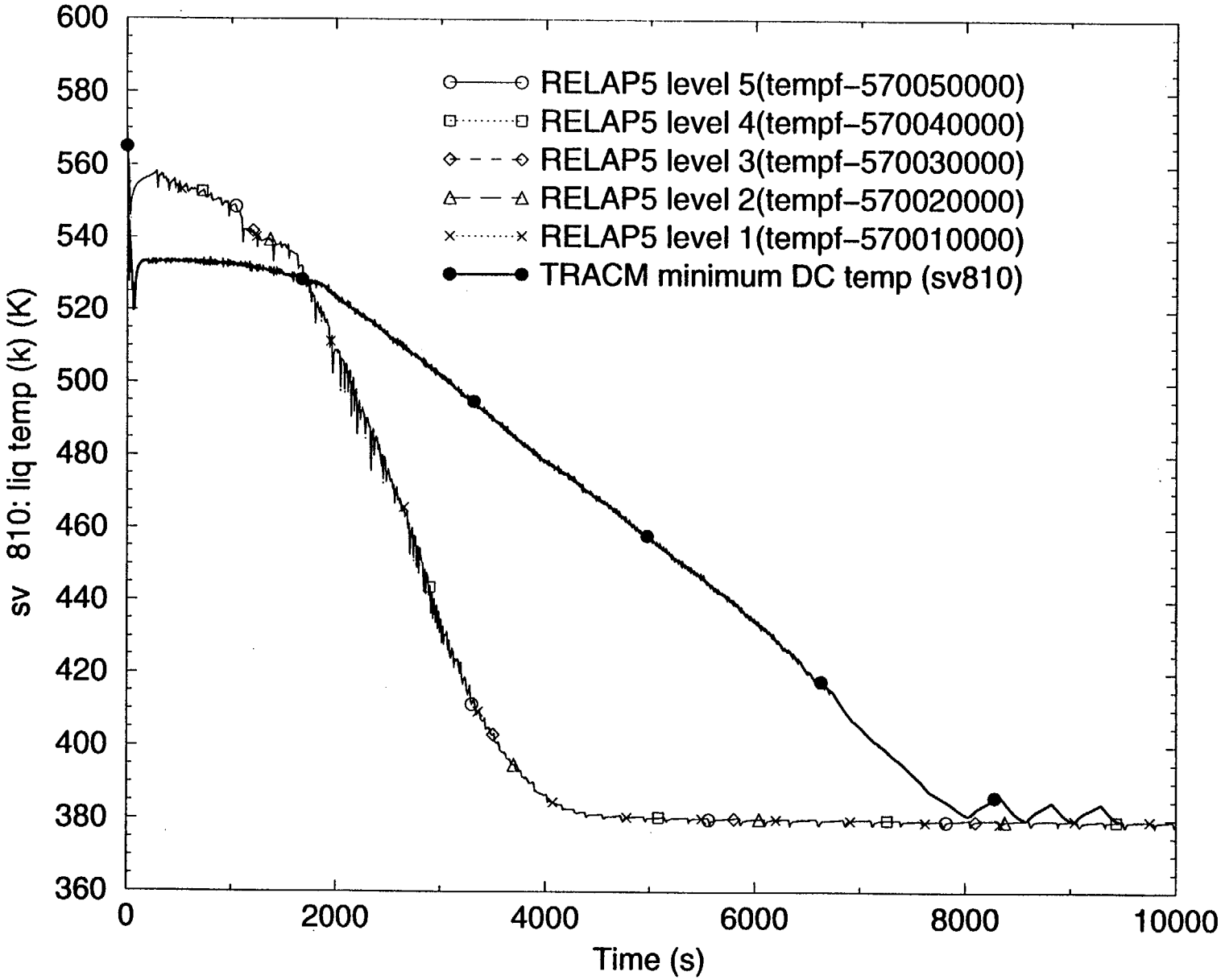


Figure 5.2.9 Min. and Max. DC Wall Heat Transfer Coefficients

Calculated by TRACM for Oconee Main Steam Line A Break Scenario

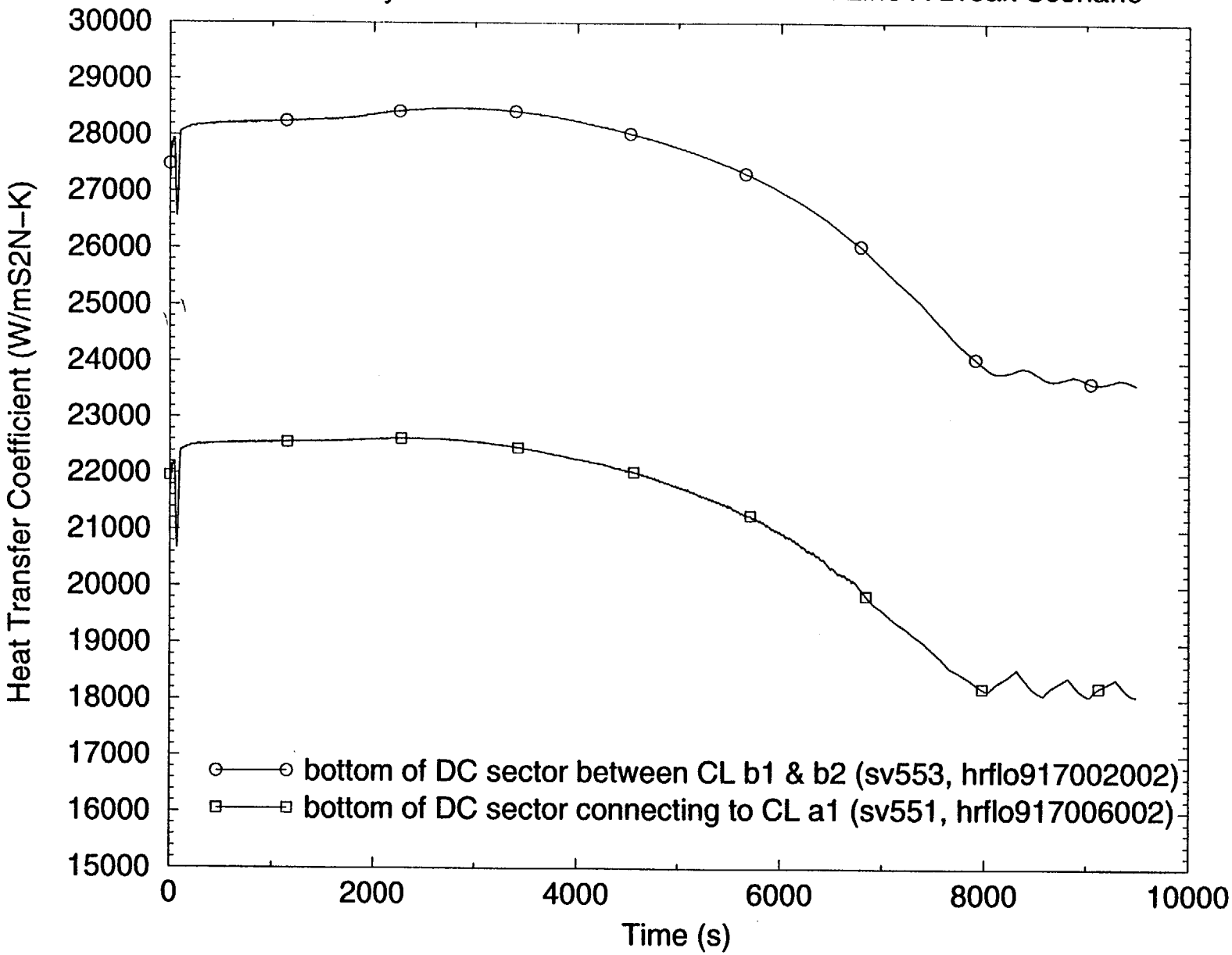


Figure 5.2.10 Min. and Max. DC Wall Heat Transfer Coefficients

Calculated by RELAP5 for Oconee Main Steam Line A Break Case 27 Scenario

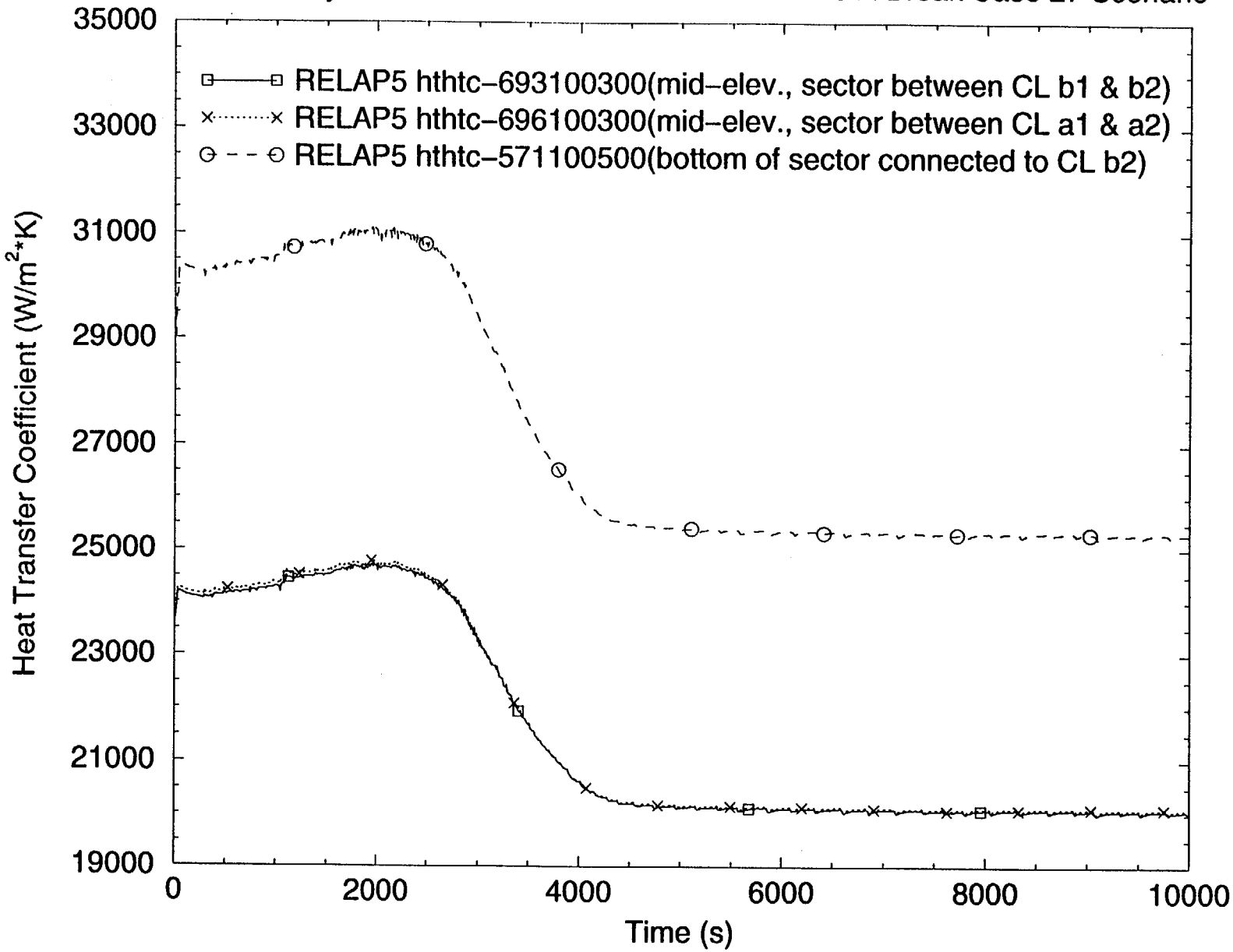


Figure 5.2.11 Hot Leg Mass Flow Rates

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

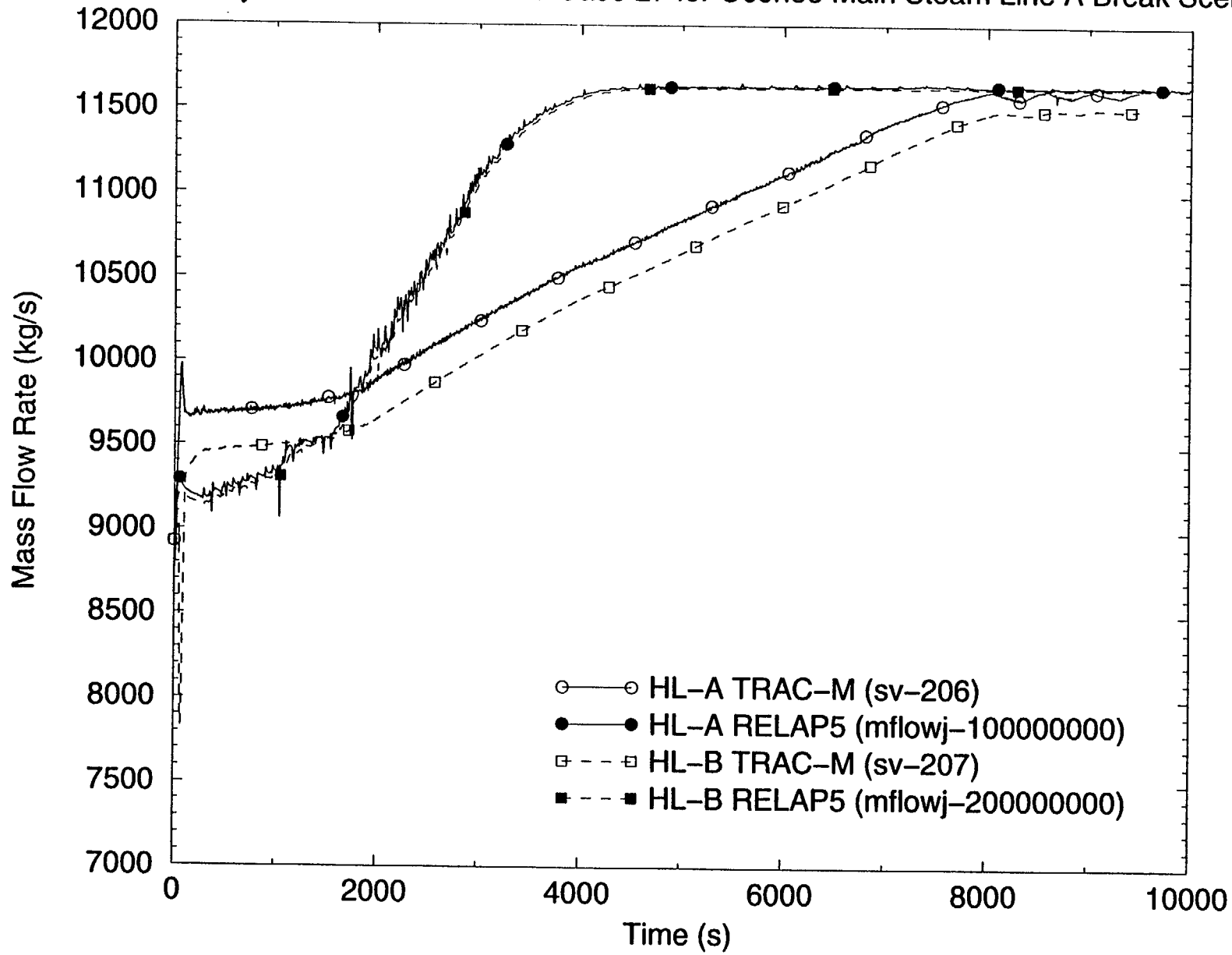


Figure 5.2.12 Loop A Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

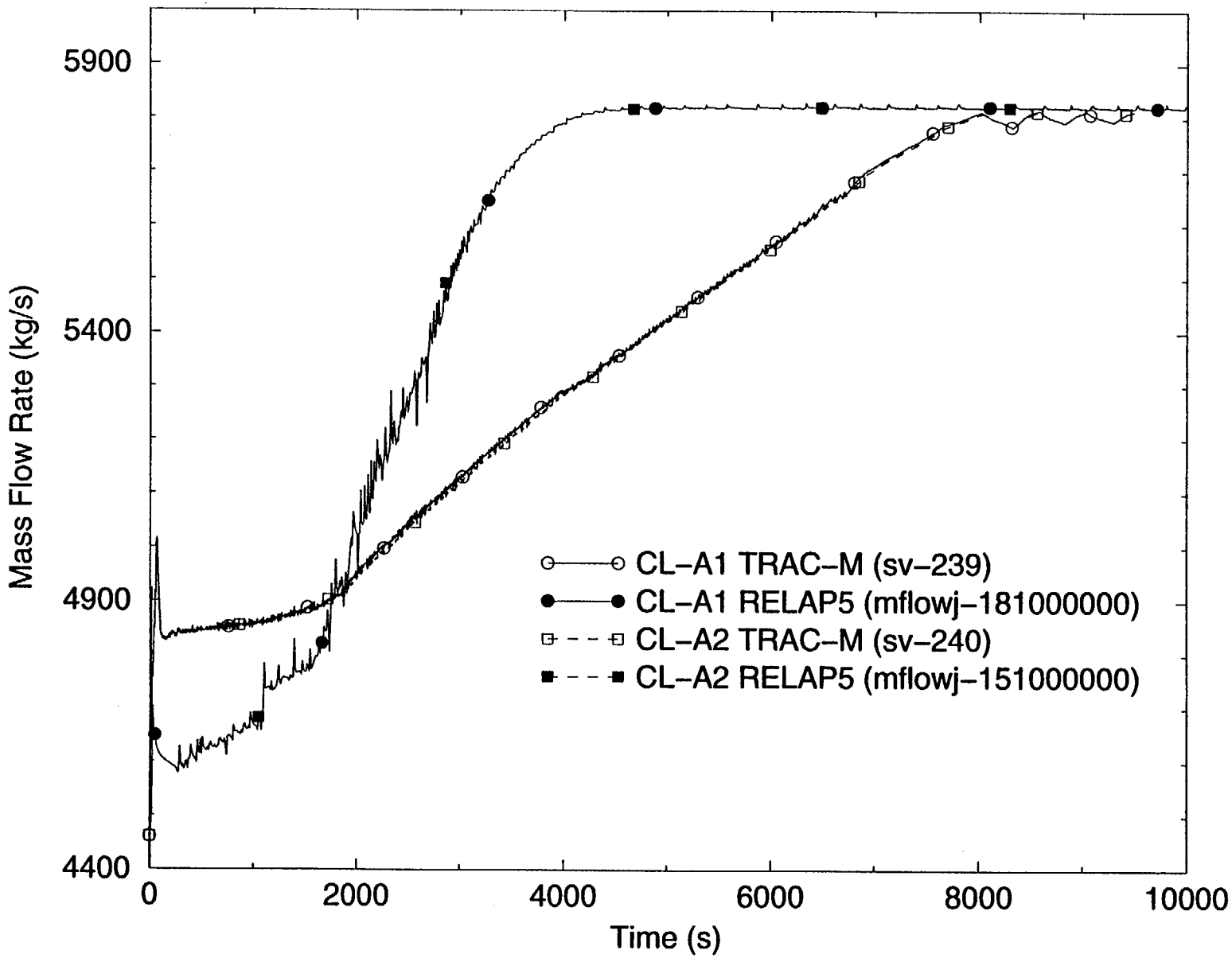


Figure 5.2.12A Loop B Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 Case 27 for Oconee Main Steam Line A Break Scenario

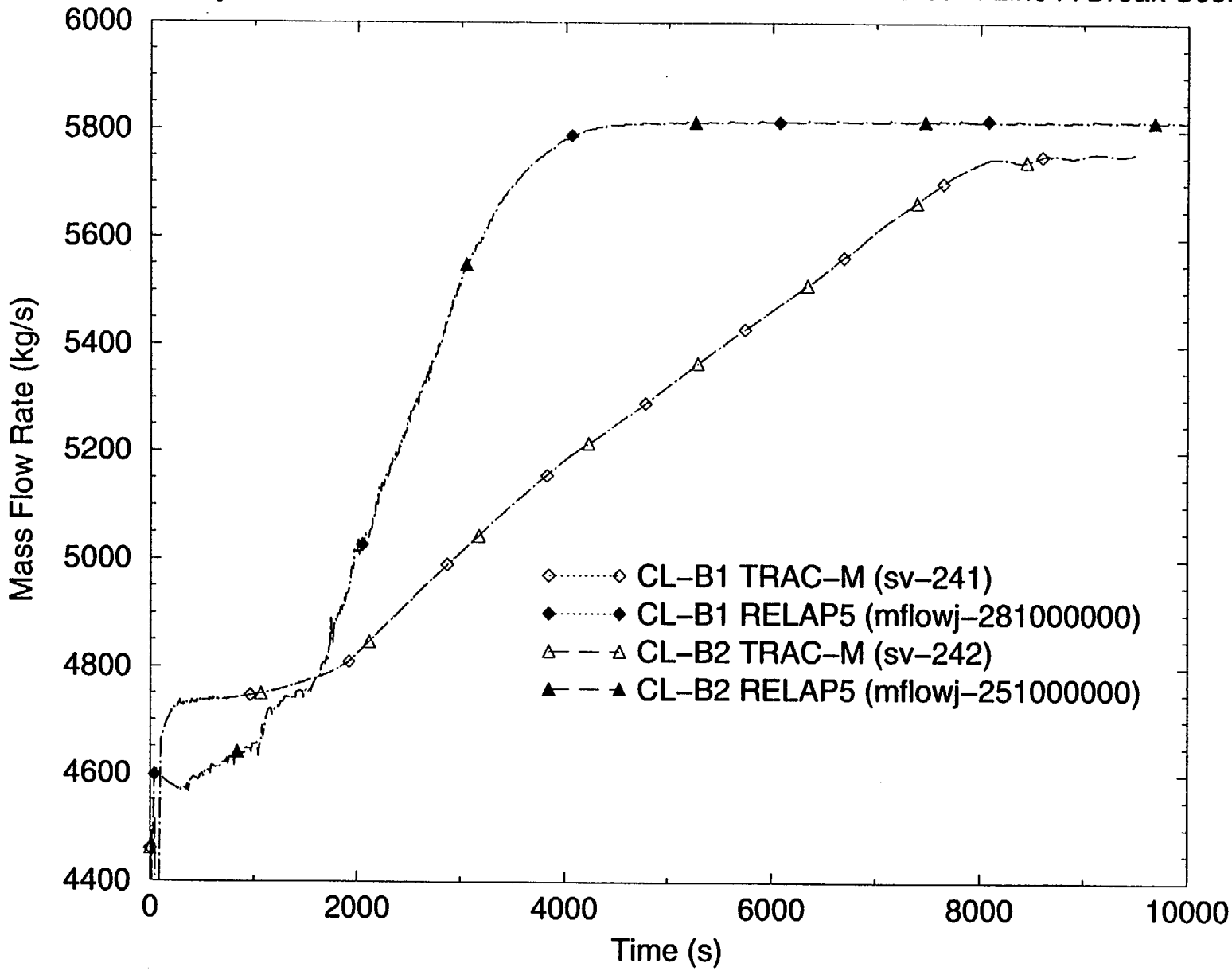


Figure 5.2.13 Hot Leg Temperatures

Calculated by TRACM for Oconee Main Steam Line A Break Scenario

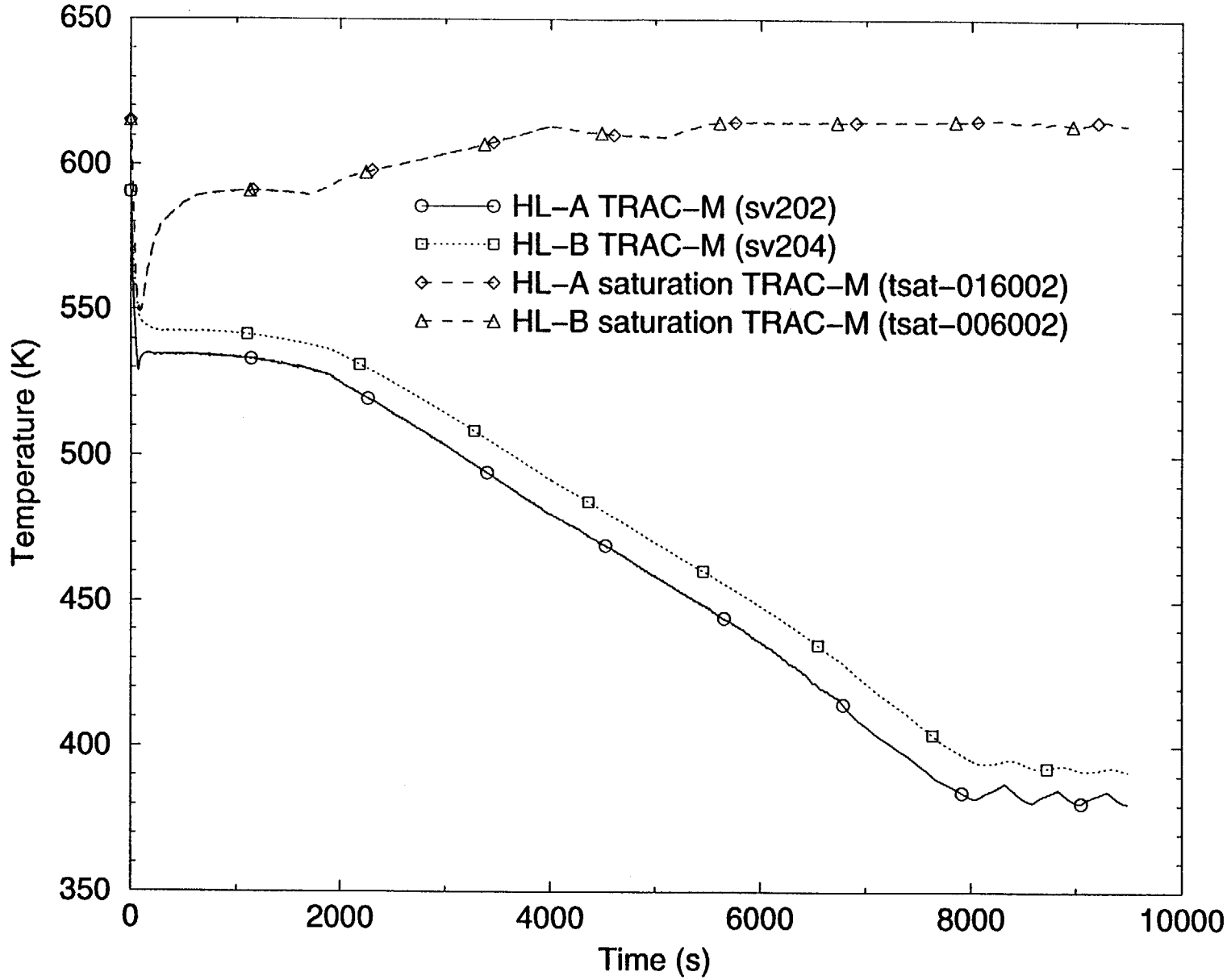


Figure 5.2.13A Hot Leg Temperatures

Calculated by RELAP5 for Oconee Main Steam Line A Break Scenario Case 27

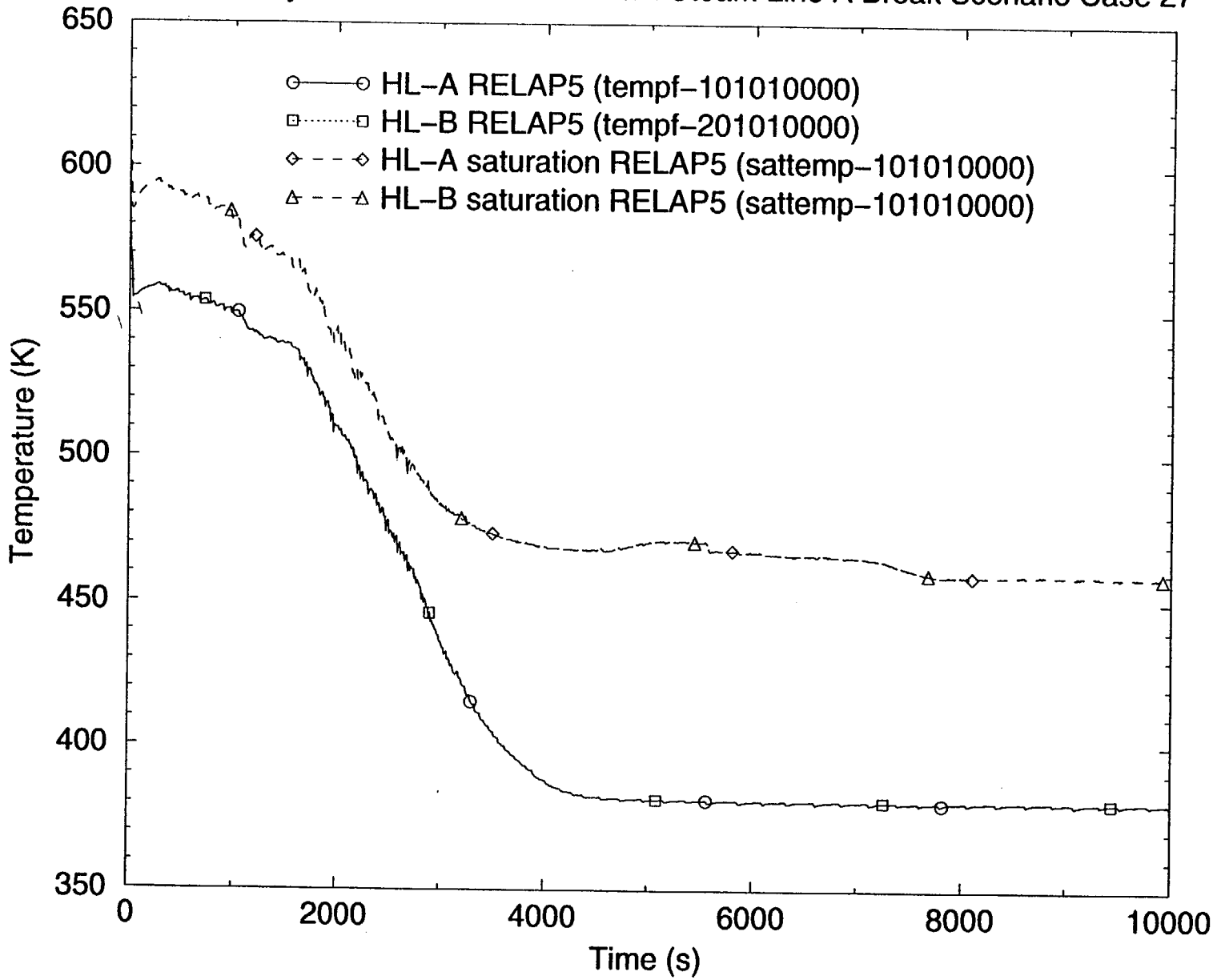


Figure 5.2.14 Cold Leg Temperatures

Calculated by TRACM for Oconee Main Steam Line A Break Scenario

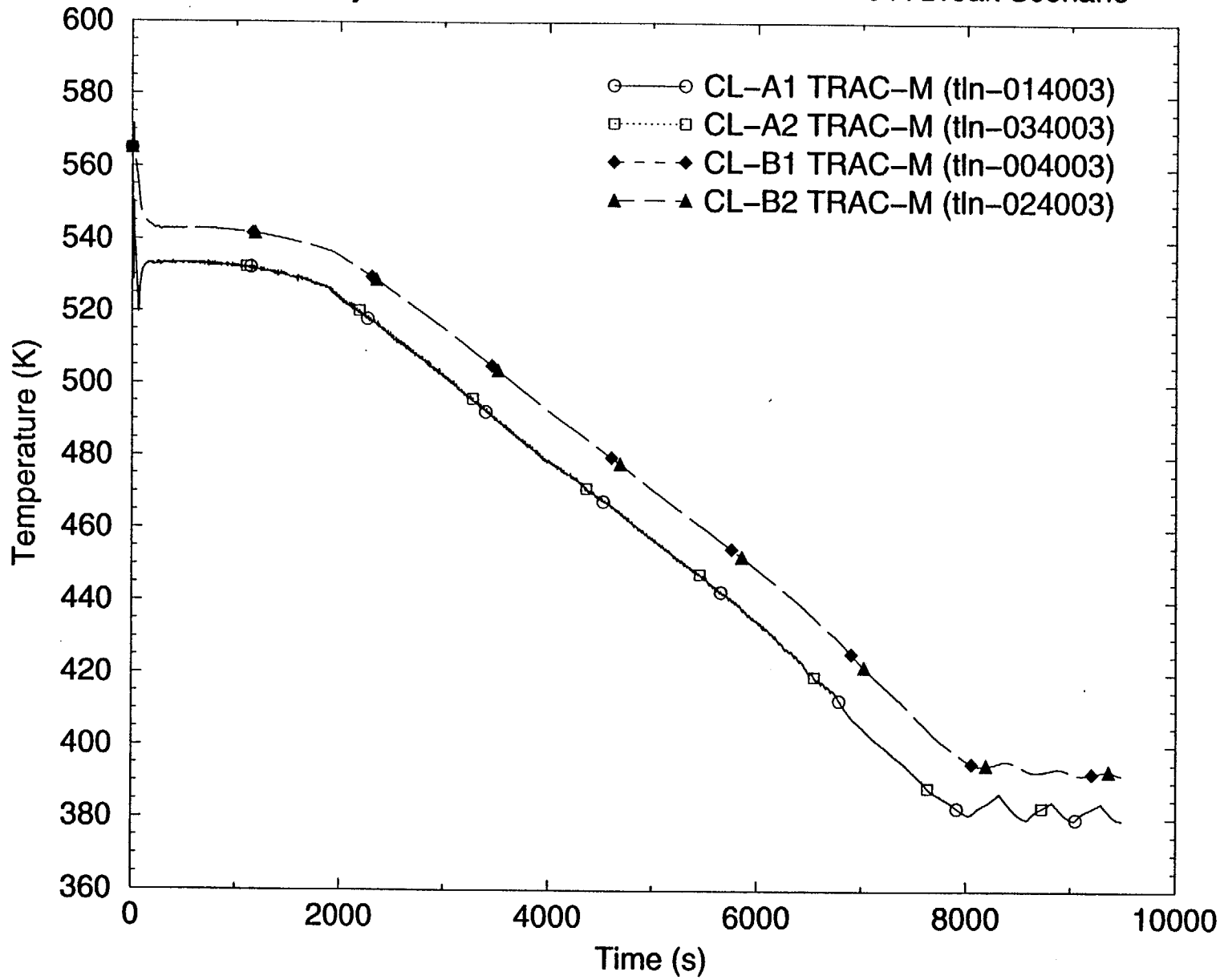


Figure 5.2.15 Cold Leg Temperatures

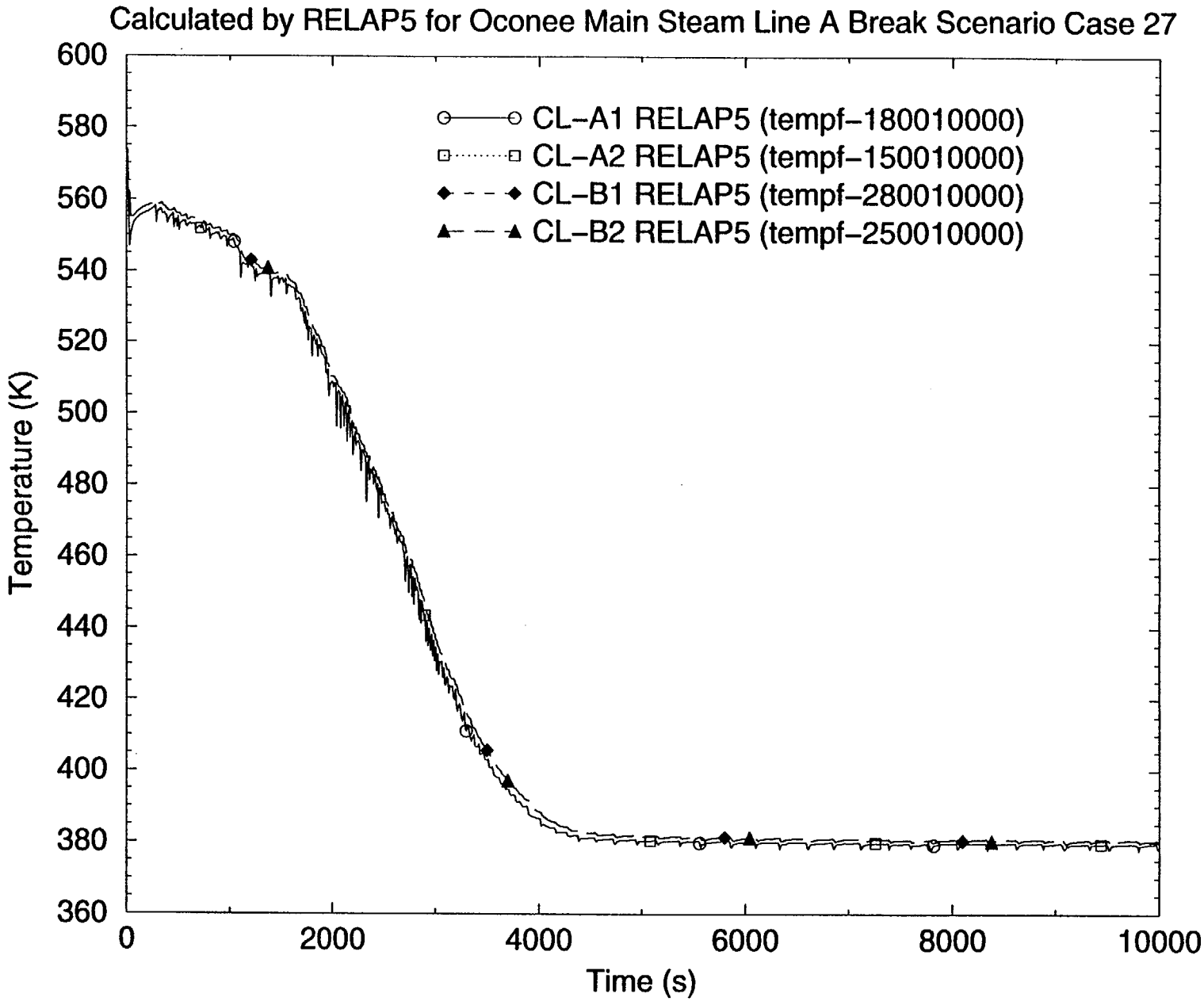


Figure 5.2.16 Total Emergency Feedwater Flow Rates

Calculated by TRACM and RELAP5 Case 61 for Oconee Main Steam Line A Break Scenario

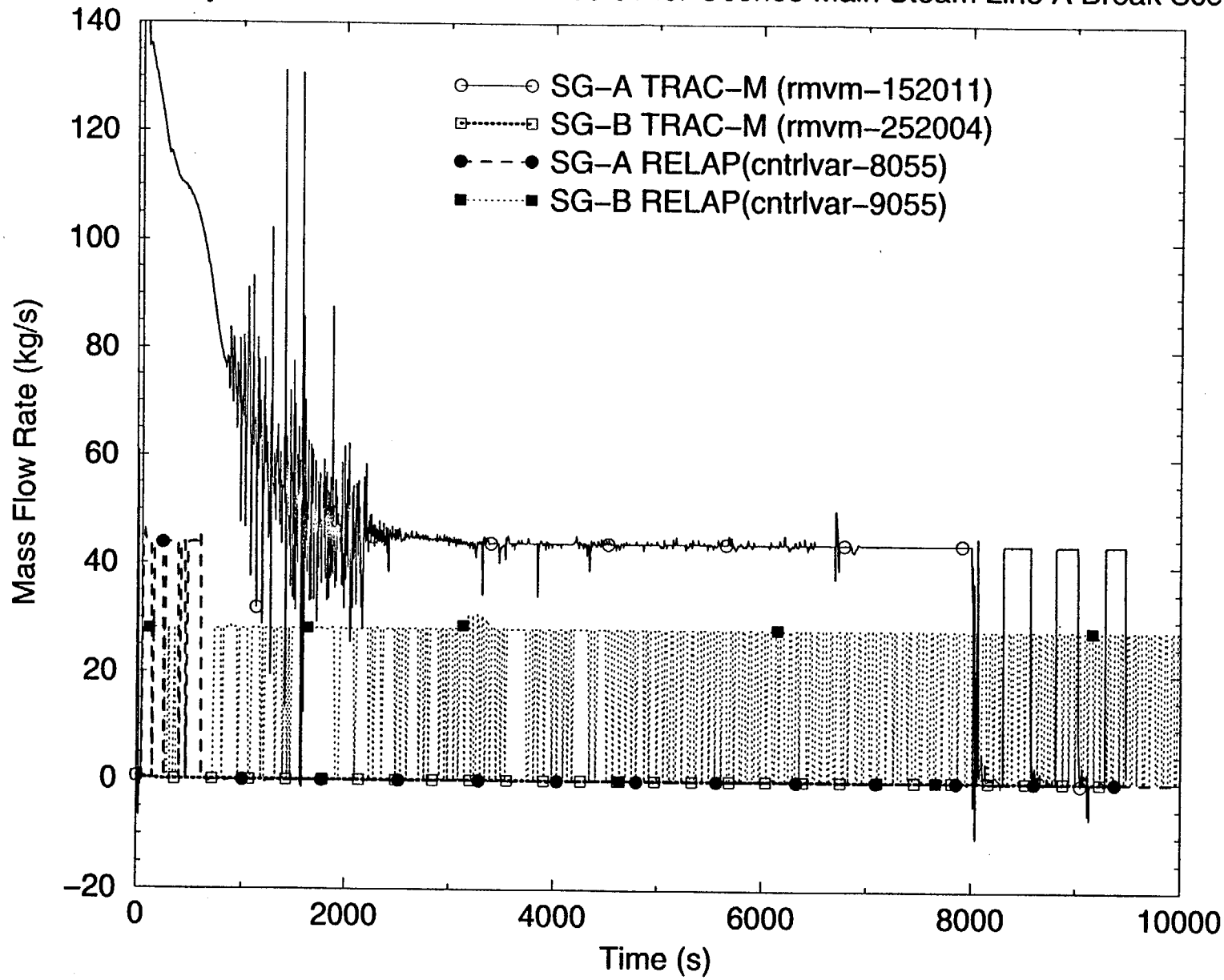


Figure 5.2.17 Downcomer Mid–Elevation Pressure

Calculated by TRACM and RELAP5 Case 61 for Oconee Main Steam Line A Break Scenario

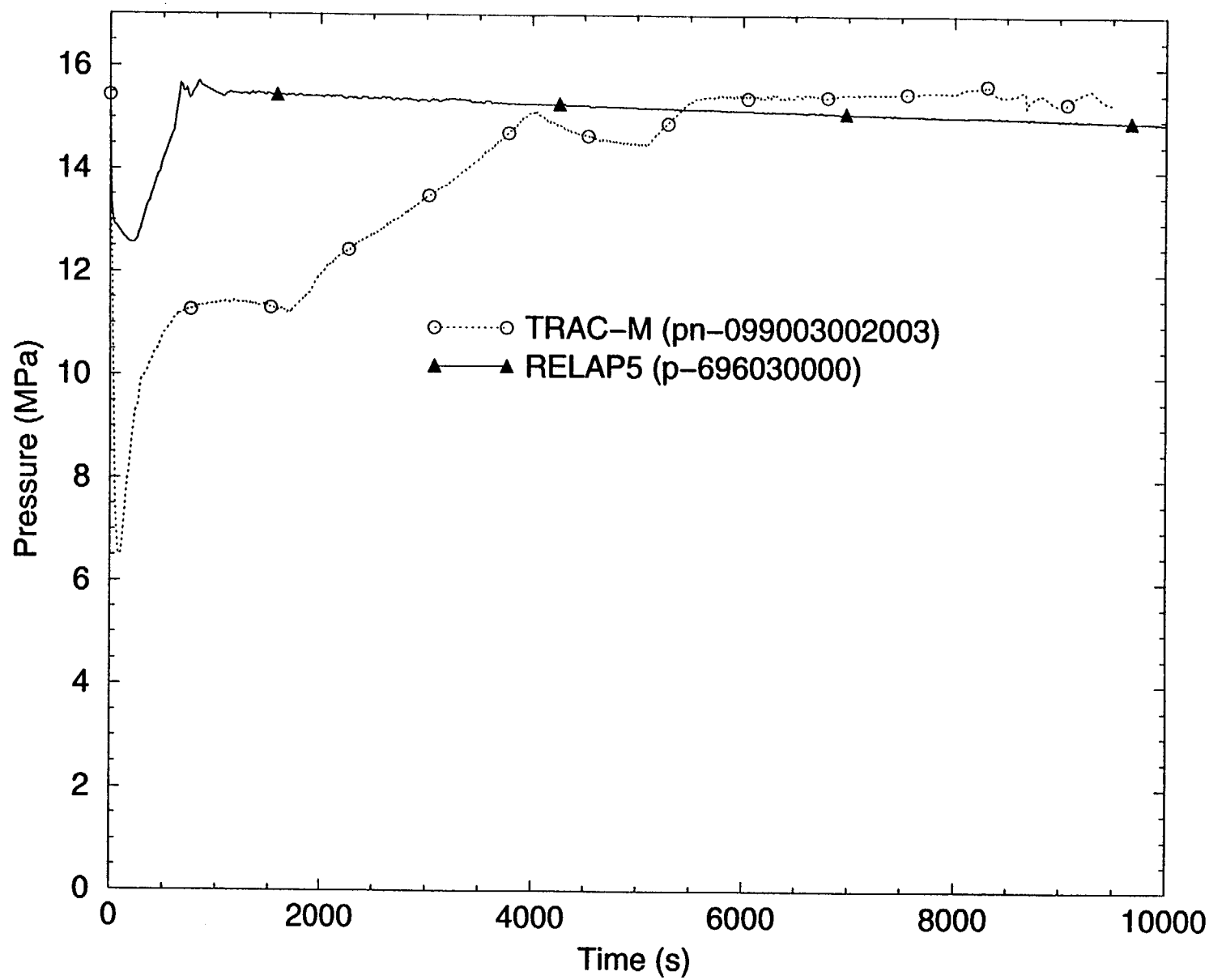


Figure 5.2.18 Makeup/Letdown Flow

Calculated by TRACM and RELAP5 Case 61 for Oconee Main Steam Line A Break Scenario

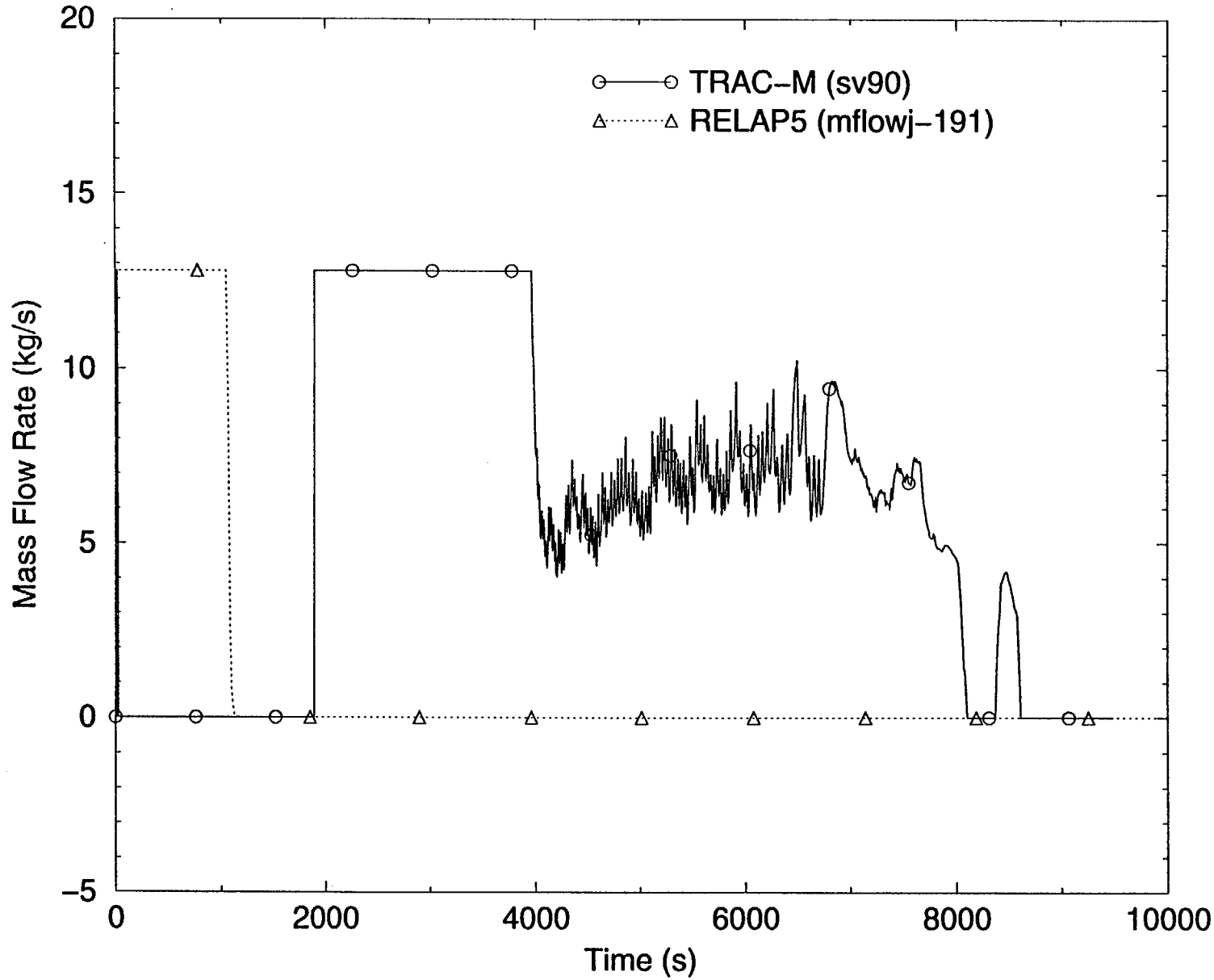
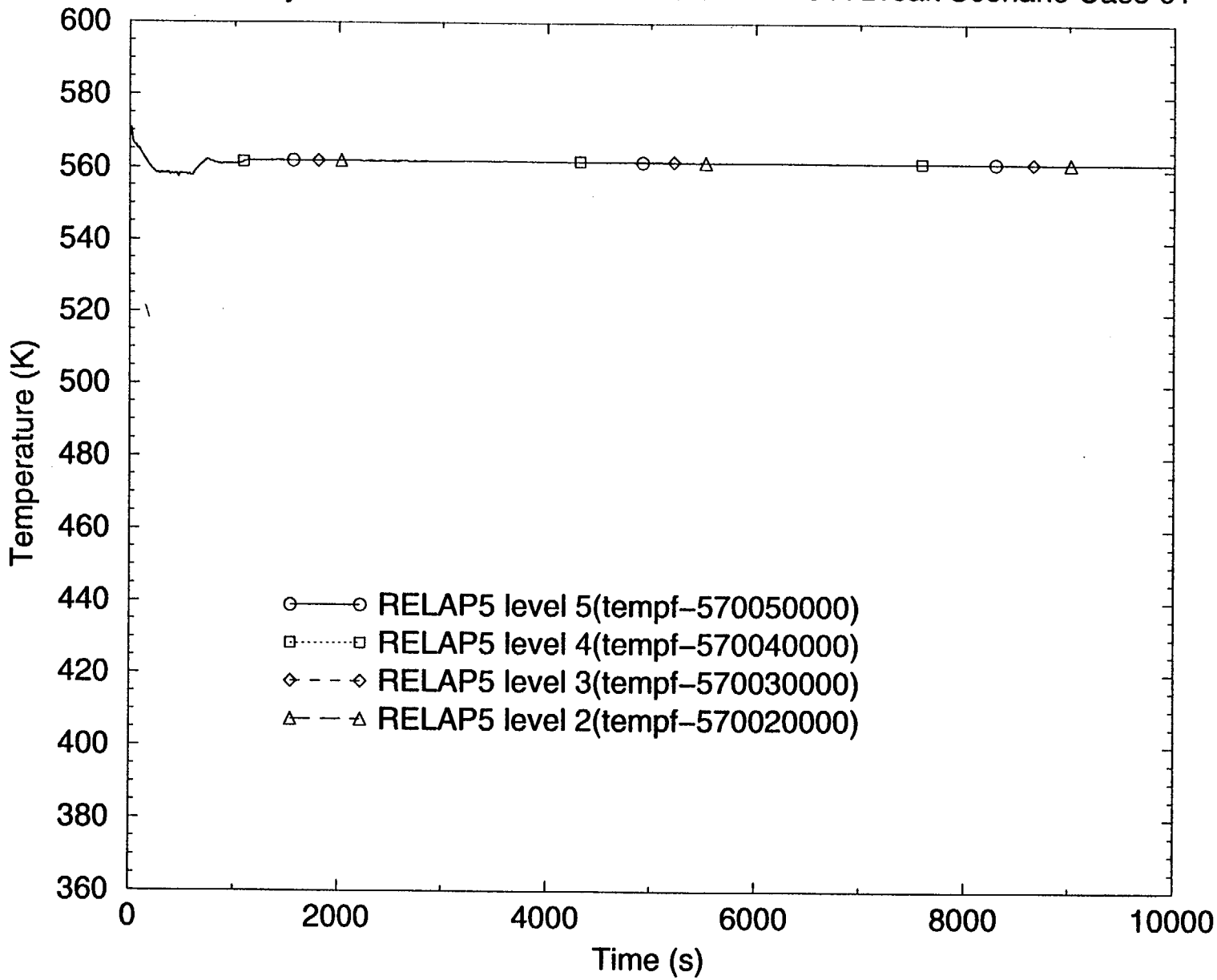


Figure 5.2.19 Downcomer Liquid Temperatures

Calculated by RELAP5 for Oconee Main Steam Line A Break Scenario Case 61



5.3 Steam Generator Overfeed

RELAP5 SG overfeed Case 19 is compared with a TRAC-M case in this Section.

5.3.1 Sequence of Events

A scenario selected for an overfeed to steam generators started with the reactor scram. Timing of major events is shown in Table 5.3.1. RCPs were not tripped because there was always sufficient subcooling margin. Since the pressure did not decrease much, as shown in Figure 5.3.1, HPI was not actuated, and vent valves stayed shut. The reason for a rapid initial reduction in pressure in Figure 5.3.1 for both TRAC-M and RELAP5 calculations was a rapid reduction of core power while losing heat through steam generators even though the rate of heat removal in SGs is greatly reduced as shown in Figures 5.3.2 and 5.3.3. The pressure calculated by RELAP5 was less than that of TRAC-M because a liquid level control setpoint of 5.7m (224") used by RELAP5 was less than that of TRAC-M (6.4m [252"]) as shown in Figure 5.3.4. Because of this difference, TRAC-M calculated a higher temperature in the pressurizer top region than RELAP5 as shown in Figure 5.3.5 which shows quite similar differences in level as the pressure plots (Figure 5.3.1). The pressure reduction during the first 1000 seconds was recovered quickly by the makeup flow as shown in Figure 5.3.6.

The pressurizer was refilled starting at 900 seconds for TRAC-M versus at 930 seconds for RELAP5 as shown in Figure 5.3.4. In RELAP5 case there was a small temporary refill at 80 seconds, but it lasted only for 100 seconds, and the liquid level was decreasing again until the second and final refilling time of 930 seconds. The pressurizer level was overshot to 7m (276") at 1200 seconds for TRAC-M while it was overshot to 7.3m (287") at 1500 seconds for RELAP5 before it was settled to 6.6m at 2500 seconds and to 6.4m (252") at 7000 seconds for TRAC-M and 5.7m (224") at 4000 seconds for RELAP5.

In TRAC-M, turbine bypass valves opened at 20 seconds and closed at 50 seconds and subsequently opened and closed periodically. In RELAP5, turbine bypass valves opened at 1 second, closed at 110 seconds, reopened at 1750 seconds, and remained open afterwards. Turbine bypass flow rates are shown in Figures 5.3.7 and 5.3.8, respectively, for TRAC-M and RELAP5. Steam line SRVs opened at 20 seconds and closed at 82 seconds in TRAC-M while they opened at 1 second and closed at 60 seconds in RELAP5. The flow rates through steam line SRVs are shown in Figure 5.3.9.

MFW pumps tripped immediately after the reactor scram which occurred at the start of the transient. The MFW flow rates were ramping down in both TRAC-M and RELAP5 cases as shown in Figure 5.3.10.

The EFW flows are shown in Figures 5.3.11 and 5.3.12, respectively, for TRAC-M and RELAP5. The EFW came on immediately after MFW pumps tripped off and stayed on until 914 seconds in TRAC-M and until 970 seconds in RELAP5 after which the EFW pumps were turned off because SGs were flooded as shown in Figure 5.3.13. After 1630 seconds in TRAC-M and after 1760 seconds in RELAP5 the EFW pumps were turned on and off to maintain the SGs to be full of liquid (i.e., 96 percent of the operating range). Since the EFW flows calculated by both TRAC-M and RELAP5 were highly oscillatory, as shown in Figures 5.3.11 and 5.3.12, they were integrated and plotted in Figure 5.3.13A to see how much EFW flows were delivered to SGs. RELAP5 calculated about 50 percent more than what TRAC-M calculated. The reason for the

higher value of RELAP5 was that the RELAP5 calculated steam flows leaving SGs were also higher than the TRAC-M-calculated values by about 50 percent as shown in Figure 5.3.13B. In other words, in RELAP5, more flows were leaving SGs, and thus more EFW flows had to be supplied to maintain the same liquid level in SGs.

The primary liquid volume shrinkages due to SG overfeed was not significant enough to cause any void to occur at the top of hot legs, nor at the top of the downcomer, nor in the vessel upper head.

5.3.1 Comparison of Sequence of Events Between TRAC-M and RELAP5 Calculations for a Steam Generator Overfeed Scenario

	TRAC-M **Seconds**	**RELAP5** **Case 19** **Seconds**
1. Reactor scram	0	0
2. RCP trip	Did not trip	Did not trip
3. HPI actuation	Did not actuate	Did not actuate
4. Vent valve opening	Did not open	Did not open
5. Pressurizer refill	900	First refill at 80 seconds for 100 seconds followed by the second refill at 930 seconds
6. Turbine bypass valve opening and closing	Opened at 20 seconds, Closed at 50 seconds, and then opened and closed periodically	Opened at 1 second, closed at 110 seconds, reopened at 1750 seconds, and remained open afterwards
7. Steam line safety valve opening	20 to 77 seconds	1 to 60 seconds
8. Main feedwater pump trip	0	0
9. Emergency feedwater pump on	2–914 periodically after 1630 seconds	2–970 periodically after 1760 seconds
10. Vessel upper head voiding	Did not occur	Did not occur
11. Upper downcomer voiding	Did not occur	Did not occur
12. Hot leg top voiding	Did not occur	Did not occur

5.3.2 Main Pressurized Thermal Shock Parameters

The minimum downcomer liquid temperatures are shown in Figures 5.3.14 and 5.3.15, respectively, for TRAC-M and RELAP5. In TRAC-M the minimum temperature of 542K occurred at 910 seconds while in RELAP5 the minimum temperature of 537K occurred at 940 seconds. The minimum temperatures occurred relatively early since the core power input was drastically reduced as the reactor scrammed at the start of the transient while the heat extraction through SGs stayed relatively high, as shown in Figure 5.3.16, even though this was also greatly reduced from the steady state value of 100 percent power level. Between about 1000 seconds and about 1750 seconds the heat transfer rates in SGs were drastically reduced because of no steam flows from SGs as shown in Figure 5.3.16, resulting in a heat-up in both the primary and the secondary systems (Figures 5.3.1 and 5.3.17). There were no turbine bypass flows and thus no flows in SGs and consequently no heat transfer in SGs between about 1000 seconds and 1750 seconds. In order to have turbine bypass flows in this time period, the steam line pressure had to be higher than the pressure set point for opening turbine bypass valves.

The downcomer pressure in the downcomer is shown in Figure 5.3.18. It is seen that at the time of the minimum downcomer temperature TRAC-M calculated 13.4 MPa as compared to 12.2 MPa by RELAP5. The behavior of the downcomer pressure was quite similar to the pressurizer pressure as discussed previously in Section 5.3.1.

The minimum and the maximum heat transfer coefficients are shown in Figures 5.3.19 and 5.3.20, respectively, for TRAC-M and RELAP5. The maximum heat transfer coefficient at the time of the minimum downcomer temperature was 28,200 W/(m*m K) in TRAC-M and 30,600 W/(m*m K) in RELAP5 while the minimum heat transfer coefficient at the same minimum downcomer temperature was 22,600 W/(m*m K) in TRAC-M and 24,500 W/(m*m K) in RELAP5. The maximum occurred at the bottom node of downcomer sector beneath hot leg "A" or "B" in TRAC-M and at the bottom node of downcomer sector beneath Cold Leg B2 in RELAP5. The minimum occurred at the bottom node of downcomer sector beneath cold leg "A1", "A2", "B1", or "B2" in TRAC-M and at the upper part (the first node below the cold leg junction) of a sector located between cold leg "A1" and "A2" or between cold leg "B1" and "B2" in RELAP5.

5.3.3 Other Plant Parameters

Besides four parameters of main interest for PTS concerns as discussed in Section 5.3.2, there are four additional plant parameters of next highest interest. They are the cold leg flow rate and temperature and the hot leg flow rate and temperature.

The cold leg flow rates are shown in Figures 5.3.21 and 5.3.22 which show an excellent agreement between TRAC-M and RELAP5 calculation results. Cold leg flow rates peaked at about 910 seconds in TRAC-M and about 930 seconds in RELAP5 as a result of a higher density of liquid due to repressurization by the influx of the makeup flow.

The hot leg flow rates are shown in Figure 5.3.23 which also show an excellent agreement between TRAC-M and RELAP5. As in cold leg flow rates, the hot leg flow rates also peaked at around 900 seconds for the same reason as for the cold leg flow rates (i.e., a higher density).

The cold leg temperatures are shown in Figure 5.3.24 for TRAC-M results and in Figure 5.3.25 for RELAP5 results. TRAC-M results show the minimum cold leg temperature to be 541K in cold leg "A1" and "A2" and 544K in cold leg "B1" and "B2" while RELAP5 results show the minimum temperature to be 537K in all cold legs. Both TRAC-M and RELAP5 show the same final temperature of about 560K which was maintained indefinitely after 2000 seconds.

The hot leg temperatures are shown in Figure 5.3.26 which also shows an excellent agreement between TRAC-M and RELAP5 except for the minimum temperatures which are different up to 7 K. RELAP5 shows a lower minimum temperature of 538K versus the TRAC-M minimum temperature of 542K for hot leg "A" and 545 K for hot leg "B".

5.3.4 Pressurized Thermal Shock Implications

Both TRAC-M and RELAP5 calculation results show that the minimum downcomer temperature is much higher than the PTS screening criterion temperature, and thus the SG overfeed scenario considered here does not lead to any PTS concerns. For this scenario RCPs do not trip, and thus a normal loop flow is maintained, precluding the possibility of a stratified flow in the cold legs. Furthermore, the HPI flow which may cause PTS concerns is not even actuated because the primary system pressure stays above the HPI actuation point.

Text continues on page 131.

Figure 5.3.1 Primary System Pressures

Calculated by TRACM and RELAP5 for SG Overfeed Scenario

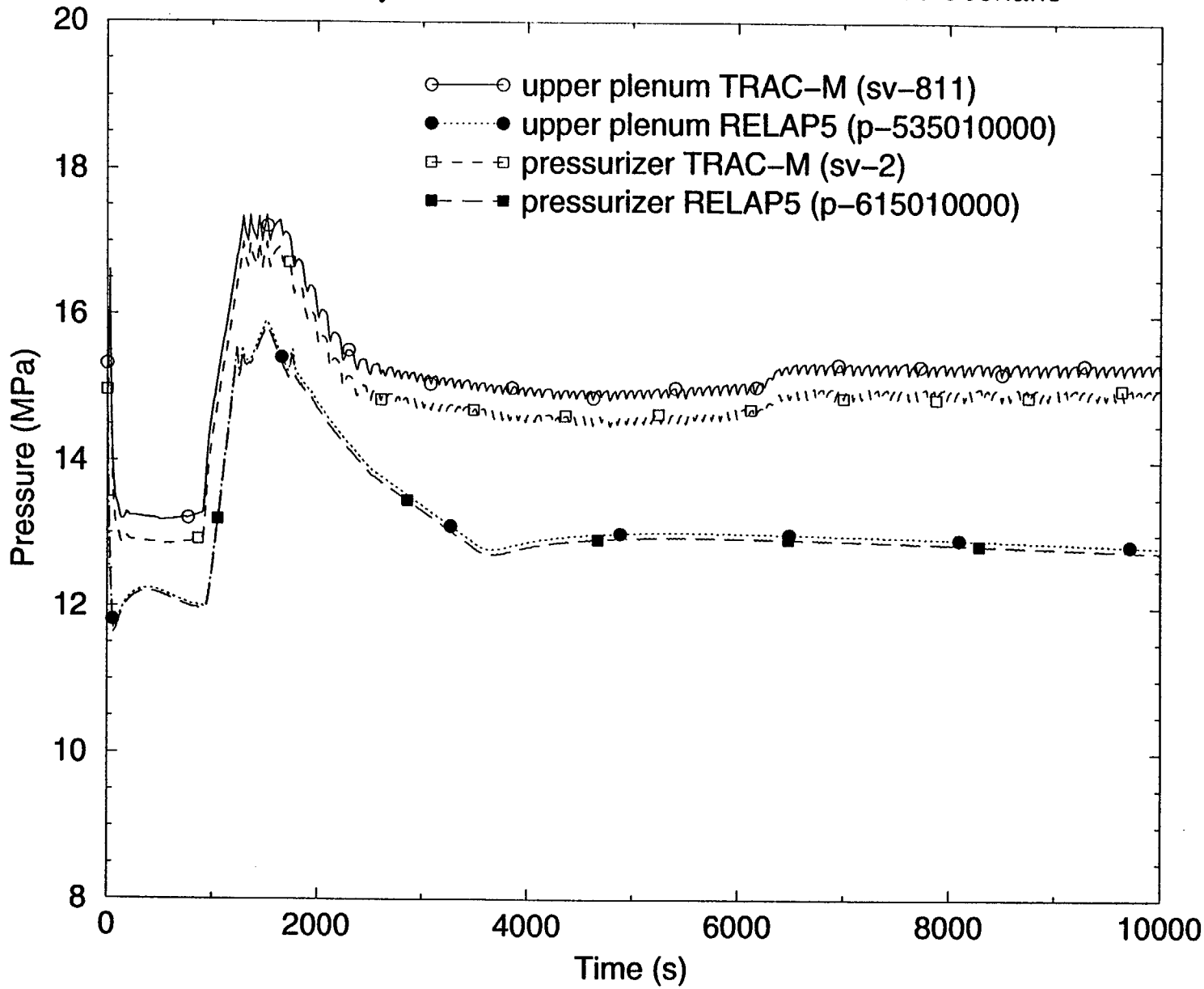


Figure 5.3.2 Reactor Power

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

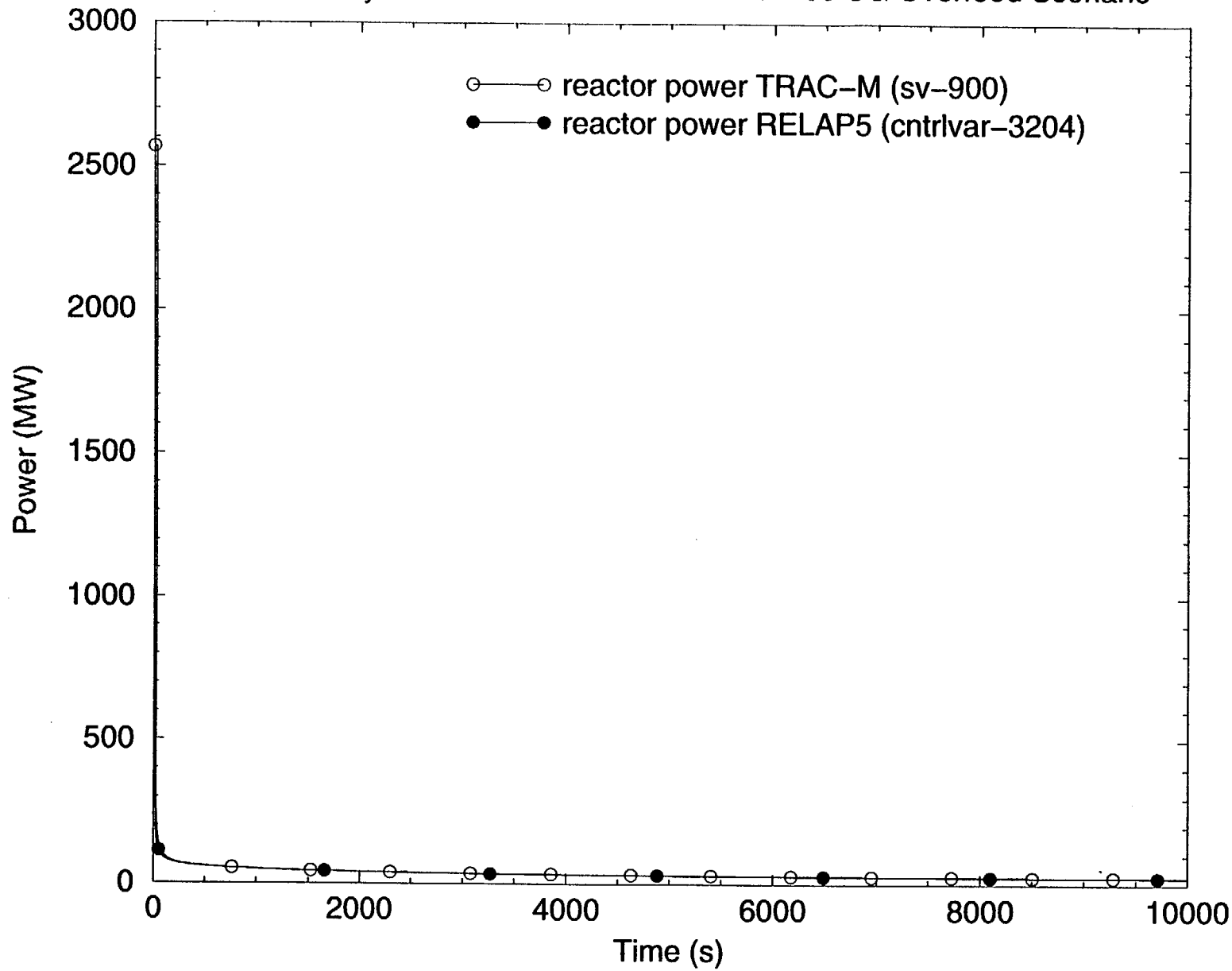


Figure 5.3.3 Heat Transfer Rates Through SGs

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

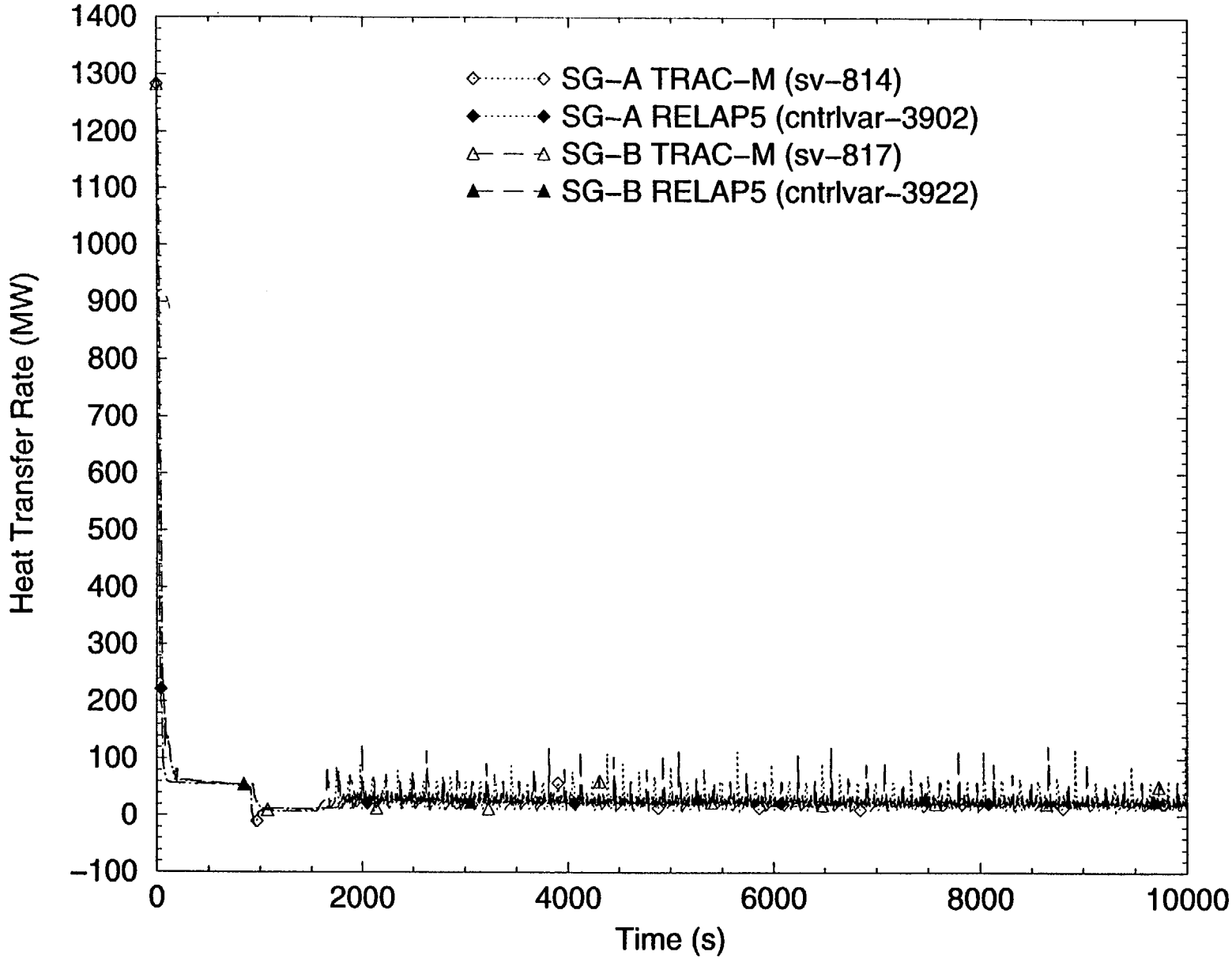


Figure 5.3.4 Pressurizer Water Level

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

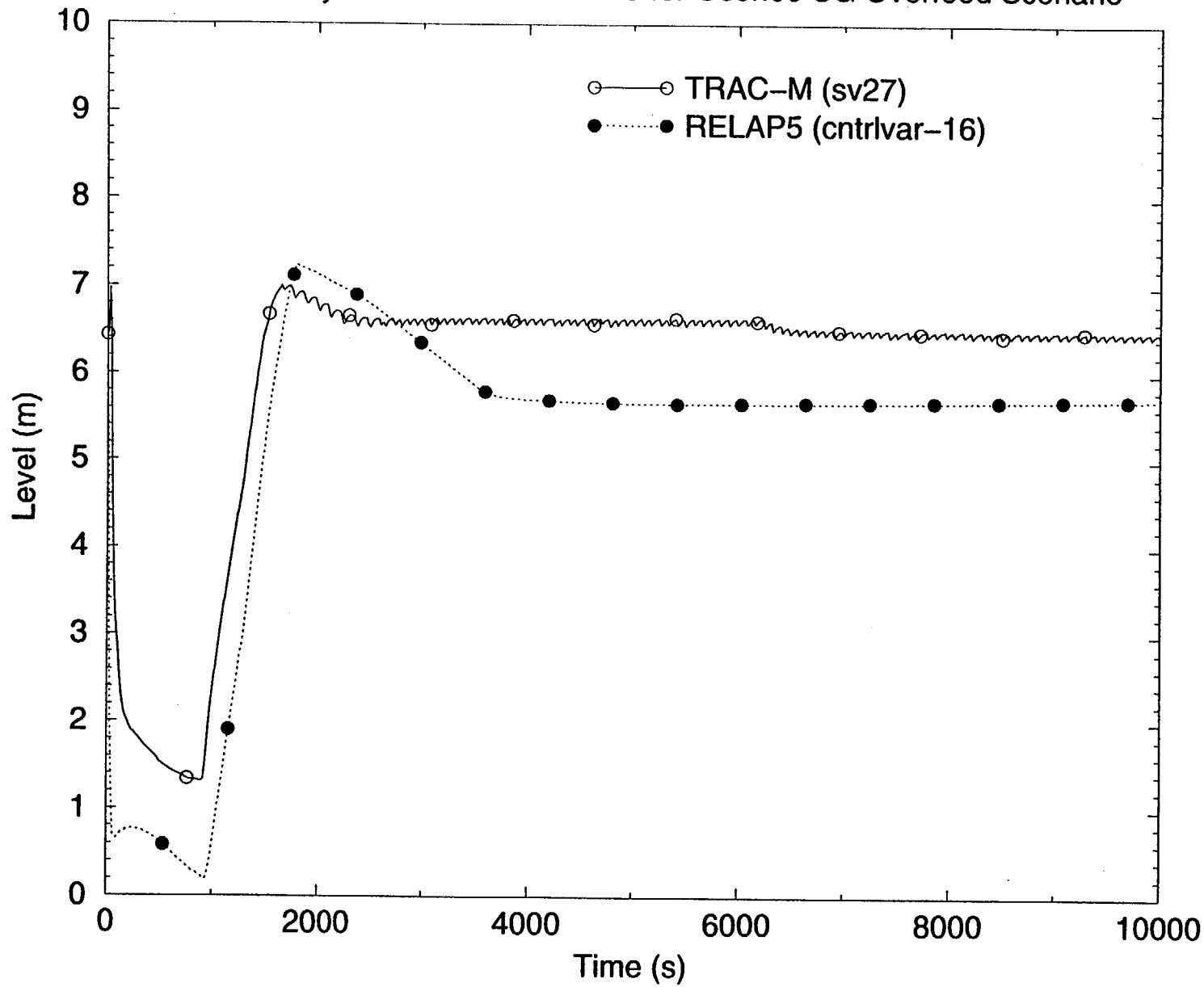


Figure 5.3.5 Temperature of Pressurizer Top Region

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

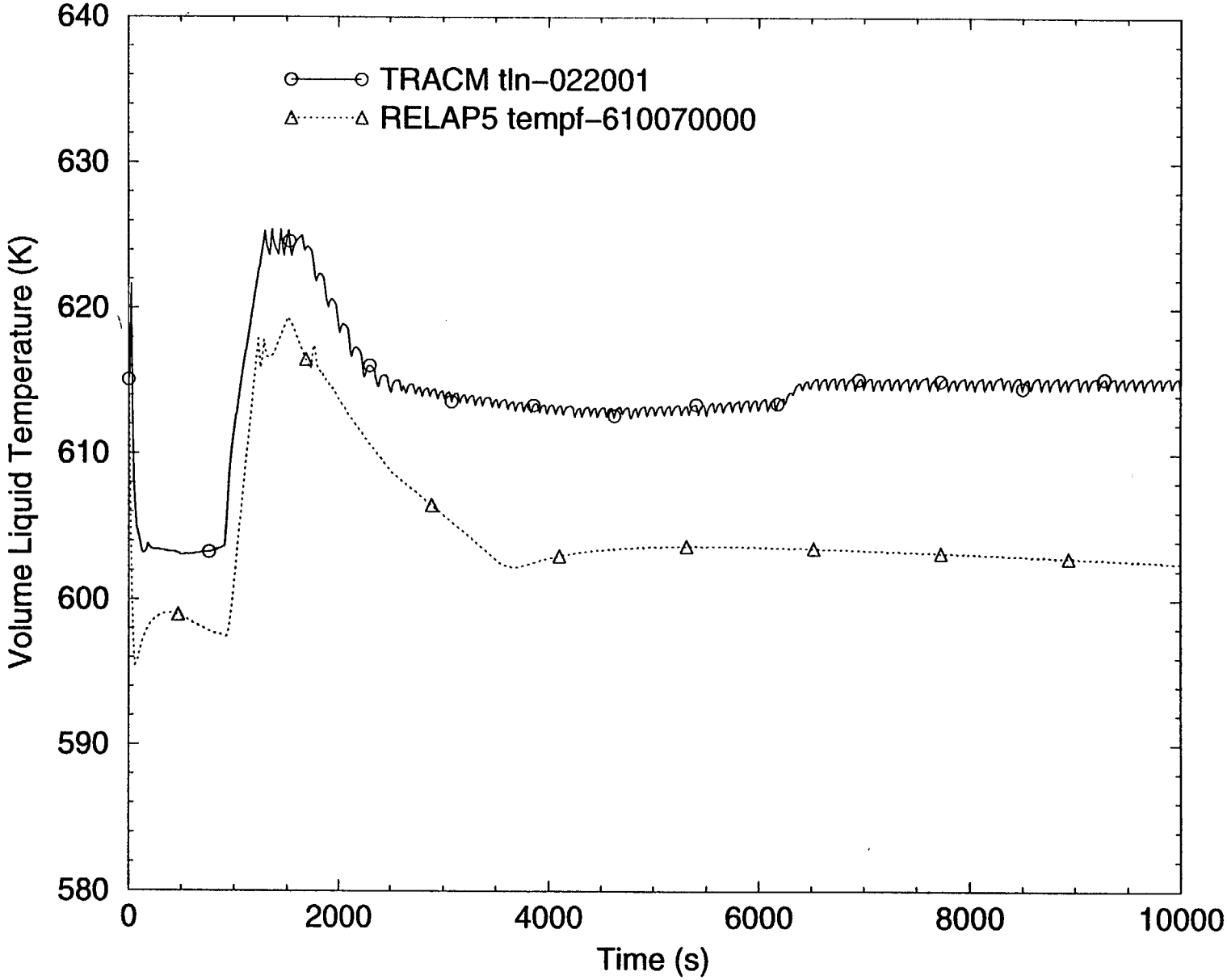


Figure 5.3.6 Makeup/Letdown Flow

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

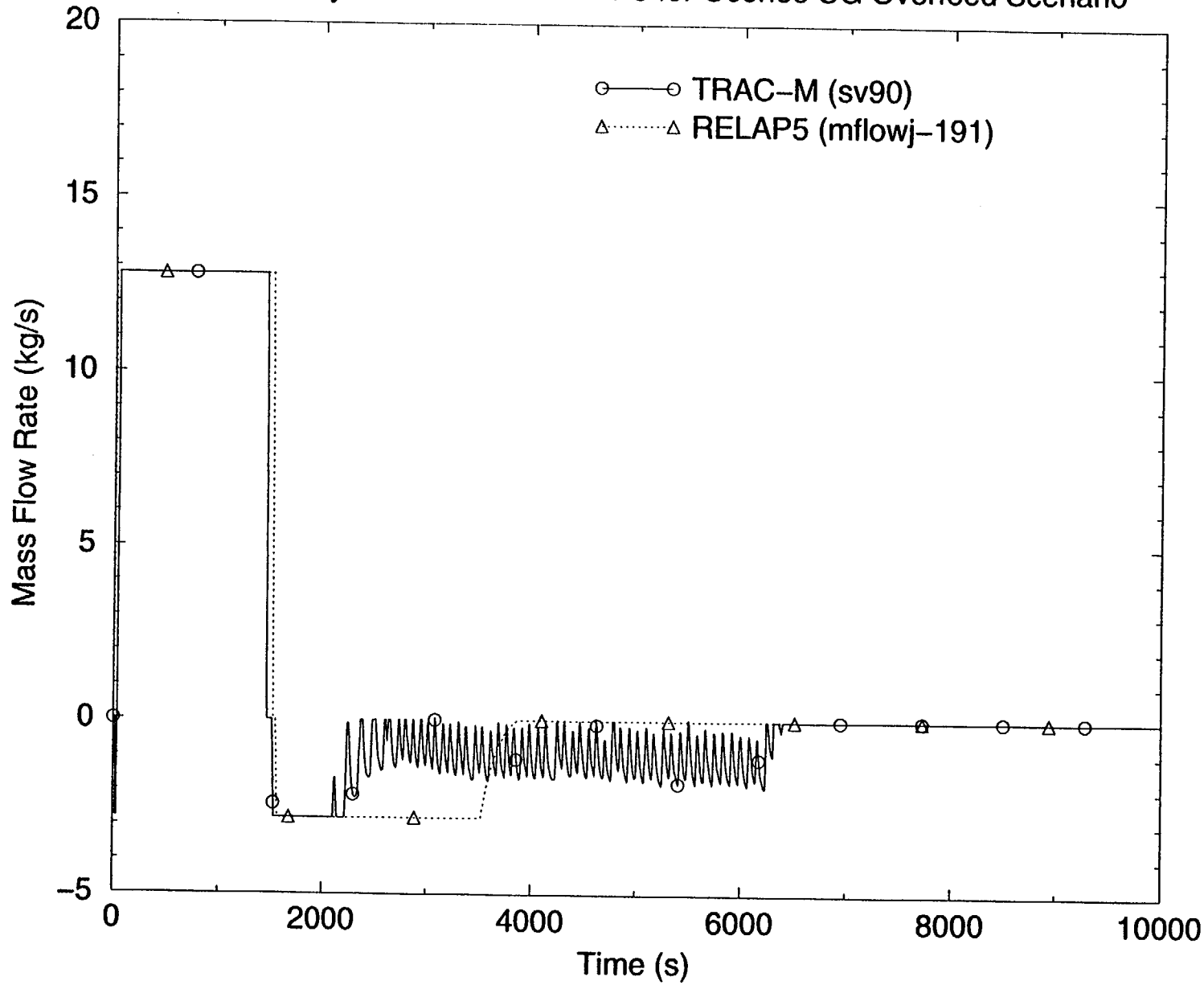


Figure 5.3.7 Turbine Bypass Flow Rates

Calculated by TRACM for Oconee SG Overfeed Scenario

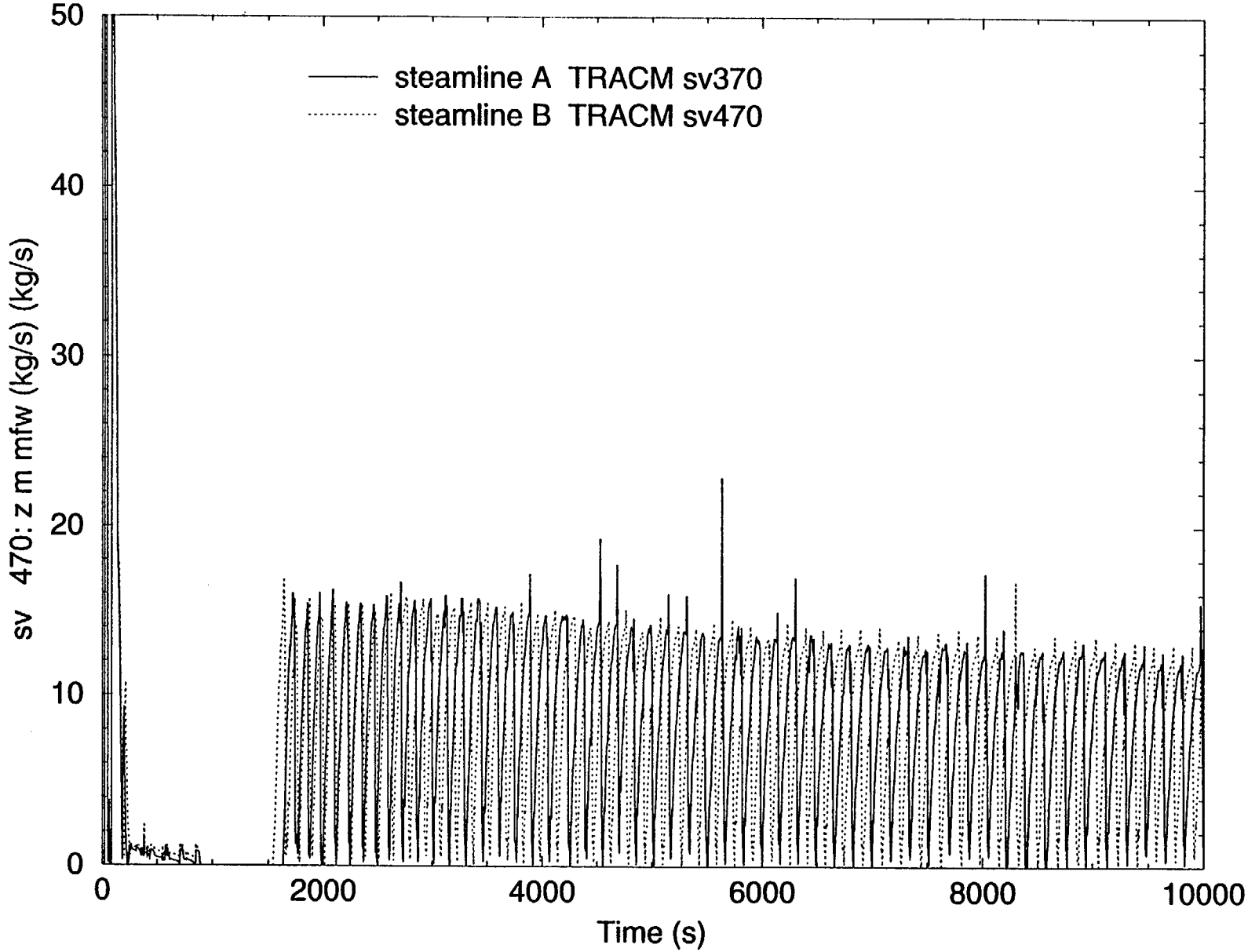


Figure 5.3.8 Turbine Bypass Flow Rates

Calculated by RELAP5 for Oconee SG Overfeed Scenario

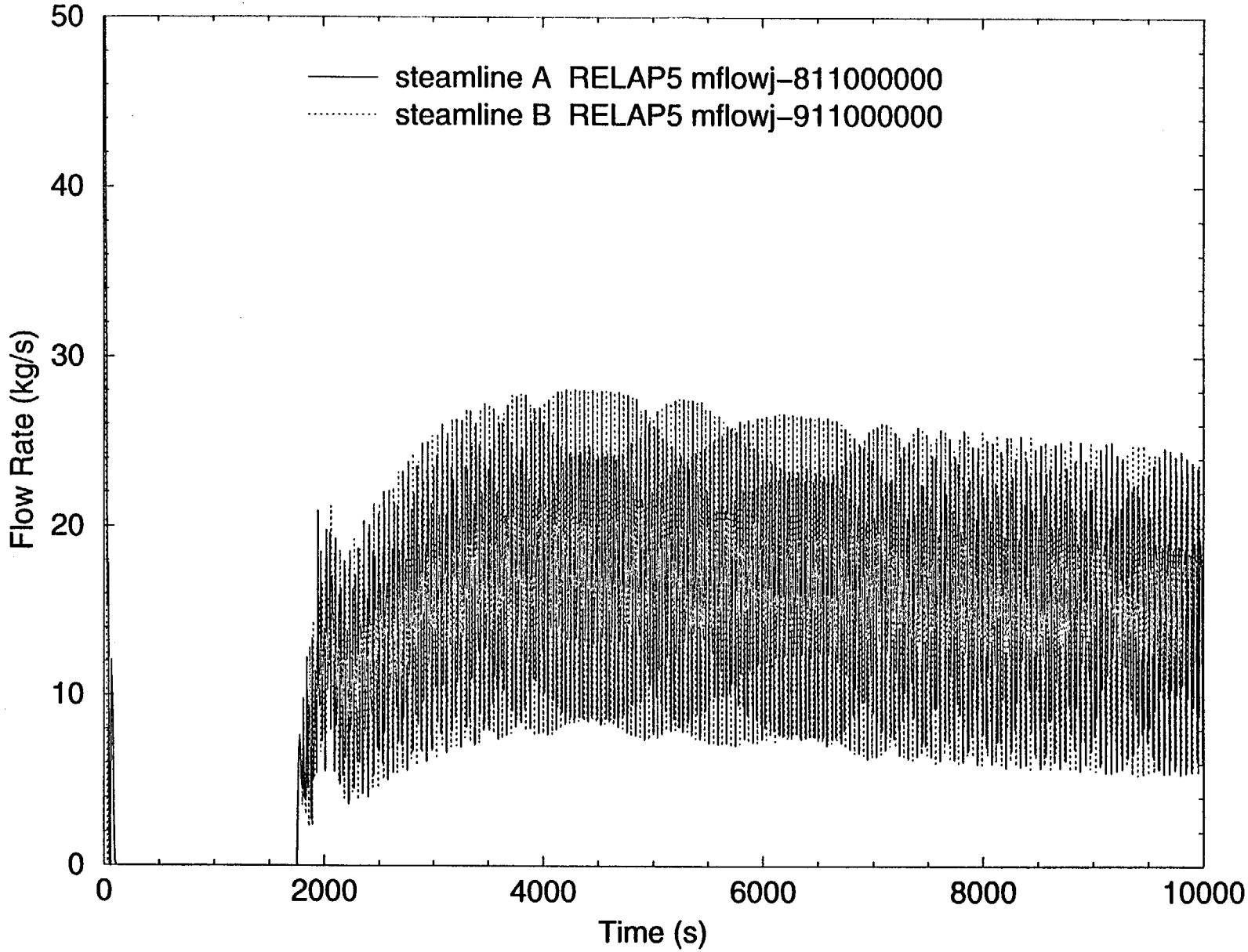


Figure 5.3.9 Steamline Safety Relief Valve Flow Rates

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

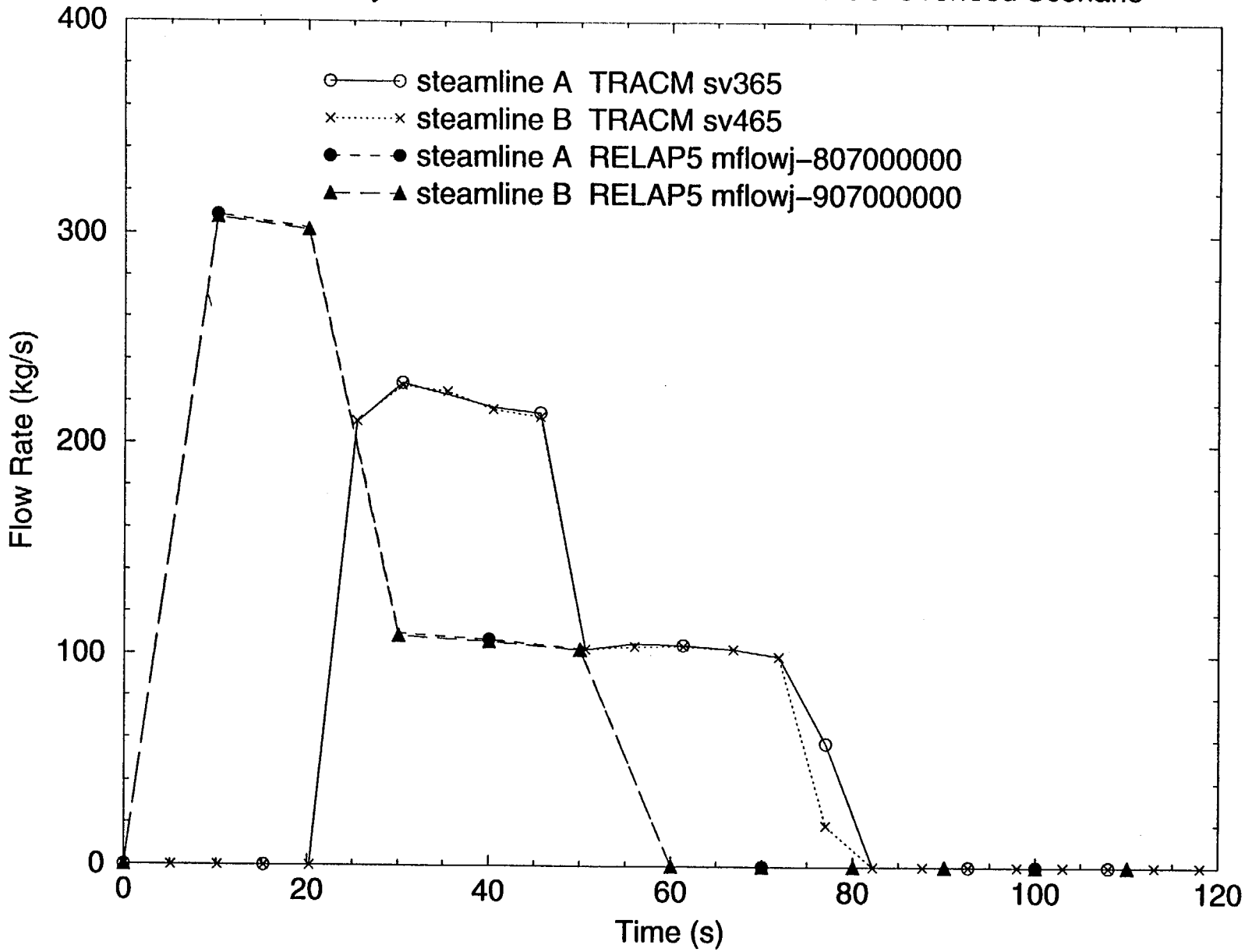


Figure 5.3.10 Main Feedwater Flow Rates

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

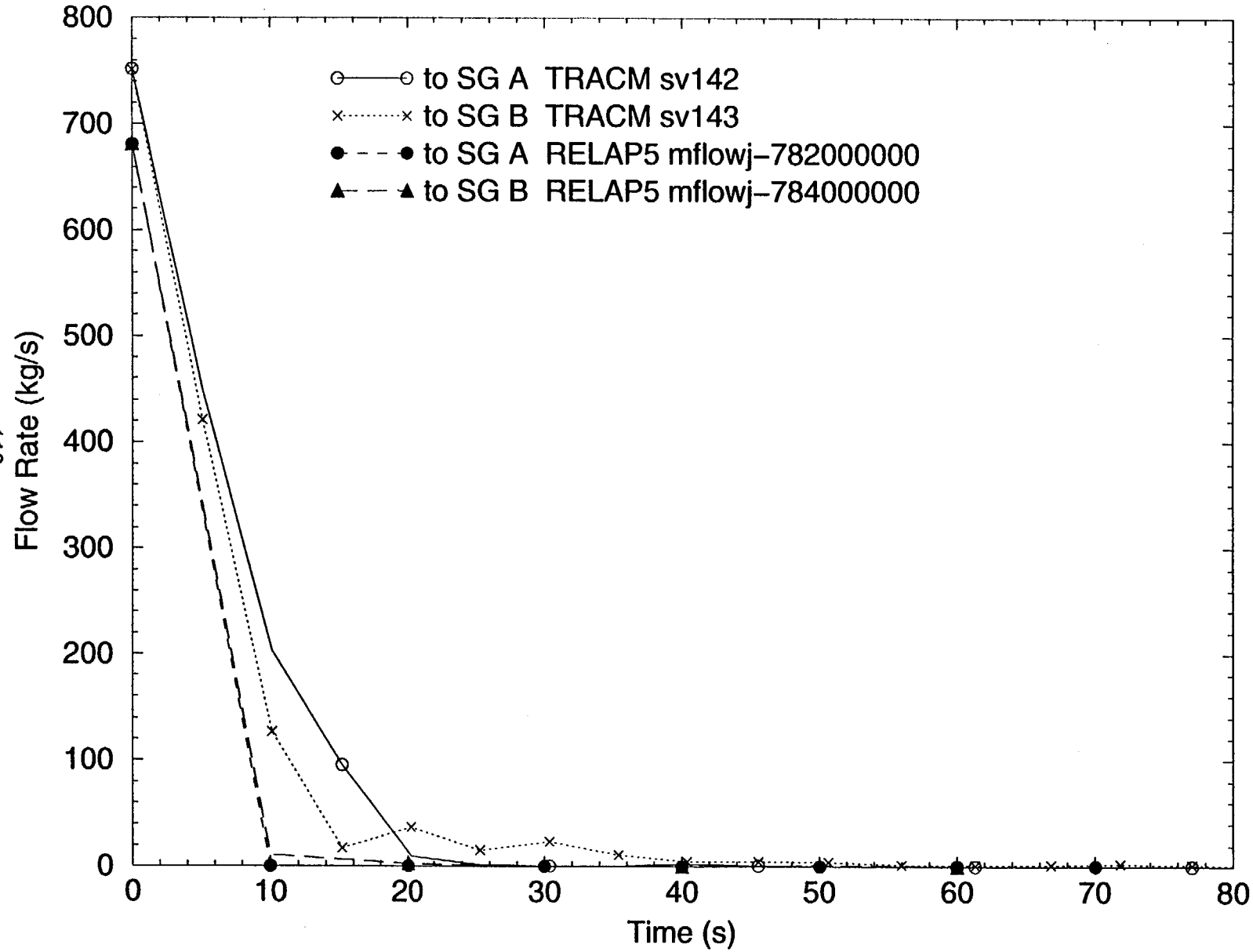


Figure 5.3.11 Total Emergency Feedwater Flow Rates

Calculated by TRACM for Oconee SG Overfeed Scenario

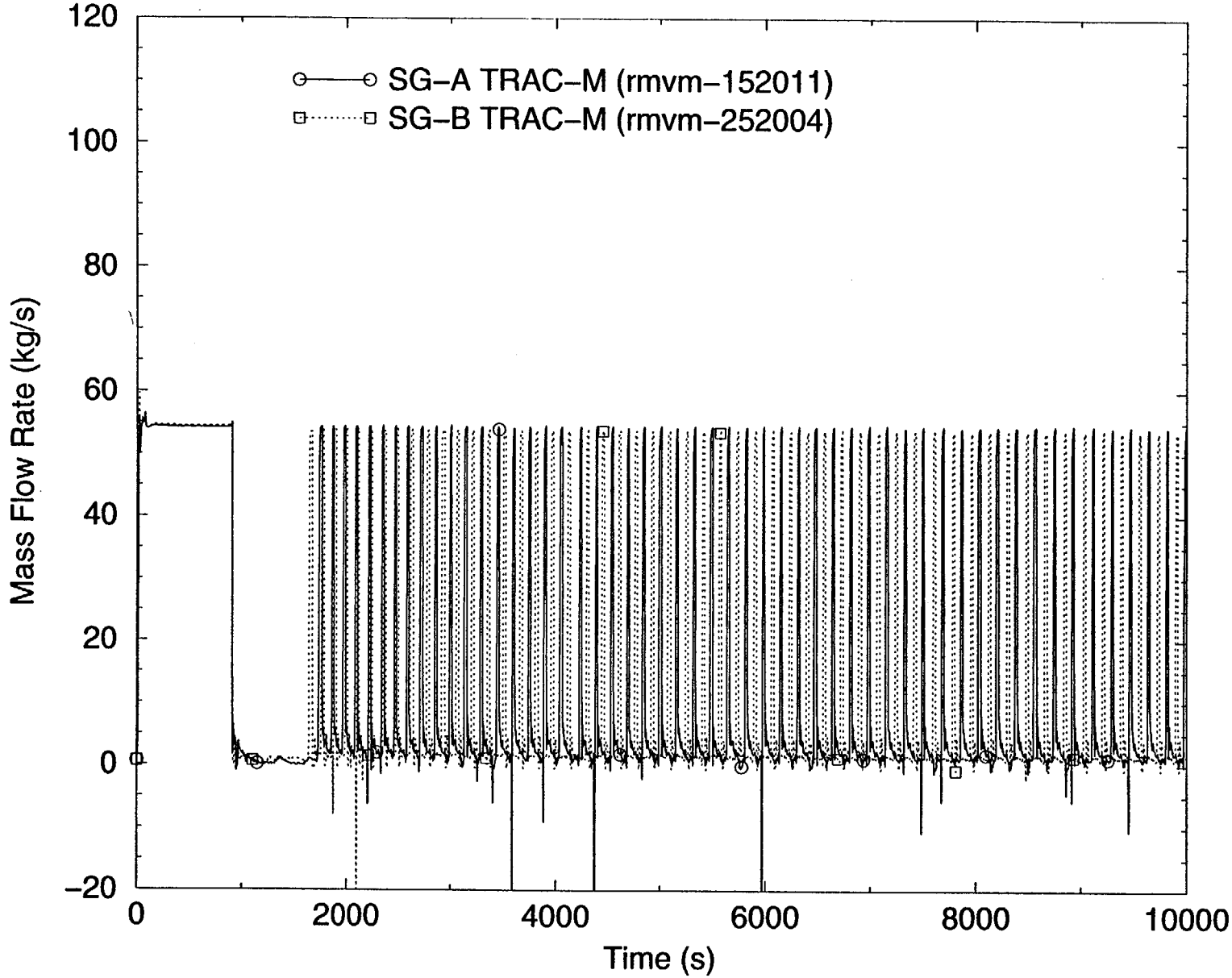


Figure 5.3.12 Total Emergency Feedwater Flow Rates

Calculated by RELAP5 for Oconee SG Overfeed Scenario

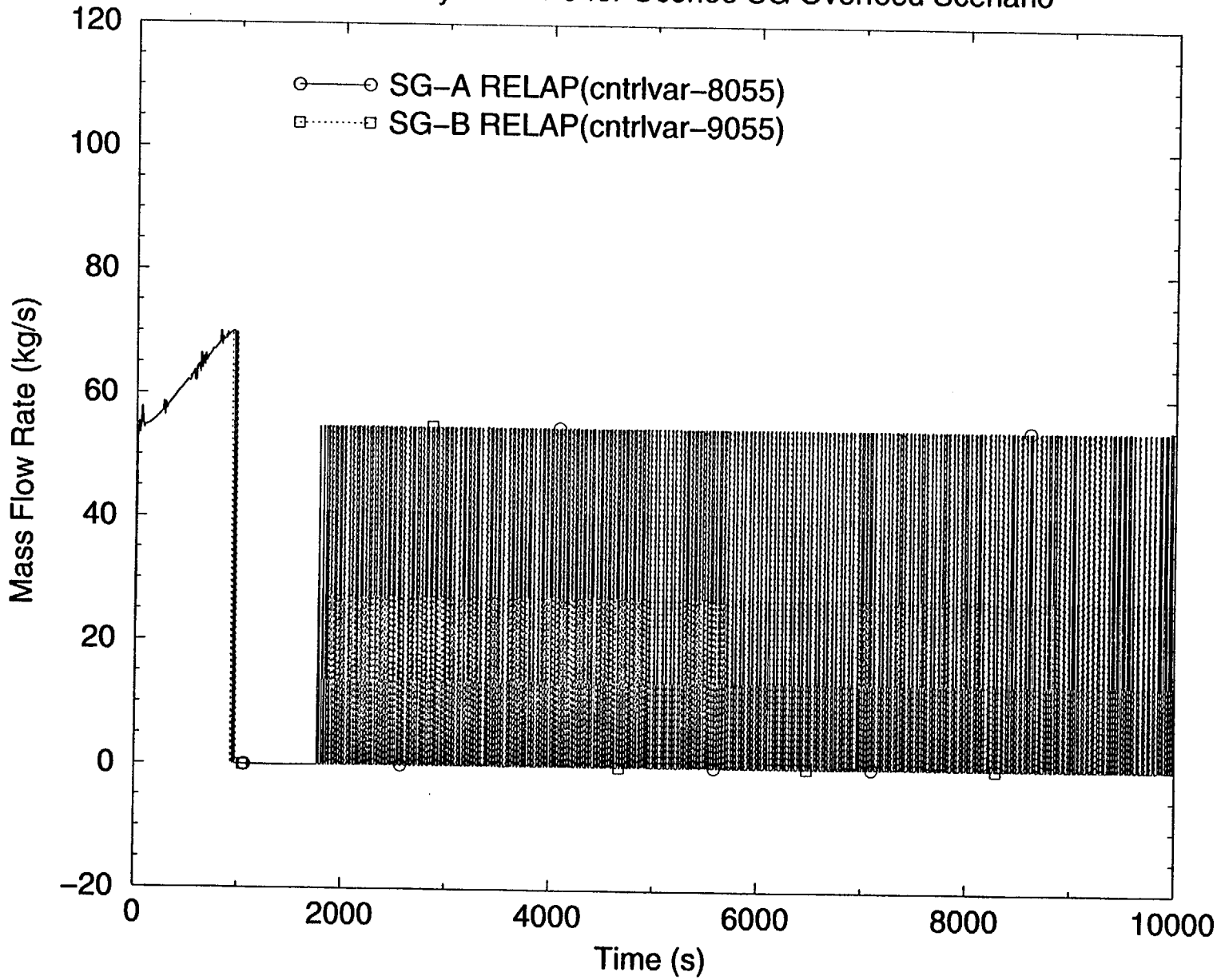


Figure 5.3.13 Steam Generator Operating Range Levels

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

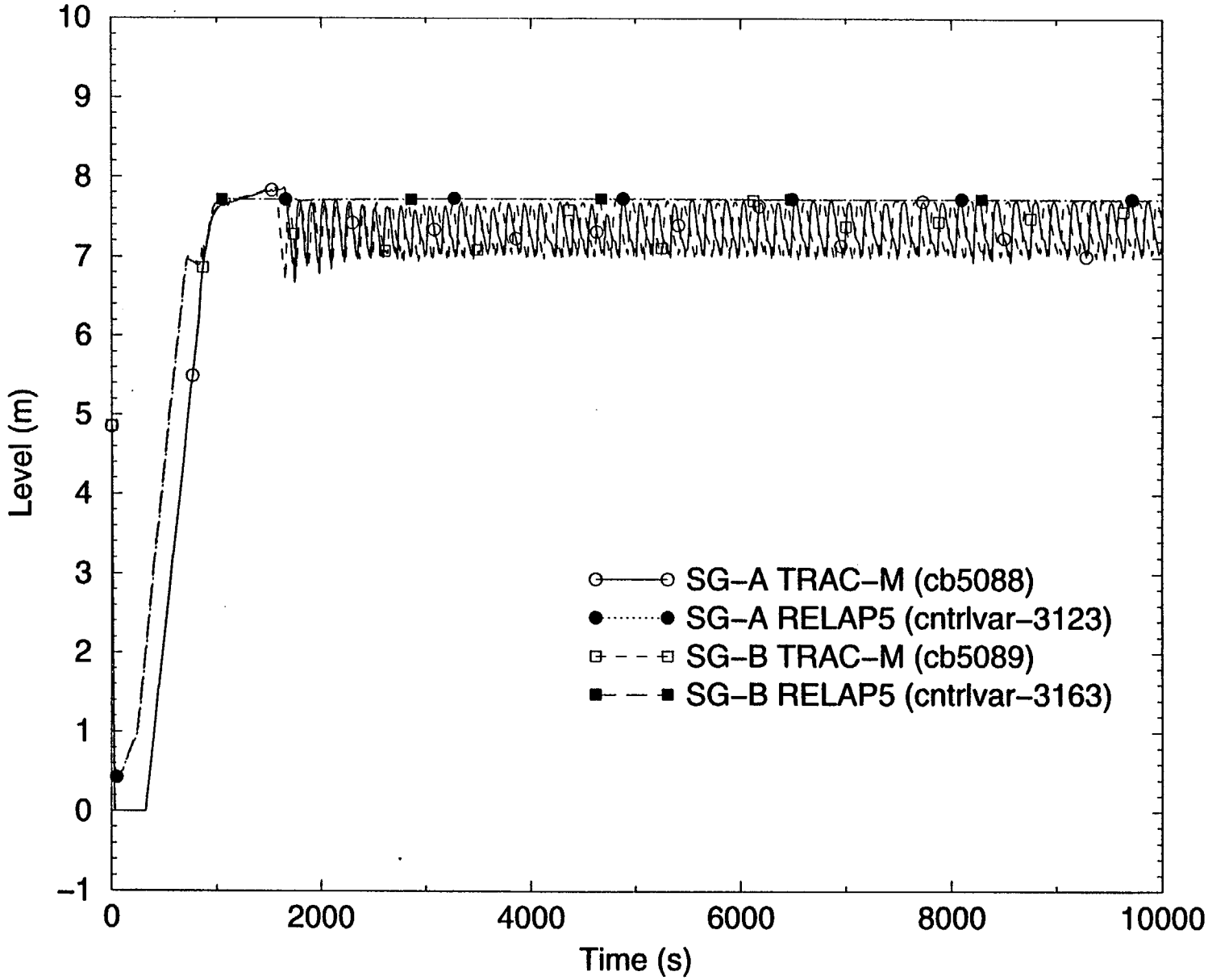


Figure 5.3.13A Total Emergency Feedwater Delivered

Calculated by TRACM and RELAP5 for SG Overfeed Scenario

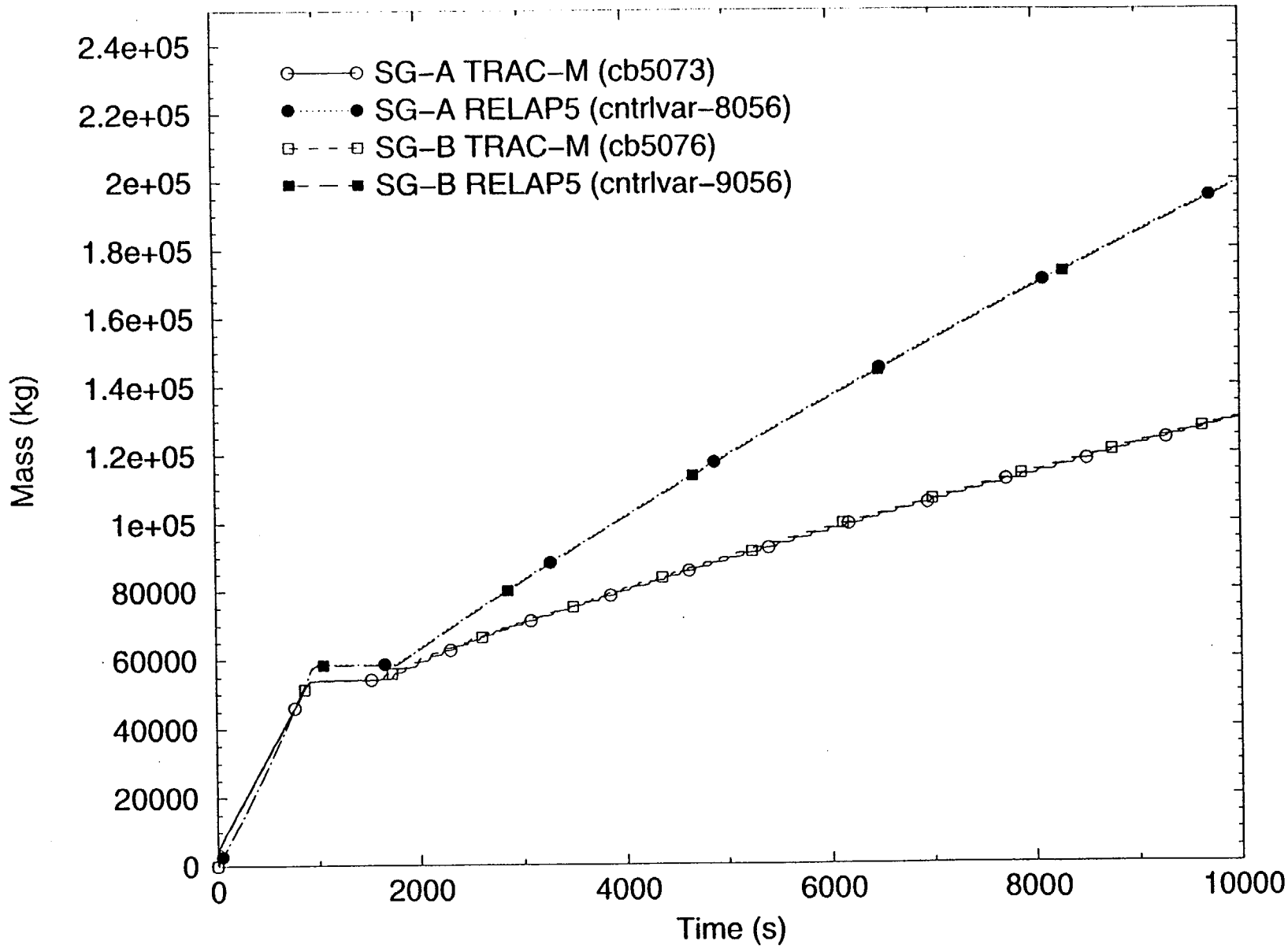


Figure 5.3.13B Integrated SG Exit Flow

Calculated by TRACM and RELAP5 for SG Overfeed Scenario

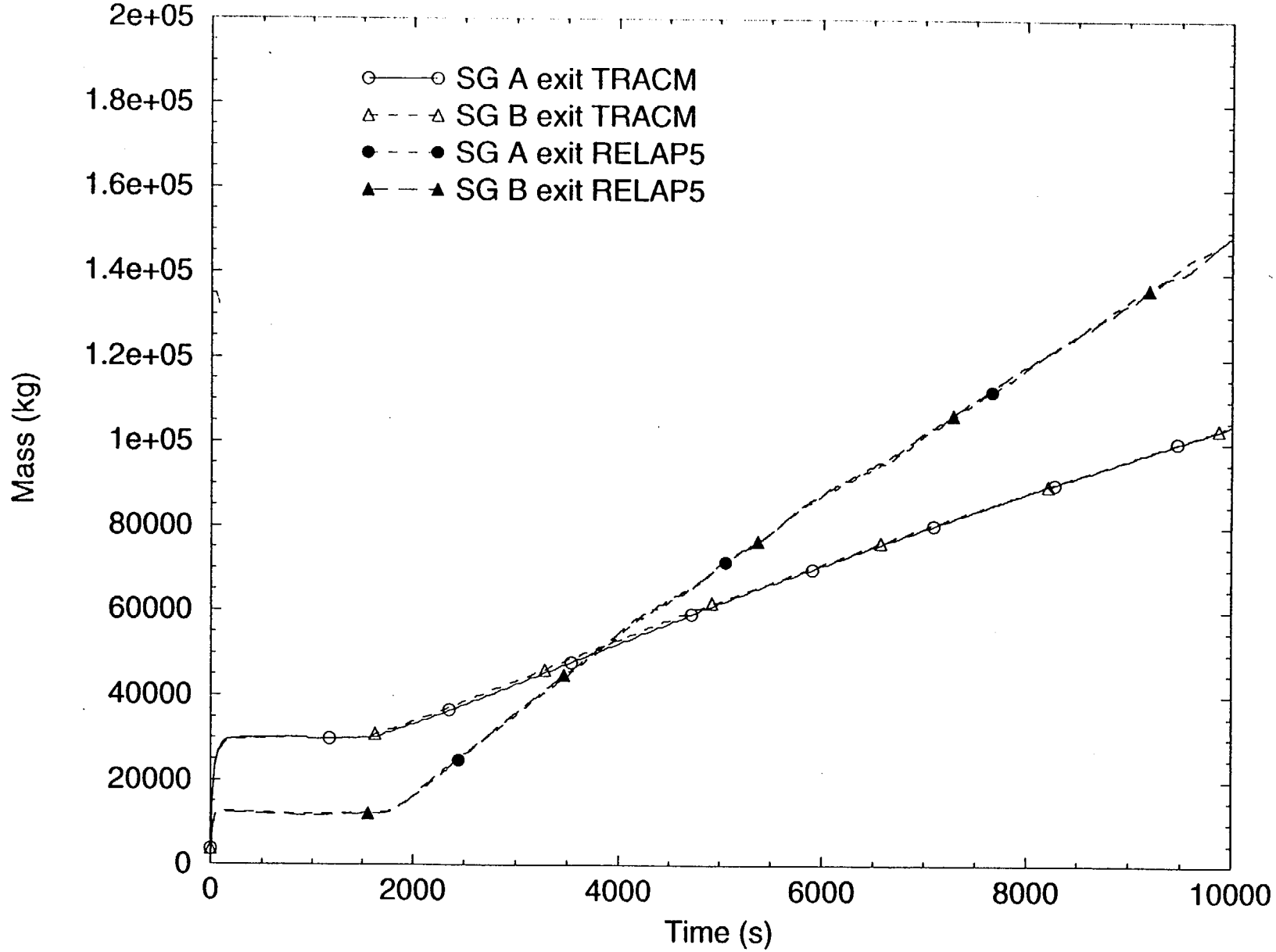


Figure 5.3.14 Minimum Downcomer Liquid Temperatures

Calculated by TRACM for Oconee SG Overfeed Scenario

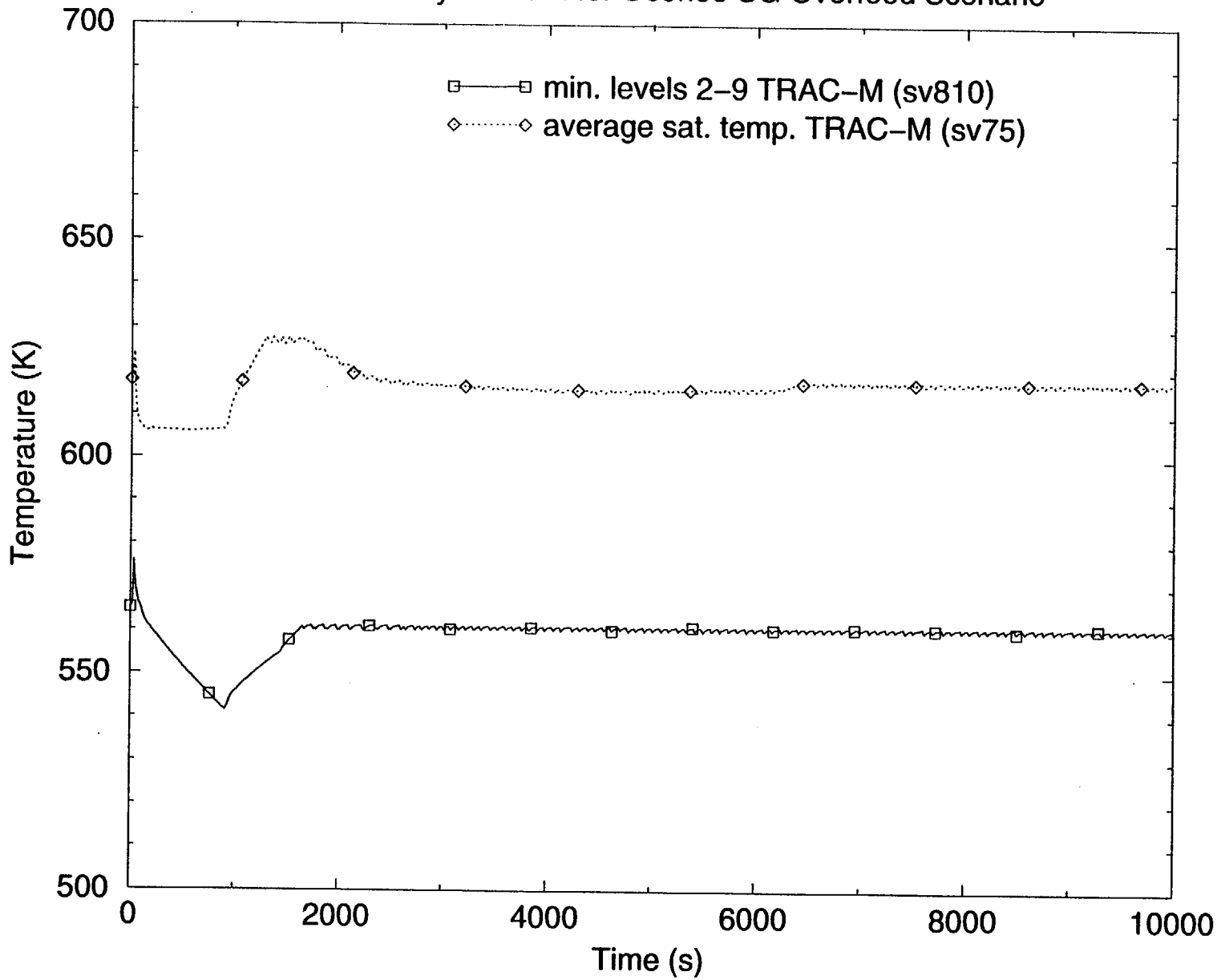


Figure 5.3.15 Downcomer Liquid Temperatures

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

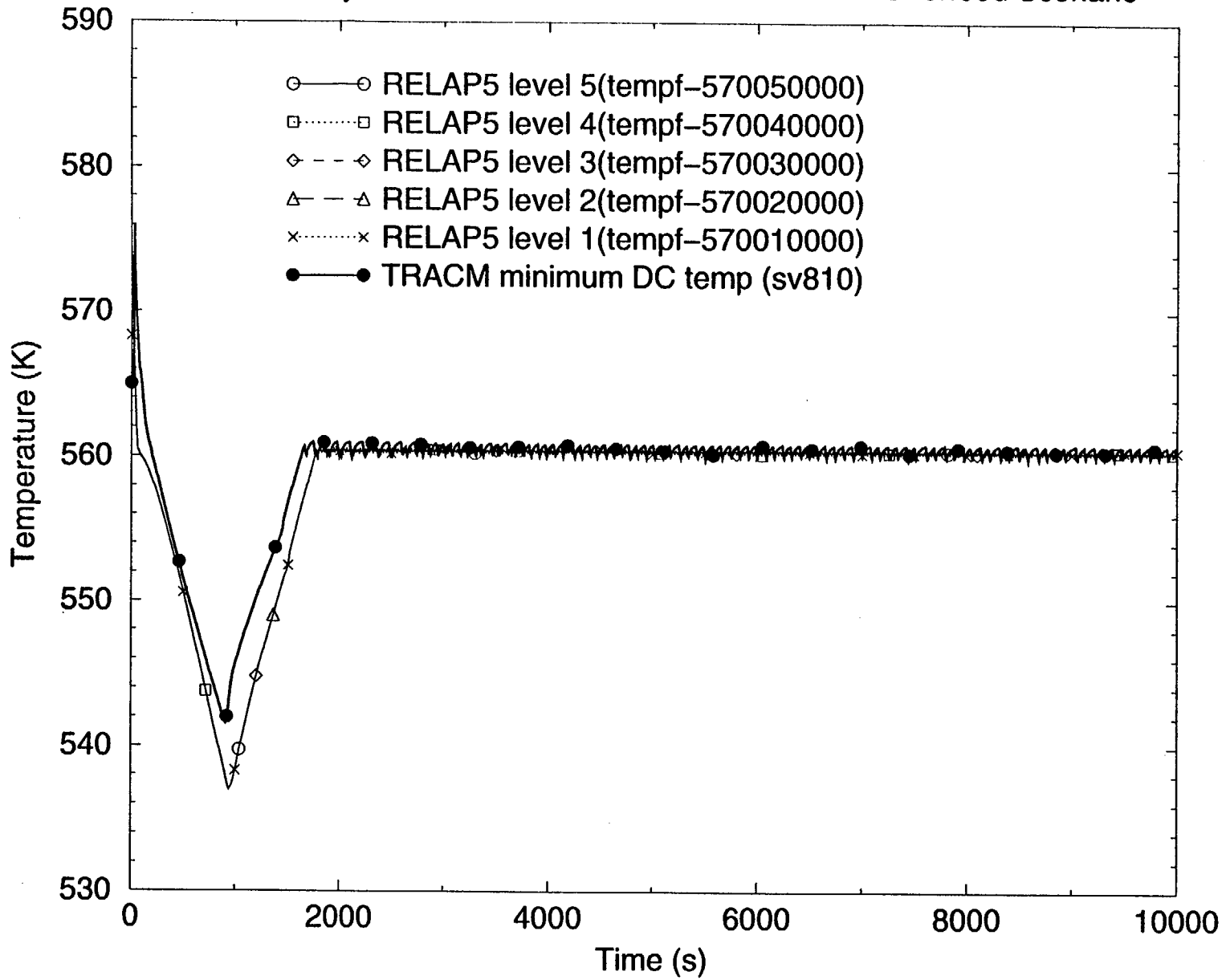


Figure 5.3.16 Heat Transf. Rates between SG Pri. and Sec. Sides

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

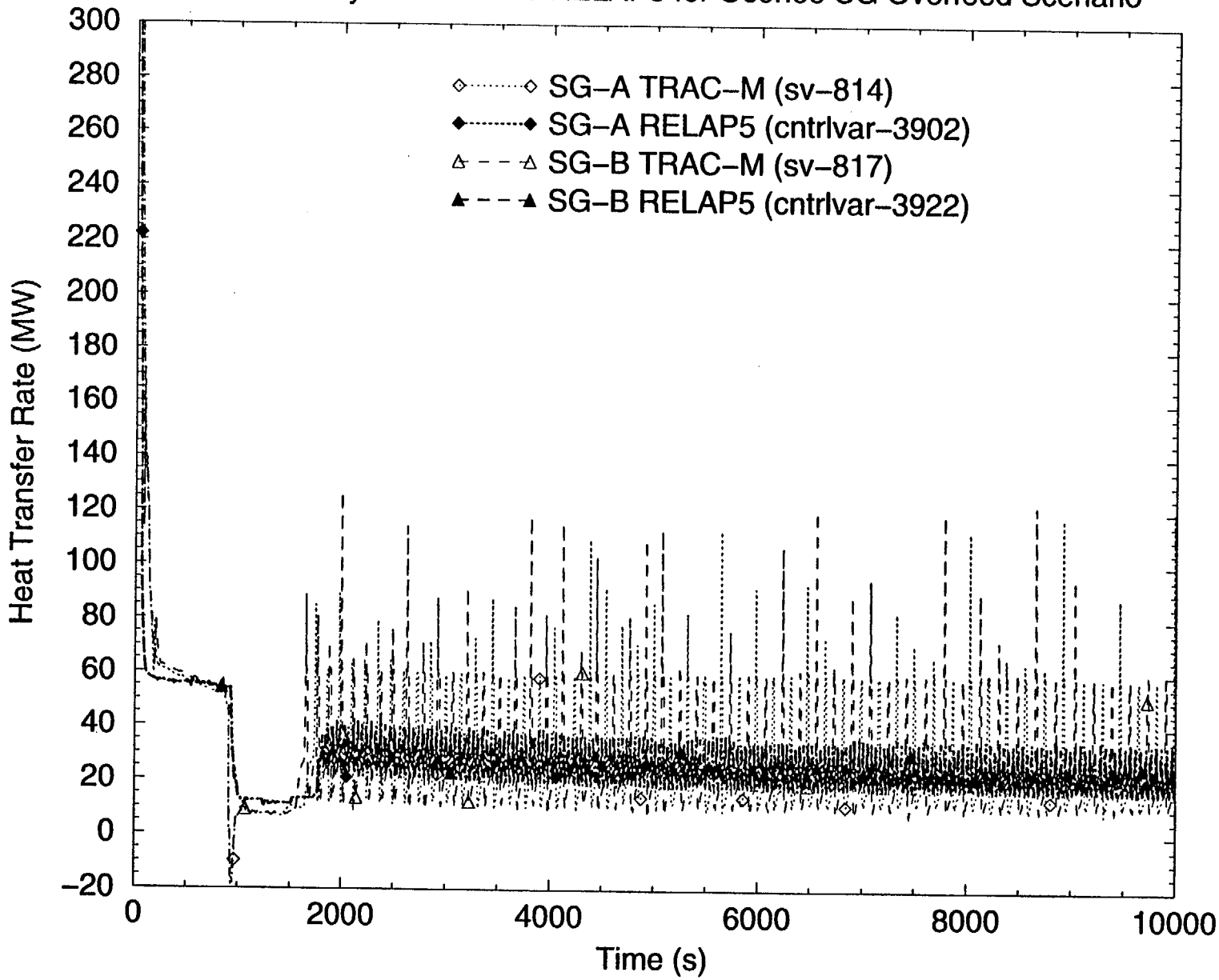


Figure 5.3.17 Secondary System Pressures

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

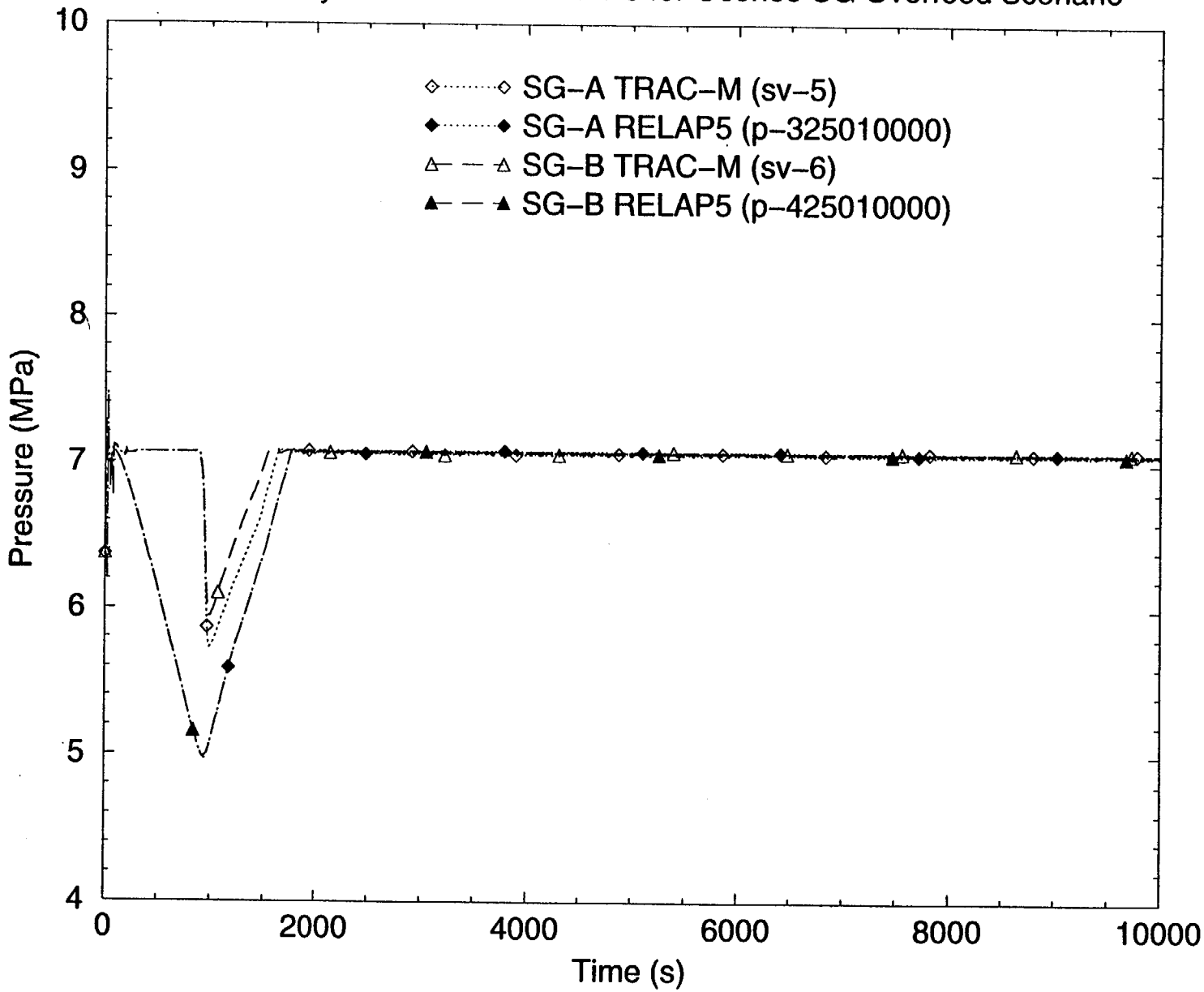


Figure 5.3.18 Downcomer Mid–Elevation Pressure

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

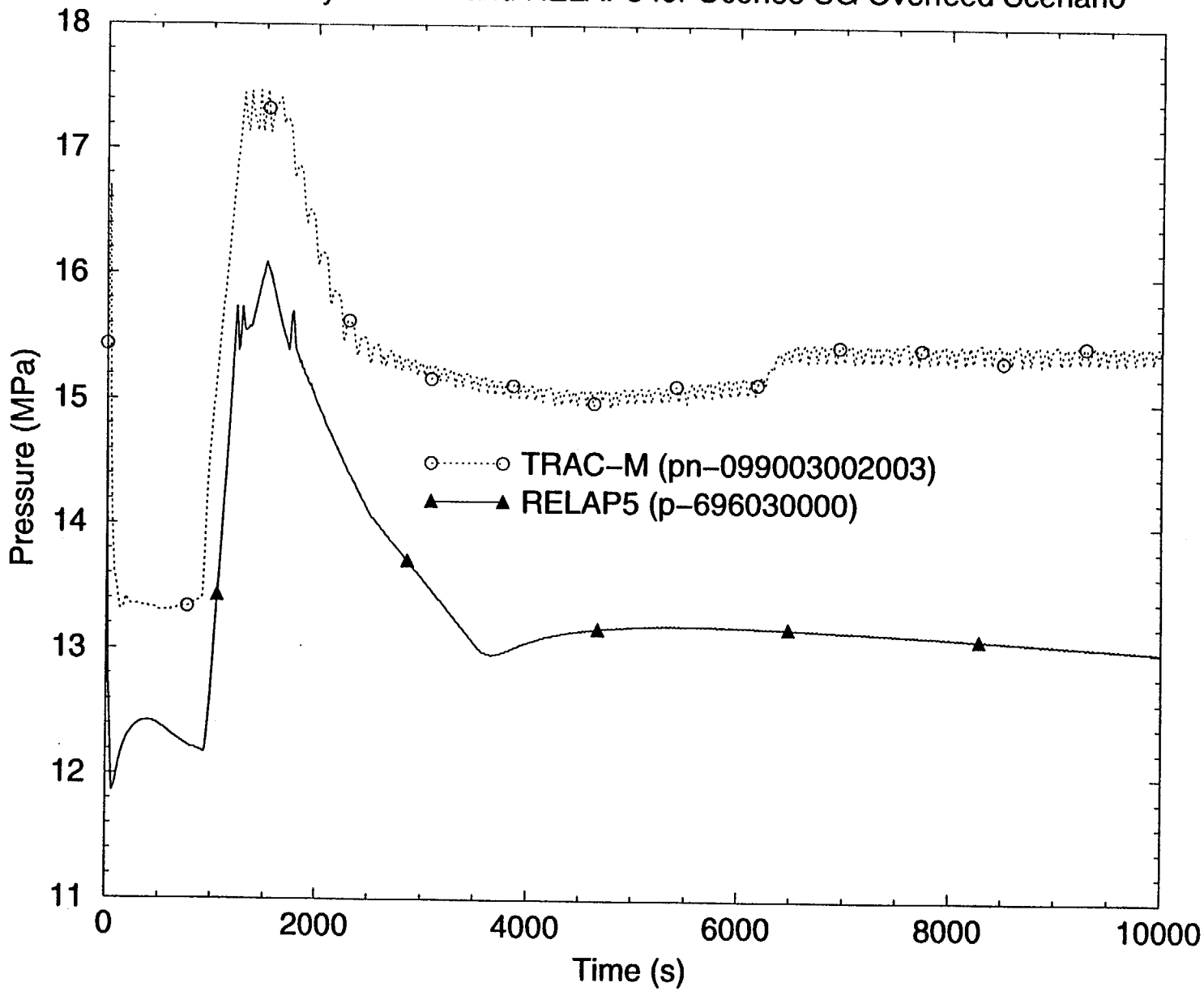


Figure 5.3.19 Min. and Max. DC Wall Heat Transfer Coefficients

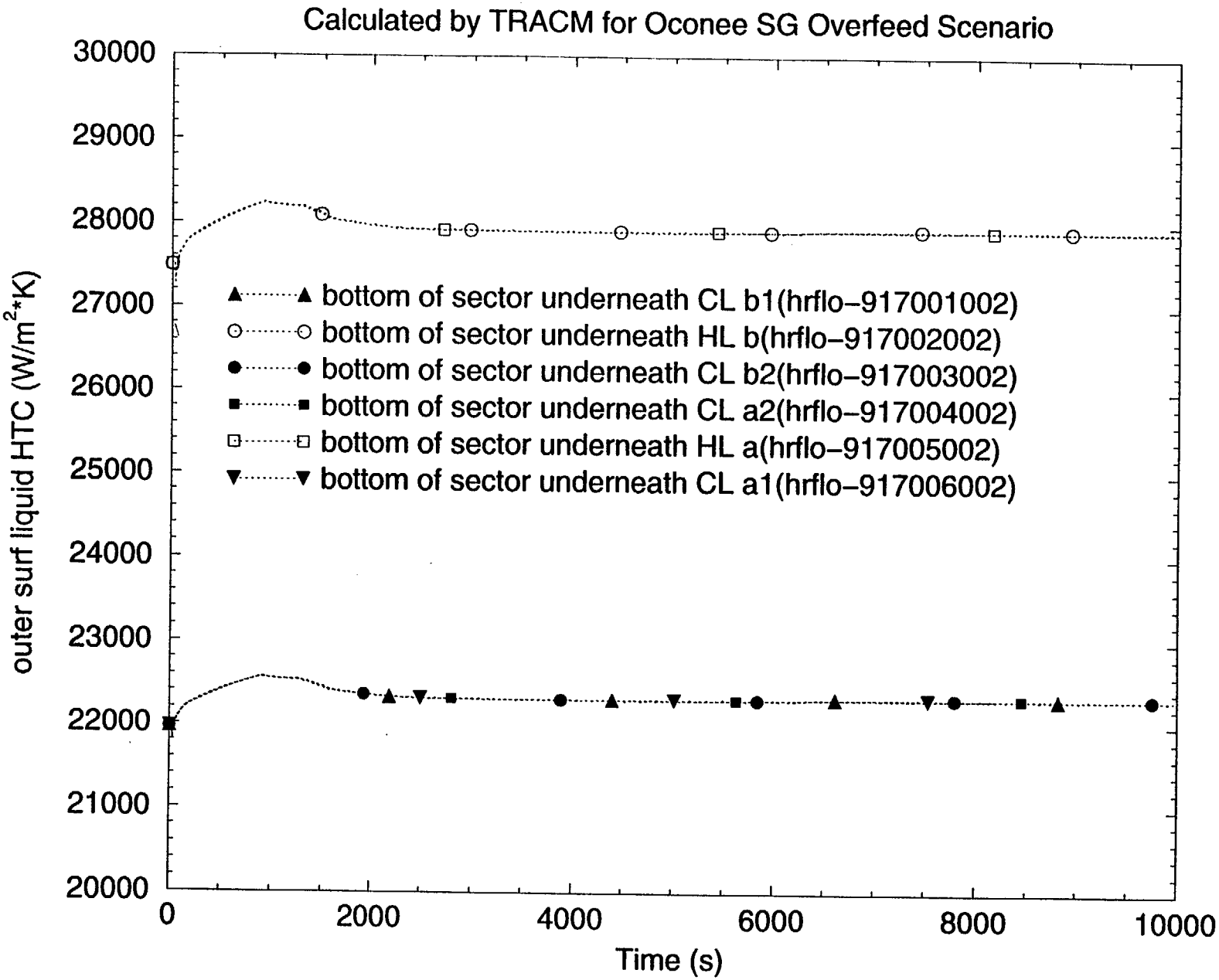


Figure 5.3.20 Min. and Max. DC Wall Heat Trans. Coeff.

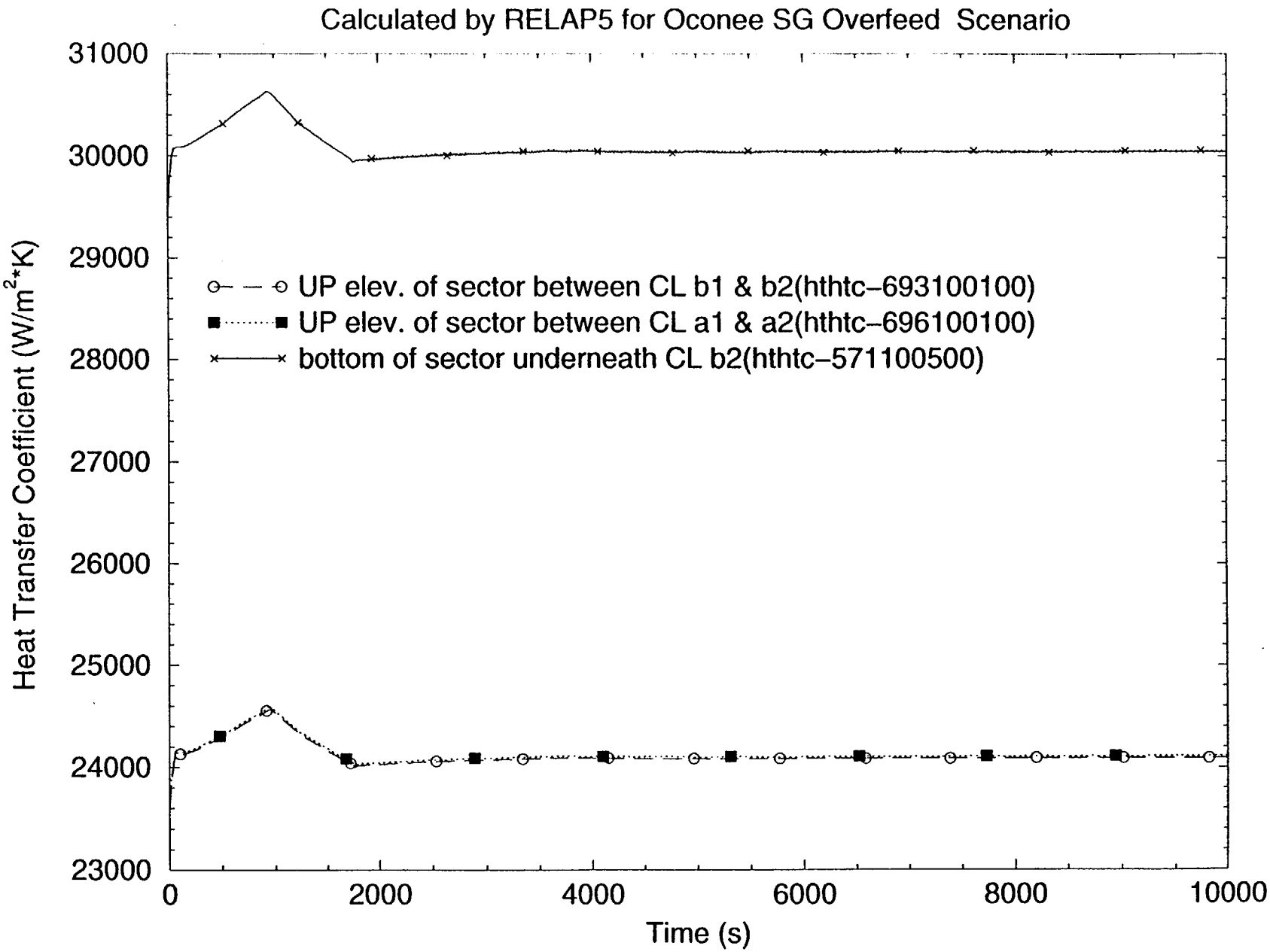


Figure 5.3.21 Loop A Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

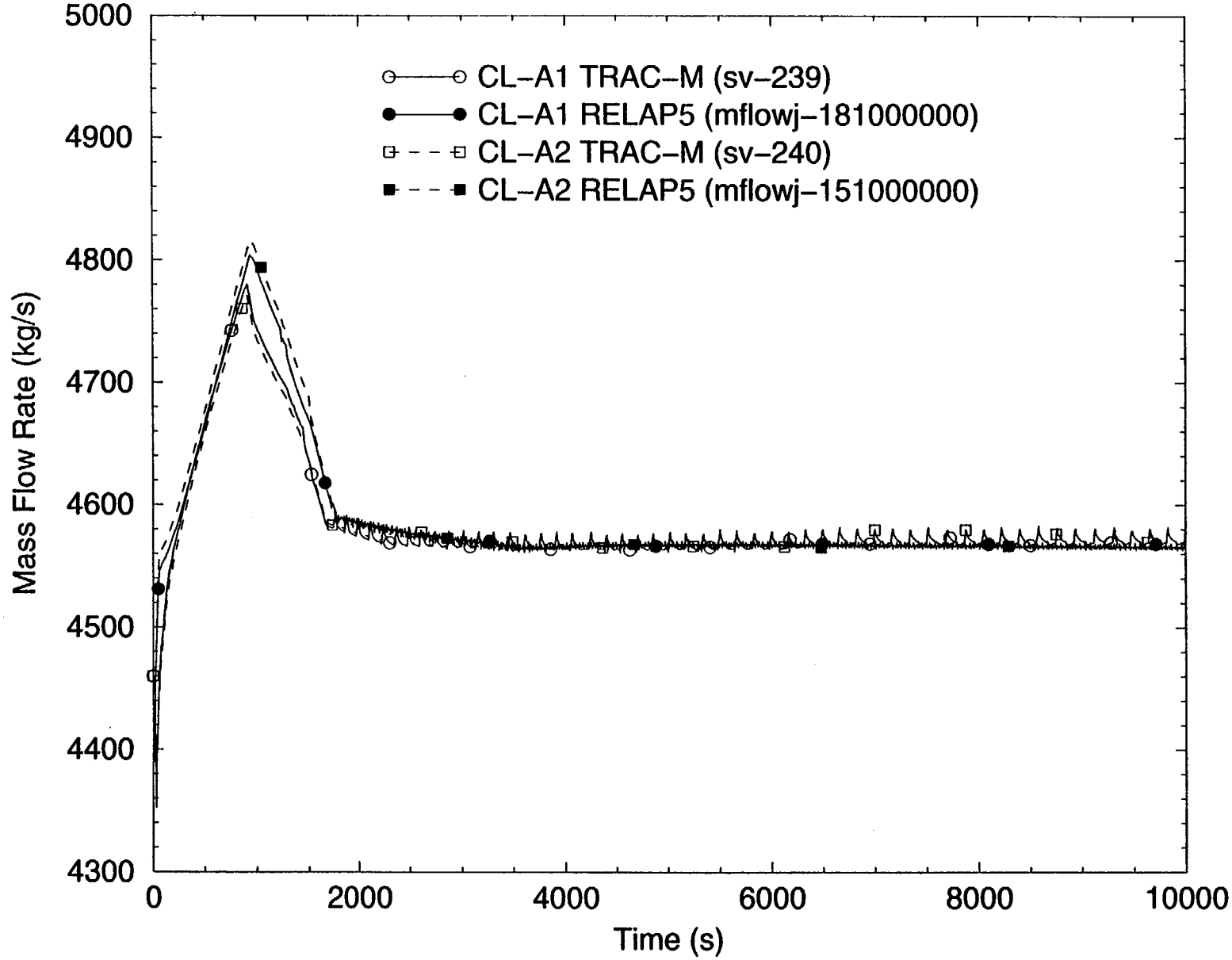


Figure 5.3.22 Loop B Cold Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

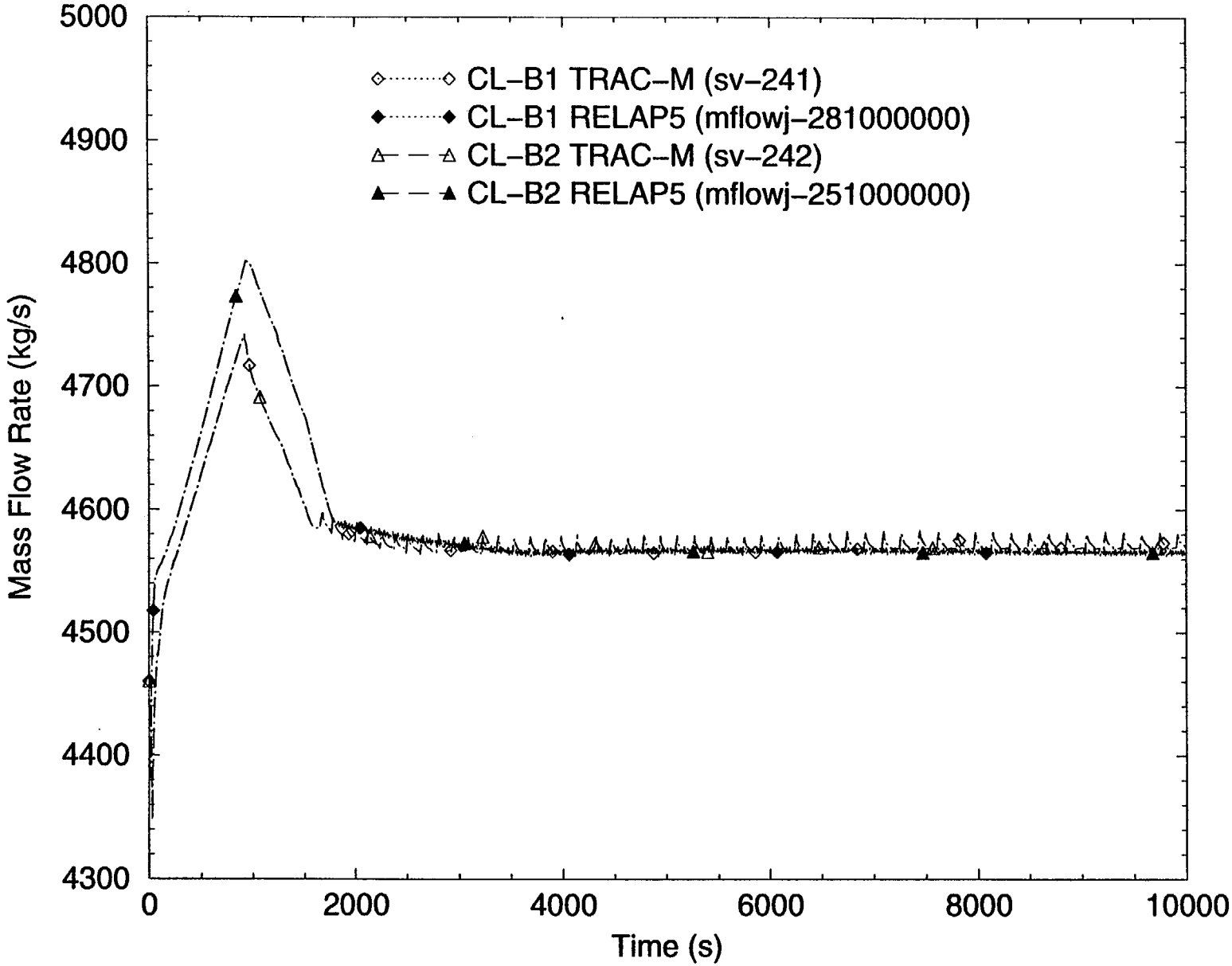


Figure 5.3.23 Hot Leg Mass Flow Rates

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario

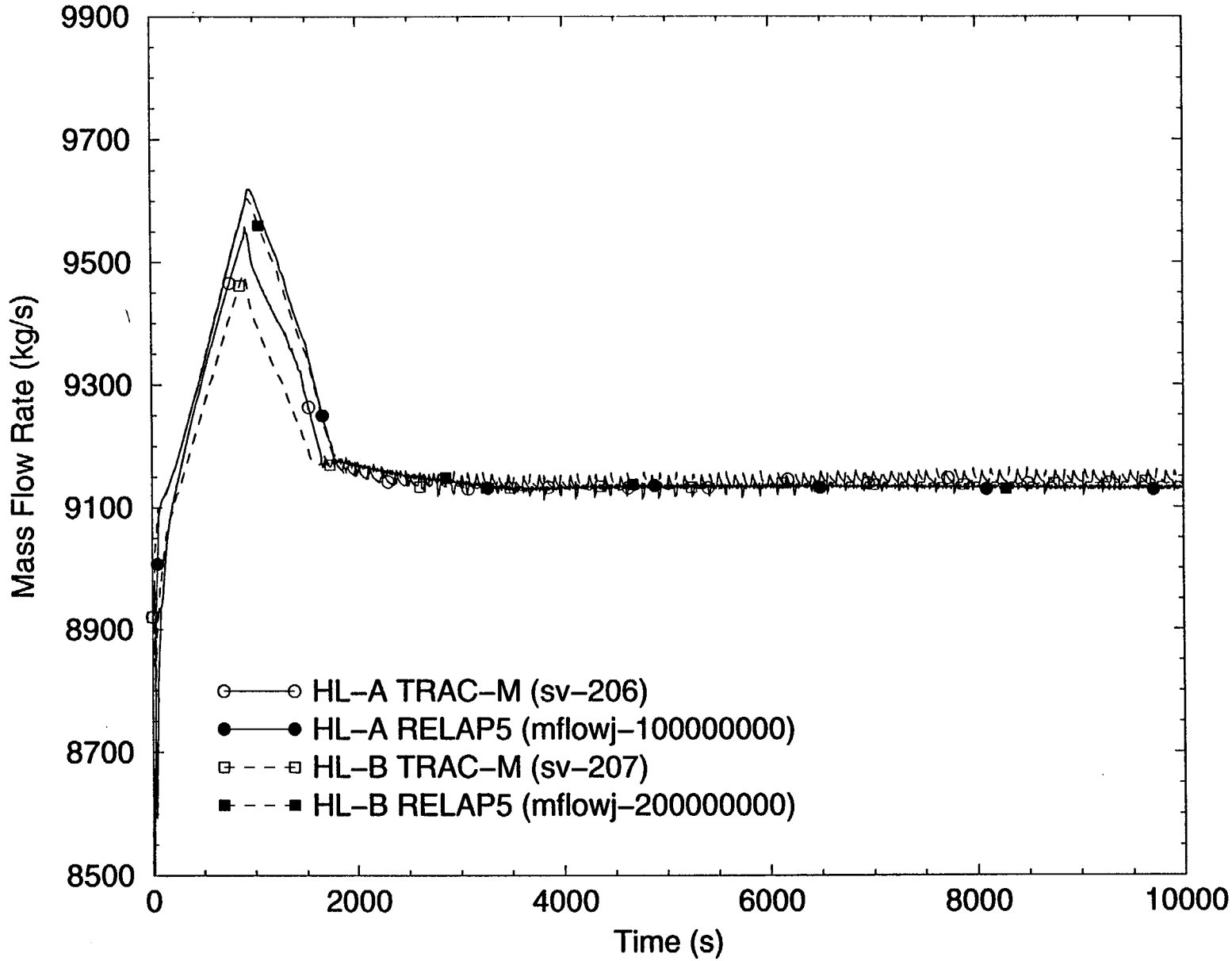


Figure 5.3.24 Cold Leg Temperatures

Calculated by TRACM for Oconee PTS SG Overfeed Scenario

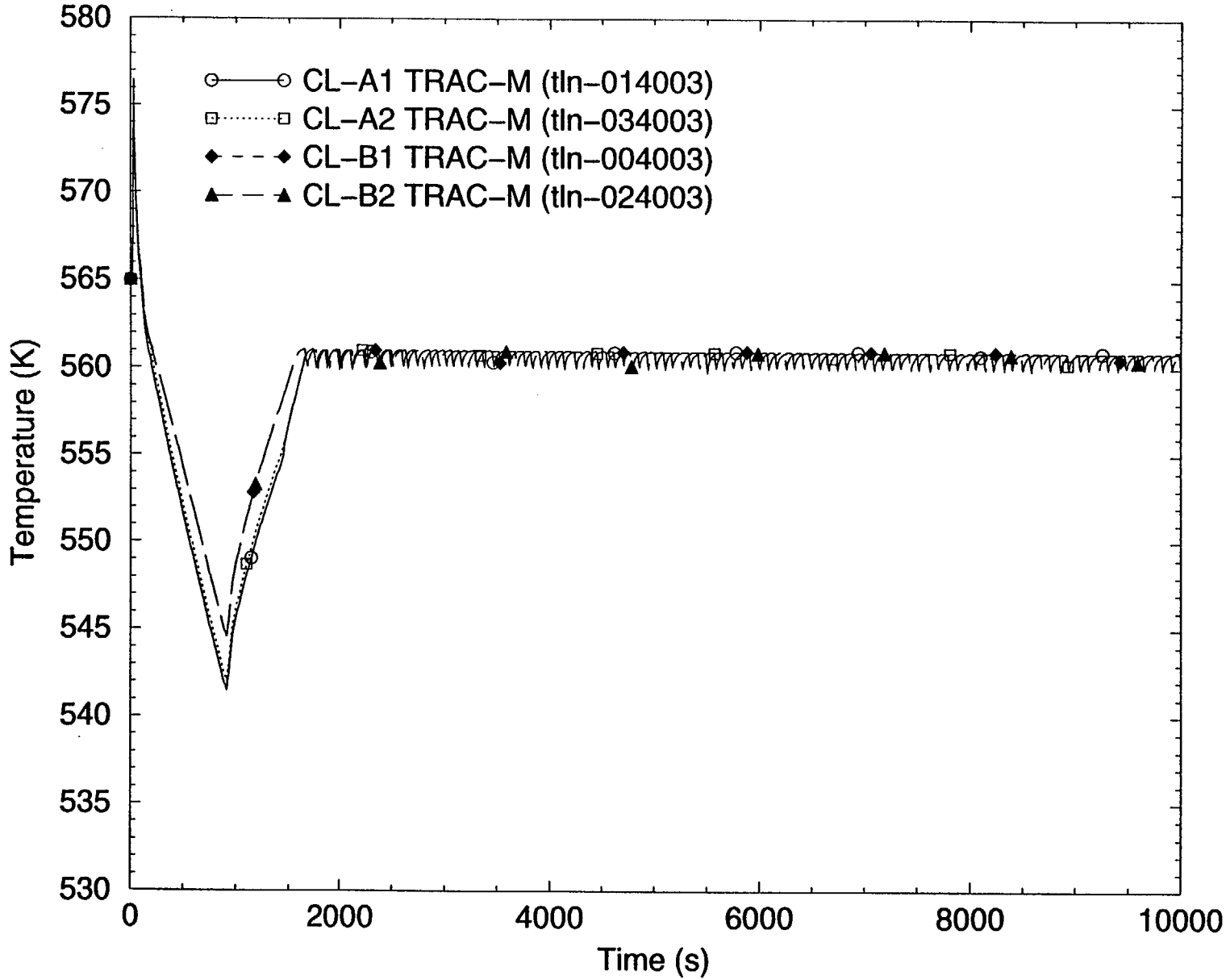


Figure 5.3.25 Cold Leg Temperatures

Calculated by RELAP5 for Oconee SG Overfeed Scenario

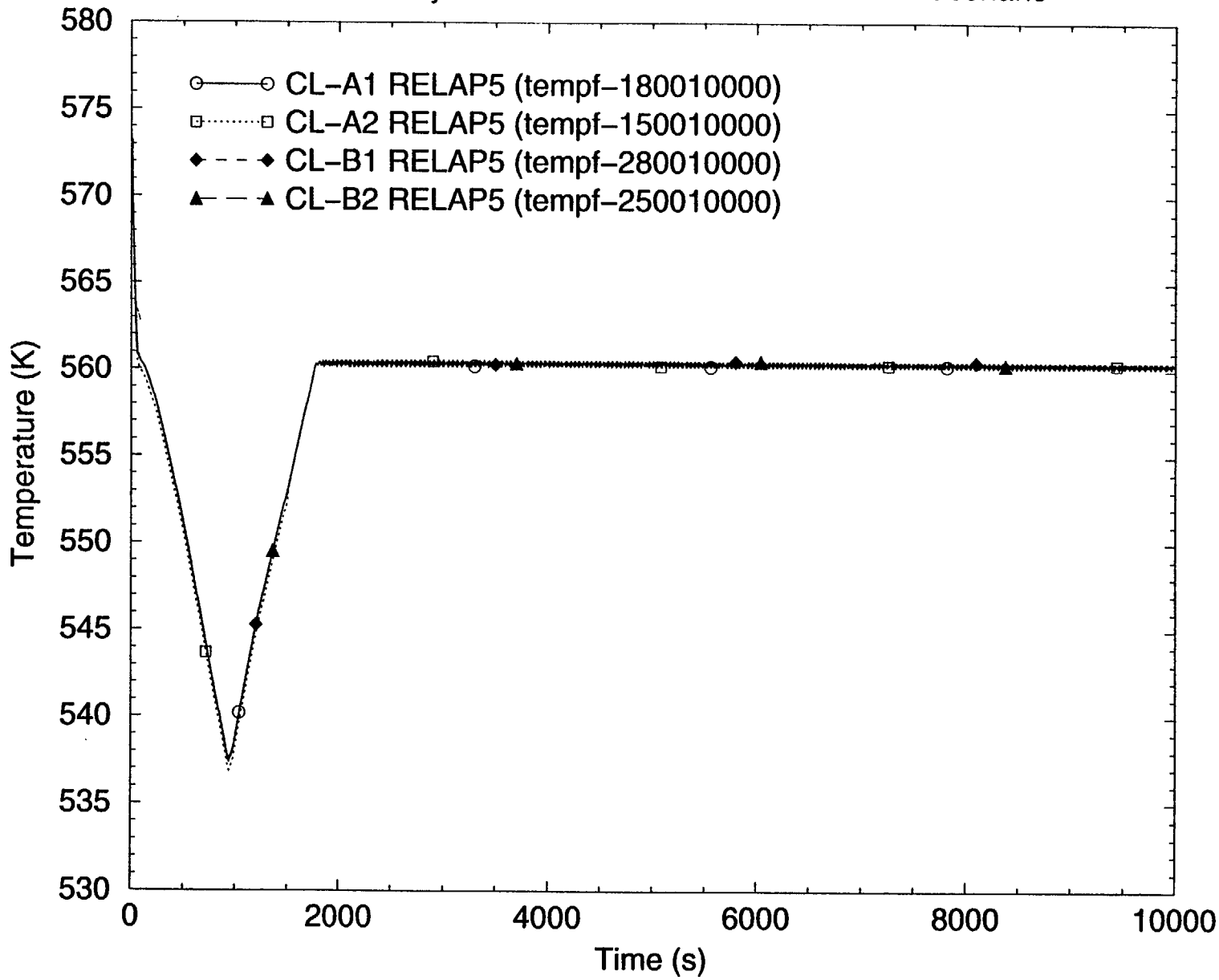
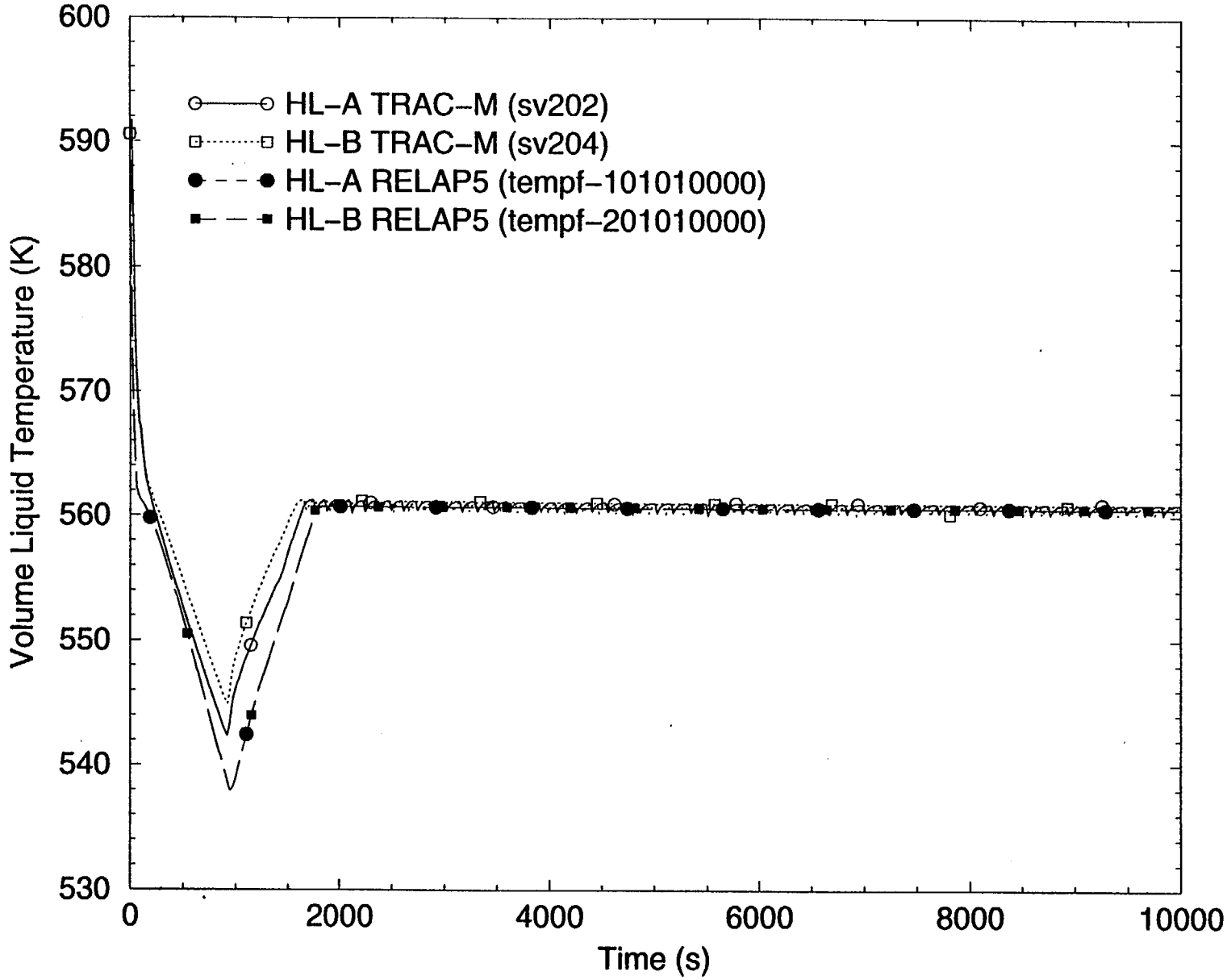


Figure 5.3.26 Hot Leg Temperatures

Calculated by TRACM and RELAP5 for Oconee SG Overfeed Scenario



6 SUMMARY OF FINDINGS

6.1 Pressurized Thermal Shock Concerns

Generally speaking, TRAC-M results are consistent with RELAP5 results for comparable scenarios. The four parameters of main PTS concerns are summarized in Table 6.1.1 which compares TRAC-M results with RELAP5 results. The table also indicates the major reasons why TRAC-M results are different from RELAP5 results. The RELAP5 Case 61 MSLB scenario results show much different minimum downcomer temperatures than the TRAC-M minimum downcomer temperatures since this scenario is quite different from the other MSLB scenario, in the sense that the operator's corrective action of isolating the broken loop SG is considered in Case 61 where as in the other MSLB scenario the operator's corrective action is not considered. Therefore, RELAP Case 61 should not be used for checking TRAC-M results.

Out of five scenarios listed in Table 6.1.1, only one MSLB scenario leads to the condition of the PTS concerns (i.e., high pressure and low temperature) based on TRAC-M calculations. The calculated pressure is 15.3 MPa (2219 psia) while the calculated minimum downcomer temperature is 380K which is less than the PTS threshold value of 422K (300 °F) for circumferential welds and 405K (270 °F) for forgings, axial welds, and plate materials which are stipulated in 10 CFR 50.61. However, it should be pointed out that this scenario has a very low probability of actual occurrence because the operator is expected to isolate the affected steam generator (i.e., terminate the emergency feedwater flow to minimize cooldown) as soon as a main steam line break is recognized. When the operator isolates the affected steam generator, the primary system cooldown would be minimal. For example, in RELAP5 Case 61, where the operator isolated the affected steam generator in 10 minutes, the cooldown was only about 10K (18 °F), and the minimum downcomer temperature was 557K (543 °F).

6.2 Code Performance

6.2.1 TRAC-M Version 3782

Based on calculation results obtained from four different scenarios (i.e., two scenarios on turbine bypass valve stuck open, one scenario on MSLB, and one scenario on overfeed to SGs), TRAC-M Version 3782 performance was reasonable.

Since the comparisons can only be made between TRAC-M and RELAP5 and not between TRAC-M and data, the code performance could not be checked against experimental values. However, there was no code output which would prompt a question on the validity of the code results.

In terms of robustness of the code, (i.e., the ability of moving forward in time without the calculation being terminated), TRAC-M requires a great deal of improvement. In performing calculations on MSLB and some stuck-open turbine bypass valves, the calculations were terminated many times because of inability of finding a converged numerical iterative solution, and the calculations had to be restarted with a smaller maximum time step size. The code should have an improved solution logic such that this time consuming manual restart would not be required.

For better efficiency of the code application, the TRAC-M input deck structure must be completely overhauled since it is very primitive and is much more difficult to use as compared to RELAP5. In addition, variable definitions must be overhauled since they are not consistent and non-intuitive in many cases and are not conforming to the standard engineering nomenclature in many cases.

Table 6.1.1 Comparisons Between TRAC-M and RELAP5 Results for Selected Pressurized Thermal Shock Thermal-Hydraulic Calculations

		Minimum T liquid in downcomer K	Time of minimum T liquid Seconds	P in DC @ minimum T liquid MPa	Minimum h in downcomer @ minimum T liquid W/M**2-K	Maximum h in downcomer @ minimum T liquid W/M**2-K	Main Reasons of Discrepancy Between TRAC-M and RELAP5
1. Turbine Bypass Valve Stuck Open	TRAC-M (Case 1)	474	9,300	3.5	22,100	28,000	HPI throttling logic (not including Pzr level check) was applied in TRAC-M while it was not in RELAP5. In TRAC-M case, a minimum of 50 °F subcooling and other HPI throttling criteria, as described by Oconee, were applied for HPI throttling.
	RELAP5 (Case 35)	473	9,630	11.1	24,500	30,400	
	TRAC-M (Case 2)	472	10,000	15.4	22,100	28,000	HPI not throttled if Pzr level < 10 ft. HPI flow increased the system P to above 11.1 MPa, HPI actuation point, after about 500 seconds. Case 1 and 2 TRAC-M results were close except P which didn't affect minimum T much.
2. Main Steam Line Break	TRAC-M	380	9,030	15.3	18,000	23,700	HPI throttling logic was applied in TRAC-M while not in RELAP5. Other comments same as above in No. 1. Steam line break flow in RELAP5 Case 27 was much higher than that in RELAP5 Case 61, and thus more cooling in Case 27.
	RELAP5 (Case 27)	380	8,300	1.5	20,000	25,300	
	RELAP5 (Case 61)	557	465	13.9	24,000	30,100	HPI actuated in TRAC-M while not in RELAP5 because of a lower P due to a higher steam line break flow in TRAC-M. HPI flow and a continuous EFW flow to SG "A" caused a steady decrease in T in TRAC-M while not in RELAP5 which terminated EFW flow to SG "A" after 10 minutes although EFW flow to SG "B" continued.
3. SG Overfeed to 96 percent	TRAC-M	542	910	13.4	22,600	28,200	Correct implementation of SG safety valves in TRAC-M. In both TRAC-M and RELAP5, turbine bypass valves were modulating to control the steam line pressure. Decay power in TRAC-M was about 3 percent higher than in RELAP5.
	RELAP5 (Case 19)	537	940	12.2	24,500	30,600	

6.2.2 RELAP5 MOD 3.2.2 Gamma

All RELAP5 calculations were performed by ISL., and thus the author does not have the first hand knowledge on the robustness and the efficiency of the code performance. However, the author was informed that RELAP5 completed calculations in real time or faster in many cases. In terms of the validity of the RELAP5 results, all seemed to be reasonable. There was no output which would prompt a question on the validity of the results.

7 CONCLUSIONS

Based on the calculation results obtained from four PTS scenarios, TRAC-M V3782 results support the results obtained from RELAP5 Mod 3.2.2 Gamma calculations. TRAC-M results of a MSLB scenario show that the minimum downcomer temperature would fall below the PTS screening criteria if the corrective action of the operator in isolating the broken loop SG is not considered. However, if the corrective action is considered, the cooldown is insignificant, and the PUT concerns will not arise.

8 REFERENCES

1. Lime, James F. and Steiner, James L., "An Updated Oconee Plant Model for Pressurized Thermal Shock Analyses," LA-CP-01-96, March 2001.

2. Arcieri, W.C., et al., "RELAP5 Thermal Hydraulic Analysis to Support PTS Evaluations for the Oconee-1 Nuclear Power Plant," Draft NUREG/CR Report, 2001.

3. Swindlehurst, Gregg B., "Responses to 13 NRC Questions Dated 2/24/2000 (Oconee PTS)," e-mail, April 2, 2000.

APPENDIX A

TRAC-M Version 3782 Input Listing for a Steady State Calculation of the Oconee Unit 1 Plant

```
free format
*
* This TRAC-M Oconee Unit 1 steady state input deck (Revision 14) was developed
by modifying LANL's Revision 13 deck to change HPI throttling logic so that HPI
won't be throttled if Pzr. liquid level is below 3.048 m (120 inch.). gsr 8/19/0
1.
*
* LANL developed Revision 13 Oconee Unit 1 steady state input deck to perform a
series of PTS (Pressurized Thermal Shock) calculations in 2001.
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
            1             0              1             0
Oconee-1 Full-Power PTS Steady-State Plant Model
*
*****************
* namelist data *
*****************
*
 &inopts
  icflow=2, nhtstr=33, noair=0, imfr=3,
  nlt=11, ipowr=-1, tpowr=3.5,
 &end
*
*        dstep          timet
             0     0.0000E+00
*       stdyst          transi          ncomp          njun          ipak
             2               0            141           126             1
*         epso           epss
    1.0000E-03     1.0000E-04
*       oitmax          sitmax         isolut        ncontr
            10              10              0             4
*         ntsv           ntcb          ntcf          ntrp          ntcp
           284            936         64524            42             0
*
*************************
* component-number data *
*************************
*
* iorder array *
* pipe   *     1 s   * loop b hot leg candy cane
* pipe   *     2 s   * sg-b primary tube bundle
* pump   *     3 s   * loop b1 pump (intact leg)
* tee    *     4 s   * loop b1 intact cold leg
* tee    *     6 s   * loop b upper head tee
* fill   *     9 s   * loop b1 hpis
* tee    *    11 s   * loop a hot leg candy cane
* pipe   *    12 s   * sg-a primary tube bundle
* pump   *    13 s   * loop a1 pump (intact leg)
* tee    *    14 s   * loop a1 intact cold leg
* tee    *    16 s   * loop a upper head tee
* fill   *    18 s   * makeup/letdown flow
* fill   *    19 s   * loop a1 hpis
* tee    *    20 s   * hpi/makeup-letdown header
* prizer *    22 s   * pressurizer
* pump   *    23 s   * loop b2 pump
* tee    *    24 s   * loop b2 intact cold leg
* valve  *    25 s   * pressurizer porv
* break  *    26 s   * porv boundary
* pump   *    33 s   * loop a2 pump (break leg)
* tee    *    34 s   * loop a2 intact cold leg
* fill   *    39 s   * loop a2 hpis
* fill   *    59 s   * loop b2 hpis
* tee    *    63 s   * loop b loop seals
* tee    *    73 s   * loop a loop seals
* tee    *    78 s   * lpis b header
* fill   *    79 s   * lpis b
* valve  *    80 s   * accum valve on loop b side
* pipe   *    81 s   * accumulator b
* fill   *    82 s   * accumulator b zero-flow boundary
```



```
* tee    *    88 s   * lpis a header
* fill   *    89 s   * lpis a
* valve  *    90 s   * accum valve on loop a side
* pipe   *    91 s   * accumulator a
* fill   *    92 s   * accumulator a zero-flow boundary
* vessel *    99 s   * vessel
* tee    *   121 s   * sg-a boiler region
* tee    *   122 s   * sg-a upper boiler region
* tee    *   123 s   * sg-a downcomer region
* pipe   *   124 s   * sg-a steam exit
* valve  *   148 s   * sg a fw switchover valve
* valve  *   150 s   * sg a efw line check valve
* tee    *   152 s   * sg a efw inlet line
* tee    *   154 s   * sg a efw header
* fill   *   156 s   * sg a md efw
* fill   *   158 s   * sg a td efw
* tee    *   201 s   * sg-b boiler region
* tee    *   202 s   * sg-b upper boiler region
* tee    *   203 s   * sg-b downcomer region
* pipe   *   204 s   * sg-b steam exit
* valve  *   248 s   * sg b fw switchover valve
* valve  *   250 s   * sg b efw line check valve
* tee    *   252 s   * sg b efw inlet line
* tee    *   254 s   * sg b efw header
* fill   *   256 s   * sg b md efw
* fill   *   258 s   * sg b td efw
* tee    *   345 s   * sg-a steam line with srv
* tee    *   350 s   * sg-a steam line with tbv
* valve  *   355 s   * sg-a turbine stop valve
* break  *   360 s   * sg-a steam line pressure boundary
* valve  *   365 s   * sg-a steam line srv
* break  *   367 s   * sg-a srv boundary
* valve  *   370 s   * sg-a steam line tbv
* break  *   372 s   * sg-a tbv boundary
* tee    *   445 s   * sg-b steam line with srv
* tee    *   450 s   * sg-b steam line with tbv
* valve  *   455 s   * sg-b turbine stop valve
* break  *   460 s   * sg-b steam line pressure boundary
* valve  *   465 s   * sg-b steam line srv
* break  *   467 s   * sg-b srv boundary
* valve  *   470 s   * sg-b steam line tbv
* break  *   472 s   * sg-b tbv boundary
* pipe   *   501 s   * core bypass pipe 1
* pipe   *   502 s   * core bypass pipe 2
* pipe   *   503 s   * core bypass pipe 3
* pipe   *   504 s   * core bypass pipe 4
* pipe   *   505 s   * core bypass pipe 5
* pipe   *   506 s   * core bypass pipe 6
* break  *   730 s   * condenser hotwell boundary
* pump   *   734 s   * hotwell pump
* pipe   *   736 s   * demineralization system
* pump   *   738 s   * booster pump
* pipe   *   740 s   * feedwater line to lp heaters
* fill   *   742 s   * cond.drain to lp d heater
* tee    *   746 s   * feedwater lp d heater
* fill   *   748 s   * cond.drain to lp c heater
* tee    *   750 s   * feedwater lp c heater
* tee    *   752 s   * feedwater pump inlet header
* pump   *   754 s   * mfw a pump
* valve  *   756 s   * mfw a pump check valve
* pump   *   760 s   * mfw b pump
* valve  *   761 s   * mfw b pump check valve
* plenum *   763 s   * feedwater pump outlet header
* pipe   *   764 s   * a & b hp heater pipe 1
* pipe   *   766 s   * a & b hp heater pipe 2
* plenum *   768 s   * hp heater outlet header
* valve  *   770 s   * sg a mfw control valve
* valve  *   772 s   * sg a mfw startup valve
* valve  *   774 s   * sg b mfw control valve
* valve  *   776 s   * sg b mfw startup valve
* plenum *   780 s   * fw-a cv header
* plenum *   782 s   * fw-b cv header
* valve  *   784 s   * fw-a isolation valve
```

```
143  * valve   *   786 s   * fw-b isolation valve
144  * pipe    *   788 s   * sg a feedwater inlet line
145  * valve   *   789 s   * sg a feedwater line check valve
146  * pipe    *   790 s   * sb b feedwater inlet line
147  * valve   *   791 s   * sb b feedwater line check valve
148  * rod     *   900 s   * reactor-core fuel rods
149  * slab    *   910 s   * vessel level 1, cells 1-6
150  * slab    *   911 s   * vessel level 2, cells 1-6
151  * slab    *   912 s   * vessel levels 3-4, cells 1-6
152  * slab    *   913 s   * vessel level 5, cells 1-6
153  * slab    *   914 s   * vessel levels 6-9, cells 1-6
154  * slab    *   915 s   * vessel level 10, cells 1-6
155  * slab    *   916 s   * vessel level 1, cells 7-12
156  * slab    *   917 s   * vessel levels 2-5, cells 7-12
157  * slab    *   918 s   * vessel levels 6-9, cells 7-12
158  * slab    *   919 s   * vessel level 10, cells 7-12
159  * rod     *   930 s   * sg-a tube bundle hs
160  * slab    *   931 s   * sg-a outlet plenum hs
161  * slab    *   932 s   * sg-a inlet plenum hs
162  * rod     *   933 s   * sg-a lower outer shell hs
163  * rod     *   934 s   * sg-a upper outer shell hs
164  * rod     *   940 s   * sg-b tube bundle hs
165  * slab    *   941 s   * sg-b outlet plenum hs
166  * slab    *   942 s   * sg-b inlet plenum hs
167  * rod     *   943 s   * sg-b lower outer shell hs
168  * rod     *   944 s   * sg-b upper outer shell hs
169  * rod     *   950 s   * c736 pipe wall, cells 1-10
170  * rod     *   951 s   * c736 power, cells 11-20
171  * rod     *   952 s   * lp f heater power
172  * rod     *   953 s   * lp e heater power
173  * rod     *   954 s   * lp d heater power
174  * rod     *   955 s   * lp c heater power
175  * rod     *   956 s   * hp heater a-1 power
176  * rod     *   957 s   * hp heater b-1 power
177  * rod     *   958 s   * hp heater a-2 power
178  * rod     *   959 s   * hp heater b-2 power
179  * rod     *   960 s   * c788 pipe wall
180  * rod     *   961 e   * c790 pipe wall
181  *
182  * constrained steady-state data
183  * numcss      amncss      maxcss      nmpcss      napcss
184      3         0.0         200.0       -1          0
185     13         0.0         200.0       -1          0
186     23         0.0         200.0       -1          0
187     33         0.0         200.0       -1          0
188  *
189  **************************
190  * control-parameter data *
191  **************************
192  *
193  *
194  ************************************************************************
195  *                                                                      *
196  *                          SIGNAL VARIABLE DATA                        *
197  *                                                                      *
198  ************************************************************************
199  *
200  * idsv   isvn    ilcn    icn1    icn2
201    1      0       0       0       0       * time
202    2      21      22      1       0       * prizer pressure
203    3      20      203     11      1       * loop b sg downcomer level
204    4      20      123     11      1       * loop a sg downcomer level
205    5      21      124     6       0       * sg-a steam outlet pressure
206    6      21      204     6       0       * sg-b steam outlet pressure
207    7      21      14      1       0       * a1 cold leg pressure for hpi
208    8      21      34      1       0       * a2 cold leg pressure for hpi
209    9      21      4       1       0       * b1 cold leg pressure for hpi
210    10     21      24      1       0       * b2 cold leg pressure for hpi
211    11     -21     80      3       4       * loop b side accum check valve delta-p
212    12     -21     90      3       4       * loop a side accum check valve delta-p
213     21     69      9      1        0      * hpi b1 mass flow
214     22     69      19     1        0      * hpi a1 mass flow
215     23     69      39     1        0      * hpi a2 mass flow
```



```
216     24     69      59      1       0       * hpi b2 mass flow
217     25     69      80      4       0       * accumulator b mass flow
218     26     69      90      4       0       * accumulator a mass flow
219     27     20      22      4       1       * pressurizer liquid level
220     28     20      81      4       1       * accumulator b liquid level
221     29     20      91      4       1       * accumulator a liquid level
222     30     69      89      1       0       * lpsi mass flow
223     31     56      13      0       0       * dummy sv for break flow
224  * placeholder for break mass flow signal variable
225  * replace above signal variable in loca transients
226  * with signal variable below.
227  *   31     69      31      1       0        / break mass flow
228     32     76      14      3       1       * cold leg a1 mixture density
229     33     76      34      3       1       * cold leg a2 mixture density
230     34     76      4       3       1       * cold leg b1 mixutre density
231     35     76      24      3       1       * cold leg b2 mixture density
232     36     27      14      1       0       * cold leg a1 void fraction
233     37     27      34      1       0       * cold leg a2 void fraction
234     38     27      4       1       0       * cold leg b1 void fraction
235     39     27      24      1       0       * cold leg b2 void fraction
236     40     84      73      4       0       * cold leg sat temp
237     41     70      99      1009    0       * vent valve mass flow, sector 1
238     42     70      99      2009    0       * vent valve mass flow, sector 2
239     43     70      99      3009    0       * vent valve mass flow, sector 3
240     44     70      99      4009    0       * vent valve mass flow, sector 4
241     45     70      99      5009    0       * vent valve mass flow, sector 5
242     46     70      99      6009    0       * vent valve mass flow, sector 6
243     47     42     148      0       0       * fw-a switchover valve flow area fract
    ion
244     48     42     248      0       0       * fw-b switchover valve flow area fract
    ion
245     49     42     784      0       0       * fw-a isolation valve flow area fracti
    on
246     50     42     786      0       0       * fw-b isolation valve flow area fracti
    on
247     51     23      99      1001    -12001  * lower plenum avg liquid temperature
248     52     23      99      1002    -6005   * core average liquid temperature
249     53     23      99      1006    -6009   * upper plenum average liquid temperatu
    re
250     54     23      99      1010    -12010  * upper head average liquid temperature
251     55     23      99      7002    -12009  * downcomer average liquid temperature
252     56     23      99      1006    -6006   * core exit average liquid temperature
253     57     23      99      7006   -12006   * downcomer avg liq temp at core exit e
    lev
254     61     27      99      1001    -12001  * lower plenum avg void fraction
255     62     27      99      1002    -6005   * core average void fraction
256     63     27      99      1006    -6009   * upper plenum average void fraction
257     64     27      99      1010    -12010  * upper head average void fraction
258     65     27      99      7002    -12009  * downcomer average void fraction
259     71     84      99      1001    -12001  * lower plenum avg sat temperature
260     72     84      99      1002    -6005   * core average sat temperature
261     73     84      99      1006    -6009   * upper plenum average sat temperature
262     74     84      99      1010    -12010  * upper head average sat temperature
263     75     84      99      7002    -12009  * downcomer average sat temperature
264     78     21       78     1       0       *  lpis b pressure
265     79     69       79     1       0       *  lpis b mass flow
266     88     21       88     1       0       *  lpis a pressure
267     89     69       89     1       0       *  lpis a mass flow
268     90     69       18     1       0       *  makeup/letdown flow
269     91     20      122     1       2       * sg-a upper boiler liquid level
270     92     20      202     1       2       * sg-b upper boiler liquid level
271     93     20      124     1       1       * sg-a boiler exit liquid level
272     94     20      204     1       1       * sg-b boiler exit liquid level
273     95     69      734     2       0       * hotwell pump mass flow
274     99     56      37      0       0       * trip set status for both mfw pumps tr
    ipped
275    100     56      100     0       0       * trip set status for tbv-a stuck-open
    transient
276    105     56      105     0       0       * trip set status for tbv-b stuck-open
    transient
277    110     56      110     0       0       * trip set status for tbv-a open status
278    115     56      115     0       0       * trip set status for tbv-b open status
279    118     56      118     0       0       * trip set status for efw level control
```

```
   failure
                                                  * with operator level control transient
   119     56      119      0       0             * trip set status for efw level control
   failure
                                                  * without operator intervention transie
  nt
   130     56      130      0       0             * trip set status for low-sg pressure
   135     56      135      0       0             * trip set status for low pzr pressure
   140     27       81      4      -1             * accumulator b vapor fraction
   141     27       91      4      -1             * accumulator a vapor fraction
   142     69      789      3       0             * main feedwater flow at sg a inlet
   143     69      791      3       0             * main feedwater flow at sg b inlet
   144     69      152     11       0             * aux feedwater flow at sg a inlet
   145     69      252      5       0             * aux feedwater flow at sg b inlet
   146     69      124      7       0             * steam flow at sg a exit
   147     69      204      7       0             * steam flow at sg b exit
   151     69      501      1       0             * core bypass flow 1
   152     69      502      1       0             * core bypass flow 2
   153     69      503      1       0             * core bypass flow 3
   154     69      504      1       0             * core bypass flow 4
   155     69      505      1       0             * core bypass flow 5
   156     69      506      1       0             * core bypass flow 6
   160     23       11      6       0             * tliq at top of hot leg a
   161     84       11      6       0             * tsat at top of hot leg a
 * note: for hot-leg break in loop a, change signal variables 160 and 161
 * in transient restart deck to the signal variables below
 *  160     23      111      3       0            / tliq at top of hot leg a
 *  161     84      111      3       0            / tsat at top of hot leg a
   162     23      1        6       0             * tliq at top of hot leg b
   163     84      1        6       0             * tsat at top of hot leg b
   171     69      99    1005       0             * core exit total mass flow, sector 1
   172     69      99    2005       0             * core exit total mass flow, sector 2
   173     69      99    3005       0             * core exit total mass flow, sector 3
   174     69      99    4005       0             * core exit total mass flow, sector 4
   175     69      99    5005       0             * core exit total mass flow, sector 5
   176     69      99    6005       0             * core exit total mass flow, sector 6
   201      0      1        0       0             * time step size
   202     23       11      5       0             * loop a hot leg liquid temperature
   203     84       11      5       0             * loop a hot leg sat temperature
 * note: for hot-leg break in loop a, change signal variables 202 and 203
 * in transient restart deck to the signal variables below
 *  202     23      111      2       0            / loop a hot leg liquid temperature
 *  203     84      111      2       0            / loop a hot leg sat temperature
   204     23      1        5       0             * loop b hot leg liquid temperature
   205     84      1        5       0             * loop b hot leg sat temperature
   206     69      11       1       0             * loop a hot leg mass flow
   207     69      1        1       0             * loop b hot leg mass flow
   208     20      121      1      11             * sg-a lower boiler liquid level
   209     20      201      1      11             * sg-b lower boiler liquid level
   210     23      768      1       0             * feedwater liquid temperature
   212     56      13       0       0             * trip 13 iset (= 0 steady state, 1 tra
  n)
   213     69      788      1       0             * loop a feedwater mass flow
   214     69      790      1       0             * loop b feedwater mass flow
   215    -21      770      1       2             * loop a MFCV delta-p
   216    -21      774      1       2             * loop b MFCV delta-p
   217     21      738      1       0             * condensate booster pump suction press
   218     21      754      1       0             * MFW pump a suction pressure
   219     21      754      2       0             * MFW pump a discharge pressure
   220     56      45       0       0             * turbine trip status
   221     56      20       0       0             * RCP trip status
   222     56      40       0       0             * reactor trip status
   223     21      345      3       0             * sl-a pressure at srv
   224     21      350     14       0             * sl-a pressure at tbv
   225     21      445      3       0             * sl-b pressure at srv
   226     21      450     14       0             * sl-b pressure at tbv
   227     69      360      1       0             * sl-a steam flow
   228     69      460      1       0             * sl-b steam flow
   233     41      754      0       0             * mfw a rotor speed
 *  The following 4 SVs are changed to use CL Ts in RCP suction side.  gsr
 *  235     23       14      1       0              cold leg a1 liquid temperature
 *  236     23       34      1       0              cold leg a2 liquid temperature
 *  237     23        4      1       0              cold leg b1 liquid temperature
```



```
 *  238     23      24       1         0          cold leg b2 liquid temperature
   235     23      73       4         0        * cold leg a1 liquid temperature
   236     23      73       7         0        * cold leg a2 liquid temperature
   237     23      63       4         0        * cold leg b1 liquid temperature
   238     23      63       7         0        * cold leg b2 liquid temperature
   239     69      14       2         0        * cold leg a1 mass flow
   240     69      34       2         0        * cold leg a2 mass flow
   241     69       4       2         0        * cold leg b1 mass flow
   242     69      24       2         0        * cold leg b2 mass flow
   243     23      788     18         0        * fw line a liquid temperature
   244     23      790     10         0        * fw line b liquid temperature
   245     23      736    20          0        * fw demineralization exit temperature
   246     23      740    10          0        * fw f heater exit temperature
   247     23      740    20          0        * fw e heater exit temperature
   248     23      746    10          0        * fw d heater exit temperature
   249     23      750    10          0        * fw c heater exit temperature
   255     23      768      1         0        * fw valve inlet header temperature
   258     56      117      0         0        * tbv cooldown rate throttling trip sta
 tus
   259     56      67       0         0        * hpi cooldown rate throttling trip sta
 tus
   260     56      60       0         0        * hpi pressure throttling trip status
   265     56      65       0         0        * hpi subcooling throttling trip status
   266     21      760      1         0        * MFW pump b suction pressure
   267     21      760      2         0        * MFW pump b discharge pressure
   268     56      68       0         0        * hpi low cl temp throttling trip statu
 s
   269     21      738      2         0        * condensate booster pump disch pressur
 e
   270     56      30       0         0        * condensate booster pump trip set stat
 us
   301     41      3        0         0        * rcp b1 rotor speed
   302     62      3        0         0        * rcp b1 torque
 *note: sv 1301, 1302, 2301, 2302, 3301, and 3302 define
 *rotor speed and torque for other three pumps
   350     27      350      1         0        * steam line a void fraction
   365     69      365      2         0        * steam line a srv mass flow
   366     42      365      0         0        * steam line a srv flow area fraction
   370     69      370      2         0        * steam line a tbv mass flow
   450     27      450      1         0        * steam line b void fraction
   465     69      465      2         0        * steam line b srv mass flow
   466     42      465      0         0        * steam line b srv flow area fraction
   470     69      470      2         0        * steam line b tbv mass flow
   521    -26      917  1001001   5001001      * vessel wall delta T lev 1 rod 1
   522    -26      917  1002001   5002001      * vessel wall delta T lev 1 rod 2
   523    -26      917  1003001   5003001      * vessel wall delta T lev 1 rod 3
   524    -26      917  1004001   5004001      * vessel wall delta T lev 1 rod 4
   525    -26      917  1005001   5005001      * vessel wall delta T lev 1 rod 5
   526    -26      917  1006001   5006001      * vessel wall delta T lev 1 rod 6
   527    -26      917  1001002   5001002      * vessel wall delta T lev 2 rod 1
   528    -26      917  1002002   5002002      * vessel wall delta T lev 2 rod 2
   529    -26      917  1003002   5003002      * vessel wall delta T lev 2 rod 3
   530    -26      917  1004002   5004002      * vessel wall delta T lev 2 rod 4
   531    -26      917  1005002   5005002      * vessel wall delta T lev 2 rod 5
   532    -26      917  1006002   5006002      * vessel wall delta T lev 2 rod 6
   533    -26      917  1001003   5001003      * vessel wall delta T lev 3 rod 1
   534    -26      917  1002003   5002003      * vessel wall delta T lev 3 rod 2
   535    -26      917  1003003   5003003      * vessel wall delta T lev 3 rod 3
   536    -26      917  1004003   5004003      * vessel wall delta T lev 3 rod 4
   537    -26      917  1005003   5005003      * vessel wall delta T lev 3 rod 5
   538    -26      917  1006003   5006003      * vessel wall delta T lev 3 rod 6
   539    -26      917  1001004   5001004      * vessel wall delta T lev 4 rod 1
   540    -26      917  1002004   5002004      * vessel wall delta T lev 4 rod 2
   541    -26      917  1003004   5003004      * vessel wall delta T lev 4 rod 3
   542    -26      917  1004004   5004004      * vessel wall delta T lev 4 rod 4
   543    -26      917  1005004   5005004      * vessel wall delta T lev 4 rod 5
   544    -26      917  1006004   5006004      * vessel wall delta T lev 4 rod 6
   545    -26      917  1001005   5001005      * vessel wall delta T lev 5 rod 1
   546    -26      917  1002005   5002005      * vessel wall delta T lev 5 rod 2
   547    -26      917  1003005   5003005      * vessel wall delta T lev 5 rod 3
   548    -26      917  1004005   5004005      * vessel wall delta T lev 5 rod 4
   549    -26      917  1005005   5005005      * vessel wall delta T lev 5 rod 5
   550    -26      917  1006005   5006005      * vessel wall delta T lev 5 rod 6
```

```
417 *   The following 4 cards are changed to make compatible to FORTRAN 90 version.
418 *  551    92      917 -5001001 -5006005   - min downcomer liq htc adj to core
419 *  552    91      917 -5001001 -5006005   - min downcomer vap htc adj to core
420 *  553    92      917  5001001  5006005   - max downcomer liq htc adj to core
421 *  554    91      917  5001001  5006005   - max downcomer vap htc adj to core
422    551    92      917 -5001001 -5006004   * min downcomer liq htc adj to core
423    552    91      917 -5001001 -5006004   * min downcomer vap htc adj to core
424    553    92      917  5001001  5006004   * max downcomer liq htc adj to core
425    554    91      917  5001001  5006004   * max downcomer vap htc adj to core
426    567    69     154      4       0       * a sg efw mass flow
427    568    69     254      4       0       * b sg efw mass flow
428    742    69     742      1       0       * condensate drain mass flow to d heate
    r
429    746    69     746      1       0       * inlet mass flow to d heater
430    748    69     748      1       0       * condensate drain mass flow to to c he
    ater
431    750    69     750      1       0       * inlet mass flow to to c heater
432    756   -21     756      2       3       * mfw pump a check valve delta-p
433    761   -21     761      2       3       * mfw pump b check valve delta-p
434    764    23     764     10       0       * train 1a heater liquid temperature
435    766    23     766     10       0       * train 2a heater liquid temperature
436    767    69     764      1       0       * train 1a heater mass flow
437    768    69     766      1       0       * train 2a heater mass flow
438    789   -21     789      1       2       * mfw line a check valve delta-p
439    791   -21     791      1       2       * mfw line b check valve delta-p
440    800    20      12      2      14       * sg-a tube liquid level
441    801    20       2      2      14       * sg-b tube liquid level
442    802    23      99   -7002  -12002      * minimum downcomer temp level 2
443    803    23      99   -7003  -12003      * minimum downcomer temp level 3
444    804    23      99   -7004  -12004      * minimum downcomer temp level 4
445    805    23      99   -7005  -12005      * minimum downcomer temp level 5
446    806    23      99   -7006  -12006      * minimum downcomer temp level 6
447    807    23      99   -7007  -12007      * minimum downcomer temp level 7
448    808    23      99   -7008  -12008      * minimum downcomer temp level 8
449    809    23      99   -7009  -12009      * minimum downcomer temp level 9
450    810    23      99   -7002  -12005      * minimum downcomer temp in core region
451    811    21      99    1006  -6009       * vessel upper plenum avg. pressure
452    812    25     917 -5001001 -5006005   * minimum inside vessel wall temp level
    2-5
453    813    25     918 -5001001 -5006005   * minimum inside vessel wall temp level
    6-9
454    814   103     930      0   0           * sg-a tube bundle outer surface heat l
    oss (o.s.h.l)
455    815   103     931      0   0           * sg-a outlet plenum o.s.h.l
456    816   103     932      0   0           * sg-a inlet plenum o.s.h.l
457    817   103     940      0   0           * sg-b tube bundle o.s.h.l
458    818   103     941      0   0           * sg-b outlet plenum o.s.h.l
459    819   103     942      0   0           * sg-b inlet plenum o.s.h.l
460 ***********************************************************************
461 *   signal vars 822 and 823 must be activated as well as control blocks
462 *   -3556 and -3557 in order to calculate break energy
463 ***********************************************************************
464 *  822    86      31       1   0           break liquid specific heat
465 *  823    23      31       1   0           break liquid temp
466    824    26     917 -5001005 -5006005   * min vessel wall temp at top of core e
    lev
467 *  825    92      917  5001005  5006005    vessel wall liquid htc at core elevs
468    826    20     121      3  10           * sg-a startup level
469    827    20     201      3  10           * sg-b startup level
470    828    20     121      7  10           * sg-a op level input to cb
471    829    20     201      7  10           * sg-b op level input to cb
472    830    27     121      3  10           * sg-a avg void frac
473    831    27     201      3  10           * sg-b avg void frac
474    832    84      11     -2  -5           * min sat. temp in hl-a riser
475    833    84       1     -2  -5           * min sat. temp in hl-b riser
476    834    23      11      2   5           * max temp in hl-a riser
477    835    23       1      2   5           * max temp in hl-b riser
478    836    23      73      4   0           * cl-a1 temp at pump suction
479    837    23      73      7   0           * cl-a2 temp at pump suction
480    838    23      63      4   0           * cl-b1 temp at pump suction
481    839    23      63      7   0           * cl-b2 temp at pump suction
482    840    23      99  -1006 -6006         * min temp at core exit
483    841    84      11      2   5           * max sat temp in hl-a riser
```



```
484    842    84       1      2   5           * max sat temp in hl-b riser
485    843    23      11     -2  -5           * min temp in hl-a riser
486    844    23       1     -2  -5           * min temp in hl-b riser
487    845    26     917 5001001 5006005     * check max inside vessel wall temp, co
    re region
488    846    26     917 1001001 1006005     * check max inside vessel wall temp. co
    re region
489 ***********************************************************************
490 *   signal variable 847 is activated in a transient to calc break energy
491 ***********************************************************************
492    847    56      13      0   0           * dummy break power out
493 * additional signal variables for the cold leg loop flows
494    851    69      13      1   0           * cold leg A1 loop flow
495    852    69      33      1   0           * cold leg A2 loop flow
496    853    69       3      1   0           * cold leg B1 loop flow
497    854    69      23      1   0           * cold leg B2 loop flow
498 * additional signal variables for the ECC water density
499    861    76      19      1   0           * cold leg A1 ECC water density
500    862    76      39      1   0           * cold leg A2 ECC water density
501    863    76       9      1   0           * cold leg B1 ECC water density
502    864    76      59      1   0           * cold leg B2 ECC water density
503 * additional signal variables for the cold leg loop density
504    871    76      13      2   0           * cold leg A1 loop water density
505    872    76      33      2   0           * cold leg A2 loop water density
506    873    76       3      2   0           * cold leg B1 loop water density
507    874    76      23      2   0           * cold leg B2 loop water density
508    900    18     900      0       0       * reactor power
509    901    59     900      0       0       * max avg rod cladding temperature
510    902    60     900      0       0       * max hot rod pct
511    903    57     900      0       0       * prompt-fission power
512    904    58     900      0       0       * decay-heat power
513    905    26     917 -5001005 -5006005   * min vessel inner wall temp @ core exi
    t elev
514   1301    41      13      0       0       * rcp a1 rotor speed
515   1302    62      13      0       0       * rcp a1 torque
516   1501   -21     150      1       2       * efw line a check valve delta-p
517   1541    21     154      1       0       * efw line a pressure
518   2301    41      23      0       0       * rcp b2 rotor speed
519   2302    62      23      0       0       * rcp b2 torque
520   2501   -21     250      1       2       * efw line b check valve delta-p
521   2541    21     254      1       0       * efw line b pressure
522   3301    41      33      0       0       * rcp a2 rotor speed
523   3302    62      33      0       0       * rcp a2 torque
524 *
525 ***********************************************************************
526 *                                                                     *
527 *                        CONTROL BLOCK DATA                           *
528 *                                                                     *
529 ***********************************************************************
530 *
531 *     control
532 *     block
533 *     numbers   control system
534 *     -------   ------------------------------------------------------
535 *
536 *      -100s    RCP power control blocks
537 *      -700s    HPI, RCP, and MFW realignment trip signals
538 *      -800s    hotwell, condensate booster and MFW pump trip signals
539 *      -900s    feedwater condensate drain control
540 *     -1100s    HPI flowrate signals
541 *     -1200s    MFW pump trip logic
542 *     -1300s    reactor and turbine trip logic
543 *     -1500s    high and low pressure heater control
544 *     -1600s    motor driven EFW pump flowrate
545 *     -1700s    steam driven EFW pump flowrate
546 *     -1800s    ULD control blocks
547 *     -2000s    ICS feedwater control
548 *     -3300s    a loop ICS TBV control
549 *     -3400s    b loop ICS TBV control
550 *     -4000s    cold leg thermal startification criteria
551 *
552 ***********************************************************************
553 *                        constant value control blocks                *
```

```
*****************************************************************
*
*     control
*     block id  control block value
*     --------  -------------------
*
*         -14   120 inches = 3.048 m Pzr level below which HPI not throttled
*         -15       41.11 m3     sg vf region volume-boiler
*         -16      2.5908 m      sg op level min 102 in AUSLTS
*         -17      0.1524 m      sg su level min 6 in AUSLTS
*         -18       4.345 m      sg fa
*         -19     10.0076 m      sg su level max
*         -20           0
*         -21           1
*         -22          -1
*         -23        6.29 m2     acc fa
*         -24     .27778 K       = .5 F delta T
*         -25    138254.5
*         -26   6.76519e7
*         -27      533.15 K      = 500 F
*         -28      55.556 K      = 100 F delta T
*         -29     1.0e+20                          /gsr
*         -30       7.014 MPa    = 1017.3 PSIA
*         -31       7.064 MPa    = 1024.5 PSIA
*         -32      11.066 MPa    = 1605 PSIA
*         -33          30 sec
*         -34          42 K
*         -35       .1524 m      = 6 in
*         -36       9.711 m      = 96% operating range
*         -37         .21 MPa    = 30.5 PSIA
*         -38        1.72 MPa    = 249.5 PSIA
*         -39       8.651 MPa = 1254.7 psia
*         -40           6 m
*         -41         6.2 m
*         -42       5.271 MPa    = 764.5 PSIA
*         -43       .0254 m      = 1 in
*         -44         .25 sec-1
*         -45         -.5 sec-1
*         -46         .05 MPa    = 7.25 PSIA
*         -47         .14 MPa    = 20.3 PSIA
*         -48       16.65 MPa    = 2414.8 PSIA
*         -49       16.99 MPa    = 2464.1 PSIA
*         -50       8.892 MPa    = 1289.7 PSIA
*         -51       1.724 MPa    = 250 PSIA
*         -52      6.1468 m      = 242 in
*         -53      2568e6 W      = steady state power
*         -54      599.26 K      = 619 F
*         -55      15.937 MPa    = 2311.5 PSIA
*         -56      12.531 MPa    = 1817.5 PSIA
*         -57       1.075
*
*                                  1.055 x (ss power = 2568e6 W)
*         -58      153585 W-s/kg = ---------------------------------
*                                  (total ss hl flow = 17640 kg/sec)
*
*         -59          .3 sec
*         -60          .5 sec
*         -61           5 sec
*         -62         1.5 sec
*         -63      6.2053 MPa    = 900 PSI
*         -64       68948 Pa     = 10 PSI
*         -65      .34474 MPa    = 50 PSI
*         -66      .75843 MPa    = 110 PSI
*         -67     385.2e6 W      = 15% of steady state power
*         -68  4.834561e-6         converts Pa to volts DC
*         -69          10
*         -70         752 kg/sec = a loop FW flow
*         -71         752 kg/sec = b loop FW flow
*         -72      2.2046          converts kg to lbm
*         -73     2629000
*         -74     .008333
*         -75     .003333
*         -76          18
```



```
*         -77      459.67          converts F to R
*         -78    2616.915
*         -79          .2
*         -80   -.0083333 sec-1  = -50% / min
*         -81   -.0033333 sec-1  = -20% / min
*         -82         .05
*         -83         .75
*         -84          .7
*         -85         .15
*         -86       490.4
*         -87     15.2699 MPa    = 2200 PSIG
*         -88     14.9252 MPa    = 2150 PSIG
*         -89      5.588 m       = 220  in = pressurizer reference level
*         -90     27.778 K       = 50 F delta T  (changed from 5 F per GSR 10/
    24/00)
*         -91   -.015432 K/sec   = -100 F/hr
*         -92        .814 m
*         -93       1.014 m
*         -94       6.148 m
*         -95       6.348 m
*         -96       9.611 m
*         -97       9.811 m
*         -98       15.75 m
*         -99       15.95 m
*
*        idcb        icbn        icb1        icb2        icb3 /gsr
          -14           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.       3.048       3.048       3.048       3.048
*
*        idcb        icbn        icb1        icb2        icb3
          -15           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.       41.11       41.11       41.11       41.11
*
*        idcb        icbn        icb1        icb2        icb3
          -16           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.      2.5908      2.5908      2.5908      2.5908
*
*
*        idcb        icbn        icb1        icb2        icb3
          -17           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.      0.1524      0.1524      0.1524      0.1524
*
*        idcb        icbn        icb1        icb2        icb3
          -18           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.       4.345       4.345       4.345       4.345
*
*        idcb        icbn        icb1        icb2        icb3
          -19           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.     10.0076     10.0076     10.0076     10.0076
*
*        idcb        icbn        icb1        icb2        icb3
          -20           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.          0.          0.          0.          0.
*
*        idcb        icbn        icb1        icb2        icb3
          -21           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.          1.          1.          1.          1.
*
*        idcb        icbn        icb1        icb2        icb3
          -22           9           0           0           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
           1.         -1.         -1.         -1.         -1.
*
*        idcb        icbn        icb1        icb2        icb3
          -23           9           0           0           0
```

```
699  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
700              1.          6.29          6.29          6.29          6.29
701  *
702  *        idcb          icbn          icb1          icb2          icb3
703               -24             9             0             0             0
704  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
705              1.       .27778        .27778        .27778        .27778
706  *
707  *        idcb          icbn          icb1          icb2          icb3
708               -25             9             0             0             0
709  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
710              1.     138254.5      138254.5      138254.5      138254.5
711  *
712  *        idcb          icbn          icb1          icb2          icb3
713               -26             9             0             0             0
714  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
715              1.   6.76519e+7    6.76519e+7    6.76519e+7    6.76519e+7
716  *
717  *        idcb          icbn          icb1          icb2          icb3
718               -27             9             0             0             0
719  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
720              1.      533.15        533.15        533.15        533.15
721  *
722  *        idcb          icbn          icb1          icb2          icb3
723               -28             9             0             0             0
724  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
725              1.      55.556        55.556        55.556        55.556
726  *
727  *        idcb          icbn          icb1          icb2          icb3  /gsr
728               -29             9             0             0             0
729  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
730              1.      1.0e+20       1.0e+20       1.0e+20       1.0e+20
731  *
732  *        idcb          icbn          icb1          icb2          icb3
733               -30             9             0             0             0
734  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
735              1.    7.014e+6      7.014e+6      7.014e+6      7.014e+6
736  *
737  *        idcb          icbn          icb1          icb2          icb3
738               -31             9             0             0             0
739  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
740              1.    7.064e+6      7.064e+6      7.064e+6      7.064e+6
741  *
742  *        idcb          icbn          icb1          icb2          icb3
743               -32             9             0             0             0
744  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
745              1.   11.066e+6     11.066e+6     11.066e+6     11.066e+6
746  *
747  *        idcb          icbn          icb1          icb2          icb3
748               -33             9             0             0             0
749  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
750              1.         30.           30.           30.           30.
751  *
752  *        idcb          icbn          icb1          icb2          icb3
753               -34             9             0             0             0
754  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
755              1.         42.           42.           42.           42.
756  *
757  *        idcb          icbn          icb1          icb2          icb3
758               -35             9             0             0             0
759  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
760              1.      .1524         .1524         .1524         .1524
761  *
762  *        idcb          icbn          icb1          icb2          icb3
763               -36             9             0             0             0
764  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
765              1.      9.711         9.711         9.711         9.711
766  *
767  *        idcb          icbn          icb1          icb2          icb3
768               -37             9             0             0             0
769  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
770              1.     .21e+6        .21e+6        .21e+6        .21e+6
771  *
```



```
772  *        idcb          icbn          icb1          icb2          icb3
773               -38             9             0             0             0
774  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
775              1.   1.72e+6      1.72e+6      1.72e+6      1.72e+6
776  *
777  *        idcb          icbn          icb1          icb2          icb3
778               -39             9             0             0             0
779  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
780              1.   8.651e+6      8.651e+6      8.651e+6      8.651e+6
781  *
782  *        idcb          icbn          icb1          icb2          icb3
783               -40             9             0             0             0
784  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
785              1.          6.            6.            6.            6.
786  *
787  *        idcb          icbn          icb1          icb2          icb3
788               -41             9             0             0             0
789  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
790              1.          6.2           6.2           6.2           6.2
791  *
792  *        idcb          icbn          icb1          icb2          icb3
793               -42             9             0             0             0
794  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
795              1.   5.271e+6      5.271e+6      5.271e+6      5.271e+6
796  *
797  *        idcb          icbn          icb1          icb2          icb3
798               -43             9             0             0             0
799  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
800              1.       .0254         .0254         .0254         .0254
801  *
802  *        idcb          icbn          icb1          icb2          icb3
803               -44             9             0             0             0
804  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
805              1.         .25           .25           .25           .25
806  *
807  *        idcb          icbn          icb1          icb2          icb3
808               -45             9             0             0             0
809  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
810              1.          -.5           -.5           -.5           -.5
811  *
812  *        idcb          icbn          icb1          icb2          icb3
813               -46             9             0             0             0
814  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
815              1.     .05e+6        .05e+6        .05e+6        .05e+6
816  *
817  *        idcb          icbn          icb1          icb2          icb3
818               -47             9             0             0             0
819  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
820              1.     .14e+6        .14e+6        .14e+6        .14e+6
821  *
822  *        idcb          icbn          icb1          icb2          icb3
823               -48             9             0             0             0
824  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
825              1.   16.65e+6      16.65e+6      16.65e+6      16.65e+6
826  *
827  *        idcb          icbn          icb1          icb2          icb3
828               -49             9             0             0             0
829  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
830              1.   16.99e+6      16.99e+6      16.99e+6      16.99e+6
831  *
832  *        idcb          icbn          icb1          icb2          icb3
833               -50             9             0             0             0
834  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
835              1.   8.892e+6      8.892e+6      8.892e+6      8.892e+6
836  *
837  *        idcb          icbn          icb1          icb2          icb3
838               -51             9             0             0             0
839  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
840              1.   1.724e+6      1.724e+6      1.724e+6      1.724e+6
841  *
842  *        idcb          icbn          icb1          icb2          icb3
843               -52             9             0             0             0
844  *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
```

```
845            1.        6.1468        6.1468        6.1468        6.1468
846  *
847  *       idcb          icbn          icb1          icb2          icb3
848           -53             9             0             0             0
849  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
850            1.      2568.e+6      2568.e+6      2568.e+6      2568.e+6
851  *         1.     3.894e-10     3.894e-10     3.894e-10     3.894e-10
852  *
853  *       idcb          icbn          icb1          icb2          icb3
854           -54             9             0             0             0
855  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
856            1.        599.26        599.26        599.26        599.26
857  *
858  *       idcb          icbn          icb1          icb2          icb3
859           -55             9             0             0             0
860  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
861            1.     15.937e+6     15.937e+6     15.937e+6     15.937e+6
862  *
863  *       idcb          icbn          icb1          icb2          icb3
864           -56             9             0             0             0
865  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
866            1.     12.531e+6     12.531e+6     12.531e+6     12.531e+6
867  *
868  *       idcb          icbn          icb1          icb2          icb3
869           -57             9             0             0             0
870  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
871            1.         1.075         1.075         1.075         1.075
872  *
873  *       idcb          icbn          icb1          icb2          icb3
874           -58             9             0             0             0
875  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
876            1.       153585.       153585.       153585.       153585.
877  *
878  *       idcb          icbn          icb1          icb2          icb3
879           -59             9             0             0             0
880  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
881            1.            .3            .3            .3            .3
882  *
883  *       idcb          icbn          icb1          icb2          icb3
884           -60             9             0             0             0
885  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
886            1.            .5            .5            .5            .5
887  *
888  *       idcb          icbn          icb1          icb2          icb3
889           -61             9             0             0             0
890  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
891            1.            5.            5.            5.            5.
892  *
893  *       idcb          icbn          icb1          icb2          icb3
894           -62             9             0             0             0
895  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
896            1.           1.5           1.5           1.5           1.5
897  *
898  *       idcb          icbn          icb1          icb2          icb3
899           -63             9             0             0             0
900  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
901            1.     6.2053e+6     6.2053e+6     6.2053e+6     6.2053e+6
902  *
903  *       idcb          icbn          icb1          icb2          icb3
904           -64             9             0             0             0
905  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
906            1.        68948.        68948.        68948.        68948.
907  *
908  *       idcb          icbn          icb1          icb2          icb3
909           -65             9             0             0             0
910  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
911            1.     .34474e+6     .34474e+6     .34474e+6     .34474e+6
912  *
913  *  cb-66 changed to 125 psi bias
914  *       idcb          icbn          icb1          icb2          icb3
915           -66             9             0             0             0
916  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
917            1.     .86184e+6     .86184e+6     .86184e+6     .86184e+6
```



```
918  *         1.     .75843e+6     .75843e+6     .75843e+6     .75843e+6
919  *
920  *       idcb          icbn          icb1          icb2          icb3
921           -67             9             0             0             0
922  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
923            1.      385.2e+6      385.2e+6      385.2e+6      385.2e+6
924  *
925  *       idcb          icbn          icb1          icb2          icb3
926           -68             9             0             0             0
927  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
928            1.   4.834561e-6   4.834561e-6   4.834561e-6   4.834561e-6
929  *
930  *       idcb          icbn          icb1          icb2          icb3
931           -69             9             0             0             0
932  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
933            1.           10.           10.           10.           10.
934  *
935  *       idcb          icbn          icb1          icb2          icb3
936           -70             9             0             0             0
937  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
938            1.          752.          752.          752.          752.
939  *
940  *       idcb          icbn          icb1          icb2          icb3
941           -71             9             0             0             0
942  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
943            1.          752.          752.          752.          752.
944  *
945  *       idcb          icbn          icb1          icb2          icb3
946           -72             9             0             0             0
947  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
948            1.        2.2046        2.2046        2.2046        2.2046
949  *
950  *       idcb          icbn          icb1          icb2          icb3
951           -73             9             0             0             0
952  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
953            1.       2629000.      2629000.      2629000.      2629000.
954  *
955  *       idcb          icbn          icb1          icb2          icb3
956           -74             9             0             0             0
957  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
958            1.       .008333       .008333       .008333       .008333
959  *
960  *       idcb          icbn          icb1          icb2          icb3
961           -75             9             0             0             0
962  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
963            1.       .003333       .003333       .003333       .003333
964  *
965  *       idcb          icbn          icb1          icb2          icb3
966           -76             9             0             0             0
967  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
968            1.           18.           18.           18.           18.
969  *
970  *       idcb          icbn          icb1          icb2          icb3
971           -77             9             0             0             0
972  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
973            1.        459.67        459.67        459.67        459.67
974  *
975  *       idcb          icbn          icb1          icb2          icb3
976           -78             9             0             0             0
977  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
978            1.      2616.915      2616.915      2616.915      2616.915
979  *
980  *       idcb          icbn          icb1          icb2          icb3
981           -79             9             0             0             0
982  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
983            1.            .2            .2            .2            .2
984  *
985  *       idcb          icbn          icb1          icb2          icb3
986           -80             9             0             0             0
987  *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
988            1.     -.0083333     -.0083333     -.0083333     -.0083333
989  *
990  *       idcb          icbn          icb1          icb2          icb3
```

```
991            -81          9          0          0          0
992  *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
993             1.  -.0033333  -.0033333  -.0033333  -.0033333
994  *
995  *        idcb       icbn       icb1       icb2       icb3
996            -82          9          0          0          0
997  *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
998             1.         .05        .05        .05        .05
999  *
1000 *        idcb       icbn       icb1       icb2       icb3
1001           -83          9          0          0          0
1002 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1003            1.        .75        .75        .75        .75
1004 *
1005 *        idcb       icbn       icb1       icb2       icb3
1006           -84          9          0          0          0
1007 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1008            1.         .7         .7         .7         .7
1009 *
1010 *        idcb       icbn       icb1       icb2       icb3
1011           -85          9          0          0          0
1012 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1013            1.        .15        .15        .15        .15
1014 *
1015 *        idcb       icbn       icb1       icb2       icb3
1016           -86          9          0          0          0
1017 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1018            1.       490.4      490.4      490.4      490.4
1019 *
1020 *        idcb       icbn       icb1       icb2       icb3
1021           -87          9          0          0          0
1022 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1023            1.   15.2699e+6  15.2699e+6  15.2699e+6  15.2699e+6
1024 *
1025 *        idcb       icbn       icb1       icb2       icb3
1026           -88          9          0          0          0
1027 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1028            1.   14.9252e+6  14.9252e+6  14.9252e+6  14.9252e+6
1029 *
1030 *        idcb       icbn       icb1       icb2       icb3
1031           -89          9          0          0          0
1032 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1033            1.       5.588      5.588      5.588      5.588
1034 *
1035 *        idcb       icbn       icb1       icb2       icb3
1036           -90          9          0          0          0
1037 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1038            1.      27.778     27.778     27.778     27.778
1039 *          1.      2.7778     2.7778     2.7778     2.7778
1040 *
1041 *        idcb       icbn       icb1       icb2       icb3
1042           -91          9          0          0          0
1043 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1044            1.    -.015432   -.015432   -.015432   -.015432
1045 *
1046 *        idcb       icbn       icb1       icb2       icb3
1047           -92          9          0          0          0
1048 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1049            1.        .814       .814       .814       .814
1050 *
1051 *        idcb       icbn       icb1       icb2       icb3
1052           -93          9          0          0          0
1053 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1054            1.       1.014      1.014      1.014      1.014
1055 *
1056 *        idcb       icbn       icb1       icb2       icb3
1057           -94          9          0          0          0
1058 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1059            1.       6.148      6.148      6.148      6.148
1060 *
1061 *        idcb       icbn       icb1       icb2       icb3
1062           -95          9          0          0          0
1063 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
```



```
1064            1.      6.348      6.348      6.348      6.348
1065 *
1066 *        idcb       icbn       icb1       icb2       icb3
1067           -96          9          0          0          0
1068 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1069            1.      9.611      9.611      9.611      9.611
1070 *
1071 *        idcb       icbn       icb1       icb2       icb3
1072           -97          9          0          0          0
1073 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1074            1.      9.811      9.811      9.811      9.811
1075 *
1076 *        idcb       icbn       icb1       icb2       icb3
1077           -98          9          0          0          0
1078 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1079            1.      15.75      15.75      15.75      15.75
1080 *
1081 *        idcb       icbn       icb1       icb2       icb3
1082           -99          9          0          0          0
1083 *       cbgain      cbxmin     cbxmax     cbcon1     cbcon2
1084            1.      15.95      15.95      15.95      15.95
1085 *
1086 ************************************************************************
1087 *                        rcp power calculation                         *
1088 ************************************************************************
1089 *
1090 * rcp b1 power
1091 *  idcb     icbn     icb1     icb2     icb3
1092   -101     39      *multi* 301     302
1093 *      cbgain  cbxmin  cbxmax  cbcon1  cbcon2
1094          0.0     0.0     0.0     0.0     0.0
1095 *
1096 * rcp a1 power
1097 *  idcb     icbn     icb1     icb2     icb3
1098   -102     39      *multi* 1301     1302
1099 *      cbgain  cbxmin  cbxmax  cbcon1  cbcon2
1100          0.0     0.0     0.0     0.0     0.0
1101 *
1102 * rcp b2 power
1103 *  idcb     icbn     icb1     icb2     icb3
1104   -103     39      *multi* 2301     2302
1105 *      cbgain  cbxmin  cbxmax  cbcon1  cbcon2
1106          0.0     0.0     0.0     0.0     0.0
1107 *
1108 * rcp a2 power
1109 *  idcb     icbn     icb1     icb2     icb3
1110   -104     39      *multi* 3301     3302
1111 *      cbgain  cbxmin  cbxmax  cbcon1  cbcon2
1112          0.0     0.0     0.0     0.0     0.0
1113 *
1114 * sum b1, a1, and b2 rcp power
1115 *  idcb     icbn     icb1     icb2     icb3
1116   -105     57      *sum3*  -101   -102   -103
1117 *      cbgain  cbxmin  cbxmax  cbcon1  cbcon2
1118          0.0     0.0     0.0     0.0     0.0
1119 *
1120 * total rcp power
1121 *  idcb     icbn     icb1     icb2     icb3
1122   -106      3      *add*  -104   -105
1123 *      cbgain  cbxmin  cbxmax  cbcon1  cbcon2
1124          0.0     0.0     0.0     0.0     0.0
1125 *
1126 ************************************************************************
1127 *                      rcp coastdown calculation
1128 ************************************************************************
1129 *
1130 *    calculate time after trip
1131   -110   24   *int.w.mode*   -21   221   221
1132     0.0   0.0   0.0   0.0   0.0
1133 *
1134 *    coastdown speed fraction vs time
1135   -112   101   *table*   -110  167   0
1136     0.0   0.0   0.0   0.0   0.0
```

```
* time   coastdown speed fraction
  0.00   1.00000 s
  2.49   0.97220 s
  5.00   0.79968 s
  7.52   0.67504 s
  10.02   0.58276 s
  12.52   0.51091 s
  15.02   0.45368 s
  17.52   0.40724 s
  20.02   0.36905 s
  22.52   0.33713 s
  25.02   0.31000 s
  27.52   0.28668 s
  30.02   0.26642 s
  32.52   0.24868 s
  35.02   0.23300 s
  37.52   0.21905 s
  40.02   0.20656 s
  42.52   0.19531 s
  45.02   0.18514 s
  47.52   0.17589 s
  50.02   0.16745 s
  52.52   0.15971 s
  55.02   0.15260 s
  57.52   0.14604 s
  60.02   0.13996 s
  62.52   0.13432 s
  65.02   0.12907 s
  67.52   0.12417 s
  70.02   0.11958 s
  72.52   0.11528 s
  75.02   0.11123 s
  77.52   0.10741 s
  80.02   0.10381 s
  82.52   0.10040 s
  85.02   0.09717 s
  87.52   0.09412 s
  90.02   0.09122 s
  92.52   0.08846 s
  95.02   0.08585 s
  97.52   0.08337 s
  100.02   0.08101 s
  102.52   0.07877 s
  105.02   0.07664 s
  107.52   0.07461 s
  110.02   0.07269 s
  112.52   0.07085 s
  115.02   0.06911 s
  117.52   0.06744 s
  120.02   0.06585 s
  122.52   0.06433 s
  125.02   0.06287 s
  127.52   0.06148 s
  130.02   0.06014 s
  132.52   0.05885 s
  135.02   0.05760 s
  137.52   0.05640 s
  140.02   0.05523 s
  142.52   0.05411 s
  145.02   0.05302 s
  147.52   0.05196 s
  150.02   0.05094 s
  152.52   0.04996 s
  155.02   0.04903 s
  157.52   0.04812 s
  160.02   0.04724 s
  162.52   0.04637 s
  165.02   0.04550 s
  167.52   0.04464 s
  170.02   0.04380 s
  172.52   0.04303 s
  175.02   0.04234 s
  177.52   0.04174 s
```



```
  180.02   0.04121 s
  182.52   0.04070 s
  185.02   0.04018 s
  187.52   0.03964 s
  190.02   0.03910 s
  192.52   0.03858 s
  195.02   0.03809 s
  197.52   0.03762 s
  200.02   0.03713 s
  202.52   0.03661 s
  205.02   0.03605 s
  207.52   0.03547 s
  210.02   0.03488 s
  212.52   0.03431 s
  215.02   0.03377 s
  217.52   0.03326 s
  220.02   0.03273 s
  222.52   0.03206 s
  225.02   0.03121 s
  227.52   0.03051 s
  230.02   0.03003 s
  232.52   0.02959 s
  235.02   0.02916 s
  237.52   0.02870 s
  240.02   0.02819 s
  242.52   0.02773 s
  245.02   0.02732 s
  247.52   0.02693 s
  250.02   0.02654 s
  252.52   0.02614 s
  255.02   0.02574 s
  257.52   0.02537 s
  260.02   0.02502 s
  262.52   0.02468 s
  265.02   0.02435 s
  267.52   0.02401 s
  270.02   0.02369 s
  272.52   0.02337 s
  275.02   0.02307 s
  277.52   0.02277 s
  280.02   0.02247 s
  282.52   0.02217 s
  285.02   0.02188 s
  287.52   0.02159 s
  290.02   0.02131 s
  292.52   0.02103 s
  295.02   0.02076 s
  297.52   0.02050 s
  300.02   0.02024 s
  302.52   0.01998 s
  305.02   0.01973 s
  307.52   0.01949 s
  310.02   0.01925 s
  312.52   0.01901 s
  315.02   0.01878 s
  317.52   0.01855 s
  320.02   0.01833 s
  322.52   0.01811 s
  325.02   0.01789 s
  327.52   0.01767 s
  330.02   0.01746 s
  332.52   0.01725 s
  335.02   0.01705 s
  337.52   0.01685 s
  340.02   0.01665 s
  342.52   0.01646 s
  345.02   0.01628 s
  347.52   0.01609 s
  350.02   0.01591 s
  352.52   0.01573 s
  355.02   0.01556 s
  357.52   0.01537 s
  360.02   0.01518 s
```

```
  362.52    0.01497 s
  365.02    0.01476 s
  367.52    0.01456 s
  370.04    0.01436 s
  372.50    0.01416 s
  374.99    0.01395 s
  377.51    0.01373 s
  379.99    0.01351 s
  382.52    0.01326 s
  385.02    0.01296 s
  387.50    0.01256 s
  390.02    0.01197 s
  392.52    0.01116 s
  394.99    0.01015 s
  397.52    0.00891 s
  400.01    0.00752 s
  402.53    0.00606 s
  405.03    0.00463 s
  407.53    0.00327 s
  410.03    0.00202 s
  412.53    0.00089 s
  415.03    0.00000 e
*
*   select steady-state pump speed
   -113    61   *zerohold*   301   212
    0.0   0.0   0.0   0.0   0.0
*
*   maximum pump speed for pump b1 (comp. 3)
   -114   36   *maxtrans*   -113
    0.0   0.0   0.0   0.0   0.0
*
*   select steady-state pump speed
   -115    61   *zerohold*   1301   212
    0.0   0.0   0.0   0.0   0.0
*
*   maximum pump speed for pump a1 (comp. 13)
   -116   36   *maxtrans*   -115
    0.0   0.0   0.0   0.0   0.0
*
*   select steady-state pump speed
   -117    61   *zerohold*   2301   212
    0.0   0.0   0.0   0.0   0.0
*
*   maximum pump speed for pump b2 (comp. 23)
   -118   36   *maxtrans*   -117
    0.0   0.0   0.0   0.0   0.0
*
*   select steady-state pump speed
   -119    61   *zerohold*   3301   212
    0.0   0.0   0.0   0.0   0.0
*
*   maximum pump speed for pump a2 (comp. 33)
   -120   36   *maxtrans*   -119
    0.0   0.0   0.0   0.0   0.0
*
*   pump b1 coastdown speed
   -122   39   *multi*   -114   -112
    0.0   0.0   0.0   0.0   0.0
*
*   pump a1 coastdown speed
   -124   39   *multi*   -116   -112
    0.0   0.0   0.0   0.0   0.0
*
*   pump b2 coastdown speed
   -126   39   *multi*   -118   -112
    0.0   0.0   0.0   0.0   0.0
*
*   pump a2 coastdown speed
   -128   39   *multi*   -120   -112
    0.0   0.0   0.0   0.0   0.0
*
*********************************************************************
* accumulator liquid volume
```



```
*********************************************************************
*
*   accumulator b liquid volume
   -140   54   *subtr*  -21   140
       39.93  0.0   39.93  0.0    0.0
*
*   accumulator a liquid volume
   -141   54   *subtr*  -21   141
       39.93  0.0   39.93  0.0    0.0
*
*********************************************************************
* total eccs mass flows
*********************************************************************
*
*   sum of hpi flow a1 and a2
   -142    3   *add*     22    23
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*   sum of hpi flow b1 and b2
   -143    3   *add*     21    24
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*   total hpi flow
   -144    3   *add*   -142  -143
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*   sum of accumulator flow
   -145    3   *add*     25    26
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*   sum of lpis flow
   -146    3   *add*     79    89
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*   sum of hpi, accumulator, and lpis flows
   -147   57   *sum3*   -144   -145   -146
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*   reserved cb -148 for break flow - total eccs flow
*   to be activated in loca transient calculations
*
*   break flow minus total eccs flow
*   -148   54   /subtr/   31   -147
*         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*********************************************************************
*                          core bypass flow
*********************************************************************
*
*  sum core bypass mass flow sectors 1 through 3
  -151   57   *sum3*   151   152   153
        1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*  sum core bypass mass flow sectors 4 through 6
  -152   57   *sum3*   154   155   156
        1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*  sum core bypass mass flow sectors 1 through 6
  -153    3   *add*   -151  -152
        1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*  sum cold leg mass flows a1 and a2
  -154    3   *add*    239   240
        1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*  sum cold leg mass flows b1 and b2
  -155    3   *add*    241   242
        1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*  total cold leg mass flow
  -156    3   *add*   -154  -155
        1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
```

```
*  core bypass flow fraction
  -157   14   *div*   -153  -156
         1.0     -1.0e20   1.0e20   0.0      1.0e-20
*
*********************************************************************
*   subcooling margin at top of hot legs                            *
*********************************************************************
*
*  subcooling margin at top of hot leg a
  -160   54   *subtr*   161   160
    0.0   0.0   0.0   0.0   0.0
*
*  subcooling margin at top of hot leg b
  -162   54   *subtr*   163   162
    0.0   0.0   0.0   0.0   0.0
*
*********************************************************************
*                        core exit mass flows                       *
*********************************************************************
*
*  sum core exit mass flow sectors 1 through 3
  -171   57   *sum3*   171   172   173
    0.0   0.0   0.0   0.0   0.0
*
*  sum core exit mass flow sectors 4 through 6
  -172   57   *sum3*   174   175   176
    0.0   0.0   0.0   0.0   0.0
*
*  sum core exit mass flow sectors 1 through 6
  -173    3   *add*   -171   -172
    0.0   0.0   0.0   0.0   0.0
*
*********************************************************************
*                        eccs energy inflow                         *
*********************************************************************
*
*  hpi energy inflow (j/s) = (hpi flow) x 94473.0,
*  where 94473.0 = hpi average enthalpy at 294.3 k
*  over a pressure range between 10.0e05 and 110.0e05 pa
*
  -181   39   *multi*  -144  -21
         94473.0   0.0   1.0e20   0.0   0.0
*
*  cft energy inflow (j/s) = (cft flow) x 137475.0,
*  where 137475.0 = hpi average enthalpy at 305.4 k
*  over a pressure range between 10.0e05 and 40.0e05 pa
*
  -182   39   *multi*  -145  -21
         137475.0   0.0   1.0e20   0.0   0.0
*
*  lpi energy inflow (j/s) = (lpi flow) x 89637.0,
*  where 89637.0 = hpi average enthalpy at 294.3 k
*  over a pressure range between 7.86e05 and 14.75e05 pa
*
  -183   39   *multi*  -146  -21
         89637.0   0.0   1.0e20   0.0   0.0
*
*  total eccs energy inflow
  -184   57   *sum3*   -181   -182   -183
         0.0   0.0   0.0   0.0   0.0
*
*********************************************************************
*                        vent valve flows                           *
*********************************************************************
*
*  sum vent valves mass flow sectors 1 through 3
  -201   57   *sum3*   41   42   43
    0.0   0.0   0.0   0.0   0.0
*
*  sum vent valves mass flow sectors 4 through 6
  -202   57   *sum3*   44   45   46
    0.0   0.0   0.0   0.0   0.0
*
```



```
*  sum vent valves mass flow sectors 1 through 6
  -203    3   *add*   -201   -202
    0.0   0.0   0.0   0.0   0.0
*
*********************************************************************
*   change in pressurizer water level for makeup/letdown flow control
*********************************************************************
*
*  compute pressurizer water level relative to lower tap
  -218   56   *sumconst*  27
    1.0   -1.0e20  1.0e20   -0.844   0.0
*
*  pressurizer water level - reference water level
  -220   54   *subtr*  -218   -89
    0.0   0.0   0.0   0.0   0.0
*
*  lag change in pressurizer water level
  -222   26   *lag*  -220
    1.0  -10.0    10.0   1.0  0.0
*
*  table of makeup/letdown flow as f(change in pzr level)
  -224   101   *table*   -222   4   0
   0.0   0.0   0.0   0.0   0.0
*  delta-z (m)  mass flow (kg/s)
    -0.254    12.787 s
    -0.127     0.0   s
     0.127     0.0   s
     0.254    -2.808 e
*
*  set makeup/letdown flow to zero if pressurizer pressure .le. 1600 psig
   -226   22   *inputswitch*   -20   -224   135
    0.0    0.0    0.0   0.0    0.0
*
*********************************************************************
* steam generator total boiler liquid level
*********************************************************************
*
* sg-a boiler total liquid level
   -230   57   *sum3*   208   91   93
    0.0    0.0    0.0   0.0    0.0
*
* sg-b boiler total liquid level
   -231   57   *sum3*   209   92   94
    0.0    0.0    0.0   0.0    0.0
*
*********************************************************************
*                      a loop SRV area fraction                     *
*********************************************************************
*
*     control
*     block id  control block value
*     --------  -------------------
*
*         -302  7.3409 MPa  =  1064.7 PSIA       =  1050 PSIG
*         -304  6.7536 MPa  =  .92(1064.7 PSIA)
*         -306  7.4443 MPa  =  1079.7 PSIA       =  1065 PSIG
*         -308  6.8488 MPa  =  .92(1079.7 PSIA)
*         -310  7.5477 MPa  =  1094.7 PSIA       =  1080 PSIG
*         -312  6.9439 MPa  =  .92(1094.7 PSIA)
*         -314  7.6167 MPa  =  1104.7 PSIA       =  1090 PSIG
*         -316  7.0074 MPa  =  .92(1104.7 PSIA)
*         -318  7.6856 MPa  =  1114.7 PSIA       =  1100 PSIG
*         -320  7.0708 MPa  =  .92(1114.7 PSIA)
*         -322  7.7132 MPa  =  1118.7 PSIA       =  1104 PSIG
*         -324  7.0962 MPa  =  .92(1118.7 PSIA)
*
*         -388  a loop SRV area fraction
*
*
*         idcb          icbn          icb1          icb2          icb3
          -302             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.     7.3409e+6     7.3409e+6     7.3409e+6     7.3409e+6
```

```
1575 *
1576 *      idcb        icbn        icb1        icb2        icb3
1577        -304           9           0           0           0
1578 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1579        1.     6.7536e+6   6.7536e+6   6.7536e+6   6.7536e+6
1580 *
1581 *      idcb        icbn        icb1        icb2        icb3
1582        -306           9           0           0           0
1583 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1584        1.     7.4443e+6   7.4443e+6   7.4443e+6   7.4443e+6
1585 *
1586 *      idcb        icbn        icb1        icb2        icb3
1587        -308           9           0           0           0
1588 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1589        1.     6.8488e+6   6.8488e+6   6.8488e+6   6.8488e+6
1590 *
1591 *      idcb        icbn        icb1        icb2        icb3
1592        -310           9           0           0           0
1593 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1594        1.     7.5477e+6   7.5477e+6   7.5477e+6   7.5477e+6
1595 *
1596 *      idcb        icbn        icb1        icb2        icb3
1597        -312           9           0           0           0
1598 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1599        1.     6.9439e+6   6.9439e+6   6.9439e+6   6.9439e+6
1600 *
1601 *      idcb        icbn        icb1        icb2        icb3
1602        -314           9           0           0           0
1603 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1604        1.     7.6167e+6   7.6167e+6   7.6167e+6   7.6167e+6
1605 *
1606 *      idcb        icbn        icb1        icb2        icb3
1607        -316           9           0           0           0
1608 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1609        1.     7.0074e+6   7.0074e+6   7.0074e+6   7.0074e+6
1610 *
1611 *      idcb        icbn        icb1        icb2        icb3
1612        -318           9           0           0           0
1613 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1614        1.     7.6856e+6   7.6856e+6   7.6856e+6   7.6856e+6
1615 *
1616 *      idcb        icbn        icb1        icb2        icb3
1617        -320           9           0           0           0
1618 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1619        1.     7.0708e+6   7.0708e+6   7.0708e+6   7.0708e+6
1620 *
1621 *      idcb        icbn        icb1        icb2        icb3
1622        -322           9           0           0           0
1623 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1624        1.     7.7132e+6   7.7132e+6   7.7132e+6   7.7132e+6
1625 *
1626 *      idcb        icbn        icb1        icb2        icb3
1627        -324           9           0           0           0
1628 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1629        1.     7.0962e+6   7.0962e+6   7.0962e+6   7.0962e+6
1630 *
1631 *      idcb        icbn        icb1        icb2        icb3
1632        -332          20         223        -304           0
1633 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1634        1.           0.          1.          0.     1.0e-20
1635 *
1636 *      idcb        icbn        icb1        icb2        icb3
1637        -334          20         223        -302           0
1638 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1639        1.           0.          1.          0.     1.0e-20
1640 *
1641 *      idcb        icbn        icb1        icb2        icb3
1642        -336          20         223        -308           0
1643 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1644        1.           0.          1.          0.     1.0e-20
1645 *
1646 *      idcb        icbn        icb1        icb2        icb3
1647        -338          20         223        -306           0
```



```
1648 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1649        1.           0.          1.          0.     1.0e-20
1650 *
1651 *      idcb        icbn        icb1        icb2        icb3
1652        -340          20         223        -312           0
1653 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1654        1.           0.          1.          0.     1.0e-20
1655 *
1656 *      idcb        icbn        icb1        icb2        icb3
1657        -342          20         223        -310           0
1658 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1659        1.           0.          1.          0.     1.0e-20
1660 *
1661 *      idcb        icbn        icb1        icb2        icb3
1662        -344          20         223        -316           0
1663 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1664        1.           0.          1.          0.     1.0e-20
1665 *
1666 *      idcb        icbn        icb1        icb2        icb3
1667        -346          20         223        -314           0
1668 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1669        1.           0.          1.          0.     1.0e-20
1670 *
1671 *      idcb        icbn        icb1        icb2        icb3
1672        -348          20         223        -320           0
1673 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1674        1.           0.          1.          0.     1.0e-20
1675 *
1676 *      idcb        icbn        icb1        icb2        icb3
1677        -350          20         223        -318           0
1678 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1679        1.           0.          1.          0.     1.0e-20
1680 *
1681 *      idcb        icbn        icb1        icb2        icb3
1682        -352          20         223        -324           0
1683 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1684        1.           0.          1.          0.     1.0e-20
1685 *
1686 *      idcb        icbn        icb1        icb2        icb3
1687        -354          20         223        -322           0
1688 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1689        1.           0.          1.          0.     1.0e-20
1690 *
1691 *      idcb        icbn        icb1        icb2        icb3
1692        -356           5        -368        -332           0
1693 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1694        1.           0.          1.          0.     1.0e-20
1695 *
1696 *      idcb        icbn        icb1        icb2        icb3
1697        -358           5        -370        -336           0
1698 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1699        1.           0.          1.          0.     1.0e-20
1700 *
1701 *      idcb        icbn        icb1        icb2        icb3
1702        -360           5        -372        -340           0
1703 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1704        1.           0.          1.          0.     1.0e-20
1705 *
1706 *      idcb        icbn        icb1        icb2        icb3
1707        -362           5        -374        -344           0
1708 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1709        1.           0.          1.          0.     1.0e-20
1710 *
1711 *      idcb        icbn        icb1        icb2        icb3
1712        -364           5        -376        -348           0
1713 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1714        1.           0.          1.          0.     1.0e-20
1715 *
1716 *      idcb        icbn        icb1        icb2        icb3
1717        -366           5        -378        -352           0
1718 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
1719        1.           0.          1.          0.     1.0e-20
1720 *
```

```
*        idcb        icbn        icb1        icb2        icb3
          -368          25        -356        -334           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -370          25        -358        -338           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -372          25        -360        -342           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -374          25        -362        -346           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -376          25        -364        -350           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -378          25        -366        -354           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -380           3        -368        -370           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          2.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -382           3        -372        -374           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          2.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -384           3        -376        -378           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             2.          0.          4.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -386           3        -380        -382           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          4.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -388           3        -386        -384           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            .125          0.          1.          0.    1.0e-20
*
*************************************************************************
*                      b loop SRV area fraction                         *
*************************************************************************
*
*     control
*     block id  control block value
*     --------  -------------------
*
*         -488  b loop SRV area fraction
*
*
*        idcb        icbn        icb1        icb2        icb3
          -432          20         225        -304           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -434          20         225        -302           0
```



```
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -436          20         225        -308           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -438          20         225        -306           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -440          20         225        -312           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -442          20         225        -310           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -444          20         225        -316           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -446          20         225        -314           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -448          20         225        -320           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -450          20         225        -318           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -452          20         225        -324           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -454          20         225        -322           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -456           5        -468        -432           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -458           5        -470        -436           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -460           5        -472        -440           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
*        idcb        icbn        icb1        icb2        icb3
          -462           5        -474        -444           0
*      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
             1.          0.          1.          0.    1.0e-20
*
```

```
1867 *        idcb          icbn          icb1          icb2          icb3
1868          -464             5          -476          -448             0
1869 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1870          1.            0.            1.            0.        1.0e-20
1871 *
1872 *        idcb          icbn          icb1          icb2          icb3
1873          -466             5          -478          -452             0
1874 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1875          1.            0.            1.            0.        1.0e-20
1876 *
1877 *        idcb          icbn          icb1          icb2          icb3
1878          -468            25          -456          -434             0
1879 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1880          1.            0.            1.            0.        1.0e-20
1881 *
1882 *        idcb          icbn          icb1          icb2          icb3
1883          -470            25          -458          -438             0
1884 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1885          1.            0.            1.            0.        1.0e-20
1886 *
1887 *        idcb          icbn          icb1          icb2          icb3
1888          -472            25          -460          -442             0
1889 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1890          1.            0.            1.            0.        1.0e-20
1891 *
1892 *        idcb          icbn          icb1          icb2          icb3
1893          -474            25          -462          -446             0
1894 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1895          1.            0.            1.            0.        1.0e-20
1896 *
1897 *        idcb          icbn          icb1          icb2          icb3
1898          -476            25          -464          -450             0
1899 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1900          1.            0.            1.            0.        1.0e-20
1901 *
1902 *        idcb          icbn          icb1          icb2          icb3
1903          -478            25          -466          -454             0
1904 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1905          1.            0.            1.            0.        1.0e-20
1906 *
1907 *        idcb          icbn          icb1          icb2          icb3
1908          -480             3          -468          -470             0
1909 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1910          1.            0.            2.            0.        1.0e-20
1911 *
1912 *        idcb          icbn          icb1          icb2          icb3
1913          -482             3          -472          -474             0
1914 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1915          1.            0.            2.            0.        1.0e-20
1916 *
1917 *        idcb          icbn          icb1          icb2          icb3
1918          -484             3          -476          -478             0
1919 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1920          2.            0.            4.            0.        1.0e-20
1921 *
1922 *        idcb          icbn          icb1          icb2          icb3
1923          -486             3          -480          -482             0
1924 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1925          1.            0.            4.            0.        1.0e-20
1926 *
1927 *        idcb          icbn          icb1          icb2          icb3
1928          -488             3          -486          -484             0
1929 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1930          .125          0.            1.            0.        1.0e-20
1931 *
1932 ************************************************************************
1933 *                HPI, RCP, and MFW realignment trip signals            *
1934 ************************************************************************
1935 *
1936 *     control
1937 *     block id  control block value
1938 *     --------  -------------------
1939 *
```



```
1940 *        -745  HPI trip signal
1941 *        -725  RCP trip signal used in trip 20
1942 *        -740  MFW realignment trip signal
1943 *
1944 *
1945 *        idcb          icbn          icb1          icb2          icb3
1946          -705            34             2           -32             0
1947 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1948          1.            0.            1.            0.        1.0e-20
1949 *
1950 *        idcb          icbn          icb1          icb2          icb3
1951          -710            54           203           202             0
1952 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1953           0.0          0.0           0.0           0.0           0.0
1954 *        1.            0.            1.            0.        1.0e-20
1955 *
1956 *        idcb          icbn          icb1          icb2          icb3
1957          -715            54           205           204             0
1958 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1959           0.0          0.0           0.0           0.0           0.0
1960 *        1.            0.            1.            0.        1.0e-20
1961 *
1962 *        idcb          icbn          icb1          icb2          icb3
1963          -725            37          -710          -715             0
1964 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1965          1.        -1.e+99        1.e+99            0.        1.0e-20
1966 *
1967 *        idcb          icbn          icb1          icb2          icb3
1968          -720            36          -705             0             0
1969 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1970          1.            0.            1.            0.        1.0e-20
1971 *
1972 *        idcb          icbn          icb1          icb2          icb3
1973          -730            24           -21          -720          -720
1974 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1975          1.            0.        1.e+99            0.        1.0e-20
1976 *
1977 *        idcb          icbn          icb1          icb2          icb3
1978          -735            34          -725           -34             0
1979 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1980          1.            0.            1.            0.        1.0e-20
1981 *
1982 *        idcb          icbn          icb1          icb2          icb3
1983          -740            21          -730           -33             0
1984 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1985          1.            0.            1.            0.        1.0e-20
1986 *
1987 *        idcb          icbn          icb1          icb2          icb3
1988          -745             5          -720          -735             0
1989 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1990          1.            0.            1.            0.        1.0e-20
1991 *
1992 *        idcb          icbn          icb1          icb2          icb3
1993          -750            39          -740           201             0
1994 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
1995          1.            0.          100.            0.        1.0e-20
1996 *
1997 *        idcb          icbn          icb1          icb2          icb3
1998          -755             5          -740          -735             0
1999 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2000          1.            0.            1.            0.        1.0e-20
2001 *
2002 *        idcb          icbn          icb1          icb2          icb3
2003          -760            25          -740           -20             0
2004 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2005          1.            0.            1.            0.        1.0e-20
2006 *
2007 *        idcb          icbn          icb1          icb2          icb3
2008          -765             3          -765          -750             0
2009 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2010          1.            0.            5.            0.        1.0e-20
2011 *
2012 *        idcb          icbn          icb1          icb2          icb3
```

```
          -770          39        -760         201           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.        100.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -775           3        -775        -770           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          4.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -780         101        -765           4           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
* cftab      +           +           +           +           +
           -10.        0.s
             0.        0.s
             5.        1.s
            10.        1.e
*
*         idcb        icbn        icb1        icb2        icb3
          -785         101        -765           4           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
* cftab      +           +           +           +           +
           -10.        1.s
             0.        1.s
             5.        0.s
            10.        0.e
*
*         idcb        icbn        icb1        icb2        icb3
          -790         101        -775           4           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
* cftab      +           +           +           +           +
           -10.        1.s
             0.        1.s
             4.        0.s
            10.        0.e
*
*********************************************************************
*          hotwell and condensate booster pump trip signals         *
*********************************************************************
*
*     control
*     block id  control block value
*     --------  -------------------
*
*        -835  hotwell pump trip signal
*              0 = off, 1 = triped
*        -865  condensate booster pump trip signal
*              0 = off, 1 = triped
*
*       hotwell level defined as a constant, 0.2 m
*         idcb        icbn        icb1        icb2        icb3
          -800           9           0           0           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.         0.2         0.2         0.2         0.2
*
*         idcb        icbn        icb1        icb2        icb3
          -801           9           0           0           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.        400.        400.        400.        400.
*
*         idcb        icbn        icb1        icb2        icb3
          -802          21         212         -21           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -803          21           1        -801           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
```



```
*         idcb        icbn        icb1        icb2        icb3
          -804          25        -802        -803           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -805          34        -800         -35           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -810          34         217         -37           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -820           5        -804        -805           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -825           5        -804        -810           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -835          36        -820           0           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -840          36        -825           0           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
          -865          25        -835        -840           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0e-20
*
*********************************************************************
*                   Feedwater heater condensate drain               *
*********************************************************************
*
* start time integration when turbine trip set status is set to 1
* gain = 0.2 so that output equals 1 after 5 s.  this control block
* serves as a condensate-drain mass-flow reducer after turbine trip.
*         idcb        icbn        icb1        icb2        icb3
          -900          23         220           0           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            0.2         0.          1.          0.     0.0
*
* subtract cb-900 from 1 to calculate mass flow multiplier
*         idcb        icbn        icb1        icb2        icb3
          -902          54         -21        -900           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
            1.          0.          1.          0.     1.0
*
* condensate drain into d heater. gain = 0.17306/2.204623 = 0.0785
*         idcb        icbn        icb1        icb2        icb3
          -904          39         746        -902           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
        0.0785          0.      1.0e10          0.     1.0e-20
*
* condensate drain into e heater. gain = 1.330652/2.204623 = 0.60357
*         idcb        icbn        icb1        icb2        icb3
          -906          39         750        -902           0
*       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
       0.60347          0.      1.0e10          0.     1.0e-20
*
*********************************************************************
*                        HPI flowrate signals                       *
*********************************************************************
```

```
2159 *
2160 *     control
2161 *     block id  control block value
2162 *     --------  -------------------
2163 *
2164 *       -1188  a1 hpi flowrate (kg/sec)
2165 *       -1192  a2 hpi flowrate (kg/sec)
2166 *       -1196  b1 hpi flowrate (kg/sec)
2167 *       -1198  b2 hpi flowrate (kg/sec)
2168 *
2169 *
2170 *        idcb          icbn          icb1          icb2          icb3
2171         -1101            37           235           236             0
2172 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2173            1.       -1.e+99        1.e+99            0.      1.0e-20
2174 *
2175 *        idcb          icbn          icb1          icb2          icb3
2176         -1102            21             2           -87             0
2177 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2178            1.            0.            1.            0.      1.0e-20
2179 *
2180 *        idcb          icbn          icb1          icb2          icb3
2181         -1103            37           237           238             0
2182 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2183            1.       -1.e+99        1.e+99            0.      1.0e-20
2184 *
2185 *        idcb          icbn          icb1          icb2          icb3
2186         -1104            21             2           -88             0
2187 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2188            1.            0.            1.            0.      1.0e-20
2189 *
2190 *        idcb          icbn          icb1          icb2          icb3
2191         -1105            37         -1101         -1103             0
2192 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2193            1.       -1.e+99        1.e+99            0.      1.0e-20
2194 *
2195 *        idcb          icbn          icb1          icb2          icb3
2196         -1106             5          -740           268             0
2197 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2198            1.            0.            1.            0.      1.0e-20
2199 *
2200 *        idcb          icbn          icb1          icb2          icb3
2201         -1108            54           203           202             0
2202 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2203            1.       -1.e+99        1.e+99            0.      1.0e-20
2204 *
2205 *        idcb          icbn          icb1          icb2          icb3
2206         -1112            54           205           204             0
2207 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2208            1.       -1.e+99        1.e+99            0.      1.0e-20
2209 *
2210 *        idcb          icbn          icb1          icb2          icb3
2211         -1116            34             2           -32             0
2212 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2213            1.            0.            1.            0.      1.0e-20
2214 *
2215 *        idcb          icbn          icb1          icb2          icb3
2216         -1117             3           235           236             0
2217 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2218            1.       -1.e+99        1.e+99            0.      1.0e-20
2219 *
2220 *        idcb          icbn          icb1          icb2          icb3
2221         -1118             3           237           238             0
2222 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2223            1.       -1.e+99        1.e+99            0.      1.0e-20
2224 *
2225 *        idcb          icbn          icb1          icb2          icb3
2226         -1120             5         -1104         -1144             0
2227 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2228            1.            0.            1.            0.      1.0e-20
2229 *
2230 *        idcb          icbn          icb1          icb2          icb3
2231         -1122            34         -1105           -27             0
```



```
2232 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2233            1.            0.            1.            0.      1.0e-20
2234 *
2235 *        idcb          icbn          icb1          icb2          icb3
2236         -1124            37         -1108         -1112             0
2237 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2238            1.       -1.e+99        1.e+99            0.      1.0e-20
2239 *
2240 *        idcb          icbn          icb1          icb2          icb3
2241         -1128            36         -1116             0             0
2242 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2243            1.            0.            1.            0.            0.
2244 *
2245 *        idcb          icbn          icb1          icb2          icb3
2246         -1130             3         -1117         -1118             0
2247 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2248             .25      -1.e+99        1.e+99            0.      1.0e-20
2249 *
2250 *        idcb          icbn          icb1          icb2          icb3 /gsr
2251         -1131            21            27           -14             0
2252 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2253            1.            0.            1.            0.      1.0e-20
2254 *
2255 *        idcb          icbn          icb1          icb2          icb3
2256         -1132            25         -1102         -1120             0
2257 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2258            1.            0.            1.            0.      1.0e-20
2259 *
2260 *        idcb          icbn          icb1          icb2          icb3
2261         -1136             5           260         -1128             0
2262 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2263            1.            0.            1.            0.      1.0e-20
2264 *
2265 *        idcb          icbn          icb1          icb2          icb3
2266         -1137            21         -1124           -90             0
2267 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2268            1.            0.            1.            0.      1.0e-20
2269 *
2270 *   Add HPI throttling logic not to throttle if pzr level below 120 inch.
2271 *   by  gsr 7/6/01
2272 *
2273 *        idcb          icbn          icb1          icb2          icb3
2274         -1133             5         -1131         -1137             0
2275 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2276            1.            0.            1.            0.      1.0e-20
2277 *
2278 *        idcb          icbn          icb1          icb2          icb3   /gsr
2279         -1138            21         -1124           -28             0
2280 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2281            1.            0.            1.            0.      1.0e-20
2282 *
2283 *        idcb          icbn          icb1          icb2          icb3 /gsr
2284 *       -1139             5         -1122         -1137             0
2285         -1139             5         -1122         -1133             0
2286 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2287            1.            0.            1.            0.      1.0e-20
2288 *
2289 *        idcb          icbn          icb1          icb2          icb3
2290         -1140             5         -1106         -1139             0
2291 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2292            1.            0.            1.            0.      1.0e-20
2293 *
2294 *        idcb          icbn          icb1          icb2          icb3
2295         -1141             5         -1128         -1140             0
2296 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2297            1.            0.            1.            0.      1.0e-20
2298 *
2299 *        idcb          icbn          icb1          icb2          icb3
2300         -1142            22            56         -1130           221
2301 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2302            1.       -1.e+99        1.e+99            0.      1.0e-20
2303 *
2304 *        idcb          icbn          icb1          icb2          icb3
```

```
          -1143          26       -1142           0           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99         13.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1144           5       -1132       -1136           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1145         100       -1143        1000           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99        120.          0.
*
*         idcb        icbn        icb1        icb2        icb3 /gsr
*       -1146           5       -1144       -1137           0
        -1146           5       -1144       -1133           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1147           5       -1138         265           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1148          25       -1147       -1141           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1149          54       -1143       -1145           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
       .008333     -1.e+99       1.e+99          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1150          25       -1146       -1148           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1151          34       -1149         -91           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1153          21       -1149         -20           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1154          38       -1153           0           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.          1.
*
*         idcb        icbn        icb1        icb2        icb3
        -1155          61       -1142       -1154           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1157          54       -1155         -28           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1159          34       -1142       -1157           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1160           5       -1151       -1159           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
```



```
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3 /gsr
*       -1161           5       -1137       -1160           0
        -1161           5       -1133       -1160           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1162           5       -1161         259           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1163          25       -1150       -1162           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1164          22         -21         -22       -1163
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99          0.         -1.
*
*         idcb        icbn        icb1        icb2        icb3
        -1165          39       -1164         201           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.     -1.e+99       1.e+99          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1166           3       -1166       -1165           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.         10.          0.    1.0e-20
*
*         idcb        icbn        icb1        icb2        icb3
        -1167         101       -1166           4           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.          1.
* cftab       +           +           +           +           +
        -1.e+6          1.s
            0.          1.s
           10.          0.s
         1.e+6          0.e
*
*         idcb        icbn        icb1        icb2        icb3
        -1168          39       -1167       -1128           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
              1.          0.          1.          0.    1.0e-20
*
* cold leg a1 hpi flow
*         idcb        icbn        icb1        icb2        icb3
        -1172         101           7          10           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
            0.0         0.0         0.0         0.0         0.0
* cftab       +           +           +           +           +
*    P (pa)     mass flow (kg/s)
   6.89475e+05      23.2171  s
   2.06843e+06      22.3339  s
   4.13685e+06      21.1982  s
   6.20528e+06      19.6841  s
   8.27370e+06      18.0437  s
   1.03421e+07      16.5296  s
   1.24106e+07      14.6369  s
   1.44790e+07      12.4918  s
   1.72369e+07       8.0755  s
   1.86158e+07       3.5961  e
*
* cold leg a2 hpi flow
*         idcb        icbn        icb1        icb2        icb3
        -1176         101           8          10           0
*       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
            0.0         0.0         0.0         0.0         0.0
* cftab       +           +           +           +           +
*    P (pa)     mass flow (kg/s)
```

```
   6.89475e+05        23.2171  s
   2.06843e+06        22.3339  s
   4.13685e+06        21.1982  s
   6.20528e+06        19.6841  s
   8.27370e+06        18.0437  s
   1.03421e+07        16.5296  s
   1.24106e+07        14.6369  s
   1.44790e+07        12.4918  s
   1.72369e+07         8.0755  s
   1.86158e+07         3.5961  e
*
* cold leg b1 hpi flow
*          idcb          icbn          icb1          icb2          icb3
          -1180           101             9            10             0
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             0.           0.            0.            0.            0.
* cftab      +             +             +             +             +
*    P (pa)     mass flow (kg/s)
   6.89475e+05        17.2867  s
   2.06843e+06        16.7819  s
   4.13685e+06        15.5201  s
   6.20528e+06        14.3214  s
   8.27370e+06        13.1227  s
   1.03421e+07        12.1133  s
   1.24106e+07        10.8515  s
   1.44790e+07         9.2742  s
   1.72369e+07         6.3090  s
   1.86158e+07         2.2082  e
*
* cold leg b2 hpi flow
*          idcb          icbn          icb1          icb2          icb3
          -1184           101            10            10             0
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             0.           0.            0.            0.            0.
* cftab      +             +             +             +             +
*    P (pa)     mass flow (kg/s)
   6.89475e+05        17.2867  s
   2.06843e+06        16.7819  s
   4.13685e+06        15.5201  s
   6.20528e+06        14.3214  s
   8.27370e+06        13.1227  s
   1.03421e+07        12.1133  s
   1.24106e+07        10.8515  s
   1.44790e+07         9.2742  s
   1.72369e+07         6.3090  s
   1.86158e+07         2.2082  e
*
*          idcb          icbn          icb1          icb2          icb3
          -1188            39         -1168         -1172             0
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.       -1.e+99        1.e+99            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
          -1192            39         -1168         -1176             0
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.       -1.e+99        1.e+99            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
          -1196            39         -1168         -1180             0
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.       -1.e+99        1.e+99            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
          -1198            39         -1168         -1184             0
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.       -1.e+99        1.e+99            0.       1.0e-20
*
*************************************************************************
*                          MFW trip signal                              *
*************************************************************************
*
*     control
*     block id  control block value
```



```
*     --------  -------------------
*
*        -1280  MFW trip signal
*
*
*   MFW pump trip due to high discharge P is disabled because this deck doesn't
*   simulate a recirculation line around the pump.  gsr
*          idcb          icbn          icb1          icb2          icb3  /gsr
*        -1202            21           219           -50             0
         -1202            21           219           -29             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1204            34           218           -51             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1209             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.         100.          100.          100.          100.
*
*          idcb          icbn          icb1          icb2          icb3
         -1210            16           212           -21             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1212            21             1         -1209             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1225            25         -1210         -1212             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1230            25         -1202         -1204             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1235             5         -1225         -1230             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1240            21             4           -36             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1250            25         -1235         -1240             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1260            21             3           -36             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.       1.0e-20
*
*          idcb          icbn          icb1          icb2          icb3
         -1270            25         -1250         -1260             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.            0.
*
*          idcb          icbn          icb1          icb2          icb3
         -1280            36         -1270             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           0.            1.            0.            0.
*
```

```
2597 * main feedwater pump b trip logic
2598 *
2599 *   MFW pump trip due to high discaharge P is disabled because this deck doesn't
2600 *   simulate a recirculation line around the pump.  gsr
2601 *        idcb          icbn          icb1          icb2          icb3  /gsr
2602 *       -1282            21           267           -39             0
2603        -1282            21           267           -29             0
2604 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2605           1.            0.            1.            0.       1.0e-20
2606 *
2607 *        idcb          icbn          icb1          icb2          icb3
2608       -1284            34           266           -51             0
2609 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2610           1.            0.            1.            0.       1.0e-20
2611 *
2612 *        idcb          icbn          icb1          icb2          icb3
2613       -1286            25         -1282         -1284             0
2614 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2615           1.            0.            1.            0.       1.0e-20
2616 *
2617 *        idcb          icbn          icb1          icb2          icb3
2618       -1288             5         -1225         -1286             0
2619 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2620           1.            0.            1.            0.       1.0e-20
2621 *
2622 *        idcb          icbn          icb1          icb2          icb3
2623       -1290            25         -1288         -1240             0
2624 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2625           1.            0.            1.            0.       1.0e-20
2626 *
2627 *        idcb          icbn          icb1          icb2          icb3
2628       -1292            25         -1290         -1260             0
2629 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2630           1.            0.            1.            0.            0.
2631 *
2632 *        idcb          icbn          icb1          icb2          icb3
2633       -1294            36         -1292             0             0
2634 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2635           1.            0.            1.            0.            0.
2636 *
2637 ************************************************************************
2638 *                   reactor and turbine trip signals                   *
2639 ************************************************************************
2640 *
2641 *     control
2642 *     block id  control block value
2643 *     --------  -------------------
2644 *
2645 *       -1393  reactor trip signal
2646 *       -1399  turbine trip signal
2647 *
2648 *
2649 *        idcb          icbn          icb1          icb2          icb3
2650       -1300             3           206           207             0
2651 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2652           1.       -1.e+99       1.e+99            0.       1.0e-20
2653 *
2654 *        idcb          icbn          icb1          icb2          icb3
2655       -1301             3           202           204             0
2656 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2657           .5       -1.e+99       1.e+99            0.       1.0e-20
2658 *
2659 *        idcb          icbn          icb1          icb2          icb3
2660       -1302            14           900           -53             0
2661 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2662           1.       -1.e+99       1.e+99            0.       1.0e-20
2663 *
2664 *        idcb          icbn          icb1          icb2          icb3
2665       -1304            21           202           -54             0
2666 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2667           1.            0.            1.            0.       1.0e-20
2668 *
2669 *        idcb          icbn          icb1          icb2          icb3
```



```
2670       -1306            21           204           -54             0
2671 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2672           1.            0.            1.            0.       1.0e-20
2673 *
2674 *        idcb          icbn          icb1          icb2          icb3
2675       -1309            14           900         -1300             0
2676 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2677           1.       -1.e+99       1.e+99            0.           0.0
2678 *
2679 *        idcb          icbn          icb1          icb2          icb3
2680       -1312            16         -1280           -21             0
2681 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2682           1.            0.            1.            0.       1.0e-20
2683 *
2684 *        idcb          icbn          icb1          icb2          icb3
2685       -1315            16           220           -21             0
2686 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2687           1.            0.            1.            0.       1.0e-20
2688 *
2689 *        idcb          icbn          icb1          icb2          icb3
2690       -1316            39         -1301           -25             0
2691 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2692           1.       -1.e+99       1.e+99            0.       1.0e-20
2693 *
2694 *        idcb          icbn          icb1          icb2          icb3
2695       -1318            21           221           -20             0
2696 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2697           1.            0.            1.            0.       1.0e-20
2698 *
2699 *        idcb          icbn          icb1          icb2          icb3
2700       -1321            21           222           -20             0
2701 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2702           1.            0.            1.            0.       1.0e-20
2703 *
2704 *        idcb          icbn          icb1          icb2          icb3
2705       -1324            21         -1302           -57             0
2706 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2707           1.            0.            1.            0.       1.0e-20
2708 *
2709 *        idcb          icbn          icb1          icb2          icb3
2710       -1327            21             2           -55             0
2711 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2712           1.            0.            1.            0.       1.0e-20
2713 *
2714 *        idcb          icbn          icb1          icb2          icb3
2715       -1330            34             2           -56             0
2716 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2717           1.            0.            1.            0.       1.0e-20
2718 *
2719 *        idcb          icbn          icb1          icb2          icb3
2720       -1333            25         -1304         -1306             0
2721 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2722           1.            0.            1.            0.       1.0e-20
2723 *
2724 *        idcb          icbn          icb1          icb2          icb3
2725       -1336            21         -1309           -58             0
2726 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2727           1.            0.            1.            0.       1.0e-20
2728 *
2729 *        idcb          icbn          icb1          icb2          icb3
2730       -1339            25         -1312         -1315             0
2731 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2732           1.            0.            1.            0.       1.0e-20
2733 *
2734 *        idcb          icbn          icb1          icb2          icb3
2735       -1340            54         -1316           -26             0
2736 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2737           1.       -1.e+99       1.e+99            0.       1.0e-20
2738 *
2739 *        idcb          icbn          icb1          icb2          icb3
2740       -1342            24           -21         -1324         -1324
2741 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
2742           1.       -1.e+99       1.e+99            0.       1.0e-20
```

```
2743 *
2744 *        idcb        icbn        icb1        icb2        icb3
2745         -1345          24         -21       -1327       -1327
2746 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2747             1.    -1.e+99      1.e+99          0.     1.0e-20
2748 *
2749 *        idcb        icbn        icb1        icb2        icb3
2750         -1348          24         -21       -1330       -1330
2751 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2752             1.    -1.e+99      1.e+99          0.     1.0e-20
2753 *
2754 *        idcb        icbn        icb1        icb2        icb3
2755         -1351          24         -21       -1333       -1333
2756 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2757             1.    -1.e+99      1.e+99          0.     1.0e-20
2758 *
2759 *        idcb        icbn        icb1        icb2        icb3
2760         -1354          24         -21       -1336       -1336
2761 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2762             1.    -1.e+99      1.e+99          0.     1.0e-20
2763 *
2764 *        idcb        icbn        icb1        icb2        icb3
2765         -1355          34           2       -1340           0
2766 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2767             1.    -1.e+99      1.e+99          0.     1.0e-20
2768 *
2769 *        idcb        icbn        icb1        icb2        icb3
2770         -1357          20       -1342         -59           0
2771 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2772             1.          0.          1.          0.     1.0e-20
2773 *
2774 *        idcb        icbn        icb1        icb2        icb3
2775         -1360          20       -1345         -60           0
2776 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2777             1.          0.          1.          0.     1.0e-20
2778 *
2779 *        idcb        icbn        icb1        icb2        icb3
2780         -1363          20       -1348         -60           0
2781 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2782             1.          0.          1.          0.     1.0e-20
2783 *
2784 *        idcb        icbn        icb1        icb2        icb3
2785         -1366          20       -1351         -61           0
2786 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2787             1.          0.          1.          0.     1.0e-20
2788 *
2789 *        idcb        icbn        icb1        icb2        icb3
2790         -1369          20       -1354         -62           0
2791 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2792             1.          0.          1.          0.     1.0e-20
2793 *
2794 *        idcb        icbn        icb1        icb2        icb3
2795         -1370          25       -1339       -1355           0
2796 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2797             1.          0.          1.          0.     1.0e-20
2798 *
2799 *        idcb        icbn        icb1        icb2        icb3
2800         -1372          25       -1318       -1321           0
2801 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2802             1.          0.          1.          0.     1.0e-20
2803 *
2804 *        idcb        icbn        icb1        icb2        icb3
2805         -1375          25       -1357       -1360           0
2806 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2807             1.          0.          1.          0.     1.0e-20
2808 *
2809 *        idcb        icbn        icb1        icb2        icb3
2810         -1378          25       -1363       -1366           0
2811 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2812             1.          0.          1.          0.     1.0e-20
2813 *
2814 *        idcb        icbn        icb1        icb2        icb3
2815         -1381          25       -1369       -1370           0
```



```
2816 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2817             1.          0.          1.          0.     1.0e-20
2818 *
2819 *        idcb        icbn        icb1        icb2        icb3
2820         -1384          25       -1372       -1375           0
2821 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2822             1.          0.          1.          0.     1.0e-20
2823 *
2824 *        idcb        icbn        icb1        icb2        icb3
2825         -1387          25       -1378       -1381           0
2826 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2827             1.          0.          1.          0.     1.0e-20
2828 *
2829 *        idcb        icbn        icb1        icb2        icb3
2830         -1390          25       -1384       -1387           0
2831 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2832             1.          0.          1.          0.     1.0e-20
2833 *
2834 *        idcb        icbn        icb1        icb2        icb3
2835         -1393          36       -1390           0           0
2836 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2837             1.          0.          1.          0.     1.0e-20
2838 *
2839 *        idcb        icbn        icb1        icb2        icb3
2840         -1396          36       -1339           0           0
2841 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2842             1.          0.          1.          0.     1.0e-20
2843 *
2844 *        idcb        icbn        icb1        icb2        icb3
2845         -1399          25       -1393       -1396           0
2846 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2847             1.          0.          1.          0.     1.0e-20
2848 *
2849 ***********************************************************************
2850 *                  high & low pressure heaters control                *
2851 ***********************************************************************
2852 *
2853 *     control
2854 *     block id  control block value
2855 *     --------  -------------------
2856 *
2857 *        -1522  demineralizer heater power (W)
2858 *        -1523  f low pressure heater power (W)
2859 *        -1524  e low pressure heater power (W)
2860 *        -1525  d low pressure heater power (W)
2861 *        -1526  c low pressure heater power (W)
2862 *        -1527  b low pressure heater power (W)
2863 *        -1592  comp 764 high pressure heater power (W)
2864 *        -1596  comp 766 high pressure heater power (W)
2865 *
2866 *
2867 *        idcb        icbn        icb1        icb2        icb3
2868        -1504           3         213         214           0
2869 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2870             1.    -1.e+99      1.e+99          0.     1360.8
2871 *
2872 *        idcb        icbn        icb1        icb2        icb3
2873        -1508          39       -1504         -72           0
2874 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2875             1.    -1.e+99      1.e+99          0.      3000.
2876 *
2877 *        idcb        icbn        icb1        icb2        icb3
2878        -1512         101       -1508           7           0
2879 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2880             1.    -1.e+99      1.e+99          0.       370.
2881 * cftab      +           +           +           +           +
2882            0.        114.s
2883          180.        150.s
2884          600.        230.s
2885          900.        266.s
2886         1560.        312.s
2887         3000.        370.s
2888        3571.4        393.e
```

```
2889 *
2890 *        idcb        icbn        icb1        icb2        icb3
2891        -1516          39       -1512         -73           0
2892 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2893          1.      -1.e+99      1.e+99          0.   9.727e+8
2894 *
2895 *        idcb        icbn        icb1        icb2        icb3
2896        -1520          16       -1393         -20           0
2897 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2898          1.          0.          1.          0.          1.
2899 *
2900 *        idcb        icbn        icb1        icb2        icb3
2901        -1521          39       -1516       -1520           0
2902 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2903          1.      -1.e+99      1.e+99          0.   9.727e+8
2904 *
2905 *        idcb        icbn        icb1        icb2        icb3
2906        -1522          39       -1521         -21           0
2907 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2908       .009556      -1.e+99      1.e+99          0.   9.295e+6
2909 *
2910 *        idcb        icbn        icb1        icb2        icb3
2911        -1523          39       -1521         -21           0
2912 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2913         .1241      -1.e+99      1.e+99          0.   1.207e+8
2914 *
2915 *        idcb        icbn        icb1        icb2        icb3
2916        -1524          39       -1521         -21           0
2917 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2918         .1345      -1.e+99      1.e+99          0.   1.308e+8
2919 *
2920 *        idcb        icbn        icb1        icb2        icb3
2921        -1525          39       -1521         -21           0
2922 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2923         .1505      -1.e+99      1.e+99          0.   1.464e+8
2924 *
2925 *        idcb        icbn        icb1        icb2        icb3
2926        -1526          39       -1521         -21           0
2927 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2928         .2581      -1.e+99      1.e+99          0.   2.511e+8
2929 *
2930 *        idcb        icbn        icb1        icb2        icb3
2931        -1527          39       -1521         -21           0
2932 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2933        .07952      -1.e+99      1.e+99          0.   7.735e+7
2934 *
2935 *        idcb        icbn        icb1        icb2        icb3
2936        -1528          16       -1393         -21           0
2937 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2938          1.          0.          1.          0.     1.e-20
2939 *
2940 *        idcb        icbn        icb1        icb2        icb3
2941        -1532          16       -1399         -21           0
2942 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2943          1.          0.          1.          0.     1.e-20
2944 *
2945 *        idcb        icbn        icb1        icb2        icb3
2946        -1536          39       -1528         -74           0
2947 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2948          1.      -1.e+99      1.e+99          0.     1.e-20
2949 *
2950 *        idcb        icbn        icb1        icb2        icb3
2951        -1540          39       -1532         -75           0
2952 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2953          1.      -1.e+99      1.e+99          0.     1.e-20
2954 *
2955 *        idcb        icbn        icb1        icb2        icb3
2956        -1544          34       -1536       -1540           0
2957 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2958          1.      -1.e+99      1.e+99          0.     1.e-20
2959 *
2960 *        idcb        icbn        icb1        icb2        icb3
2961        -1548          39       -1544         201           0
```



```
2962 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2963          1.      -1.e+99      1.e+99          0.     1.e-20
2964 *
2965 *        idcb        icbn        icb1        icb2        icb3
2966        -1552          54       -1552       -1548           0
2967 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2968          1.      -1.e+99      1.e+99          0.          1.
2969 *
2970 *        idcb        icbn        icb1        icb2        icb3
2971        -1556          39       -1552         -76           0
2972 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2973          1.          0.       21.42          0.         18.
2974 *
2975 *        idcb        icbn        icb1        icb2        icb3
2976        -1560         101       -1556           7           0
2977 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2978          1.      -1.e+99      1.e+99          0.        460.
2979 * cftab     +           +           +           +           +
2980          0.        204.s
2981        .562        240.s
2982        3.60        320.s
2983        5.40        356.s
2984        9.36        402.s
2985        18.0        460.s
2986       21.42        483.e
2987 *
2988 *        idcb        icbn        icb1        icb2        icb3
2989        -1564           3       -1560         -77           0
2990 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2991          1.      -1.e+99      1.e+99          0.      919.67
2992 *
2993 *        idcb        icbn        icb1        icb2        icb3
2994        -1568          59       -1564         764           0
2995 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
2996          1.      -1.e+99      1.e+99          1.        -1.8
2997 *
2998 *        idcb        icbn        icb1        icb2        icb3
2999        -1572          16       -1393         -20           0
3000 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3001          1.          0.          1.          0.          1.
3002 *
3003 *        idcb        icbn        icb1        icb2        icb3
3004        -1576          59       -1564         766           0
3005 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3006          1.      -1.e+99      1.e+99          1.        -1.8
3007 *
3008 *        idcb        icbn        icb1        icb2        icb3
3009        -1580          39       -1568       -1572           0
3010 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3011          1.      -1.e+99      1.e+99          0.          0.
3012 *
3013 *        idcb        icbn        icb1        icb2        icb3
3014        -1584          39       -1572       -1576           0
3015 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3016          1.      -1.e+99      1.e+99          0.          0.
3017 *
3018 *        idcb        icbn        icb1        icb2        icb3
3019        -1588          39       -1580         767           0
3020 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3021          1.      -1.e+99      1.e+99          0.          0.
3022 *
3023 *        idcb        icbn        icb1        icb2        icb3
3024        -1592          39       -1584         768           0
3025 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3026          1.      -1.e+99      1.e+99          0.          0.
3027 *
3028 *        idcb        icbn        icb1        icb2        icb3
3029        -1596          39       -1588         -78           0
3030 *      cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3031          1.      -1.e+99      1.e+99          0.          0.
3032 *
3033 *        idcb        icbn        icb1        icb2        icb3
3034        -1598          39       -1592         -78           0
```

```
3035 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3036            1.       -1.e+99        1.e+99          0.            0.
3037 *
3038 ***********************************************************************
3039 *                    motor driven EFW flowrate                        *
3040 ***********************************************************************
3041 *
3042 *     control
3043 *     block id  control block value
3044 *     --------  -------------------
3045 *
3046 *       -1697  sg a motor driven EFW flowrate (kg/sec)
3047 *       -1698  sg b motor driven EFW flowrate (kg/sec)
3048 *
3049 *
3050 *        idcb          icbn          icb1          icb2          icb3
3051        -1601            22           -95           -93           221
3052 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3053            1.       -1.e+99        1.e+99          0.        1.0e-20
3054 *
3055 *        idcb          icbn          icb1          icb2          icb3
3056        -1602            22           -94           -92           221
3057 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3058            1.       -1.e+99        1.e+99          0.        1.0e-20
3059 *
3060 *        idcb          icbn          icb1          icb2          icb3
3061        -1603            22           -97         -1601           118
3062 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3063            1.       -1.e+99        1.e+99          0.        1.0e-20
3064 *
3065 *        idcb          icbn          icb1          icb2          icb3
3066        -1604            22           -96         -1602           118
3067 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3068            1.       -1.e+99        1.e+99          0.        1.0e-20
3069 *
3070 *        idcb          icbn          icb1          icb2          icb3
3071        -1605            22           -99         -1603           119
3072 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3073            1.       -1.e+99        1.e+99          0.        1.0e-20
3074 *
3075 *        idcb          icbn          icb1          icb2          icb3
3076        -1606            22           -98         -1604           119
3077 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3078            1.       -1.e+99        1.e+99          0.        1.0e-20
3079 *
3080 *        idcb          icbn          icb1          icb2          icb3
3081        -1607            22          -230             4           119
3082 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3083            1.       -1.e+99        1.e+99          0.        1.0e-20
3084 *
3085 *        idcb          icbn          icb1          icb2          icb3
3086        -1608            34         -1607         -1605             0
3087 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3088            1.            0.            1.            0.        1.0e-20
3089 *
3090 *        idcb          icbn          icb1          icb2          icb3
3091        -1612            34         -1607         -1606             0
3092 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3093            1.            0.            1.            0.        1.0e-20
3094 *
3095 *        idcb          icbn          icb1          icb2          icb3
3096        -1616            20            99           -21             0
3097 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3098            1.            0.            1.            0.        1.0e-20
3099 *
3100 *        idcb          icbn          icb1          icb2          icb3
3101        -1618            22          -231             3           119
3102 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3103            1.       -1.e+99        1.e+99          0.        1.0e-20
3104 *
3105 *        idcb          icbn          icb1          icb2          icb3
3106        -1620            34         -1618         -1605             0
3107 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
```



```
3108            1.            0.            1.            0.        1.0e-20
3109 *
3110 *        idcb          icbn          icb1          icb2          icb3
3111        -1624            34         -1618         -1606             0
3112 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3113            1.            0.            1.            0.        1.0e-20
3114 *
3115 *        idcb          icbn          icb1          icb2          icb3
3116        -1628             5         -1644         -1608             0
3117 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3118            1.            0.            1.            0.        1.0e-20
3119 *
3120 *        idcb          icbn          icb1          icb2          icb3
3121        -1632             5         -1648         -1620             0
3122 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3123            1.            0.            1.            0.        1.0e-20
3124 *
3125 *        idcb          icbn          icb1          icb2          icb3
3126        -1636            25         -1628         -1612             0
3127 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3128            1.            0.            1.            0.        1.0e-20
3129 *
3130 *        idcb          icbn          icb1          icb2          icb3
3131        -1640            25         -1632         -1624             0
3132 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3133            1.            0.            1.            0.        1.0e-20
3134 *
3135 *        idcb          icbn          icb1          icb2          icb3
3136        -1644             5         -1636         -1616             0
3137 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3138            1.            0.            1.            0.        1.0e-20
3139 *
3140 *        idcb          icbn          icb1          icb2          icb3
3141        -1648             5         -1616         -1640             0
3142 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3143            1.            0.            1.            0.        1.0e-20
3144 *
3145 *        idcb          icbn          icb1          icb2          icb3
3146        -1652            22           -21           -22         -1644
3147 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3148            1.       -1.e+99        1.e+99          0.        1.0e-20
3149 *
3150 *        idcb          icbn          icb1          icb2          icb3
3151        -1656            22           -21           -22         -1648
3152 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3153            1.       -1.e+99        1.e+99          0.        1.0e-20
3154 *
3155 *        idcb          icbn          icb1          icb2          icb3
3156        -1660            39         -1652           201             0
3157 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3158            1.       -1.e+99        1.e+99          0.        1.0e-20
3159 *
3160 *        idcb          icbn          icb1          icb2          icb3
3161        -1664            39         -1656           201             0
3162 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3163            1.       -1.e+99        1.e+99          0.        1.0e-20
3164 *
3165 *        idcb          icbn          icb1          icb2          icb3
3166        -1668             3         -1668         -1660             0
3167 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3168            1.            0.            3.            0.        1.0e-20
3169 *
3170 *        idcb          icbn          icb1          icb2          icb3
3171        -1672             3         -1672         -1664             0
3172 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3173            1.            0.            3.            0.        1.0e-20
3174 *
3175 * sg-a motor-driven efw flow
3176 *        idcb          icbn          icb1          icb2          icb3
3177        -1676           101          1541             9             0
3178 *      cbgain        cbxmin        cbxmax        cbcon1        cbcon2
3179           0.0           0.0           0.0           0.0           0.0
3180 * cftab      +             +             +             +             +
```

```
*       P (pa)   mass flow (kg/s)
   1.90985e+06       43.8476  s
   2.14427e+06       42.9012  s
   2.80616e+06       40.3776  s
   3.37153e+06       39.1158  s
   4.77117e+06       35.3304  s
   6.14322e+06       30.9141  s
   7.52907e+06       26.4978  s
   9.13554e+06       17.3498  s
   9.90776e+06        0.0000  e
*
*         idcb          icbn          icb1          icb2          icb3
         -1680           101         -1668             4             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
* cftab      +             +             +             +             +
         -100.           0.s
            0.           0.s
            3.           1.s
          100.           1.e
*
* sg-b motor-driven efw flow
*         idcb          icbn          icb1          icb2          icb3
         -1684           101          2541             9             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
           0.0           0.0           0.0           0.0           0.0
* cftab      +             +             +             +             +
*       P (pa)   mass flow (kg/s)
   1.90985e+06       43.8476  s
   2.14427e+06       42.9012  s
   2.80616e+06       40.3776  s
   3.37153e+06       39.1158  s
   4.77117e+06       35.3304  s
   6.14322e+06       30.9141  s
   7.52907e+06       26.4978  s
   9.13554e+06       17.3498  s
   9.90776e+06        0.0000  e
*
*         idcb          icbn          icb1          icb2          icb3
         -1688           101         -1672             4             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
* cftab      +             +             +             +             +
         -100.           0.s
            0.           0.s
            3.           1.s
          100.           1.e
*
*         idcb          icbn          icb1          icb2          icb3
         -1692            39         -1676         -1680             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1696            39         -1684         -1688             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1697            39           212         -1692             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1698            39           212         -1696             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*************************************************************************
*                    turbine driven EFW flowrate                        *
*************************************************************************
*
*     control
```



```
*     block id  control block value
*     --------  -------------------
*
*        -1794  sg a steam driven EFW flowrate (kg/sec)
*        -1795  sg b steam driven EFW flowrate (kg/sec)
*
*
*         idcb          icbn          icb1          icb2          icb3
         -1701            22           -95           -93           221
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1702            22           -94           -92           221
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1703            22           -97         -1701           118
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1704            22           -96         -1702           118
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1705            22           -99         -1703           119
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1706            22           -98         -1704           119
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1707            22          -230             4           119
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1709            21           350           -79             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1712            21           450           -79             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1713            22          -231             3           119
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.       -1.e+99        1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1715            34         -1707         -1705             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1718            34         -1707         -1706             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -1721            20            99           -21             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
```

```
3327          -1724          5       -1709       -1712          0
3328  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3329           1.          0.          1.          0.    1.0e-20
3330  *
3331  *        idcb       icbn        icb1        icb2       icb3
3332          -1727         34       -1713       -1705          0
3333  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3334           1.          0.          1.          0.    1.0e-20
3335  *
3336  *        idcb       icbn        icb1        icb2       icb3
3337          -1730         34       -1713       -1706          0
3338  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3339           1.          0.          1.          0.    1.0e-20
3340  *
3341  *        idcb       icbn        icb1        icb2       icb3
3342          -1733          5       -1748       -1715          0
3343  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3344           1.          0.          1.          0.    1.0e-20
3345  *
3346  *        idcb       icbn        icb1        icb2       icb3
3347          -1736          5       -1721       -1724          0
3348  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3349           1.          0.          1.          0.    1.0e-20
3350  *
3351  *        idcb       icbn        icb1        icb2       icb3
3352          -1739          5       -1751       -1727          0
3353  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3354           1.          0.          1.          0.    1.0e-20
3355  *
3356  *        idcb       icbn        icb1        icb2       icb3
3357          -1742         25       -1733       -1718          0
3358  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3359           1.          0.          1.          0.    1.0e-20
3360  *
3361  *        idcb       icbn        icb1        icb2       icb3
3362          -1745         25       -1739       -1730          0
3363  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3364           1.          0.          1.          0.    1.0e-20
3365  *
3366  *        idcb       icbn        icb1        icb2       icb3
3367          -1748          5       -1742       -1736          0
3368  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3369           1.          0.          1.          0.    1.0e-20
3370  *
3371  *        idcb       icbn        icb1        icb2       icb3
3372          -1751          5       -1736       -1745          0
3373  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3374           1.          0.          1.          0.    1.0e-20
3375  *
3376  *        idcb       icbn        icb1        icb2       icb3
3377          -1754         22        -21        -22       -1748
3378  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3379           1.     -1.e+99      1.e+99          0.    1.0e-20
3380  *
3381  *        idcb       icbn        icb1        icb2       icb3
3382          -1757         22        -21        -22       -1751
3383  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3384           1.     -1.e+99      1.e+99          0.    1.0e-20
3385  *
3386  *        idcb       icbn        icb1        icb2       icb3
3387          -1760         39       -1754        201          0
3388  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3389           1.     -1.e+99      1.e+99          0.    1.0e-20
3390  *
3391  *        idcb       icbn        icb1        icb2       icb3
3392          -1763         39       -1757        201          0
3393  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3394           1.     -1.e+99      1.e+99          0.    1.0e-20
3395  *
3396  *        idcb       icbn        icb1        icb2       icb3
3397          -1766          3       -1766       -1760          0
3398  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3399           1.          0.          3.          0.    1.0e-20
```



```
3400  *
3401  *        idcb       icbn        icb1        icb2       icb3
3402          -1769          3       -1769       -1763          0
3403  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3404           1.          0.          3.          0.    1.0e-20
3405  *
3406  * sg-a turbine-driven efw flow
3407  *        idcb       icbn        icb1        icb2       icb3
3408          -1772        101        1541           9          0
3409  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3410           0.5         0.0       1.0e10         0.0        0.0
3411  * cftab      +           +           +           +          +
3412  *      P (pa)   mass flow (kg/s)
3413    1.90985e+06       85.1715  s
3414    2.14427e+06       85.1715  s
3415    2.80616e+06       85.1715  s
3416    3.37153e+06       81.3861  s
3417    4.77117e+06       71.9226  s
3418    6.14322e+06       62.4591  s
3419    7.52907e+06       49.2102  s
3420    9.13554e+06       26.4978  s
3421    9.90776e+06        0.0000  e
3422  *
3423  *        idcb       icbn        icb1        icb2       icb3
3424          -1775        101       -1766           4          0
3425  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3426           1.          0.          1.          0.    1.0e-20
3427  * cftab      +           +           +           +          +
3428         -100.         0.s
3429            0.         0.s
3430            3.         1.s
3431          100.         1.e
3432  *
3433  * sg-b turbine-driven efw flow
3434  *        idcb       icbn        icb1        icb2       icb3
3435          -1778        101        2541           9          0
3436  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3437           0.5         0.0       1.0e10         0.0        0.0
3438  * cftab      +           +           +           +          +
3439  *      P (pa)   mass flow (kg/s)
3440    1.90985e+06       85.1715  s
3441    2.14427e+06       85.1715  s
3442    2.80616e+06       85.1715  s
3443    3.37153e+06       81.3861  s
3444    4.77117e+06       71.9226  s
3445    6.14322e+06       62.4591  s
3446    7.52907e+06       49.2102  s
3447    9.13554e+06       26.4978  s
3448    9.90776e+06        0.0000  e
3449  *
3450  *        idcb       icbn        icb1        icb2       icb3
3451          -1781        101       -1769           4          0
3452  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3453           1.          0.          1.          0.    1.0e-20
3454  * cftab      +           +           +           +          +
3455         -100.         0.s
3456            0.         0.s
3457            3.         1.s
3458          100.         1.e
3459  *
3460  *        idcb       icbn        icb1        icb2       icb3
3461          -1784         39       -1772       -1775          0
3462  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3463           1.     -1.e+99      1.e+99          0.    1.0e-20
3464  *
3465  *        idcb       icbn        icb1        icb2       icb3
3466          -1787         39       -1778       -1781          0
3467  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
3468           1.     -1.e+99      1.e+99          0.    1.0e-20
3469  *
3470  *        idcb       icbn        icb1        icb2       icb3
3471          -1790         39        212       -1784          0
3472  *      cbgain     cbxmin      cbxmax      cbcon1     cbcon2
```

```
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1793             39            212          -1787              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*  the following control blocks were added to trip the
*  steam-driven emergency feedwater flow to zero whenever
*  the pressure in either steam line falls below 565 psia.
*
*  steam-driven efw to sg a
*         idcb           icbn           icb1           icb2           icb3
         -1794             22            -20          -1790            130
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            0.0            0.0            0.0            0.0            0.0
*
*  steam-driven efw to sg b
*         idcb           icbn           icb1           icb2           icb3
         -1795             22            -20          -1793            130
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            0.0            0.0            0.0            0.0            0.0
*
*************************************************************************
*                      unit load demand (ULD)                           *
*************************************************************************
*
*     control
*     block id  control block value
*     --------  ------------------
*
*        -1881  ULD (fractional)
*        -1887  reactor demand (fractional)
*        -1893  reactor demand (W)
*        -1881  feedwater demand (fractional)
*        -1890  feedwater demand (kg/sec)
*
*
*         idcb           icbn           icb1           icb2           icb3
         -1801              9              0              0              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.           400.           400.           400.           400.
*
*         idcb           icbn           icb1           icb2           icb3
         -1803              3            213            214              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1806              3            -70            -71              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1807             21          -2350            -20              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1808             34          -2350            -20              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1809             16           -740            -21              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1812             16          -1280            -21              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
```



```
*         idcb           icbn           icb1           icb2           icb3
         -1815             16          -1369            -21              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1818             16          -1393            -21              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1821             14          -1803          -1806              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1824             25          -1807          -1808              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1827             22            -80            -20          -1809
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1830             22            -83            -21          -1809
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1833             54          -1881          -1821              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1836             54          -1821          -1881              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1839             22            -80          -1827          -1812
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1842             22            -84          -1830          -1812
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1845             21          -1833            -82              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1848             21          -1836            -82              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.             0.             1.             0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1851             22            -81          -1839          -1815
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1854             22            -20          -1842          -1815
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
            1.        -1.e+99        1.e+99           0.        1.0e-20
*
*         idcb           icbn           icb1           icb2           icb3
         -1855             16            212            -21              0
*       cbgain         cbxmin         cbxmax         cbcon1         cbcon2
```

```
3619          1.          0.          1.          0.    1.0e-20
3620  *
3621  *     idcb        icbn        icb1        icb2        icb3
3622        -1856          21           1       -1801           0
3623  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3624          1.          0.          1.          0.    1.0e-20
3625  *
3626  *     idcb        icbn        icb1        icb2        icb3
3627        -1857          25       -1818       -1845           0
3628  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3629          1.          0.          1.          0.    1.0e-20
3630  *
3631  *     idcb        icbn        icb1        icb2        icb3
3632        -1860          25       -1824       -1848           0
3633  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3634          1.          0.          1.          0.    1.0e-20
3635  *
3636  *     idcb        icbn        icb1        icb2        icb3
3637        -1862          25       -1855       -1856           0
3638  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3639          1.          0.          1.          0.    1.0e-20
3640  *
3641  *     idcb        icbn        icb1        icb2        icb3
3642        -1863          25       -1857       -1860           0
3643  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3644          1.          0.          1.          0.    1.0e-20
3645  *
3646  *     idcb        icbn        icb1        icb2        icb3
3647        -1864           5       -1862       -1863           0
3648  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3649          1.          0.          1.          0.          0.
3650  *
3651  *     idcb        icbn        icb1        icb2        icb3
3652        -1866          22         -81       -1851       -1864
3653  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3654          1.    -1.e+99     1.e+99          0.    1.0e-20
3655  *
3656  *     idcb        icbn        icb1        icb2        icb3
3657        -1869          22         -20       -1854       -1864
3658  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3659          1.    -1.e+99     1.e+99          0.    1.0e-20
3660  *
3661  *     idcb        icbn        icb1        icb2        icb3
3662        -1872          39       -1866         201           0
3663  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3664          1.    -1.e+99     1.e+99          0.    1.0e-20
3665  *
3666  *     idcb        icbn        icb1        icb2        icb3
3667        -1875           3       -1881       -1872           0
3668  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3669          1.    -1.e+99     1.e+99          0.    1.0e-20
3670  *
3671  *     idcb        icbn        icb1        icb2        icb3
3672        -1878          21       -1881       -1869           0
3673  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3674          1.          0.          1.          0.          1.
3675  *
3676  *     idcb        icbn        icb1        icb2        icb3
3677        -1881          22       -1875       -1869       -1878
3678  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3679          1.          0.          1.          0.          1.
3680  *
3681  *     idcb        icbn        icb1        icb2        icb3
3682        -1884           3         -70         -71           0
3683  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3684          .5    -1.e+99     1.e+99          0.    1.0e-20
3685  *
3686  *     idcb        icbn        icb1        icb2        icb3
3687        -1887          35       -1881         -85           0
3688  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3689          1.          0.          1.          0.    1.0e-20
3690  *
3691  *     idcb        icbn        icb1        icb2        icb3
```



```
3692        -1890          39       -1881       -1884           0
3693  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3694          1.          0.     1.e+99          0.    1.0e-20
3695  *
3696  *     idcb        icbn        icb1        icb2        icb3
3697        -1893          39       -1887         -53           0
3698  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3699          1.          0.     1.e+99          0.    1.0e-20
3700  *
3701  ***********************************************************************
3702  *                          ICS feedwater control                      *
3703  ***********************************************************************
3704  *
3705  *     control
3706  *     block id  control block value
3707  *     --------  -------------------
3708  *
3709  *        -2820  SUFVA signal (area fraction)
3710  *        -2830  MFCVA signal (area fraction)
3711  *        -2920  MFW pump signal (rad/sec)
3712  *        -2670  SUFVB signal (area fraction)
3713  *        -2680  MFCVB signal (area fraction)
3714  *
3715  *
3716  *
3717  * A       idcb        icbn        icb1        icb2        icb3
3718        -2100          56         206           0           0
3719  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3720     .00204083    -1.e+99     1.e+99          0.    1.0e-20
3721  *
3722  * B       idcb        icbn        icb1        icb2        icb3
3723        -2110          56         202           0           0
3724  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3725       1.04092       -10.0       9.080   -581.6450    1.0e-20
3726  *
3727  * C       idcb        icbn        icb1        icb2        icb3
3728        -2120          56           5           0           0
3729  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3730   -1.16958e-5        -1.0       9.080   -7058003.    1.0e-20
3731  *
3732  * D       idcb        icbn        icb1        icb2        icb3
3733        -2130          56         210           0           0
3734  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3735      .037260      -1.270       9.080     -296.19    1.0e-20
3736  *
3737  * BA      idcb        icbn        icb1        icb2        icb3
3738        -2140          56         207           0           0
3739  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3740     .00204083    -1.e+99     1.e+99          0.    1.0e-20
3741  *
3742  * BB      idcb        icbn        icb1        icb2        icb3
3743        -2150          56         204           0           0
3744  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3745       1.04092       -10.0       9.080   -581.6450    1.0e-20
3746  *
3747  * BC      idcb        icbn        icb1        icb2        icb3
3748        -2160          56           6           0           0
3749  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3750   -1.16958e-5        -1.0       9.080   -7058003.    1.0e-20
3751  *
3752  * E       idcb        icbn        icb1        icb2        icb3
3753        -2169          57       -2110       -2120       -2130
3754  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3755          1.         -13.        30.          0.    1.0e-20
3756  *
3757  * E       idcb        icbn        icb1        icb2        icb3
3758        -2170          56       -2169           0           0
3759  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3760          1.        -10.0        12.0       -16.0    1.0e-20
3761  *
3762  * BE      idcb        icbn        icb1        icb2        icb3
3763        -2179          57       -2150       -2160       -2130
3764  *   cbgain      cbxmin      cbxmax      cbcon1      cbcon2
```

```
3765            1.        -13.        30.         0.     1.0e-20
3766 *
3767 * BE      idcb        icbn       icb1        icb2       icb3
3768          -2180          56      -2179           0          0
3769 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3770            1.       -10.0        12.0       -16.0     1.0e-20
3771 *
3772 * F       idcb        icbn       icb1        icb2       icb3
3773          -2190          56      -2170           0          0
3774 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3775        .055555          0.          2.         10.     1.0e-20
3776 *
3777 * BF      idcb        icbn       icb1        icb2       icb3
3778          -2200          56      -2180           0          0
3779 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3780        .055555          0.          2.         10.     1.0e-20
3781 *
3782 * BH      idcb        icbn       icb1        icb2       icb3
3783          -2209          39      -2140       -2200          0
3784 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3785            1.     -1.e+99     1.e+99          0.     1.0e-20
3786 *
3787 * BH      idcb        icbn       icb1        icb2       icb3
3788 *        -2210          56      -2209           0          0
3789 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3790 *          1.     -1.e+99     1.e+99       -10.0     1.0e-20
3791 *
3792 * BH      idcb        icbn       icb1        icb2       icb3
3793          -2210           9          0           0          0
3794 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3795            1.          8.          8.          8.         8.
3796 *
3797 * H       idcb        icbn       icb1        icb2       icb3
3798          -2219          39      -2100       -2190          0
3799 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3800            1.     -1.e+99     1.e+99          0.     1.0e-20
3801 *
3802 * H       idcb        icbn       icb1        icb2       icb3
3803 *        -2220          56      -2219           0          0
3804 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3805 *          1.     -1.e+99     1.e+99       -10.0     1.0e-20
3806 *
3807 * H       idcb        icbn       icb1        icb2       icb3
3808          -2220           9          0           0          0
3809 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3810            1.          8.          8.          8.         8.
3811 *
3812 * A1      idcb        icbn       icb1        icb2       icb3
3813          -2230          24        -21       -1393      -1393
3814 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3815            1.          0.     1.e+99          0.     1.0e-20
3816 *
3817 * B1      idcb        icbn       icb1        icb2       icb3
3818          -2240          56      -2230           0          0
3819 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3820      -.003333          0.     1.e+99       -300.     1.0e-20
3821 *
3822 * SP      idcb        icbn       icb1        icb2       icb3
3823          -2250          56        900           0          0
3824 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3825            1.     -1.e+99     1.e+99   -2568.0e+6     1.0e-20
3826 *
3827 * C1      idcb        icbn       icb1        icb2       icb3
3828          -2260          39      -2240         -21          0
3829 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3830           18.          0.     1.e+99          0.     1.0e-20
3831 *
3832 * JL      idcb        icbn       icb1        icb2       icb3
3833          -2270          26      -2250           0          0
3834 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3835            1.     -1.e+99     1.e+99         4.5     1.0e-20
3836 *
3837 * D1      idcb        icbn       icb1        icb2       icb3
```



```
3838          -2280         101      -2260           9          0
3839 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3840            1.          0.        500.          0.     1.0e-20
3841 * cftab     +           +           +           +          +
3842         -100.       204.0s
3843            0.       204.0s
3844          .562       240.0s
3845           3.6       320.0s
3846           5.4       356.0s
3847          9.36       402.0s
3848          18.0       460.0s
3849         21.42       483.0s
3850          100.       483.0e
3851 *
3852 * J1      idcb        icbn       icb1        icb2       icb3
3853          -2290          56      -2270           0          0
3854 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3855           -1.     -1.e+99     1.e+99   -2568.0e+6     1.0e-20
3856 *
3857 * H1      idcb        icbn       icb1        icb2       icb3
3858          -2300          56      -2240           0          0
3859 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3860          14.4          0.     1.e+99       .1111     1.0e-20
3861 *
3862 * E1      idcb        icbn       icb1        icb2       icb3
3863          -2309          59      -2280         210          0
3864 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3865            1.     -1.e+99     1.e+99         -1.        1.8
3866 *
3867 * E1      idcb        icbn       icb1        icb2       icb3
3868          -2310          56      -2309           0          0
3869 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3870            1.     -1.e+99     1.e+99       -460.     1.0e-20
3871 *
3872 * I1      idcb        icbn       icb1        icb2       icb3
3873          -2320          59      -2300       -2290          0
3874 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3875            1.       -10.        10.         -1.   6.23053e-9
3876 *
3877 * F1      idcb        icbn       icb1        icb2       icb3
3878          -2330          56      -2310           0          0
3879 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3880          .0013     -1.e+99     1.e+99      769.23     1.0e-20
3881 *
3882 * G1      idcb        icbn       icb1        icb2       icb3
3883          -2340          39      -2330       -2260          0
3884 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3885            1.     -1.e+99     1.e+99          0.     1.0e-20
3886 *
3887 * K1      idcb        icbn       icb1        icb2       icb3
3888          -2350         101      -2320           4          0
3889 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3890            1.       -10.        10.          0.     1.0e-20
3891 * cftab     +           +           +           +          +
3892         -10.5      -10.0s
3893           -.5       0.0s
3894            .5       0.0s
3895          10.5      10.0e
3896 *
3897 * SG      idcb        icbn       icb1        icb2       icb3
3898          -2353           9          0           0          0
3899 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3900            1.        500.        500.        500.       500.
3901 *
3902 * SG      idcb        icbn       icb1        icb2       icb3
3903          -2354           9          0           0          0
3904 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3905            1.          8.          8.          8.         8.
3906 *
3907 * SG      idcb        icbn       icb1        icb2       icb3
3908          -2355           3      -2350       -2340          0
3909 *       cbgain      cbxmin      cbxmax      cbcon1     cbcon2
3910            1.     -1.e+99     1.e+99          0.     1.0e-20
```

```
3911 *
3912 * SG      idcb        icbn        icb1        icb2        icb3
3913          -2356          16         212         -21           0
3914 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3915              1.          0.          1.          0.    1.0e-20
3916 *
3917 * SG      idcb        icbn        icb1        icb2        icb3
3918          -2357          21           1       -2353           0
3919 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3920              1.          0.          1.          0.    1.0e-20
3921 *
3922 * SG      idcb        icbn        icb1        icb2        icb3
3923          -2358          56       -2355           0           0
3924 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3925              1.    -1.e+99     1.e+99       -10.    1.0e-20
3926 *
3927 * SG      idcb        icbn        icb1        icb2        icb3
3928          -2359          25       -2356       -2357           0
3929 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3930              1.          0.          1.          0.    1.0e-20
3931 *
3932 * SG      idcb        icbn        icb1        icb2        icb3
3933          -2360          22       -2358       -2354       -2359
3934 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3935              1.    -1.e+99     1.e+99          0.    1.0e-20
3936 *
3937 *          idcb        icbn        icb1        icb2        icb3
3938          -2365          22         -20         -70         222
3939 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3940              1.         0.0     1.0+10          0.         0.0
3941 *
3942 * FWB     idcb        icbn        icb1        icb2        icb3
3943          -2370          54         213       -2365           0
3944 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3945              1.    -1.e+99     1.e+99          0.    1.0e-20
3946 *
3947 * R       idcb        icbn        icb1        icb2        icb3
3948          -2380          37       -2360       -2220           0
3949 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3950              1.    -1.e+99     1.e+99          0.    1.0e-20
3951 *
3952 * FSL     idcb        icbn        icb1        icb2        icb3
3953          -2390          26       -2370           0           0
3954 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3955              1.    -1.e+99     1.e+99          1.    1.0e-20
3956 *
3957 * SL      idcb        icbn        icb1        icb2        icb3
3958          -2400           3       -2390         -70           0
3959 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3960              1.    -1.e+99     1.e+99          0.    1.0e-20
3961 *
3962 * HL1     idcb        icbn        icb1        icb2        icb3
3963          -2410         101           4           4           0
3964 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3965              1.       -10.         10.          0.    1.0e-20
3966 * cftab      +           +           +           +           +
3967          -100.      -10.0s
3968         7.8352      -10.0s
3969        15.2522       10.0s
3970           100.      10.0e
3971 *
3972 * LL1     idcb        icbn        icb1        icb2        icb3
3973          -2420         101           4           4           0
3974 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3975              1.       -10.         10.          0.    1.0e-20
3976 * cftab      +           +           +           +           +
3977          -100.      -10.0s
3978             0.      -10.0s
3979           6.350      10.0s
3980           100.      10.0e
3981 *
3982 * S1      idcb        icbn        icb1        icb2        icb3
3983          -2427          14         -21         -70           0
```



```
3984 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3985             18.    -1.e+99     1.e+99          0.          0.
3986 *
3987 * S1      idcb        icbn        icb1        icb2        icb3
3988          -2428          39       -2427       -2400           0
3989 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3990              1.    -1.e+99     1.e+99          0.          0.
3991 *
3992 * S1      idcb        icbn        icb1        icb2        icb3
3993          -2429          59       -2380       -2428           0
3994 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
3995              1.    -1.e+99     1.e+99          1.         -1.
3996 *
3997 * S1      idcb        icbn        icb1        icb2        icb3
3998          -2430          56       -2429           0           0
3999 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4000              1.    -1.e+99     1.e+99         10.    1.0e-20
4001 *
4002 * P1      idcb        icbn        icb1        icb2        icb3
4003          -2440          56       -2410           0           0
4004 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4005             -2.    -1.e+99     1.e+99       -7.0    1.0e-20
4006 *
4007 * Q1      idcb        icbn        icb1        icb2        icb3
4008          -2450          37       -2430       -2440           0
4009 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4010              1.    -1.e+99     1.e+99          0.    1.0e-20
4011 *
4012 * STP     idcb        icbn        icb1        icb2        icb3
4013          -2458           9           0           0           0
4014 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4015              1.      9.8394      9.8394      9.8394      9.8394
4016 *
4017 * STP     idcb        icbn        icb1        icb2        icb3
4018          -2459           9           0           0           0
4019 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4020              1.     -7.5200     -7.5200     -7.5200     -7.5200
4021 *
4022 * STP     idcb        icbn        icb1        icb2        icb3
4023          -2460          22       -2458       -2459        -740
4024 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4025              1.    -1.e+99     1.e+99          0.    1.0e-20
4026 *
4027 * P2      idcb        icbn        icb1        icb2        icb3
4028          -2470          59       -2420       -2460           0
4029 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4030              1.    -1.e+99     1.e+99         -2.          2.
4031 *
4032 * T1      idcb        icbn        icb1        icb2        icb3
4033          -2480          35       -2470       -2450           0
4034 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4035              1.    -1.e+99     1.e+99          0.    1.0e-20
4036 *
4037 * BR      idcb        icbn        icb1        icb2        icb3
4038          -2490          37       -2360       -2210           0
4039 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4040              1.    -1.e+99     1.e+99          0.    1.0e-20
4041 *
4042 *          idcb        icbn        icb1        icb2        icb3
4043          -2495          22         -20         -71         222
4044 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4045              1.         0.0     1.0+10          0.         0.0
4046 *
4047 * FWC     idcb        icbn        icb1        icb2        icb3
4048          -2500          54         214       -2495           0
4049 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4050              1.    -1.e+99     1.e+99          0.    1.0e-20
4051 *
4052 * BHL1    idcb        icbn        icb1        icb2        icb3
4053          -2510         101           3           4           0
4054 *        cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4055              1.       -10.         10.          0.    1.0e-20
4056 * cftab      +           +           +           +           +
```

```
          -100.        -10.0s
         7.8134        -10.0s
        15.2304         10.0s
          100.          10.0e
*
* BLL1    idcb          icbn          icb1          icb2          icb3
         -2520           101             3             4             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.        -10.           10.            0.       1.0e-20
* cftab      +             +             +             +             +
          -100.        -10.0s
             0.        -10.0s
         6.350         10.0s
          100.          10.0e
*
* FBL     idcb          icbn          icb1          icb2          icb3
         -2530            26         -2500             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            1.       1.0e-20
*
* BP1     idcb          icbn          icb1          icb2          icb3
         -2540            56         -2510             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            -2.      -1.e+99       1.e+99          -7.0       1.0e-20
*
* BSL     idcb          icbn          icb1          icb2          icb3
         -2550             3         -2530           -71             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BS1     idcb          icbn          icb1          icb2          icb3
         -2557            14           -21           -71             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
            18.      -1.e+99       1.e+99            0.            0.
*
* BS1     idcb          icbn          icb1          icb2          icb3
         -2558            39         -2557         -2550             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.            0.
*
* BS1     idcb          icbn          icb1          icb2          icb3
         -2559            59         -2490         -2558             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            1.           -1.
*
* BS1     idcb          icbn          icb1          icb2          icb3
         -2560            56         -2559             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99           10.       1.0e-20
*
* BQ1     idcb          icbn          icb1          icb2          icb3
         -2570            37         -2560         -2540             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BP2     idcb          icbn          icb1          icb2          icb3
         -2580            59         -2520         -2460             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99           -2.            2.
*
* BT1     idcb          icbn          icb1          icb2          icb3
         -2590            35         -2580         -2570             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BCNST1  idcb          icbn          icb1          icb2          icb3
         -2592             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.         100.          100.          100.          100.
*
* BCNST1  idcb          icbn          icb1          icb2          icb3
         -2593             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
```



```
             1.           .12           .12           .12           .12
*
* BCNST1  idcb          icbn          icb1          icb2          icb3
         -2594             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.         .1125         .1125         .1125         .1125
*
* BCNST1  idcb          icbn          icb1          icb2          icb3
         -2595            20         -2580           -20             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -2596            16           212           -20             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -2597            34             1         -2592             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.            0.            1.            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -2598            22         -2593         -2594         -2595
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
*         idcb          icbn          icb1          icb2          icb3
         -2599             5         -2596         -2597             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.            0.            1.            0.       1.0e-20
*
* BCNST1  idcb          icbn          icb1          icb2          icb3
         -2600            22           -20         -2598         -2599
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BU1     idcb          icbn          icb1          icb2          icb3
         -2606             3         -2607         -2590             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
              .5     -1.e+99       1.e+99            0.       1.0e-20
*
* BU1     idcb          icbn          icb1          icb2          icb3
         -2607            56         -2590             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BU1     idcb          icbn          icb1          icb2          icb3
         -2608            39         -2606         -2600             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BU1     idcb          icbn          icb1          icb2          icb3
         -2609            39         -2608           201             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.      -1.e+99       1.e+99            0.       1.0e-20
*
* BU1     idcb          icbn          icb1          icb2          icb3
         -2610             3         -2610         -2609             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.        -18.0           2.0            0.       1.0e-20
*
* BCNST2  idcb          icbn          icb1          icb2          icb3
         -2618             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.           2.4           2.4           2.4           2.4
*
* BCNST2  idcb          icbn          icb1          icb2          icb3
         -2619             9             0             0             0
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
             1.            .9            .9            .9            .9
*
* BCNST2  idcb          icbn          icb1          icb2          icb3
```

```
4203          -2620          22        -2618        -2619        -2595
4204 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4205            1.      -1.e+99       1.e+99           0.      1.0e-20
4206 *
4207 * BX11    idcb         icbn         icb1         icb2         icb3
4208          -2629          39        -2620        -2590            0
4209 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4210            1.      -1.e+99       1.e+99           0.      1.0e-20
4211 *
4212 * BX11    idcb         icbn         icb1         icb2         icb3
4213          -2630          59        -2610        -2629            0
4214 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4215        0.6 *1.*    -1.e+99       1.e+99           1.           1.
4216 *
4217 * BX1     idcb         icbn         icb1         icb2         icb3
4218          -2640          56        -2630            0            0
4219 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4220            1.        -10.          10.           8.      1.0e-20
4221 *
4222 * SUB     idcb         icbn         icb1         icb2         icb3
4223          -2650          56        -2640            0            0
4224 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4225 *      7.44164        -10.          10.      -6.6562      1.0e-20
4226 *      7.44164        -10.          10.      8.16590      1.0e-20
4227      15.7393          -10.          10.      -5.5651      1.0e-20
4228 *
4229 * MFB     idcb         icbn         icb1         icb2         icb3
4230          -2660          56        -2640            0            0
4231 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4232           .5555        -10.          10.     -8.00072      1.0e-20
4233 *
4234 * SUFVB   idcb         icbn         icb1         icb2         icb3
4235          -2670          56        -2650            0            0
4236 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4237            .1           0.           1.           0.      1.0e-20
4238 *
4239 * MFCVB   idcb         icbn         icb1         icb2         icb3
4240          -2680          56        -2660            0            0
4241 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4242            .5           0.           1.           1.      1.0e-20
4243 *
4244 *         idcb         icbn         icb1         icb2         icb3
4245          -2682           9            0            0            0
4246 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4247            1.         100.         100.         100.         100.
4248 *
4249 * CNST1   idcb         icbn         icb1         icb2         icb3
4250          -2683           9            0            0            0
4251 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4252            1.          .12          .12          .12          .12
4253 *
4254 * CNST1   idcb         icbn         icb1         icb2         icb3
4255          -2684           9            0            0            0
4256 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4257            1.        .1125        .1125        .1125        .1125
4258 *
4259 * CNST1   idcb         icbn         icb1         icb2         icb3
4260          -2685          20        -2470          -20            0
4261 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4262            1.           0.           1.           0.      1.0e-20
4263 *
4264 *         idcb         icbn         icb1         icb2         icb3
4265          -2686          16          212          -20        -2689
4266 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4267            1.           0.           1.           0.      1.0e-20
4268 *
4269 *         idcb         icbn         icb1         icb2         icb3
4270          -2687          34            1        -2682        -2689
4271 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4272            1.           0.           1.           0.      1.0e-20
4273 *
4274 * CNST1   idcb         icbn         icb1         icb2         icb3
4275          -2688          22        -2683        -2684        -2685
```



```
4276 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4277            1.      -1.e+99       1.e+99           0.      1.0e-20
4278 *
4279 *         idcb         icbn         icb1         icb2         icb3
4280          -2689            5        -2686        -2687            0
4281 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4282            1.           0.           1.           0.      1.0e-20
4283 *
4284 * CNST1   idcb         icbn         icb1         icb2         icb3
4285          -2690          22          -20        -2688        -2689
4286 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4287            1.      -1.e+99       1.e+99           0.      1.0e-20
4288 *
4289 * U1      idcb         icbn         icb1         icb2         icb3
4290          -2696           3        -2697        -2480            0
4291 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4292             .5     -1.e+99       1.e+99           0.      1.0e-20
4293 *
4294 * U1      idcb         icbn         icb1         icb2         icb3
4295          -2697          56        -2480            0            0
4296 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4297            1.      -1.e+99       1.e+99           0.      1.0e-20
4298 *
4299 * U1      idcb         icbn         icb1         icb2         icb3
4300          -2698          39        -2696        -2690            0
4301 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4302            1.      -1.e+99       1.e+99           0.      1.0e-20
4303 *
4304 * U1      idcb         icbn         icb1         icb2         icb3
4305          -2699          39        -2698          201            0
4306 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4307            1.      -1.e+99       1.e+99           0.      1.0e-20
4308 *
4309 * U1      idcb         icbn         icb1         icb2         icb3
4310          -2700           3        -2700        -2699            0
4311 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4312            1.        -18.0          2.0           0.      1.0e-20
4313 *
4314 * DPAB    idcb         icbn         icb1         icb2         icb3
4315          -2710          56          215            0            0
4316 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4317            1.      -1.e+99       1.e+99     -3.55e+5      1.0e-20
4318 *
4319 * DPBB    idcb         icbn         icb1         icb2         icb3
4320          -2720          56          216            0            0
4321 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4322            1.      -1.e+99       1.e+99     -3.55e+5      1.0e-20
4323 *
4324 * CNST2   idcb         icbn         icb1         icb2         icb3
4325          -2728           9            0            0            0
4326 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4327            1.          2.4          2.4          2.4          2.4
4328 *
4329 * CNST2   idcb         icbn         icb1         icb2         icb3
4330          -2729           9            0            0            0
4331 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4332            1.           .9           .9           .9           .9
4333 *
4334 * CNST2   idcb         icbn         icb1         icb2         icb3
4335          -2730          22        -2728        -2729        -2685
4336 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4337            1.      -1.e+99       1.e+99           0.      1.0e-20
4338 *
4339 * X11     idcb         icbn         icb1         icb2         icb3
4340          -2739          39        -2730        -2480            0
4341 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4342            1.      -1.e+99       1.e+99           0.      1.0e-20
4343 *
4344 * X11     idcb         icbn         icb1         icb2         icb3
4345          -2740          59        -2700        -2739            0
4346 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4347        0.6 *1.*    -1.e+99       1.e+99           1.           1.
4348 *
```

```
4349 * DPAL    idcb        icbn        icb1        icb2        icb3
4350          -2750          26       -2710           0           0
4351 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4352             1.     -2.4e+5      2.4e+5          1.     1.0e-20
4353 *
4354 * DPBL    idcb        icbn        icb1        icb2        icb3
4355          -2760          26       -2720           0           0
4356 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4357             1.     -2.4e+5      2.4e+5          1.     1.0e-20
4358 *
4359 * X1      idcb        icbn        icb1        icb2        icb3
4360          -2770          56       -2740           0           0
4361 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4362             1.      -10.         10.          8.     1.0e-20
4363 *
4364 * SUA     idcb        icbn        icb1        icb2        icb3
4365          -2780          56       -2770           0           0
4366 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4367 *      7.44164      -10.         10.     8.16590     1.0e-20
4368      15.7393        -10.         10.     -5.5651     1.0e-20
4369 *
4370 * MFA     idcb        icbn        icb1        icb2        icb3
4371          -2790          56       -2770           0           0
4372 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4373           .5555      -10.         10.    -8.00072     1.0e-20
4374 *
4375 * DPA     idcb        icbn        icb1        icb2        icb3
4376          -2800          56       -2750           0           0
4377 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4378             1.     -1.e+99      1.e+99     3.55e+5     1.0e-20
4379 *
4380 * DPB     idcb        icbn        icb1        icb2        icb3
4381          -2810          56       -2760           0           0
4382 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4383             1.     -1.e+99      1.e+99     3.55e+5     1.0e-20
4384 *
4385 * SUFVA   idcb        icbn        icb1        icb2        icb3
4386          -2820          56       -2780           0           0
4387 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4388             .1          0.          1.          0.     1.0e-20
4389 *
4390 * MFCVA   idcb        icbn        icb1        icb2        icb3
4391          -2830          56       -2790           0           0
4392 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4393             .5          0.          1.          1.     1.0e-20
4394 *
4395 * FA      idcb        icbn        icb1        icb2        icb3
4396          -2840          56       -2800           0           0
4397 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4398     2.90074e-5     -1.e+99      1.e+99  -3.44740e+5     1.0e-20
4399 *
4400 * FB      idcb        icbn        icb1        icb2        icb3
4401          -2850          56       -2810           0           0
4402 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4403     2.90074e-5     -1.e+99      1.e+99  -3.44740e+5     1.0e-20
4404 *
4405 * FC      idcb        icbn        icb1        icb2        icb3
4406          -2860          37       -2840       -2850           0
4407 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4408             1.     -1.e+99      1.e+99          0.     1.0e-20
4409 *
4410 * FD      idcb        icbn        icb1        icb2        icb3
4411          -2870          56       -2860           0           0
4412 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4413             1.     -1.e+99      1.e+99       -.2975     1.0e-20
4414 *
4415 * FE      idcb        icbn        icb1        icb2        icb3
4416          -2879           1       -2870           0           0
4417 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4418             1.     -1.e+99      1.e+99          0.     1.0e-20
4419 *
4420 * FE      idcb        icbn        icb1        icb2        icb3
4421          -2880          39       -2870       -2879           0
```



```
4422 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4423             .2     -10.0        10.0          0.     1.0e-20
4424 *
4425 * FF      idcb        icbn        icb1        icb2        icb3
4426          -2882           9           0           0           0
4427 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4428             1.        400.        400.        400.        400.
4429 *
4430 * FF      idcb        icbn        icb1        icb2        icb3
4431          -2883           3       -2884       -2880           0
4432 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4433           .1167    -1.e+99      1.e+99          0.     1.0e-20
4434 *
4435 * FF      idcb        icbn        icb1        icb2        icb3
4436          -2884          56       -2880           0           0
4437 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4438             1.     -1.e+99      1.e+99          0.     1.0e-20
4439 *
4440 * FF      idcb        icbn        icb1        icb2        icb3
4441          -2885          39       -2883         201           0
4442 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4443             1.     -1.e+99      1.e+99          0.     1.0e-20
4444 *
4445 * FF      idcb        icbn        icb1        icb2        icb3
4446          -2886          16         212         -21           0
4447 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4448             1.          0.          1.          0.     1.0e-20
4449 *
4450 * FF      idcb        icbn        icb1        icb2        icb3
4451          -2887          21           1       -2882           0
4452 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4453             1.     -1.e+99      1.e+99          0.     1.0e-20
4454 *
4455 * FF      idcb        icbn        icb1        icb2        icb3
4456          -2888           3       -2890       -2885           0
4457 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4458             1.     -10.0        10.0          0.     1.0e-20
4459 *
4460 * FF      idcb        icbn        icb1        icb2        icb3
4461          -2889          25       -2886       -2887           0
4462 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4463             1.          0.          1.          0.     1.0e-20
4464 *
4465 * FF      idcb        icbn        icb1        icb2        icb3
4466          -2890          39       -2888       -2889           0
4467 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4468             1.     -10.0        10.0          0.     1.0e-20
4469 *
4470 * FG      idcb        icbn        icb1        icb2        icb3
4471          -2900           3       -2890       -2880           0
4472 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4473        0.5 *1.*     -10.0        10.0          0.     1.0e-20
4474 *
4475 * FI      idcb        icbn        icb1        icb2        icb3
4476          -2909           3       -2380       -2490           0
4477 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4478             1.     -1.e+99      1.e+99          0.     1.0e-20
4479 *
4480 *                 original cb -2910
4481 * FI      idcb        icbn        icb1        icb2        icb3
4482 *        -2910          59       -2909       -2900           0
4483 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4484 *            1.     -1.e+99      1.e+99          .5         -1.
4485 *
4486 * FI      idcb        icbn        icb1        icb2        icb3
4487          -2910          56       -2900           0           0
4488 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4489            -1.     -10.0        10.0         -8.     1.0e-20
4490 *
4491 * FP      idcb        icbn        icb1        icb2        icb3
4492          -2919         101       -2910           6           0
4493 *       cbgain      cbxmin      cbxmax      cbcon1      cbcon2
4494           .93659    -1.e+99      1.e+99          0.     1.0e-20
```

```
4495 * cftab      +            +            +            +            +
4496          -100.        370.4s
4497            -2.        370.4s
4498             0.        392.8s
4499             6.        460.0s
4500            10.       586.43s
4501           100.       586.43e
4502 *
4503 * FI      idcb         icbn         icb1         icb2         icb3
4504         -2920           22        -2919          -86        -2889
4505 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4506             1.      -1.e+99       1.e+99           0.      1.0e-20
4507 *
4508 ************************************************************************
4509 *                          a loop TBV control                          *
4510 ************************************************************************
4511 *
4512 *     control
4513 *     block id  control block value
4514 *     --------  -------------------
4515 *
4516 *        -3388  a loop TBV area fraction
4517 *
4518 *
4519 *        idcb         icbn         icb1         icb2         icb3
4520         -3305           33        -3381          -20            0
4521 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4522             1.           0.           1.           0.           1.
4523 *
4524 *        idcb         icbn         icb1         icb2         icb3
4525         -3310           54         224          -63            0
4526 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4527             1.      -1.e+99       1.e+99           0.      1.0e-20
4528 *
4529 *        idcb         icbn         icb1         icb2         icb3
4530         -3312            3         235          236            0
4531 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4532             1.      -1.e+99       1.e+99           0.      1.0e-20
4533 *
4534 *        idcb         icbn         icb1         icb2         icb3
4535         -3314            3         237          238            0
4536 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4537             1.      -1.e+99       1.e+99           0.      1.0e-20
4538 *
4539 *        idcb         icbn         icb1         icb2         icb3
4540         -3315            1        -3310            0            0
4541 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4542             1.      -1.e+99       1.e+99           0.      1.0e-20
4543 *
4544 *        idcb         icbn         icb1         icb2         icb3
4545         -3318            3        -3312        -3314            0
4546 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4547           .25      -1.e+99       1.e+99           0.      1.0e-20
4548 *
4549 *        idcb         icbn         icb1         icb2         icb3
4550         -3320           34        -3315          -64            0
4551 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4552             1.           0.           1.           0.           1.
4553 *
4554 *        idcb         icbn         icb1         icb2         icb3
4555         -3322           22           56        -3318          221
4556 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4557             1.      -1.e+99       1.e+99           0.      1.0e-20
4558 *
4559 *        idcb         icbn         icb1         icb2         icb3
4560         -3325            5        -3305        -3320            0
4561 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4562             1.           0.           1.           0.           1.
4563 *
4564 *        idcb         icbn         icb1         icb2         icb3
4565         -3330           21        -1881          -85            0
4566 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4567             1.           0.           1.           0.           1.
```



```
4568 *
4569 *        idcb         icbn         icb1         icb2         icb3
4570         -3332           12        -3322            0            0
4571 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4572             1.      -1.e+99       1.e+99           0.      1.0e-20
4573 *
4574 *        idcb         icbn         icb1         icb2         icb3
4575         -3335           25        -3325        -3330            0
4576 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4577             1.           0.           1.           0.           1.
4578 *
4579 *        idcb         icbn         icb1         icb2         icb3
4580         -3338           26        -3332            0            0
4581 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4582             1.      -1.e+99       1.e+99           1.      1.0e-20
4583 *
4584 *        idcb         icbn         icb1         icb2         icb3
4585         -3340           22          -65          -66        -3335
4586 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4587             1.      -1.e+99       1.e+99           0.     .34474e+6
4588 *
4589 *        idcb         icbn         icb1         icb2         icb3
4590         -3342           34        -3338          -91            0
4591 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4592             1.      -1.e+99       1.e+99           0.      1.0e-20
4593 *
4594 *        idcb         icbn         icb1         icb2         icb3
4595         -3345           22          -66        -3340        -1399
4596 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4597             1.      -1.e+99       1.e+99           0.     .34474e+6
4598 *
4599 *        idcb         icbn         icb1         icb2         icb3
4600         -3348            5         258        -3342            0
4601 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4602             1.           0.           1.           0.      1.0e-20
4603 *
4604 * bias changed to turbine trip bias
4605 *        idcb         icbn         icb1         icb2         icb3
4606         -3350           22     -66 *-20*        -3345        -1393
4607 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4608             1.      -1.e+99       1.e+99           0.     .34474e+6
4609 *
4610 *        idcb         icbn         icb1         icb2         icb3
4611         -3352           22          -21          -22        -3348
4612 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4613             1.      -1.e+99       1.e+99           0.      1.0e-20
4614 *
4615 *        idcb         icbn         icb1         icb2         icb3
4616         -3355           54        -3310        -3350            0
4617 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4618             1.      -1.e+99       1.e+99           0.    -.34474e+6
4619 *
4620 *        idcb         icbn         icb1         icb2         icb3
4621         -3358           39        -3352          201            0
4622 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4623             1.      -1.e+99       1.e+99           0.      1.0e-20
4624 *
4625 *        idcb         icbn         icb1         icb2         icb3
4626         -3360           39        -3355          -68            0
4627 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4628             1.      -1.e+99       1.e+99           0.     -1.6667
4629 *
4630 *        idcb         icbn         icb1         icb2         icb3
4631         -3362            3        -3362        -3358            0
4632 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4633             1.           0.          10.           0.      1.0e-20
4634 *
4635 *        idcb         icbn         icb1         icb2         icb3
4636         -3365           39          -69        -3360            0
4637 *       cbgain       cbxmin       cbxmax       cbcon1       cbcon2
4638             1.      -1.e+99       1.e+99           0.     -16.667
4639 *
4640 *        idcb         icbn         icb1         icb2         icb3
```

```
4641          -3370          24        -3360         212         212
4642 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4643           .15        -10.         10.          0.      1.0e-20
4644 *
4645 *         idcb         icbn         icb1        icb2        icb3
4646         -3372          101        -3362           4           0
4647 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4648           1.           0.           1.          0.          1.
4649 * cftab      +            +            +           +           +
4650         -1.e+6         1.s
4651             0.         1.s
4652            10.         0.s
4653          1.e+6         0.e
4654 *
4655 *         idcb         icbn         icb1        icb2        icb3
4656         -3375            3        -3365       -3370           0
4657 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4658           1.        -10.         10.          0.        -10.
4659 *
4660 *         idcb         icbn         icb1        icb2        icb3
4661         -3380          101        -3375           7           0
4662 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4663           1.           0.           1.          0.      1.0e-20
4664 * cftab      +            +            +           +           +
4665          -10.         0.s
4666           -8.        .12s
4667           -5.        .60s
4668           -2.        .82s
4669            0.        .87s
4670            5.        .97s
4671           10.         1.e
4672 *
4673 *         idcb         icbn         icb1        icb2        icb3
4674         -3381           26        -3380           0           0
4675 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4676           1.           0.           1.          2.      1.0e-20
4677 *
4678 *         idcb         icbn         icb1        icb2        icb3
4679         -3382            3          -21       -3381           0
4680 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4681            .5          0.           2.          0.      1.0e-20
4682 *
4683 *         idcb         icbn         icb1        icb2        icb3
4684         -3385            5          100         110           0
4685 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4686           1.           0.           1.          0.        0.0
4687 *
4688 *         idcb         icbn         icb1        icb2        icb3
4689         -3386           22        -3382       -3381       -3385
4690 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4691           1.           0.           1.          0.      1.0e-20
4692 *
4693 *         idcb         icbn         icb1        icb2        icb3
4694         -3388           39        -3386       -3372           0
4695 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4696           1.           0.           1.          0.      1.0e-20
4697 *
4698 ***********************************************************************
4699 *                          b loop TBV control                         *
4700 ***********************************************************************
4701 *
4702 *     control
4703 *     block id  control block value
4704 *     --------  -------------------
4705 *
4706 *       -3488  a loop TBV area fraction
4707 *
4708 *
4709 *         idcb         icbn         icb1        icb2        icb3
4710         -3405           33        -3481        -20           0
4711 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4712           1.           0.           1.          0.          1.
4713 *
```



```
4714 *         idcb         icbn         icb1        icb2        icb3
4715         -3410           54          226         -63           0
4716 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4717           1.       -1.e+99       1.e+99          0.      1.0e-20
4718 *
4719 *         idcb         icbn         icb1        icb2        icb3
4720         -3412            3          235         236           0
4721 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4722           1.       -1.e+99       1.e+99          0.      1.0e-20
4723 *
4724 *         idcb         icbn         icb1        icb2        icb3
4725         -3414            3          237         238           0
4726 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4727           1.       -1.e+99       1.e+99          0.      1.0e-20
4728 *
4729 *         idcb         icbn         icb1        icb2        icb3
4730         -3415            1        -3410           0           0
4731 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4732           1.       -1.e+99       1.e+99          0.      1.0e-20
4733 *
4734 *         idcb         icbn         icb1        icb2        icb3
4735         -3418            3        -3412       -3414           0
4736 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4737           .25      -1.e+99       1.e+99          0.      1.0e-20
4738 *
4739 *         idcb         icbn         icb1        icb2        icb3
4740         -3420           34        -3415         -64           0
4741 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4742           1.           0.           1.          0.          1.
4743 *
4744 *         idcb         icbn         icb1        icb2        icb3
4745         -3422           22           56       -3418         221
4746 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4747           1.       -1.e+99       1.e+99          0.      1.0e-20
4748 *
4749 *         idcb         icbn         icb1        icb2        icb3
4750         -3425            5        -3405       -3420           0
4751 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4752           1.           0.           1.          0.          1.
4753 *
4754 *         idcb         icbn         icb1        icb2        icb3
4755         -3430           21        -1881         -85           0
4756 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4757           1.           0.           1.          0.          1.
4758 *
4759 *         idcb         icbn         icb1        icb2        icb3
4760         -3432           12        -3422           0           0
4761 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4762           1.       -1.e+99       1.e+99          0.      1.0e-20
4763 *
4764 *         idcb         icbn         icb1        icb2        icb3
4765         -3435           25        -3425       -3430           0
4766 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4767           1.           0.           1.          0.          1.
4768 *
4769 *         idcb         icbn         icb1        icb2        icb3
4770         -3438           26        -3432           0           0
4771 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4772           1.       -1.e+99       1.e+99          1.      1.0e-20
4773 *
4774 *         idcb         icbn         icb1        icb2        icb3
4775         -3440           22          -65         -66       -3435
4776 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4777           1.       -1.e+99       1.e+99          0.     .34474e+6
4778 *
4779 *         idcb         icbn         icb1        icb2        icb3
4780         -3442           34        -3438         -91           0
4781 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
4782           1.       -1.e+99       1.e+99          0.      1.0e-20
4783 *
4784 *         idcb         icbn         icb1        icb2        icb3
4785         -3445           22          -66       -3440       -1399
4786 *       cbgain       cbxmin       cbxmax      cbcon1      cbcon2
```

```
4787            1.        -1.e+99        1.e+99          0.     .34474e+6
4788  *
4789  *       idcb          icbn           icb1          icb2          icb3
4790         -3448             5            258         -3442             0
4791  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4792            1.            0.             1.            0.       1.0e-20
4793  *
4794  * bias changed to turbine trip bias
4795  *       idcb          icbn           icb1          icb2          icb3
4796         -3450            22       -66 *-20*       -3445         -1393
4797  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4798            1.       -1.e+99        1.e+99          0.     .34474e+6
4799  *
4800  *       idcb          icbn           icb1          icb2          icb3
4801         -3452            22            -21           -22         -3448
4802  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4803            1.       -1.e+99        1.e+99          0.       1.0e-20
4804  *
4805  *       idcb          icbn           icb1          icb2          icb3
4806         -3455            54          -3410         -3450             0
4807  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4808            1.       -1.e+99        1.e+99          0.     -.34474e+6
4809  *
4810  *       idcb          icbn           icb1          icb2          icb3
4811         -3458            39          -3452           201             0
4812  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4813            1.       -1.e+99        1.e+99          0.       1.0e-20
4814  *
4815  *       idcb          icbn           icb1          icb2          icb3
4816         -3460            39          -3455           -68             0
4817  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4818            1.       -1.e+99        1.e+99          0.       -1.6667
4819  *
4820  *       idcb          icbn           icb1          icb2          icb3
4821         -3462             3          -3462         -3458             0
4822  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4823            1.            0.            10.            0.       1.0e-20
4824  *
4825  *       idcb          icbn           icb1          icb2          icb3
4826         -3465            39            -69         -3460             0
4827  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4828            1.       -1.e+99        1.e+99          0.       -16.667
4829  *
4830  *       idcb          icbn           icb1          icb2          icb3
4831         -3470            24          -3460           212           212
4832  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4833           .15          -10.            10.            0.       1.0e-20
4834  *
4835  *       idcb          icbn           icb1          icb2          icb3
4836         -3472           101          -3462             4             0
4837  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4838            1.            0.             1.            0.            1.
4839  * cftab     +             +              +             +             +
4840        -1.e+6           1.s
4841            0.           1.s
4842           10.           0.s
4843        1.e+6           0.e
4844  *
4845  *       idcb          icbn           icb1          icb2          icb3
4846         -3475             3          -3465         -3470             0
4847  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4848            1.          -10.            10.            0.          -10.
4849  *
4850  *       idcb          icbn           icb1          icb2          icb3
4851         -3480           101          -3475             7             0
4852  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4853            1.            0.             1.            0.       1.0e-20
4854  * cftab     +             +              +             +             +
4855          -10.           0.s
4856           -8.          .12s
4857           -5.          .60s
4858           -2.          .82s
4859            0.          .87s
```



```
4860            5.          .97s
4861           10.           1.e
4862  *
4863  *       idcb          icbn           icb1          icb2          icb3
4864         -3481            26          -3480             0             0
4865  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4866            1.            0.             1.            2.       1.0e-20
4867  *
4868  *       idcb          icbn           icb1          icb2          icb3
4869         -3482             3            -21         -3481             0
4870  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4871           .5            0.             2.            0.       1.0e-20
4872  *
4873  *       idcb          icbn           icb1          icb2          icb3
4874         -3485             5            105           115             0
4875  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4876            1.            0.             1.            0.           0.0
4877  *
4878  *       idcb          icbn           icb1          icb2          icb3
4879         -3486            22          -3482         -3481         -3485
4880  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4881            1.            0.             1.            0.       1.0e-20
4882  *
4883  *       idcb          icbn           icb1          icb2          icb3
4884         -3488            39          -3486         -3472             0
4885  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4886            1.            0.             1.            0.       1.0e-20
4887  *
4888  ************************************************************************
4889  *       the following are added to produce the requested plots         *
4890  ************************************************************************
4891  *
4892  *       idcb          icbn           icb1          icb2          icb3
4893         -3510            39             29           -23             0
4894  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4895  *          1.            0.             0.            0.            0.
4896            0.            0.             0.            0.       1.0e-20
4897  *
4898  *       idcb          icbn           icb1          icb2          icb3
4899         -3520            39             28           -23             0
4900  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4901            0.            0.             0.            0.       1.0e-20
4902  *
4903  *       idcb          icbn           icb1          icb2          icb3
4904         -3530            57             21            22            23
4905  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4906  *          1.            0.             0.            0.            0.
4907            0.            0.             0.            0.       1.0e-20
4908  *
4909  *       idcb          icbn           icb1          icb2          icb3
4910         -3531            57          -3530            24           -20
4911  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4912  *          1.            0.             0.            0.            0.
4913            0.            0.             0.            0.       1.0e-20
4914  *
4915  *       idcb          icbn           icb1          icb2          icb3
4916         -3532            57             25            26           -20
4917  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4918  *          1.            0.             0.            0.            0.
4919            0.            0.             0.            0.       1.0e-20
4920  *
4921  *       idcb          icbn           icb1          icb2          icb3
4922         -3533            57          -3531            30         -3532
4923  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4924            0.            0.             0.            0.       1.0e-20
4925  *
4926  *       idcb          icbn           icb1          icb2          icb3
4927         -3534            14            239            32             0
4928  *     cbgain        cbxmin         cbxmax        cbcon1        cbcon2
4929  *          1.            0.             0.            0.            0.
4930            0.            0.             0.            0.       1.0e-20
4931  *
4932  *       idcb          icbn           icb1          icb2          icb3
```

```
4933          -3535          14         240          33           0
4934 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4935 *          1.          0.         0.         0.         0.
4936            0.          0.         0.         0.    1.0e-20
4937 *
4938 *        idcb        icbn       icb1       icb2       icb3
4939          -3536          14        241         34          0
4940 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4941 *          1.          0.         0.         0.         0.
4942            0.          0.         0.         0.    1.0e-20
4943 *
4944 *        idcb        icbn       icb1       icb2       icb3
4945          -3537          14        242         35          0
4946 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4947 *          1.          0.         0.         0.         0.
4948            0.          0.         0.         0.    1.0e-20
4949 *
4950 *        idcb        icbn       icb1       icb2       icb3
4951          -3538          57      -1794      -1697        -20
4952 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4953 *          1.          0.         0.         0.         0.
4954            0.          0.         0.         0.    1.0e-20
4955 *
4956 *        idcb        icbn       icb1       icb2       icb3
4957          -3539          57      -1795      -1698        -20
4958 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4959 *          1.          0.         0.         0.         0.
4960            0.          0.         0.         0.    1.0e-20
4961 *
4962 *        idcb        icbn       icb1       icb2       icb3
4963          -3540          57        213        214        -20
4964 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4965 *          1.          0.         0.         0.         0.
4966            0.          0.         0.         0.    1.0e-20
4967 *
4968 *        idcb        icbn       icb1       icb2       icb3
4969          -3541          57      -3538      -3539        -20
4970 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4971 *          1.          0.         0.         0.         0.
4972            0.          0.         0.         0.    1.0e-20
4973 *
4974 *        idcb        icbn       icb1       icb2       icb3
4975          -3542          57      -3540      -3541        -20
4976 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4977 *          1.          0.         0.         0.         0.
4978            0.          0.         0.         0.    1.0e-20
4979 *
4980 *        idcb        icbn       icb1       icb2       icb3
4981          -3543          23      -3542          0          0
4982 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4983 *          1.          0.         0.         0.         0.
4984            0.          0.         0.         0.    1.0e-20
4985 *
4986 *        idcb        icbn       icb1       icb2       icb3
4987          -3544          57        365        370        -20
4988 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4989 *          1.          0.         0.         0.         0.
4990            0.          0.         0.         0.    1.0e-20
4991 *
4992 *        idcb        icbn       icb1       icb2       icb3
4993          -3545          57        465        470        -20
4994 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
4995 *          1.          0.         0.         0.         0.
4996            0.          0.         0.         0.    1.0e-20
4997 *
4998 *        idcb        icbn       icb1       icb2       icb3
4999          -3546          57      -3544      -3545        -20
5000 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5001 *          1.          0.         0.         0.         0.
5002            0.          0.         0.         0.    1.0e-20
5003 *
5004 *        idcb        icbn       icb1       icb2       icb3
5005          -3547          23      -3546          0          0
```



```
5006 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5007 *          1.          0.         0.         0.         0.
5008            0.          0.         0.         0.    1.0e-20
5009 *
5010 *        idcb        icbn       icb1       icb2       icb3
5011          -3548           3        202        204          0
5012 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5013 *          0.5         0.         0.         0.         0.
5014            0.5    -1.0e+20   1.0e+20         0.    1.0e-20
5015 *
5016 *        idcb        icbn       icb1       icb2       icb3
5017          -3549           3        235        236          0
5018 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5019 *          0.5         0.         0.         0.         0.
5020            0.5    -1.0e+20   1.0e+20         0.    1.0e-20
5021 *
5022 *        idcb        icbn       icb1       icb2       icb3
5023          -3550           3        237        238          0
5024 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5025 *          0.5         0.         0.         0.         0.
5026            0.5    -1.0e+20   1.0e+20         0.    1.0e-20
5027 *
5028 *        idcb        icbn       icb1       icb2       icb3
5029          -3551           3      -3549      -3550          0
5030 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5031 *          0.5         0.         0.         0.         0.
5032            0.5    -1.0e+20   1.0e+20         0.    1.0e-20
5033 *
5034 *        idcb        icbn       icb1       icb2       icb3
5035          -3552           3      -3548      -3551          0
5036 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5037 *          0.5         0.         0.         0.         0.
5038            0.5    -1.0e+20   1.0e+20         0.    1.0e-20
5039 *
5040 *        idcb        icbn       icb1       icb2       icb3
5041          -3553          37        812        813          0
5042 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5043 *          1.          0.         0.         0.         0.
5044            0.          0.         0.         0.    1.0e-20
5045 *
5046 *        idcb        icbn       icb1       icb2       icb3
5047          -3554          57        814        815        816
5048 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5049 *          1.          0.         0.         0.         0.
5050            0.          0.         0.         0.    1.0e-20
5051 *
5052 *        idcb        icbn       icb1       icb2       icb3
5053          -3555          57        817        818        819
5054 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5055 *          1.          0.         0.         0.         0.
5056            0.          0.         0.         0.    1.0e-20
5057 *
5058 ************************************************************************
5059 *     dummy control blocks -3556 and -3557 are activated
5060 *     as well as dummy signal variables 822 and 823 during a HL break
5061 *     transient
5062 ************************************************************************
5063 *        idcb        icbn       icb1       icb2       icb3
5064          -3556           9          0          0          0
5065 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5066            1.         17.        17.        17.        17.
5067 *
5068 *        idcb        icbn       icb1       icb2       icb3
5069          -3557           9          0          0          0
5070 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5071            1.         17.        17.        17.        17.
5072 *
5073 *        idcb        icbn       icb1       icb2       icb3
5074          -3558          56        826          0          0
5075 *      cbgain      cbxmin     cbxmax     cbcon1     cbcon2
5076 *          1.          0.         0.     0.1404         0.
5077            1.    -1.0e+20   1.0e+20     0.1404    1.0e-20
5078 *
```

```
5079 *      idcb        icbn        icb1        icb2        icb3
5080       -3559          56         827           0           0
5081 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5082 *         1.          0.          0.      0.1404          0.
5083           1.   -1.0e+20     1.0e+20      0.1404    1.0e-20
5084 *
5085 *      idcb        icbn        icb1        icb2        icb3
5086       -3560          58       -3558         -19         -17
5087 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5088 *         1.          0.          0.          0.          0.
5089           0.          0.          0.          0.    1.0e-20
5090 *
5091 *      idcb        icbn        icb1        icb2        icb3
5092       -3561          58       -3559         -19         -17
5093 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5094 *         1.          0.          0.          0.          0.
5095           0.          0.          0.          0.    1.0e-20
5096 *
5097 *      idcb        icbn        icb1        icb2        icb3
5098       -3562          56         828           0           0
5099 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5100 *         1.          0.          0.       0.482          0.
5101           0.          0.          0.      0.9392    1.0e-20
5102 *
5103 *      idcb        icbn        icb1        icb2        icb3
5104       -3563          56         829           0           0
5105 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5106 *         1.          0.          0.       0.482          0.
5107           0.          0.          0.      0.9392    1.0e-20
5108 *
5109 *      idcb        icbn        icb1        icb2        icb3
5110       -3564          58       -3562         -19         -16
5111 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5112 *         1.          0.          0.          0.          0.
5113           0.          0.          0.          0.    1.0e-20
5114 *
5115 *      idcb        icbn        icb1        icb2        icb3
5116       -3565          58       -3563         -19         -16
5117 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5118 *         1.          0.          0.          0.          0.
5119           0.          0.          0.          0.    1.0e-20
5120 *
5121 *      idcb        icbn        icb1        icb2        icb3
5122       -3566          39         830       -3564           0
5123 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5124 *         1.          0.          0.          0.          0.
5125           0.          0.          0.          0.    1.0e-20
5126 *
5127 *      idcb        icbn        icb1        icb2        icb3
5128       -3567          39         831       -3565           0
5129 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5130 *         1.          0.          0.          0.          0.
5131           0.          0.          0.          0.    1.0e-20
5132 *
5133 *      idcb        icbn        icb1        icb2        icb3
5134       -3568          39         -18       -3564           0
5135 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5136 *         1.          0.          0.          0.          0.
5137           0.          0.          0.          0.    1.0e-20
5138 *
5139 *      idcb        icbn        icb1        icb2        icb3
5140       -3569          39         -18       -3565           0
5141 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5142 *         1.          0.          0.          0.          0.
5143           0.          0.          0.          0.    1.0e-20
5144 *
5145 *      idcb        icbn        icb1        icb2        icb3
5146       -3570          39         830         -15           0
5147 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5148 *         1.          0.          0.          0.          0.
5149           0.          0.          0.          0.    1.0e-20
5150 *
5151 *      idcb        icbn        icb1        icb2        icb3
```



```
5152       -3571          39         831         -15           0
5153 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5154 *         1.          0.          0.          0.          0.
5155           0.          0.          0.          0.    1.0e-20
5156 *
5157 *      idcb        icbn        icb1        icb2        icb3
5158       -3572          57       -3570       -3568         -20
5159 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5160 *         1.          0.          0.          0.          0.
5161           0.          0.          0.          0.    1.0e-20
5162 *
5163 *      idcb        icbn        icb1        icb2        icb3
5164       -3573          57       -3571       -3569         -20
5165 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5166 *         1.          0.          0.          0.          0.
5167           0.          0.          0.          0.    1.0e-20
5168 *
5169 *      idcb        icbn        icb1        icb2        icb3
5170       -3574          14       -3572         -18           0
5171 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5172 *         1.          0.          0.          0.          0.
5173           0.          0.          0.          0.    1.0e-20
5174 *
5175 *      idcb        icbn        icb1        icb2        icb3
5176       -3575          14       -3573         -18           0
5177 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5178 *         1.          0.          0.          0.          0.
5179           0.          0.          0.          0.    1.0e-20
5180 *
5181 *      idcb        icbn        icb1        icb2        icb3
5182       -3576          54         832         834           0
5183 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5184 *         1.          0.          0.          0.          0.
5185           0.          0.          0.          0.    1.0e-20
5186 *
5187 *      idcb        icbn        icb1        icb2        icb3
5188       -3577          54         833         835           0
5189 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5190 *         1.          0.          0.          0.          0.
5191           0.          0.          0.          0.    1.0e-20
5192 *
5193 *      idcb        icbn        icb1        icb2        icb3
5194       -3578         100         836         301           0
5195 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5196 *         1.          0.          0.       300.          0.
5197           0.          0.          0.      300.0    1.0e-20
5198 *
5199 *      idcb        icbn        icb1        icb2        icb3
5200       -3579         100         837         301           0
5201 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5202 *         1.          0.          0.       300.          0.
5203           0.          0.          0.      300.0    1.0e-20
5204 *
5205 *      idcb        icbn        icb1        icb2        icb3
5206       -3580         100         838         301           0
5207 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5208 *         1.          0.          0.       300.          0.
5209           0.          0.          0.      300.0    1.0e-20
5210 *
5211 *      idcb        icbn        icb1        icb2        icb3
5212       -3581         100         839         301           0
5213 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5214 *         1.          0.          0.       300.          0.
5215           0.          0.          0.      300.0    1.0e-20
5216 *
5217 *      idcb        icbn        icb1        icb2        icb3
5218       -3582         100         840         301           0
5219 *     cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5220 *         1.          0.          0.       300.          0.
5221           0.          0.          0.      300.0    1.0e-20
5222 *
5223 *      idcb        icbn        icb1        icb2        icb3
5224       -3583         100         836        3601           0
```

```
5225 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5226 *         1.            0.            0.         3600.            0.
5227           0.            0.            0.        3600.0      1.0e-20
5228 *
5229 *       idcb          icbn          icb1          icb2          icb3
5230      -3584           100           837          3601             0
5231 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5232 *         1.            0.            0.         3600.            0.
5233           0.            0.            0.        3600.0      1.0e-20
5234 *
5235 *       idcb          icbn          icb1          icb2          icb3
5236      -3585           100           838          3601             0
5237 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5238 *         1.            0.            0.         3600.            0.
5239           0.            0.            0.        3600.0      1.0e-20
5240 *
5241 *       idcb          icbn          icb1          icb2          icb3
5242      -3586           100           839          3601             0
5243 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5244 *         1.            0.            0.         3600.            0.
5245           0.            0.            0.        3600.0      1.0e-20
5246 *
5247 *       idcb          icbn          icb1          icb2          icb3
5248      -3587           100           840          3601             0
5249 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5250 *         1.            0.            0.         3600.            0.
5251           0.            0.            0.        3600.0      1.0e-20
5252 *
5253 *       idcb          icbn          icb1          icb2          icb3
5254      -3588            54         -3578           836             0
5255 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5256 *         1.            0.            0.            0.            0.
5257           0.            0.            0.            0.      1.0e-20
5258 *
5259 *       idcb          icbn          icb1          icb2          icb3
5260      -3589            54         -3579           837             0
5261 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5262 *         1.            0.            0.            0.            0.
5263           0.            0.            0.            0.      1.0e-20
5264 *
5265 *       idcb          icbn          icb1          icb2          icb3
5266      -3590            54         -3580           838             0
5267 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5268 *         1.            0.            0.            0.            0.
5269           0.            0.            0.            0.      1.0e-20
5270 *
5271 *       idcb          icbn          icb1          icb2          icb3
5272      -3591            54         -3581           839             0
5273 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5274 *         1.            0.            0.            0.            0.
5275           0.            0.            0.            0.      1.0e-20
5276 *
5277 *       idcb          icbn          icb1          icb2          icb3
5278      -3592            54         -3582           840             0
5279 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5280 *         1.            0.            0.            0.            0.
5281           0.            0.            0.            0.      1.0e-20
5282 *
5283 *       idcb          icbn          icb1          icb2          icb3
5284      -3593            54         -3583           836             0
5285 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5286 *         1.            0.            0.            0.            0.
5287           0.            0.            0.            0.      1.0e-20
5288 *
5289 *       idcb          icbn          icb1          icb2          icb3
5290      -3594            54         -3584           837             0
5291 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5292 *         1.            0.            0.            0.            0.
5293           0.            0.            0.            0.      1.0e-20
5294 *
5295 *       idcb          icbn          icb1          icb2          icb3
5296      -3595            54         -3585           838             0
5297 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
```



```
5298 *         1.            0.            0.            0.            0.
5299           0.            0.            0.            0.      1.0e-20
5300 *
5301 *       idcb          icbn          icb1          icb2          icb3
5302      -3596            54         -3586           839             0
5303 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5304 *         1.            0.            0.            0.            0.
5305           0.            0.            0.            0.      1.0e-20
5306 *
5307 *       idcb          icbn          icb1          icb2          icb3
5308      -3597            54         -3587           840             0
5309 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5310 *         1.            0.            0.            0.            0.
5311           0.            0.            0.            0.      1.0e-20
5312 *
5313 *       idcb          icbn          icb1          icb2          icb3
5314      -3598           100           806           301             0
5315 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5316 *         1.            0.            0.         300.            0.
5317           0.            0.            0.        300.0      1.0e-20
5318 *
5319 *       idcb          icbn          icb1          icb2          icb3
5320      -3599           100           806          3601             0
5321 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5322 *         1.            0.            0.         3600.            0.
5323           0.            0.            0.        3600.0      1.0e-20
5324 *
5325 *       idcb          icbn          icb1          icb2          icb3
5326      -3600            54         -3598           806             0
5327 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5328 *         1.            0.            0.            0.            0.
5329           0.            0.            0.            0.      1.0e-20
5330 *
5331 *       idcb          icbn          icb1          icb2          icb3
5332      -3601            54         -3599           806             0
5333 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5334 *         1.            0.            0.            0.            0.
5335           0.            0.            0.            0.      1.0e-20
5336 *
5337 *       idcb          icbn          icb1          icb2          icb3
5338      -3602            54           841           843             0
5339 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5340 *         1.            0.            0.            0.            0.
5341           0.            0.            0.            0.      1.0e-20
5342 *
5343 *       idcb          icbn          icb1          icb2          icb3
5344      -3603            54           842           844             0
5345 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5346 *         1.            0.            0.            0.            0.
5347           0.            0.            0.            0.      1.0e-20
5348 *
5349 *       idcb          icbn          icb1          icb2          icb3
5350      -3604            12           836             0             0
5351 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5352 *         1.            0.            0.            0.            0.
5353           0.            0.            0.            0.      1.0e-20
5354 *
5355 *       idcb          icbn          icb1          icb2          icb3
5356      -3605            12           837             0             0
5357 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5358 *         1.            0.            0.            0.            0.
5359           0.            0.            0.            0.      1.0e-20
5360 *
5361 *       idcb          icbn          icb1          icb2          icb3
5362      -3606            12           838             0             0
5363 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5364 *         1.            0.            0.            0.            0.
5365           0.            0.            0.            0.      1.0e-20
5366 *
5367 *       idcb          icbn          icb1          icb2          icb3
5368      -3607            12           839             0             0
5369 *     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5370 *         1.            0.            0.            0.            0.
```

```
5371          0.          0.          0.          0.     1.0e-20
5372 *
5373 *      idcb        icbn        icb1        icb2        icb3
5374       -3608          12         840           0           0
5375 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5376 *        1.          0.          0.          0.          0.
5377          0.          0.          0.          0.     1.0e-20
5378 *
5379 *      idcb        icbn        icb1        icb2        icb3
5380       -3609          12         806           0           0
5381 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5382 *        1.          0.          0.          0.          0.
5383          0.          0.          0.          0.     1.0e-20
5384 *
5385 *      idcb        icbn        icb1        icb2        icb3
5386       -3610          54         845         846           0
5387 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5388 *        1.          0.          0.          0.          0.
5389          0.          0.          0.          0.     1.0e-20
5390 *
5391 *      idcb        icbn        icb1        icb2        icb3
5392       -3611          14         826         -19           0
5393 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5394          0.          0.          0.          0.     1.0e-20
5395 *
5396 *      idcb        icbn        icb1        icb2        icb3
5397       -3612          14         827         -19           0
5398 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5399          0.          0.          0.          0.     1.0e-20
5400 *
5401 *      idcb        icbn        icb1        icb2        icb3
5402       -3613          14       -3562         -19           0
5403 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5404          0.          0.          0.          0.     1.0e-20
5405 *
5406 *      idcb        icbn        icb1        icb2        icb3
5407       -3614          14       -3563         -19           0
5408 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5409          0.          0.          0.          0.     1.0e-20
5410 *
5411 ***********************************************************************
5412 * control blocks for detection of thermal stratification in cold leg
5413 ***********************************************************************
5414 *                    constant value control blocks
5415 ***********************************************************************
5416 *    cb id       cb value        note
5417 *    =====       ========     ==============
5418 *      -21        1.0         already defined
5419 *    -4000        1.0e-6
5420 *    -4001       -1.4
5421 *
5422 *      idcb        icbn        icb1        icb2        icb3
5423       -4000           9           0           0           0
5424 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5425        1.        1.0e-6      1.0e-6      1.0e-6      1.0e-6
5426 *
5427 *      idcb        icbn        icb1        icb2        icb3
5428       -4001           9           0           0           0
5429 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5430        1.         -1.4        -1.4        -1.4        -1.4
5431 *
5432 ***********************************************************************
5433 * Froude number for CL A1
5434 ***********************************************************************
5435 *      idcb        icbn        icb1        icb2        icb3
5436       -4101          14         871         861           0
5437 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5438         -1.     -1.e+99      1.e+99          0.     1.0e-20
5439 *
5440 *      idcb        icbn        icb1        icb2        icb3
5441       -4102           3       -4101         -21           0
5442 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5443          1.     -1.e+99      1.e+99          0.     1.0e-20
```



```
5444 *
5445 *      idcb        icbn        icb1        icb2        icb3
5446       -4103           1       -4102           0           0
5447 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5448          1.     -1.e+99      1.e+99          0.     1.0e-20
5449 *
5450 *      idcb        icbn        icb1        icb2        icb3
5451       -4104          52       -4103           0           0
5452 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5453          1.     -1.e+99      1.e+99          0.     1.0e-20
5454 *
5455 *      idcb        icbn        icb1        icb2        icb3
5456       -4105          39       -4104         861           0
5457 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5458          1.     -1.e+99      1.e+99          0.     1.0e-20
5459 *
5460 *      idcb        icbn        icb1        icb2        icb3
5461       -4106           3       -4105       -4000           0
5462 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5463          1.     -1.e+99      1.e+99          0.     1.0e-20
5464 *
5465 *      idcb        icbn        icb1        icb2        icb3
5466       -4107          14          22       -4106           0
5467 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5468      0.953     -1.e+99      1.e+99          0.     1.0e-20
5469 ***********************************************************************
5470 * Stratification criterion for CL A1
5471 ***********************************************************************
5472 *
5473 *      idcb        icbn        icb1        icb2        icb3
5474       -4111          39         851         861           0
5475 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5476          1.     -1.e+99      1.e+99          0.     1.0e-20
5477 *
5478 *      idcb        icbn        icb1        icb2        icb3
5479       -4112          39          22         871           0
5480 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5481          1.     -1.e+99      1.e+99          0.     1.0e-20
5482 *
5483 *      idcb        icbn        icb1        icb2        icb3
5484       -4113           3       -4112       -4000           0
5485 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5486          1.     -1.e+99      1.e+99          0.     1.0e-20
5487 *
5488 *      idcb        icbn        icb1        icb2        icb3
5489       -4114          14       -4111       -4113           0
5490 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5491          1.     -1.e+99      1.e+99          0.     1.0e-20
5492 *
5493 *      idcb        icbn        icb1        icb2        icb3
5494       -4115           1       -4114           0           0
5495 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5496          1.     -1.e+99      1.e+99          0.     1.0e-20
5497 *
5498 *      idcb        icbn        icb1        icb2        icb3
5499       -4116           3       -4115         -21           0
5500 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5501          1.     -1.e+99      1.e+99          0.     1.0e-20
5502 *
5503 *      idcb        icbn        icb1        icb2        icb3
5504       -4117          60       -4116       -4001           0
5505 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5506          1.     -1.e+99      1.e+99          0.     1.0e-20
5507 *
5508 ***********************************************************************
5509 * Froude number for CL A2
5510 ***********************************************************************
5511 *      idcb        icbn        icb1        icb2        icb3
5512       -4201          14         872         862           0
5513 *    cbgain      cbxmin      cbxmax      cbcon1      cbcon2
5514         -1.     -1.e+99      1.e+99          0.     1.0e-20
5515 *
5516 *      idcb        icbn        icb1        icb2        icb3
```

```
      -4202          3       -4201        -21          0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4203           1       -4202          0           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4204          52       -4203          0           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4205          39       -4204        862           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4206           3       -4205      -4000           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4207          14         22      -4206           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
      0.953     -1.e+99      1.e+99         0.     1.0e-20
*********************************************************************
* Stratification criterion for CL A2
*********************************************************************
*
*     idcb        icbn        icb1       icb2        icb3
      -4211          39        852        862           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4212          39         23        872           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4213           3       -4212      -4000           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4214          14       -4211      -4213           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4215           1       -4214          0           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4216           3       -4215        -21           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4217          60       -4216      -4001           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*********************************************************************
* Froude number for CL B1
*********************************************************************
*     idcb        icbn        icb1       icb2        icb3
      -4301          14        873        863           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
```



```
        -1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4302           3       -4301        -21           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4303           1       -4302          0           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4304          52       -4303          0           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4305          39       -4304        863           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4306           3       -4305      -4000           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4307          14         21      -4306           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
      0.953     -1.e+99      1.e+99         0.     1.0e-20
*********************************************************************
* Stratification criterion for CL B1
*********************************************************************
*
*     idcb        icbn        icb1       icb2        icb3
      -4311          39        853        863           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4312          39         21        873           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4313           3       -4312      -4000           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4314          14       -4311      -4313           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4315           1       -4314          0           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4316           3       -4315        -21           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*     idcb        icbn        icb1       icb2        icb3
      -4317          60       -4316      -4001           0
*    cbgain      cbxmin      cbxmax     cbcon1      cbcon2
        1.     -1.e+99      1.e+99         0.     1.0e-20
*
*********************************************************************
* Froude number for CL B2
*********************************************************************
```

```
*       idcb          icbn          icb1          icb2          icb3
       -4401            14           874           864             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          -1.      -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4402             3         -4401           -21             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4403             1         -4402             0             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4404            52         -4403             0             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4405            39         -4404           864             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4406             3         -4405         -4000             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4407            14            24         -4406             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
        0.953      -1.e+99       1.e+99            0.      1.0e-20
*****************************************************************
* Stratification criterion for CL B2
*****************************************************************
*
*       idcb          icbn          icb1          icb2          icb3
       -4411            39           854           864             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4412            39            24           874             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4413             3         -4412         -4000             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4414            14         -4411         -4413             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4415             1         -4414             0             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4416             3         -4415           -21             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4417            60         -4416         -4001             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.       -1.e+99       1.e+99            0.      1.0e-20
*
```



```
*****************************************************************
* stratification indicators: 1 for stratified and 0 for mixed
*****************************************************************
*                    CL A1
*****************************************************************
*       idcb          icbn          icb1          icb2          icb3
       -4100            34         -4107         -4117             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*****************************************************************
*                    CL A2
*****************************************************************
*       idcb          icbn          icb1          icb2          icb3
       -4200            34         -4207         -4217             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*****************************************************************
*                    CL B1
*****************************************************************
*       idcb          icbn          icb1          icb2          icb3
       -4300            34         -4307         -4317             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*****************************************************************
*                    CL B2
*****************************************************************
*       idcb          icbn          icb1          icb2          icb3
       -4400            34         -4407         -4417             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*****************************************************************
*          CLs A1 and A2 and B1 and B2
*****************************************************************
*       idcb          icbn          icb1          icb2          icb3
       -4498            39         -4100         -4200             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4499            39         -4300         -4400             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*
*       idcb          icbn          icb1          icb2          icb3
       -4500            39         -4498         -4499             0
*     cbgain        cbxmin        cbxmax        cbcon1        cbcon2
          1.            0.            1.            0.      1.0e-20
*
*******************************************************************
*                    plot parameter control blocks                *
*******************************************************************
*
*     control
*     block id  control block value
*     --------  -------------------
*
*        -5053  maximum vessel wall dT/dx (K/m)
*        -5054  minimum downcomer wall htc (W/m2-K)
*        -5055  maximum downcomer wall htc (W/m2-K)
*        -5056  volumetric flow rate in a1 cl (m3/sec)
*        -5057  volumetric flow rate in a2 cl (m3/sec)
*        -5058  volumetric flow rate in b1 cl (m3/sec)
*        -5059  volumetric flow rate in b2 cl (m3/sec)
*        -5073  integrated mass flow into a sg (kg)
*        -5074  integrated mass flow out of a sg (kg)
*        -5076  integrated mass flow into b sg (kg)
*        -5077  integrated mass flow out of b sg (kg)
*        -5078  total efw delivered to a sg (kg)
*        -5079  total efw delivered to b sg (kg)
*        -5084  avg cl temperature cooldown rate, 5 min interval (K/sec)
*        -5087  core exit temp cooldown rate, 5 min interval (K/sec)
*        -5088  a sg operating range level (m)
*        -5089  b sg operating range level (m)
```

```
5809 *        -5090  a sg startup range level (m)
5810 *        -5091  a sg startup range level (m)
5811 *        -5092  average hot leg temperature (K)
5812 *        -5105  avg cl temperature cooldown rate, 60 min interval (K/sec)
5813 *        -5108  core exit temp cooldown rate, 60 min interval (K/sec)
5814 *        -5111  dncmr cooldown rate @ top of core elev, 5 min interval (K/sec)
5815 *        -5114  dncmr cooldown rate @ top of core elev, 60 min interval (K/sec)
5816 *
5817 *
5818 ************************************************************************
5819 *
5820 *     maximum vessel wall dT/dx   (delta x = .2299 m = vess wall thickness)
5821 *
5822 *         idcb          icbn          icb1          icb2          icb3
5823          -5025            35           521           522             0
5824 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5825              1.      -1.e+99        1.e+99            0.      1.0e-20
5826 *
5827 *         idcb          icbn          icb1          icb2          icb3
5828          -5026            35         -5025           523             0
5829 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5830              1.      -1.e+99        1.e+99            0.      1.0e-20
5831 *
5832 *         idcb          icbn          icb1          icb2          icb3
5833          -5027            35         -5026           524             0
5834 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5835              1.      -1.e+99        1.e+99            0.      1.0e-20
5836 *
5837 *         idcb          icbn          icb1          icb2          icb3
5838          -5028            35         -5027           525             0
5839 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5840              1.      -1.e+99        1.e+99            0.      1.0e-20
5841 *
5842 *         idcb          icbn          icb1          icb2          icb3
5843          -5029            35         -5028           526             0
5844 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5845              1.      -1.e+99        1.e+99            0.      1.0e-20
5846 *
5847 *         idcb          icbn          icb1          icb2          icb3
5848          -5030            35         -5029           527             0
5849 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5850              1.      -1.e+99        1.e+99            0.      1.0e-20
5851 *
5852 *         idcb          icbn          icb1          icb2          icb3
5853          -5031            35         -5030           528             0
5854 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5855              1.      -1.e+99        1.e+99            0.      1.0e-20
5856 *
5857 *         idcb          icbn          icb1          icb2          icb3
5858          -5032            35         -5031           529             0
5859 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5860              1.      -1.e+99        1.e+99            0.      1.0e-20
5861 *
5862 *         idcb          icbn          icb1          icb2          icb3
5863          -5033            35         -5032           530             0
5864 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5865              1.      -1.e+99        1.e+99            0.      1.0e-20
5866 *
5867 *         idcb          icbn          icb1          icb2          icb3
5868          -5034            35         -5033           531             0
5869 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5870              1.      -1.e+99        1.e+99            0.      1.0e-20
5871 *
5872 *         idcb          icbn          icb1          icb2          icb3
5873          -5035            35         -5034           532             0
5874 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5875              1.      -1.e+99        1.e+99            0.      1.0e-20
5876 *
5877 *         idcb          icbn          icb1          icb2          icb3
5878          -5036            35         -5035           533             0
5879 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5880              1.      -1.e+99        1.e+99            0.      1.0e-20
5881 *
```



```
5882 *         idcb          icbn          icb1          icb2          icb3
5883          -5037            35         -5036           534             0
5884 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5885              1.      -1.e+99        1.e+99            0.      1.0e-20
5886 *
5887 *         idcb          icbn          icb1          icb2          icb3
5888          -5038            35         -5037           535             0
5889 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5890              1.      -1.e+99        1.e+99            0.      1.0e-20
5891 *
5892 *         idcb          icbn          icb1          icb2          icb3
5893          -5039            35         -5038           536             0
5894 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5895              1.      -1.e+99        1.e+99            0.      1.0e-20
5896 *
5897 *         idcb          icbn          icb1          icb2          icb3
5898          -5040            35         -5039           537             0
5899 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5900              1.      -1.e+99        1.e+99            0.      1.0e-20
5901 *
5902 *         idcb          icbn          icb1          icb2          icb3
5903          -5041            35         -5040           538             0
5904 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5905              1.      -1.e+99        1.e+99            0.      1.0e-20
5906 *
5907 *         idcb          icbn          icb1          icb2          icb3
5908          -5042            35         -5041           539             0
5909 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5910              1.      -1.e+99        1.e+99            0.      1.0e-20
5911 *
5912 *         idcb          icbn          icb1          icb2          icb3
5913          -5043            35         -5042           540             0
5914 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5915              1.      -1.e+99        1.e+99            0.      1.0e-20
5916 *
5917 *         idcb          icbn          icb1          icb2          icb3
5918          -5044            35         -5043           541             0
5919 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5920              1.      -1.e+99        1.e+99            0.      1.0e-20
5921 *
5922 *         idcb          icbn          icb1          icb2          icb3
5923          -5045            35         -5044           542             0
5924 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5925              1.      -1.e+99        1.e+99            0.      1.0e-20
5926 *
5927 *         idcb          icbn          icb1          icb2          icb3
5928          -5046            35         -5045           543             0
5929 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5930              1.      -1.e+99        1.e+99            0.      1.0e-20
5931 *
5932 *         idcb          icbn          icb1          icb2          icb3
5933          -5047            35         -5046           544             0
5934 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5935              1.      -1.e+99        1.e+99            0.      1.0e-20
5936 *
5937 *         idcb          icbn          icb1          icb2          icb3
5938          -5048            35         -5047           545             0
5939 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5940              1.      -1.e+99        1.e+99            0.      1.0e-20
5941 *
5942 *         idcb          icbn          icb1          icb2          icb3
5943          -5049            35         -5048           546             0
5944 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5945              1.      -1.e+99        1.e+99            0.      1.0e-20
5946 *
5947 *         idcb          icbn          icb1          icb2          icb3
5948          -5050            35         -5049           547             0
5949 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
5950              1.      -1.e+99        1.e+99            0.      1.0e-20
5951 *
5952 *         idcb          icbn          icb1          icb2          icb3
5953          -5051            35         -5050           548             0
5954 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
```

```
5955            1.        -1.e+99        1.e+99          0.       1.0e-20
5956 *
5957 *        idcb          icbn           icb1           icb2          icb3
5958         -5052            35          -5051            549             0
5959 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
5960            1.        -1.e+99        1.e+99          0.       1.0e-20
5961 *
5962 *        idcb          icbn           icb1           icb2          icb3
5963         -5053            35          -5052            550             0
5964 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
5965        4.3497        -1.e+99        1.e+99          0.       1.0e-20
5966 *
5967 ************************************************************************
5968 *
5969 *     minimum and maximum downcomer wall htc
5970 *
5971 *        idcb          icbn           icb1           icb2          icb3
5972         -5054            37            551            552             0
5973 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
5974            1.        -1.e+99        1.e+99          0.       1.0e-20
5975 *
5976 *        idcb          icbn           icb1           icb2          icb3
5977         -5055            35            553            554             0
5978 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
5979            1.        -1.e+99        1.e+99          0.       1.0e-20
5980 *
5981 ************************************************************************
5982 *
5983 *     cl a1 volumetric flow rate
5984 *
5985 *        idcb          icbn           icb1           icb2          icb3
5986         -5056            14            239             32             0
5987 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
5988            1.        -1.e+99        1.e+99          0.       1.0e-20
5989 *
5990 ************************************************************************
5991 *
5992 *     cl a2 volumetric flow rate
5993 *
5994 *        idcb          icbn           icb1           icb2          icb3
5995         -5057            14            240             33             0
5996 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
5997            1.        -1.e+99        1.e+99          0.       1.0e-20
5998 *
5999 ************************************************************************
6000 *
6001 *     cl b1 volumetric flow rate
6002 *
6003 *        idcb          icbn           icb1           icb2          icb3
6004         -5058            14            241             34             0
6005 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6006            1.        -1.e+99        1.e+99          0.       1.0e-20
6007 *
6008 ************************************************************************
6009 *
6010 *     cl b2 volumetric flow rate
6011 *
6012 *        idcb          icbn           icb1           icb2          icb3
6013         -5059            14            242             35             0
6014 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6015            1.        -1.e+99        1.e+99          0.       1.0e-20
6016 *
6017 ************************************************************************
6018 *
6019 *     integrated mass flow into / out of a sg
6020 *
6021 *        idcb          icbn           icb1           icb2          icb3
6022         -5072             3            142            144             0
6023 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6024            1.        -1.e+99        1.e+99          0.       1.0e-20
6025 *
6026 *        idcb          icbn           icb1           icb2          icb3
6027         -5073            24          -5072            212           212
```



```
6028 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6029            1.        -1.e+99        1.e+99          1.       1.0e-20
6030 *
6031 *        idcb          icbn           icb1           icb2          icb3
6032         -5074            24            146            212           212
6033 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6034            1.        -1.e+99        1.e+99          1.       1.0e-20
6035 *
6036 ************************************************************************
6037 *
6038 *     integrated mass flow into / out of b sg
6039 *
6040 *        idcb          icbn           icb1           icb2          icb3
6041         -5075             3            143            145             0
6042 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6043            1.        -1.e+99        1.e+99          0.       1.0e-20
6044 *
6045 *        idcb          icbn           icb1           icb2          icb3
6046         -5076            24          -5075            212           212
6047 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6048            1.        -1.e+99        1.e+99          1.       1.0e-20
6049 *
6050 *        idcb          icbn           icb1           icb2          icb3
6051         -5077            24            147            212           212
6052 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6053            1.        -1.e+99        1.e+99          1.       1.0e-20
6054 *
6055 ************************************************************************
6056 *
6057 *     total efw delivered to a and b sg
6058 *
6059 *        idcb          icbn           icb1           icb2          icb3
6060         -5078            23            567              0             0
6061 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6062            1.        -1.e+99        1.e+99          0.       1.0e-20
6063 *
6064 *        idcb          icbn           icb1           icb2          icb3
6065         -5079            23            568              0             0
6066 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6067            1.        -1.e+99        1.e+99          0.       1.0e-20
6068 *
6069 ************************************************************************
6070 *
6071 *     average cl temperature cooldown rate
6072 *
6073 *        idcb          icbn           icb1           icb2          icb3
6074         -5080           100          -1130           1000             0
6075 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6076            1.        -1.e+99        1.e+99         300.       1.0e-20
6077 *
6078 *        idcb          icbn           icb1           icb2          icb3
6079         -5081            54          -1130          -5080             0
6080 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6081           -1.        -1.e+99        1.e+99          0.       1.0e-20
6082 *
6083 *        idcb          icbn           icb1           icb2          icb3
6084         -5082             9              0              0             0
6085 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6086            1.         300.           300.           300.          300.
6087 *
6088 *        idcb          icbn           icb1           icb2          icb3
6089         -5083            37              1          -5082             0
6090 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6091            1.            1.        1.e+99          0.       1.0e-20
6092 *
6093 *        idcb          icbn           icb1           icb2          icb3
6094         -5084            14          -5081          -5083             0
6095 *      cbgain        cbxmin         cbxmax         cbcon1        cbcon2
6096            1.        -1.e+99        1.e+99          0.       1.0e-20
6097 *
6098 ************************************************************************
6099 *
6100 *     core exit temperature cooldown rate
```

```
6101 *
6102 *        idcb          icbn          icb1          icb2          icb3
6103         -5085           100            56          1000             0
6104 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6105            1.      -1.e+99        1.e+99          300.      1.0e-20
6106 *
6107 *        idcb          icbn          icb1          icb2          icb3
6108         -5086            54            56         -5085             0
6109 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6110           -1.      -1.e+99        1.e+99            0.      1.0e-20
6111 *
6112 *        idcb          icbn          icb1          icb2          icb3
6113         -5087            14         -5086         -5083             0
6114 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6115            1.      -1.e+99        1.e+99            0.      1.0e-20
6116 *
6117 ************************************************************************
6118 *
6119 *     a and b sg operating range levels
6120 *
6121 *     operating range = 102 - 394 inches above lower tube sheet
6122 *
6123 *        idcb          icbn          icb1          icb2          icb3
6124         -5088            56             4             0             0
6125 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6126            1.            0.       10.008       -2.5908      1.0e-20
6127 *
6128 *        idcb          icbn          icb1          icb2          icb3
6129         -5089            56             3             0             0
6130 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6131            1.            0.       10.008       -2.5908      1.0e-20
6132 *
6133 ************************************************************************
6134 *
6135 *     a and b sg startup range levels
6136 *
6137 *     startup range = 6 - 256 inches above lower tube sheet
6138 *
6139 *        idcb          icbn          icb1          icb2          icb3
6140         -5090            56             4             0             0
6141 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6142            1.            0.        6.5024        -.1524      1.0e-20
6143 *
6144 *        idcb          icbn          icb1          icb2          icb3
6145         -5091            56             3             0             0
6146 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6147            1.            0.        6.5024        -.1524      1.0e-20
6148 *
6149 ************************************************************************
6150 *
6151 *     average hot leg temperature
6152 *
6153 *        idcb          icbn          icb1          icb2          icb3
6154         -5092             3           202           204             0
6155 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6156             .5      -1.e+99        1.e+99            0.      1.0e-20
6157 *
6158 ************************************************************************
6159 *
6160 *     average cl temperature cooldown rate, 60 min interval
6161 *
6162 *        idcb          icbn          icb1          icb2          icb3
6163         -5101           100         -1130          1500             0
6164 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6165            1.      -1.e+99        1.e+99         3600.      1.0e-20
6166 *
6167 *        idcb          icbn          icb1          icb2          icb3
6168         -5102            54         -1130         -5101             0
6169 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6170           -1.      -1.e+99        1.e+99            0.      1.0e-20
6171 *
6172 *        idcb          icbn          icb1          icb2          icb3
6173         -5103             9             0             0             0
```



```
6174 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6175            1.       3600.        3600.        3600.        3600.
6176 *
6177 *        idcb          icbn          icb1          icb2          icb3
6178         -5104            37             1         -5103             0
6179 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6180            1.            1.      1.e+99            0.      1.0e-20
6181 *
6182 *        idcb          icbn          icb1          icb2          icb3
6183         -5105            14         -5102         -5104             0
6184 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6185            1.      -1.e+99        1.e+99            0.      1.0e-20
6186 *
6187 ************************************************************************
6188 *
6189 *     core exit temperature cooldown rate, 60 min interval
6190 *
6191 *        idcb          icbn          icb1          icb2          icb3
6192         -5106           100            56          1500             0
6193 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6194            1.      -1.e+99        1.e+99         3600.      1.0e-20
6195 *
6196 *        idcb          icbn          icb1          icb2          icb3
6197         -5107            54            56         -5106             0
6198 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6199           -1.      -1.e+99        1.e+99            0.      1.0e-20
6200 *
6201 *        idcb          icbn          icb1          icb2          icb3
6202         -5108            14         -5107         -5104             0
6203 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6204            1.      -1.e+99        1.e+99            0.      1.0e-20
6205 *
6206 ************************************************************************
6207 *
6208 *     downcomer cooldown rate at top of core elev, 5 min interval
6209 *
6210 *        idcb          icbn          icb1          icb2          icb3
6211         -5109           100            57          1000             0
6212 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6213            1.      -1.e+99        1.e+99          300.      1.0e-20
6214 *
6215 *        idcb          icbn          icb1          icb2          icb3
6216         -5110            54            57         -5109             0
6217 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6218           -1.      -1.e+99        1.e+99            0.      1.0e-20
6219 *
6220 *        idcb          icbn          icb1          icb2          icb3
6221         -5111            14         -5110         -5083             0
6222 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6223            1.      -1.e+99        1.e+99            0.      1.0e-20
6224 *
6225 ************************************************************************
6226 *
6227 *     downcomer cooldown rate at top of core elev, 60 min interval
6228 *
6229 *        idcb          icbn          icb1          icb2          icb3
6230         -5112           100            57          1500             0
6231 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6232            1.      -1.e+99        1.e+99         3600.      1.0e-20
6233 *
6234 *        idcb          icbn          icb1          icb2          icb3
6235         -5113            54            57         -5112             0
6236 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6237           -1.      -1.e+99        1.e+99            0.      1.0e-20
6238 *
6239 *        idcb          icbn          icb1          icb2          icb3
6240         -5114            14         -5113         -5104             0
6241 *       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
6242            1.      -1.e+99        1.e+99            0.      1.0e-20
6243 *
6244 ************************************************************************
6245 *                                                                      *
6246 *                              TRIP DATA                               *
```

```
6247 *                                                                    *
6248 ***********************************************************************
6249 *
6250 *      trip id  trip used for
6251 *      -------  -------------
6252 *
6253 *          11  null trip
6254 *          12  always on trip
6255 *          13  transient trip
6256 *          20  RCP trip
6257 *          25  hotwell pump trip
6258 *          30  condensate booster pump trip
6259 *          31  feedwater a startup valve closed trip signal
6260 *          32  feedwater b startup valve closed trip signal
6261 *          35  MFW pump a trip
6262 *          36  MFW pump b trip
6263 *          37  trip to indicate both MFW pumps tripped
6264 *          40  reactor trip  (can be manual)
6265 *          45  turbine trip  (can be manual)
6266 *          50  mfw realignment and isolation trip
6267 *          55  hpi trip
6268 *          60  permits throttling of hpi based on pressure
6269 *          65  permits throttling of hpi based on subcooling
6270 *          67  permits throttling of hpi based on cooldown rate
6271 *          68  permits throttling of hpi based on low cl temperature
6272 *          70  turbine trip with 0.5-s delay for fw heaters and drain
6273 *          77  pressurizer porv trip
6274 *          80  loop b accumulator check valve trap
6275 *          90  loop a accumulator check valve trap
6276 *         100  trip signal to model sl-a stuck-open tbv transient
6277 *         105  trip signal to model sl-b stuck-open tbv transient
6278 *         110  trip signal to indicate sl-a tbv has opened
6279 *         115  trip signal to indicate sl-b tbv has opened
6280 *         117  permits throttling of tbvs based on cooldown rate
6281 *         118  trip signal to model efw failure with operator level control
6282 *         119  trip signal to model efw failure without operator level control
6283 *         756  mfw pump a check valve trip
6284 *         761  mfw pump b check valve trip
6285 *         789  mfw line a check valve trip
6286 *         791  mfw line b check valve trip
6287 *         150  efw line a check valve trip
6288 *         250  efw line b check valve trip
6289 *
6290 *       signal     trip cntr      setpoint      dump and     trip cntr
6291 *     exp trip         trip        factor    termination    time step
6292 *    data sets     data sets        tables         trips     data sets
6293 *
6294 *         ntse          ntct          ntsf          ntdp          ntsd
6295 *            0             5             0             0             0
6296 *
6297 ***********************************************************************
6298 * null trip   (ISET always = 0)                                      *
6299 ***********************************************************************
6300 *
6301 *         idtp          isrt          iset          itst          idsg
6302 *           11             1             0             1             1
6303 *      setp(1)       setp(2)       setp(3)       setp(4)
6304 *          -2.           -1.
6305 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6306 *          0.0           0.0
6307 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6308 *            0             0
6309 *
6310 ***********************************************************************
6311 * always on trip   (ISET always = 1)                                 *
6312 ***********************************************************************
6313 *
6314 *         idtp          isrt          iset          itst          idsg
6315 *           12             2             1             1             1
6316 *      setp(1)       setp(2)       setp(3)       setp(4)
6317 *          -2.           -1.
6318 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6319 *          0.0           0.0
```



```
6320 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6321 *            0             0
6322 *
6323 ***********************************************************************
6324 * transient trip   (ISET = 0 steady state, ISET = 1 transient)       *
6325 ***********************************************************************
6326 *
6327 *         idtp          isrt          iset          itst          idsg
6328 *           13             2             0             1             1
6329 *      setp(1)       setp(2)       setp(3)       setp(4)
6330 *          -1.           0.
6331 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6332 *          0.0           0.0
6333 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6334 *            0             0
6335 *
6336 ***********************************************************************
6337 * RCP trip - changed to trip on subcooling margin of 0.28 c          *
6338 ***********************************************************************
6339 *
6340 *         idtp          isrt          iset          itst          idsg
6341 *           20             1             0             1          -725
6342 *      setp(1)       setp(2)       setp(3)       setp(4)
6343 *          0.28        1000.0  * 0.28 deg subcooling
6344 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6345 *          0.0           0.0    * 0 s delay
6346 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6347 *            0             0
6348 *
6349 ***********************************************************************
6350 * hotwell pump trip - changed to trip on closed startup valve        *
6351 ***********************************************************************
6352 *
6353 *         idtp          isrt          iset          itst          idsg
6354 *           25             2             0             1          -835
6355 *           25             2             0             3           840
6356 *      setp(1)       setp(2)       setp(3)       setp(4)
6357 *         -1.5          1.5
6358 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6359 *          0.0           0.0
6360 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6361 *            0             0
6362 *
6363 ***********************************************************************
6364 * condensate booster pump trip - changed to trip on closed suv       *
6365 ***********************************************************************
6366 *
6367 *         idtp          isrt          iset          itst          idsg
6368 *           30             2             0             1          -865
6369 *           30             2             0             3           840
6370 *      setp(1)       setp(2)       setp(3)       setp(4)
6371 *         -1.5          1.5
6372 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6373 *          0.0           0.0
6374 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6375 *            0             0
6376 *
6377 ***********************************************************************
6378 * trip signal for closed startup valve a
6379 ***********************************************************************
6380 *
6381 *         idtp          isrt          iset          itst          idsg
6382 *           31             1             0             1         -2820
6383 *      setp(1)       setp(2)       setp(3)       setp(4)
6384 *          0.01          1.1
6385 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6386 *          0.0           0.0
6387 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6388 *            0             0
6389 *
6390 ***********************************************************************
6391 * trip signal for closed startup valve b
6392 ***********************************************************************
```

```
6393  *
6394  *         idtp          isrt          iset          itst          idsg
6395                32             1             0             1         -2670
6396  *      setp(1)       setp(2)       setp(3)       setp(4)
6397              0.01           1.1
6398  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6399               0.0           0.0
6400  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6401                 0             0
6402  *
6403  ************************************************************************
6404  * MFW pump a trip for high and low pressure and for sg level          *
6405  ************************************************************************
6406  *
6407  *         idtp          isrt          iset          itst          idsg
6408                33             2             0             1         -1280
6409  *      setp(1)       setp(2)       setp(3)       setp(4)
6410               -.5            .5
6411  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6412               0.0           0.0
6413  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6414                 0             0
6415  *
6416  ************************************************************************
6417  * MFW pump b trip for high and low pressure and for sg level          *
6418  ************************************************************************
6419  *
6420  *         idtp          isrt          iset          itst          idsg
6421                34             2             0             1         -1294
6422  *      setp(1)       setp(2)       setp(3)       setp(4)
6423               -.5            .5
6424  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6425               0.0           0.0
6426  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6427                 0             0
6428  *
6429  ************************************************************************
6430  * main feedwater pump a trip
6431  ************************************************************************
6432  *
6433  *         idtp          isrt          iset          itst          idsg
6434                35             2             0             3          810
6435  *      setp(1)       setp(2)       setp(3)       setp(4)
6436              -0.5           0.5
6437  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6438               0.0           0.0
6439  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6440                 0             0
6441  *
6442  ************************************************************************
6443  * main feedwater pump b trip
6444  ************************************************************************
6445  *
6446  *         idtp          isrt          iset          itst          idsg
6447                36             2             0             3          820
6448  *      setp(1)       setp(2)       setp(3)       setp(4)
6449              -0.5           0.5
6450  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6451               0.0           0.0
6452  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6453                 0             0
6454  *
6455  ************************************************************************
6456  * both feedwater pumps tripped
6457  ************************************************************************
6458  *
6459  *         idtp          isrt          iset          itst          idsg
6460                37             2             0             3          830
6461  *      setp(1)       setp(2)       setp(3)       setp(4)
6462              -0.5           0.5
6463  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6464               0.0           0.0
6465  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
```



```
6466                 0             0
6467  *
6468  ************************************************************************
6469  * reactor trip                                                         *
6470  ************************************************************************
6471  *
6472  *         idtp          isrt          iset          itst          idsg
6473                40             2             0             1         -1393
6474  *      setp(1)       setp(2)       setp(3)       setp(4)
6475               -.5            .5
6476  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6477               0.0           0.0
6478  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6479                 0             0
6480  *
6481  ************************************************************************
6482  * turbine trip                                                         *
6483  ************************************************************************
6484  *
6485  *         idtp          isrt          iset          itst          idsg
6486                45             2             0             1         -1399
6487  *      setp(1)       setp(2)       setp(3)       setp(4)
6488               -.5            .5
6489  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6490               0.0           0.0
6491  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6492                 0             0
6493  *
6494  ************************************************************************
6495  * mfw realignment and mfw isolation valve trip                         *
6496  ************************************************************************
6497  *
6498  *         idtp          isrt          iset          itst          idsg
6499                50             2             0             1          -740
6500  *      setp(1)       setp(2)       setp(3)       setp(4)
6501               -.5            .5
6502  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6503               0.0           0.0
6504  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6505                 0             0
6506  *
6507  ************************************************************************
6508  * hpi trip                                                             *
6509  ************************************************************************
6510  *
6511  *         idtp          isrt          iset          itst          idsg
6512                55             2             0             1          -745
6513  *      setp(1)       setp(2)       setp(3)       setp(4)
6514               -.5            .5
6515  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6516               0.0           0.0
6517  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6518                 0             0
6519  *
6520  ************************************************************************
6521  * trip to permit hpi throttling by operator based on high pressure    *
6522  * currently ISET always = 1, i.e. pressure throttling is turned on.   *
6523  * per deb 11/3/00, disable high pressure throttling - idsg set to -20
6524  ************************************************************************
6525  *
6526  *         idtp          isrt          iset          itst          idsg
6527                60             2             0             1           -20
6528  *      setp(1)       setp(2)       setp(3)       setp(4)
6529               -.5            .5
6530  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6531               0.0           0.0
6532  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6533                 0             0
6534  *
6535  ************************************************************************
6536  * trip to permit hpi throttling by operator based on subcooling       *
6537  * currently ISET always = 1, i.e. subcooling throttling is turned on *
6538  ************************************************************************
```

```
6539  *
6540  *          idtp          isrt          iset          itst          idsg
6541                65             2             1             1           -21
6542  *       setp(1)       setp(2)       setp(3)       setp(4)
6543                -.5           .5
6544  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6545                0.0           0.0
6546  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6547                 0             0
6548  *
6549  ************************************************************************
6550  * trip to permit hpi throttling by operator based on cooldown rate    *
6551  * currently ISET always = 1, i.e. cooldown throttling is turned on    *
6552  ************************************************************************
6553  *
6554  *          idtp          isrt          iset          itst          idsg
6555                67             2             1             1           -21
6556  *       setp(1)       setp(2)       setp(3)       setp(4)
6557                -.5           .5
6558  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6559                0.0           0.0
6560  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6561                 0             0
6562  *
6563  ************************************************************************
6564  * trip to permit hpi throttling by operator based low cold leg temp   *
6565  * currently ISET always = 1, i.e. cooldown throttling is turned on    *
6566  ************************************************************************
6567  *
6568  *          idtp          isrt          iset          itst          idsg
6569                68             2             1             1           -21
6570  *       setp(1)       setp(2)       setp(3)       setp(4)
6571                -.5           .5
6572  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6573                0.0           0.0
6574  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6575                 0             0
6576  *
6577  ************************************************************************
6578  * turbine trip with 0.5 s delay for feedwater heaters and drain flow *
6579  ************************************************************************
6580  *
6581  *          idtp          isrt          iset          itst          idsg
6582                70             2             0             1         -1399
6583  *       setp(1)       setp(2)       setp(3)       setp(4)
6584                -.5           .5
6585  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6586                0.5           0.5
6587  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6588                 0             0
6589  *
6590  ************************************************************************
6591  * 77 ,    porv  trip
6592  ************************************************************************
6593  *
6594  *          idtp          isrt          iset          itst          idsg
6595                77            -3             0             1             2
6596  *       setp(1)       setp(2)       setp(3)       setp(4)
6597      1.6650E+07    1.6700E+07    1.6950E+07    1.7000E+07
6598  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6599                0.0           0.0           0.0           0.0
6600  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6601                 0             0             0             0
6602  *
6603  ************************************************************************
6604  * 80 ,  loop b accum check valve
6605  ************************************************************************
6606  *
6607  *          idtp          isrt          iset          itst          idsg
6608                80            -3             0            -1            11
6609  *       setp(1)       setp(2)       setp(3)       setp(4)
6610      5.0000E+04    7.0000E+04    1.2000E+05    1.4000E+05
6611  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
```



```
6612                0.0           0.0           0.0           0.0
6613  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6614                 0             0             0             0
6615  *
6616  ************************************************************************
6617  * 90 ,  loop a accum check valve
6618  ************************************************************************
6619  *
6620  *          idtp          isrt          iset          itst          idsg
6621                90            -3             0            -1            12
6622  *       setp(1)       setp(2)       setp(3)       setp(4)
6623      5.0000E+04    7.0000E+04    1.2000E+05    1.4000E+05
6624  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6625                0.0           0.0           0.0           0.0
6626  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6627                 0             0             0             0
6628  *
6629  ************************************************************************
6630  * trip to initiate a sl-a tbv stuck-open transient
6631  * one of two turbine bypass valves of steam line a assumed
6632  * to stay open after both open.
6633  * currently set to not initiate a tbv stuck-open transient
6634  * set idsg to -21 to model a tbv stuck-open transient in sl a
6635  ************************************************************************
6636  *
6637  *          idtp          isrt          iset          itst          idsg
6638               100             2             0             1           -20
6639  *       setp(1)       setp(2)       setp(3)       setp(4)
6640                -.5           .5
6641  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6642                0.0           0.0
6643  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6644                 0             0
6645  *
6646  ************************************************************************
6647  * trip to initiate a sl-b tbv stuck-open transient signal
6648  * one of two turbine bypass valves of steam line b assumed
6649  * to stay open after both open.
6650  * currently set to not initiate a tbv stuck-open transient
6651  * set idsg to -21 to model a tbv stuck-open transient in sl b
6652  ************************************************************************
6653  *
6654  *          idtp          isrt          iset          itst          idsg
6655               105             2             0             1           -20
6656  *       setp(1)       setp(2)       setp(3)       setp(4)
6657                -.5           .5
6658  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6659                0.0           0.0
6660  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6661                 0             0
6662  *
6663  ************************************************************************
6664  * trip to indicate that sl-a tbv has opened
6665  ************************************************************************
6666  *
6667  *          idtp          isrt          iset          itst          idsg
6668               110             2             0             1         -3381
6669  *       setp(1)       setp(2)       setp(3)       setp(4)
6670                -.5           .5
6671  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6672                0.0           0.0
6673  *       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6674                 0             0
6675  *
6676  ************************************************************************
6677  * trip to indicate that sl-b tbv has opened
6678  ************************************************************************
6679  *
6680  *          idtp          isrt          iset          itst          idsg
6681               115             2             0             1         -3481
6682  *       setp(1)       setp(2)       setp(3)       setp(4)
6683                -.5           .5
6684  *       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
```

```
6685            0.0           0.0
6686 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6687              0             0
6688 *
6689 ************************************************************************
6690 * trip to permit tbv throttling by operator based on cooldown rate    *
6691 * currently ISET always = 0, i.e. cooldown throttling is turned off   *
6692 * to turn this option on, change idsg from -20 to -21
6693 ************************************************************************
6694 *
6695 *         idtp          isrt          iset          itst          idsg
6696            117             2             0             1           -20
6697 *      setp(1)       setp(2)       setp(3)       setp(4)
6698             -.5            .5
6699 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6700            0.0           0.0
6701 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6702              0             0
6703 *
6704 ************************************************************************
6705 * trip to model efw level control failure followed by operator level *
6706 * control to 96% OR; currently ISET always = 0, i.e. efw failure is  *
6707 * turned off; to turn this option on, change idsg from -20 to -21    *
6708 ************************************************************************
6709 *
6710 *         idtp          isrt          iset          itst          idsg
6711            118             2             0             1           -20
6712 *      setp(1)       setp(2)       setp(3)       setp(4)
6713             -.5            .5
6714 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6715            0.0           0.0
6716 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6717              0             0
6718 *
6719 ************************************************************************
6720 * trip to model efw level control failure with no operator            *
6721 * intervention; efw will stay on until the boiler section level is    *
6722 * 52 ft; currently ISET always = 0, i.e. efw failure is turned off;   *
6723 * to turn this option on, change idsg from -20 to -21                *
6724 ************************************************************************
6725 *
6726 *         idtp          isrt          iset          itst          idsg
6727            119             2             0             1           -20
6728 *      setp(1)       setp(2)       setp(3)       setp(4)
6729             -.5            .5
6730 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6731            0.0           0.0
6732 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6733              0             0
6734 *
6735 ************************************************************************
6736 * low sg-a pressure trip signal
6737 ************************************************************************
6738 *
6739 *         idtp          isrt          iset          itst          idsg
6740            120             1             0             1             5
6741 *      setp(1)       setp(2)       setp(3)       setp(4)
6742      3.8955e06      7.0e06
6743 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6744            0.0           0.0
6745 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6746              0             0
6747 *
6748 ************************************************************************
6749 * low sg-b pressure trip signal
6750 ************************************************************************
6751 *
6752 *         idtp          isrt          iset          itst          idsg
6753            125             1             0             1             6
6754 *      setp(1)       setp(2)       setp(3)       setp(4)
6755      3.8955e06      7.0e06
6756 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6757            0.0           0.0
```



```
6758 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6759              0             0
6760 *
6761 ************************************************************************
6762 * mfw and sd-efw trip on low sg pressure
6763 ************************************************************************
6764 *
6765 *         idtp          isrt          iset          itst          idsg
6766            130             2             0             3           800
6767 *      setp(1)       setp(2)       setp(3)       setp(4)
6768            -0.5           0.5
6769 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6770            0.0           0.0
6771 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6772              0             0
6773 *
6774 ************************************************************************
6775 * low pressurizer pressure trip signal
6776 ************************************************************************
6777 *
6778 *         idtp          isrt          iset          itst          idsg
6779            135             1             0             1             2
6780 *      setp(1)       setp(2)       setp(3)       setp(4)
6781     11.133e06     11.134e06
6782 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6783            0.0           0.0
6784 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6785              0             0
6786 *
6787 ************************************************************************
6788 * 150, efw line a check valve trip
6789 ************************************************************************
6790 *
6791 *         idtp          isrt          iset          itst          idsg
6792           -150            -3             1            -1          1501
6793 *      setp(1)       setp(2)       setp(3)       setp(4)
6794            0.0        1000.0        6895.0       10342.0
6795 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6796            0.0           0.0           0.0           0.0
6797 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6798              0             0             0             0
6799 *
6800 ************************************************************************
6801 * 250, efw line b check valve trip
6802 ************************************************************************
6803 *
6804 *         idtp          isrt          iset          itst          idsg
6805           -250            -3             1            -1          2501
6806 *      setp(1)       setp(2)       setp(3)       setp(4)
6807            0.0        1000.0        6895.0       10342.0
6808 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6809            0.0           0.0           0.0           0.0
6810 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6811              0             0             0             0
6812 *
6813 ************************************************************************
6814 * 756, mfw pump a check valve trip
6815 ************************************************************************
6816 *
6817 *         idtp          isrt          iset          itst          idsg
6818           -756            -3             1            -1           756
6819 *      setp(1)       setp(2)       setp(3)       setp(4)
6820            0.0        1000.0        6895.0       10342.0
6821 *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
6822            0.0           0.0           0.0           0.0
6823 *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
6824              0             0             0             0
6825 *
6826 ************************************************************************
6827 * 761, mfw pump b check valve trip
6828 ************************************************************************
6829 *
6830 *         idtp          isrt          iset          itst          idsg
```

```
          -761          -3           1          -1         761
*      setp(1)       setp(2)       setp(3)       setp(4)
           0.0        1000.0        6895.0       10342.0
*      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
           0.0           0.0           0.0           0.0
*      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0
*
*********************************************************************
* 789, mfw line a check valve trip
*********************************************************************
*
*         idtp          isrt          iset          itst          idsg
         -789            -3             1            -1           789
*      setp(1)       setp(2)       setp(3)       setp(4)
           0.0        1000.0        6895.0       10342.0
*      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
           0.0           0.0           0.0           0.0
*      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0
*
*********************************************************************
* 791, mfw line b check valve trip
*********************************************************************
*
*         idtp          isrt          iset          itst          idsg
         -791            -3             1            -1           791
*      setp(1)       setp(2)       setp(3)       setp(4)
           0.0        1000.0        6895.0       10342.0
*      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
           0.0           0.0           0.0           0.0
*      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0
*
* tct trips
*
*  trip-control-trip signal for low steam line pressure
*
    800    2
      120      125
*
*  trip-control-trip signal to trip main feedwater pump a
    810  2
    130    33
*
*  trip-control-trip signal to trip main feedwater pump b
    820  2
    130    34
*
*  trip-control-trip signal to indicate both mfw pumps tripped
    830  2
   35   36
*
*  trip-control-trip signal to indicate both startup valves closed
    840  2
   31   32
*
*********************************************************************
*                                                                   *
*                          COMPONENT DATA                           *
*                                                                   *
*********************************************************************
*
*******   type          num           id        ctitle
pipe           1        1 $1$ loop b hot leg candy cane
*       ncells        nodes         jun1          jun2          epsw
             8            1            1             2    0.0000E+00
*         ichf        iconc         iacc          ipow
             1            0            0             0
*       iqp3tr       iqp3sv       nqp3tb       nqp3sv       nqp3rf
             0            0            0             0            0
*        radin           th        houtl         houtv        toutl
    4.5720E-01    7.3000E-02    0.0000E+00    5.6800E+00    2.9500E+02
```



```
*        toutv
    2.9500E+02
*        qp3in        qp3off        rqp3mx        qp3scl
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
* dx    *     1.1700E+00    2.5400E+00r02 3.8700E+00    2.3900E+00    2.2600E+00
* dx    *     1.1300E+00    9.0000E-01e
* vol   *     7.7000E-01    1.6700E+00r02 2.5400E+00    1.5700E+00    1.4800E+00
* vol   *     7.4000E-01    5.9000E-01e
* fa    * f   6.5670E-01e
* fric  * r08 1.0e-06     8.0000E-02e
* grav  *     0.0000E+00    9.9240E-01r03 1.0000E+00    9.4240E-01   -6.2180E-01
* grav  *    -8.6010E-01   -1.0000E+00e
* hd    * f   9.1440E-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * f   5.7900E+02e
* tv    * f   5.7900E+02e
* p     * f   1.5000E+07e
* pa    * f   0.0000E+00e
* qppp  * f   0.0000E+00e
* matid *  f             7e
* tw    * f   5.7900E+02e
*
*********************************************************************
*******   type          num           id        ctitle
pipe           2        2 $2$ sg-b primary tube bundle
*
*  ncells    nodes       jun1        jun2        epsw            cd 2
   15         0           3           2        1.0e-05
*  ichf      iconc       iacc        ipow                        cd 3
   1         0           0           0
*  radin     th          houtl       houtv       toutl           cd 6
     0.0       0.0         0.0         0.0         0.0
*  toutv     powin       powoff      rpowmx      powscl          cd 7
   0.0       0.0         0.0         1.0e20      1.0
*   cell arrays
* dx    *     2.4200E+00    5.0000E-02    1.0000E-01    2.0000E-01    4.0000E-01
* dx    *     1.0150E+00r08 1.7650E+00    2.4200E+00e
* vol   *     9.3000E+00    1.2200E-01    2.4400E-01    4.8800E-01    9.7700E-01
* vol   *     2.4790E+00r08 4.3100E+00    9.4000E+00e
* fa    *     1.70      r14 2.4400E+00    6.5670E-01e
* fric  *     1.0e-06    2.5000E-03r12 1.0e-06    2.5000E-03   8.0000E-02 e
* grav  *     4.1900E-01r15 1.0000E+00e
* hd    *     1.47      r14 1.4140E-02    9.1440E-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * f   5.5280E+02e
* tv    * f   5.5280E+02e
* p     * f   1.5000E+07e
* pa    * f   0.0000E+00e
*********************************************************************
*  type      num         id          ctitle                        cd 1
pump           3        3 $3$ loop b1 pump (intact leg)
*       ncells        nodes         jun1          jun2          epsw
             2            1           63             4    0.0000E+00
*         ichf        iconc       ipmpty          irp           ipm
             1            0            1             0             1
*       ipmptr       ipmpsv       npmptb       npmpsv       npmprf
            20         -122            0             0             0
*       iqp3tr       iqp3sv       nqp3tb       nqp3sv       nqp3rf
             0            0            0             0             0
*        radin           th        houtl         houtv        toutl
    3.5550E-01    5.7000E-02    0.0000E+00    5.6800E+00    2.9500E+02
*        toutv        effmi
    2.9500E+02    2.9513E+03
*         tfr0         tfr1          tfr2          tfr3          tfrb
```

```
        0.0  0.0000E+00  0.0000E+00       0.0       0.0
*         tfrl0          tfrl1          tfrl2          tfrl3
        0.0       0.0       0.0       0.0
*         rhead          rtork          rflow          rrho          romega
    1.0165E+03    4.4140E+04    5.9100E+00    7.4600E+02    1.2460E+02
*         omegan         omgoff         romgmx         omgscl        npmpsd
    1.2320E+02   -1.2320E+02    5.0000E+01    1.0000E+00             0
*         qp3in          qp3off         rqp3mx         qp3scl
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*        option
             2
*
* dx     * f   1.1400E+00e
* vol    * f   1.3900E+00e
* fa     * f   3.9700E-01e
* fric   * 1.0e-06  0.0     2.0000E-01e
* grav   *     1.0000E+00    0.0000E+00   -5.5060E-01e
* hd     * f   7.1100E-01e
* icflg  * f            0e
* nff    * f            1e
* alp    * f   0.0000E+00e
* vl     *  0.0  4460.0  0.0 e
* vv     * f   0.0000E+00e
* tl     * f   5.7900E+02e
* tv     * f   5.7900E+02e
* p      * f   1.5000E+07e
* pa     * f   0.0000E+00e
* qppp   * f   0.0000E+00e
* matid  *  f            7e
* tw     * f   5.7900E+02e
*
*********************************************************************
*******   type           num            id        ctitle
tee             4       4 $4$ loop b1 intact cold leg
*
*  pump power added to fluid
*
*        jcell         nodes          ichf          cost          epsw
             1             1             1    0.0000E+00    0.0000E+00
*       iconc1        ncell1          jun1          jun2         ipow1
             0             3             4             5             1
*       ipwtr1        ipwsv1        npwtb1        npwsv1        npwrf1
             0          -101             0             0             0
*       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
             0             0             0             0             0
*       radin1         th1          houtl1        houtv1        toutl1
    3.5550E-01    5.7000E-02    0.0000E+00    5.6800E+00    2.9500E+02
*       toutv1       pwin1        pwoff1        rpwmx1        pwscl1
    2.9500E+02       0.0           0.0          1.0e20         1.0
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*       iconc2        ncell2          jun3         ipow2
             0             1             9             0
*       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
             0             0             0             0             0
*       radin2          th2         houtl2        houtv2        toutl2
    1.2150E-01    9.5000E-03    0.0000E+00    5.6800E+00    2.9500E+02
*       toutv2
    2.9500E+02
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
* dx     * f   2.7370E+00e
* vol    * f   1.0870E+00e
* fa     * f   3.9700E-01e
* fric   *     2.0000E-01r02 1.0e-06     1.2400E-01e
* grav   *    -5.5060E-01r03 0.0000E+00e
* hd     * f   7.1100E-01e
* icflg  * f            0e
* nff    * f            1e
* alp    * f   0.0000E+00e
* vl     * f   0.0000E+00e
* vv     * f   0.0000E+00e
```



```
* tl     * f   5.7900E+02e
* tv     * f   5.7900E+02e
* p      * f   1.5000E+07e
* pa     * f   0.0000E+00e
* qppp   * f   0.0000E+00e
* matid  *  f            7e
* tw     * f   5.7900E+02e
*
* dx     *     1.0000E-01e
* vol    *     2.3000E-04e
* fa     * f   2.3000E-03e
* fric   * f   1.0e-06 e
* grav   * f   0.0000E+00e
* hd     * f   5.4100E-02e
* icflg  * f            0e
* nff    * f            1e
* alp    *     0.0000E+00e
* vl     * f   0.0000E+00e
* vv     * f   0.0000E+00e
* tl     *     5.7900E+02e
* tv     *     5.7900E+02e
* p      *     1.5000E+07e
* pa     *     0.0000E+00e
* qppp   *     0.0000E+00e
* matid  *  f            7e
* tw     *     5.7900E+02e
*
*********************************************************************
*******   type           num            id        ctitle
tee             6       6 $6$ loop b upper head tee
*        jcell         nodes          ichf          cost          epsw
             1             1             1    1.0000E+00    0.0000E+00
*       iconc1        ncell1          jun1          jun2         ipow1
             0             2             7             1             0
*       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
             0             0             0             0             0
*       radin1         th1          houtl1        houtv1        toutl1
    4.5720E-01    7.3000E-02    0.0000E+00    5.6800E+00    2.9500E+02
*       toutv1
    2.9500E+02
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*       iconc2        ncell2          jun3         ipow2
             0             1             6             0
*       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
             0             0             0             0             0
*       radin2          th2         houtl2        houtv2        toutl2
    2.8960E-01    5.0000E-02    0.0000E+00    5.6800E+00    2.9500E+02
*       toutv2
    2.9500E+02
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
* dx     * f   1.4950E+00e
* vol    *     5.7000E-01    9.8200E-01e
* fa     * f   6.5670E-01e
* fric   *     4.0000E-01r02 1.0e-06 e
* grav   * f   0.0000E+00e
* hd     * f   9.1440E-01e
* icflg  * f            0e
* nff    * f            1e
* alp    * f   0.0000E+00e
* vl     * f   0.0000E+00e
* vv     * f   0.0000E+00e
* tl     * f   5.7900E+02e
* tv     * f   5.7900E+02e
* p      * f   1.5000E+07e
* pa     * f   0.0000E+00e
* qppp   * f   0.0000E+00e
* matid  *  f            7e
* tw     * f   5.7900E+02e
*
* dx     *     3.5052E+00e
```

```
7123 * vol    *     4.1200E-01
7124 * fa     * f   2.6200E-01
7125 * fric   * f   1.0e-06 e
7126 * grav   *     1.0000E+00    5.3550E-01e
7127 * hd     * f   4.0800E-01e
7128 * icflg  * f            0e
7129 * nff    * f           -1e
7130 * alp    *     0.0000E+00e
7131 * vl     * f   0.0000E+00e
7132 * vv     * f   0.0000E+00e
7133 * tl     *     5.7900E+02e
7134 * tv     *     5.7900E+02e
7135 * p      *     1.5000E+07e
7136 * pa     *     0.0000E+00e
7137 * qppp   *     0.0000E+00e
7138 * matid *  f             7e
7139 * tw     *     5.7900E+02e
7140 *
7141 ************************************************************************
7142 *******   type            num            id        ctitle
7143 tee            11      11 $11$ loop a hot leg candy cane
7144 *        jcell          nodes          ichf          cost          epsw
7145              2              1             1    0.0000E+00    0.0000E+00
7146 *       iconc1         ncell1          jun1          jun2         ipow1
7147              0              8            11            12             0
7148 *       iqptr1         iqpsv1        nqptb1        nqpsv1        nqprf1
7149              0              0             0             0             0
7150 *       radin1            th1        houtl1        houtv1        toutl1
7151    4.5720E-01     7.3000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7152 *       toutv1
7153    2.9500E+02
7154 *        qpin1         qpoff1        rqpmx1        qpscl1
7155    0.0000E+00     0.0000E+00    0.0000E+00    0.0000E+00
7156 *       iconc2         ncell2          jun3         ipow2
7157              0              4            22             0
7158 *       iqptr2         iqpsv2        nqptb2        nqpsv2        nqprf2
7159              0              0             0             0             0
7160 *       radin2            th2        houtl2        houtv2        toutl2
7161    1.1110E-01     2.5400E-02    0.0000E+00    0.0000E+00    5.9000E+02
7162 *       toutv2
7163    5.9000E+02
7164 *        qpin2         qpoff2        rqpmx2        qpscl2
7165    0.0000E+00     0.0000E+00    0.0000E+00    0.0000E+00
7166 *
7167 * dx     *     1.1700E+00    2.5400E+00r02 3.8700E+00    2.3900E+00    2.2600E+00
7168 * dx     *     1.1300E+00    9.0000E-01e
7169 * vol    *     7.7000E-01    1.6700E+00r02 2.5400E+00    1.5700E+00    1.4800E+00
7170 * vol    *     7.4000E-01    5.9000E-01e
7171 * fa     * f   6.5670E-01e
7172 * fric   * r08 1.0e-06     8.0000E-02e
7173 * grav   *     0.0000E+00    9.9240E-01r03 1.0000E+00    9.4240E-01   -6.2180E-01
7174 * grav   *    -8.6010E-01   -1.0000E+00e
7175 * hd     * f   9.1440E-01e
7176 * icflg  * f            0e
7177 * nff    * f            1e
7178 * alp    * f   0.0000E+00e
7179 * vl     * f   0.0000E+00e
7180 * vv     * f   0.0000E+00e
7181 * tl     * f   5.7900E+02e
7182 * tv     * f   5.7900E+02e
7183 * p      * f   1.5000E+07e
7184 * pa     * f   0.0000E+00e
7185 * qppp   * f   0.0000E+00e
7186 * matid *  f             7e
7187 * tw     * f   5.7900E+02e
7188 *
7189 * dx     *     5.0000E-01r02 4.9530E+00    7.7500E-01e
7190 * vol    *     2.5340E-02r02 2.5110E-01    3.9270E-02e
7191 * fa     * f   5.0670E-02e
7192 * fric   * f   1.0e-06 e
7193 * grav   *     0.0000E+00   -6.8710E-01   -3.7820E-01    1.3530E-01    1.0000E+00
7194 e
7195 * hd     * f   2.5400E-01e
```



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7196 * icflg * f            0e
7197 * nff   * f            1e
7198 * alp   * f   0.0000E+00e
7199 * vl    * f   0.0000E+00e
7200 * vv    * f   0.0000E+00e
7201 * tl    * f   5.7900E+02e
7202 * tv    * f   5.7900E+02e
7203 * p     * f   1.5000E+07e
7204 * pa    * f   0.0000E+00e
7205 * qppp  * f   0.0000E+00e
7206 * matid *  f             7e
7207 * tw    * f   5.7900E+02e
7208 *
7209 ************************************************************************
7210 *******   type            num            id        ctitle
7211 pipe           12      12 $12$ sg-a primary tube bundle
7212 *
7213 *  ncells    nodes        jun1        jun2        epsw            cd 2
7214    15         0            13          12         1.0e-05
7215 *  ichf      iconc        iacc        ipow                        cd 3
7216    1         0            0           0
7217 *  radin     th           houtl       houtv       toutl           cd 6
7218      0.0       0.0        0.0         0.0         0.0
7219 *  toutv     powin        powoff      rpowmx      powscl          cd 7
7220    0.0       0.0          0.0         1.0e20      1.0
7221 *   cell arrays
7222 * dx    *     2.4200E+00    5.0000E-02    1.0000E-01    2.0000E-01    4.0000E-01
7223 * dx    *     1.0150E+00r08 1.7650E+00    2.4200E+00e
7224 * vol   *     9.3000E+00    1.2200E-01    2.4400E-01    4.8800E-01    9.7700E-01
7225 * vol   *     2.4790E+00r08 4.3100E+00    9.4000E+00e
7226 * fa    *     1.70      r14 2.4400E+00    6.5670E-01e
7227 * fric  *    1.0e-06    2.5000E-03r12 1.0e-06    2.5000E-03    8.0000E-02 e
7228 * grav  *     4.1900E-01r15 1.0000E+00e
7229 * hd    *     1.47      r14 1.4140E-02    9.1440E-01e
7230 * icflg * f            0e
7231 * nff   * f            1e
7232 * alp   * f   0.0000E+00e
7233 * vl    * f   0.0000E+00e
7234 * vv    * f   0.0000E+00e
7235 * tl    * f   5.5280E+02e
7236 * tv    * f   5.5280E+02e
7237 * p     * f   1.5000E+07e
7238 * pa    * f   0.0000E+00e
7239 ************************************************************************
7240 *  type      num          id          ctitle                        cd 1
7241 pump           13      13 $13$ loop a1 pump (intact leg)
7242 *       ncells          nodes          jun1          jun2          epsw
7243              2              1            73            14    0.0000E+00
7244 *         ichf          iconc        ipmpty           irp           ipm
7245              1              0             1             0             1
7246 *       ipmptr         ipmpsv        npmptb        npmpsv        npmprf
7247             20           -124             0             0             0
7248 *       iqp3tr         iqp3sv        nqp3tb        nqp3sv        nqp3rf
7249              0              0             0             0             0
7250 *        radin             th        houtl         houtv         toutl
7251    3.5550E-01     5.7000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7252 *        toutv          effmi
7253    2.9500E+02     2.9513E+03
7254 *         tfr0           tfr1          tfr2          tfr3          tfrb
7255       0.0  0.0000E+00  0.0000E+00       0.0       0.0
7256 *        tfrl0          tfrl1         tfrl2         tfrl3
7257       0.0       0.0       0.0       0.0
7258 *        rhead          rtork         rflow          rho         romega
7259    1.0165E+03     4.4140E+04    5.9100E+00    7.4600E+02    1.2460E+02
7260 *       omegan         omgoff        romgmx        omgscl         npmpsd
7261    1.2320E+02    -1.2320E+02    5.0000E+01    1.0000E+00             0
7262 *        qp3in         qp3off        rqp3mx        qp3scl
7263    0.0000E+00     0.0000E+00    0.0000E+00    0.0000E+00
7264 *       option
7265              2
7266 *
7267 * dx    * f   1.1400E+00e
7268 * vol   * f   1.3900E+00e
```

```
7269 * fa    * f   3.9700E-01e
7270 * fric  * 1.0e-06  0.0     2.0000E-01e
7271 * grav  *     1.0000E+00    0.0000E+00   -5.5060E-01e
7272 * hd    * f   7.1100E-01e
7273 * icflg * f            0e
7274 * nff   * f            1e
7275 * alp   * f   0.0000E+00e
7276 * vl    *  0.0  4460.0  0.0 e
7277 * vv    * f   0.0000E+00e
7278 * tl    * f   5.7900E+02e
7279 * tv    * f   5.7900E+02e
7280 * p     * f   1.5000E+07e
7281 * pa    * f   0.0000E+00e
7282 * qppp  * f   0.0000E+00e
7283 * matid *  f              7e
7284 * tw    * f   5.7900E+02e
7285 *
7286 ************************************************************************
7287 *******   type            num            id        ctitle
7288 tee            14      14 $14$ loop a1 intact cold leg
7289 *
7290 *  pump power added to fluid
7291 *
7292 *        jcell         nodes          ichf          cost          epsw
7293             1             1             1    0.0000E+00    0.0000E+00
7294 *       iconc1        ncell1          jun1          jun2         ipow1
7295             0             3            14            15             1
7296 *       ipwtr1        ipwsv1        npwtb1        npwsv1        npwrf1
7297             0          -102             0             0             0
7298 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7299             0             0             0             0             0
7300 *       radin1           th1        houtl1        houtv1        toutl1
7301    3.5550E-01    5.7000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7302 *       toutv1      pwin1       pwoff1      rpwmx1      pwscl1
7303    2.9500E+02      0.0         0.0       1.0e20        1.0
7304 *        qpin1       qpoff1        rqpmx1        qpscl1
7305    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7306 *       iconc2        ncell2          jun3         ipow2
7307             0             1            20             0
7308 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7309             0             0             0             0             0
7310 *       radin2           th2        houtl2        houtv2        toutl2
7311    1.2150E-01    9.5000E-03    0.0000E+00    5.6800E+00    2.9500E+02
7312 *       toutv2
7313    2.9500E+02
7314 *        qpin2       qpoff2        rqpmx2        qpscl2
7315    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7316 *
7317 * dx    * f   2.7370E+00e
7318 * vol   * f   1.0870E+00e
7319 * fa    * f   3.9700E-01e
7320 * fric  *     2.0000E-01r02 1.0e-06     1.2400E-01e
7321 * grav  *    -5.5060E-01r03 0.0000E+00e
7322 * hd    * f   7.1100E-01e
7323 * icflg * f            0e
7324 * nff   * f            1e
7325 * alp   * f   0.0000E+00e
7326 * vl    * f   0.0000E+00e
7327 * vv    * f   0.0000E+00e
7328 * tl    * f   5.7900E+02e
7329 * tv    * f   5.7900E+02e
7330 * p     * f   1.5000E+07e
7331 * pa    * f   0.0000E+00e
7332 * qppp  * f   0.0000E+00e
7333 * matid *  f              7e
7334 * tw    * f   5.7900E+02e
7335 *
7336 * dx    *     1.0000E-01e
7337 * vol   *     2.3000E-04e
7338 * fa    * f   2.3000E-03e
7339 * fric  * f   1.0e-06 e
7340 * grav  * f   0.0000E+00e
7341 * hd    * f   5.4100E-02e
```



```
7342 * icflg * f            0e
7343 * nff   * f            1e
7344 * alp   *     0.0000E+00e
7345 * vl    * f   0.0000E+00e
7346 * vv    * f   0.0000E+00e
7347 * tl    *     5.7900E+02e
7348 * tv    *     5.7900E+02e
7349 * p     *     1.5000E+07e
7350 * pa    *     0.0000E+00e
7351 * qppp  *     0.0000E+00e
7352 * matid *  f              7e
7353 * tw    *     5.7900E+02e
7354 *
7355 ************************************************************************
7356 *******   type            num            id        ctitle
7357 tee            16      16 $16$ loop a upper head tee
7358 *        jcell         nodes          ichf          cost          epsw
7359             1             1             1    1.0000E+00    0.0000E+00
7360 *       iconc1        ncell1          jun1          jun2         ipow1
7361             0             2            17            11             0
7362 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7363             0             0             0             0             0
7364 *       radin1           th1        houtl1        houtv1        toutl1
7365    4.5720E-01    7.3000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7366 *       toutv1
7367    2.9500E+02
7368 *        qpin1       qpoff1        rqpmx1        qpscl1
7369    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7370 *       iconc2        ncell2          jun3         ipow2
7371             0             1            16             0
7372 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7373             0             0             0             0             0
7374 *       radin2           th2        houtl2        houtv2        toutl2
7375    2.8960E-01    5.0000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7376 *       toutv2
7377    2.9500E+02
7378 *        qpin2       qpoff2        rqpmx2        qpscl2
7379    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7380 *
7381 * dx    * f   1.4950E+00e
7382 * vol   *     5.7000E-01    9.8200E-01e
7383 * fa    * f   6.5670E-01e
7384 * fric  *     4.0000E-01r02 1.0e-06 e
7385 * grav  * f   0.0000E+00e
7386 * hd    * f   9.1440E-01e
7387 * icflg * f            0e
7388 * nff   * f            1e
7389 * alp   * f   0.0000E+00e
7390 * vl    * f   0.0000E+00e
7391 * vv    * f   0.0000E+00e
7392 * tl    * f   5.7900E+02e
7393 * tv    * f   5.7900E+02e
7394 * p     * f   1.5000E+07e
7395 * pa    * f   0.0000E+00e
7396 * qppp  * f   0.0000E+00e
7397 * matid *  f              7e
7398 * tw    * f   5.7900E+02e
7399 *
7400 * dx    *     3.5052E+00e
7401 * vol   *     4.1200E-01e
7402 * fa    * f   2.6200E-01e
7403 * fric  * f   1.0e-06 e
7404 * grav  *     1.0000E+00    5.3550E-01e
7405 * hd    * f   4.0800E-01e
7406 * icflg * f            0e
7407 * nff   * f            -1e
7408 * alp   *     0.0000E+00e
7409 * vl    * f   0.0000E+00e
7410 * vv    * f   0.0000E+00e
7411 * tl    *     5.7900E+02e
7412 * tv    *     5.7900E+02e
7413 * p     *     1.5000E+07e
7414 * pa    *     0.0000E+00e
```

```
7415 * qppp  *     0.0000E+00
7416 * matid *  f              7e
7417 * tw    *     5.7900E+02e
7418 *
7419 ***********************************************************************
7420 *******   type          num          id        ctitle
7421 prizer        22      22 $22$ pressurizer
7422 *       ncells         nodes         jun1          jun2
7423             4             3           25            22
7424 *         ichf         iconc        qp3in
7425             1             0    0.0000E+00
7426 *        radin            th        houtl         houtv        toutl
7427     1.0671E+00    1.5700E-01    0.0000E+00    0.0000E+00    2.9500E+02
7428 *        toutv         qheat         pset         dpmax         zhtr
7429     2.9500E+02    1.6380E+06    1.4962E+07    2.4130E+05    2.0330E+00
7430 *
7431 * dx    *     1.0000E-01    9.0000E-01    1.1700E+01    1.0000E-01e
7432 * vol   *     3.5770E-01    3.2196E+00    3.8574E+01    3.5770E-01e
7433 * fa    *     3.1670E-03r03 3.5773E+00    5.0670E-02e
7434 * fric  * f   1.0e-06 e
7435 * grav  * f  -1.0000E+00e
7436 * hd    *     6.3500E-02r03 2.1342E+00    2.5400E-01e
7437 * icflg * f            0e
7438 * nff   * f            1e
7439 * alp   * r02 1.0000E+00    4.5820E-01    0.0000E+00e
7440 * vl    * f   0.0000E+00e
7441 * vv    * f   0.0000E+00e
7442 * tl    * f   6.1520E+02e
7443 * tv    * f   6.1520E+02e
7444 * p     * f   1.4962E+07e
7445 * pa    * f   0.0000E+00e
7446 * qppp  * f   0.0000E+00e
7447 * matid *  f              9e
7448 * tw    * f   6.1550E+02e
7449 *
7450 ***********************************************************************
7451 *******   type          num          id        ctitle
7452 pump          23      23 $23$ loop b2 pump
7453 *       ncells         nodes         jun1          jun2          epsw
7454             2             1          163           104    0.0000E+00
7455 *         ichf         iconc       ipmpty           irp           ipm
7456             1             0            1             0             1
7457 *       ipmptr        ipmpsv       npmptb        npmpsv       npmprf
7458            20          -126            0             0             0
7459 *       iqp3tr        iqp3sv       nqp3tb        nqp3sv       nqp3rf
7460             0             0            0             0             0
7461 *        radin            th        houtl         houtv        toutl
7462     3.5550E-01    5.7000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7463 *        toutv        effmi
7464     2.9500E+02    2.9513E+03
7465 *         tfr0         tfr1         tfr2         tfr3         tfrb
7466       0.0  0.0000E+00  0.0000E+00      0.0       0.0
7467 *        tfrl0        tfrl1        tfrl2        tfrl3
7468       0.0       0.0       0.0       0.0
7469 *        rhead        rtork        rflow         rho       romega
7470     1.0165E+03    4.4140E+04    5.9100E+00    7.4600E+02    1.2460E+02
7471 *       omegan       omgoff       romgmx       omgscl       npmpsd
7472     1.2320E+02   -1.2320E+02    5.0000E+01    1.0000E+00            0
7473 *        qp3in       qp3off       rqp3mx       qp3scl
7474     0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7475 *       option
7476             2
7477 *
7478 * dx    * f   1.1400E+00e
7479 * vol   * f   1.3900E+00e
7480 * fa    * f   3.9700E-01e
7481 * fric  * 1.0e-06  0.0     2.0000E-01e
7482 * grav  *     1.0000E+00    0.0000E+00   -5.5060E-01e
7483 * hd    * f   7.1100E-01e
7484 * icflg * f            0e
7485 * nff   * f            1e
7486 * alp   * f   0.0000E+00e
7487 * vl    *  0.0  4460.0  0.0 e
```



```
7488 * vv    * f   0.0000E+00e
7489 * tl    * f   5.7900E+02e
7490 * tv    * f   5.7900E+02e
7491 * p     * f   1.5000E+07e
7492 * pa    * f   0.0000E+00e
7493 * qppp  * f   0.0000E+00e
7494 * matid *  f              7e
7495 * tw    * f   5.7900E+02e
7496 *
7497 ***********************************************************************
7498 *******   type          num          id        ctitle
7499 tee           24      24 $24$ loop b2 intact cold leg
7500 *
7501 *  pump power added to fluid
7502 *
7503 *        jcell        nodes         ichf         cost         epsw
7504             1            1            1    0.0000E+00    0.0000E+00
7505 *       iconc1       ncell1         jun1         jun2         ipow1
7506             0            3          104          105             1
7507 *       ipwtr1       ipwsv1       npwtb1       npwsv1       npwrf1
7508             0         -103            0            0            0
7509 *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
7510             0            0            0            0            0
7511 *       radin1          th1       houtl1       houtv1       toutl1
7512     3.5550E-01    5.7000E-02    0.0000E+00    5.6800E+00    2.9500E+02
7513 *       toutv1       pwin1       pwoff1       rpwmx1       pwscl1
7514     2.9500E+02       0.0          0.0        1.0e20          1.0
7515 *        qpin1       qpoff1       rqpmx1       qpscl1
7516     0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7517 *       iconc2       ncell2         jun3         ipow2
7518             0            1          159            0
7519 *       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
7520             0            0            0            0            0
7521 *       radin2          th2       houtl2       houtv2       toutl2
7522     1.2150E-01    9.5000E-03    0.0000E+00    5.6800E+00    2.9500E+02
7523 *       toutv2
7524     2.9500E+02
7525 *        qpin2       qpoff2       rqpmx2       qpscl2
7526     0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7527 *
7528 * dx    * f   2.7370E+00e
7529 * vol   * f   1.0870E+00e
7530 * fa    * f   3.9700E-01e
7531 * fric  *     2.0000E-01r02 1.0e-06     1.2400E-01e
7532 * grav  *    -5.5060E-01r03 0.0000E+00e
7533 * hd    * f   7.1100E-01e
7534 * icflg * f            0e
7535 * nff   * f            1e
7536 * alp   * f   0.0000E+00e
7537 * vl    * f   0.0000E+00e
7538 * vv    * f   0.0000E+00e
7539 * tl    * f   5.7900E+02e
7540 * tv    * f   5.7900E+02e
7541 * p     * f   1.5000E+07e
7542 * pa    * f   0.0000E+00e
7543 * qppp  * f   0.0000E+00e
7544 * matid *  f              7e
7545 * tw    * f   5.7900E+02e
7546 *
7547 * dx    *     1.0000E-01e
7548 * vol   *     2.3000E-04e
7549 * fa    * f   2.3000E-03e
7550 * fric  * f   1.0e-06 e
7551 * grav  * f   0.0000E+00e
7552 * hd    * f   5.4100E-02e
7553 * icflg * f            0e
7554 * nff   * f            1e
7555 * alp   *     0.0000E+00e
7556 * vl    * f   0.0000E+00e
7557 * vv    * f   0.0000E+00e
7558 * tl    *     5.7900E+02e
7559 * tv    *     5.7900E+02e
7560 * p     *     1.5000E+07e
```

```
* pa    *     0.0000E+00
* qppp  *     0.0000E+00
* matid *  f              7e
* tw    *     5.7900E+02e
*
*************************************************************************
*******   type            num            id         ctitle
valve          25      25 $25$ pressurizer porv
*       ncells          nodes          jun1           jun2           epsw
             1              0            25             26     0.0000E+00
*         ichf          iconc          ivty           ivps          nvtb2
             0              0             4              2             -2
*         ivtr           ivsv         nvtb1           nvsv           nvrf
            77              1            -2              0              0
*       ivtrov         ivtyov
             0              0
*         rvmx           rvov        fminov         fmaxov
    1.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
*        radin             th         houtl          houtv          toutl
    3.1750E-02     5.0000E-01     0.0000E+00     0.0000E+00     0.0000E+00
*        toutv          avlve         hvlve         favlve           xpos
    0.0000E+00     6.0620E-04     2.7780E-02     0.0000E+00     0.0000E+00
*
* dx    *     1.0000E+00
* vol   *     3.1670E-03e
* fa    * f   3.1670E-03e
* fric  * f   1.0e-06 e
* grav  * f   1.0000E+00e
* hd    *     6.3500E-02    1.0000E-05e
* icflg * f            0e
* nff   * f            1e
* alp   *     1.0000E+00e
* vl    *     0.0000E+00    1.0000E-10e
* vv    *     0.0000E+00    1.0000E-10e
* tl    *     6.1476E+02e
* tv    *     6.1510E+02e
* p     *     1.5020E+07e
* pa    *     0.0000E+00e
* vtb1  * r02 0.0000E+00r02 1.0000E+00e
* vtb2  * r02 0.0000E+00    2.0000E+00    1.0000E+00e
*
*************************************************************************
*******   type            num            id         ctitle
break          26      26 $26$ porv boundary
*         jun1           ibty           isat           ioff
            26              0              0              0
*         dxin          volin          alpin            tin            pin
    1.0000E+00     3.1680E-03     1.0000E+00     4.0570E+02     3.0000E+05
*         pain          concin           rbmx           poff           belv
    0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
*
*************************************************************************
*******   type            num            id         ctitle
pump           33      33 $33$ loop a2 pump (break leg)
*       ncells          nodes          jun1           jun2           epsw
             2              1             83             34     0.0000E+00
*         ichf          iconc        ipmpty            irp            ipm
             1              0              1              0              1
*       ipmptr         ipmpsv        npmptb        npmpsv        npmprf
            20           -128              0              0              0
*       iqp3tr         iqp3sv        nqp3tb        nqp3sv        nqp3rf
             0              0              0              0              0
*        radin             th         houtl          houtv          toutl
    3.5550E-01     5.7000E-02     0.0000E+00     5.6800E+00     2.9500E+02
*        toutv          effmi
    2.9500E+02     2.9513E+03
*         tfr0           tfr1           tfr2           tfr3           tfrb
       0.0  0.0000E+00  0.0000E+00       0.0       0.0
*        tfr10          tfr11          tfr12          tfr13
       0.0       0.0       0.0       0.0
*        rhead          rtork          rflow           rrho         romega
    1.0165E+03     4.4140E+04     5.9100E+00     7.4600E+02     1.2460E+02
*       omegan         omgoff         romgmx         omgscl         npmpsd
```



```
    1.2320E+02    -1.2320E+02     5.0000E+01     1.0000E+00              0
*        qp3in         qp3off         rqp3mx         qp3scl
    0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
*       option
             2
*
* dx    * f   1.1400E+00e
* vol   * f   1.3900E+00e
* fa    * f   3.9700E-01e
* fric  * 1.0e-06  0.0     2.0000E-01e
* grav  *     1.0000E+00    0.0000E+00   -5.5060E-01e
* hd    * f   7.1100E-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000E+00e
* vl    *  0.0  4460.0  0.0 e
* vv    * f   0.0000E+00e
* tl    * f   5.7900E+02e
* tv    * f   5.7900E+02e
* p     * f   1.5000E+07e
* pa    * f   0.0000E+00e
* qppp  * f   0.0000E+00e
* matid *  f              7e
* tw    * f   5.7900E+02e
*
*************************************************************************
*******   type            num            id         ctitle
tee            34      34 $34$ loop a2 intact cold leg
*
*  pump power added to fluid
*
*        jcell          nodes           ichf           cost           epsw
             1              1              1     0.0000E+00     0.0000E+00
*       iconc1         ncell1           jun1           jun2          ipow1
             0              3             34             35              1
*       ipwtr1         ipwsv1        npwtb1        npwsv1        npwrf1
             0           -104              0              0              0
*       iqptr1         iqpsv1        nqptb1        nqpsv1        nqprf1
             0              0              0              0              0
*       radin1            th1        houtl1        houtv1        toutl1
    3.5550E-01     5.7000E-02     0.0000E+00     5.6800E+00     2.9500E+02
*       toutv1          pwin1        pwoff1        rpwmx1        pwscl1
    2.9500E+02       0.0       0.0       1.0e20        1.0
*        qpin1         qpoff1        rqpmx1        qpscl1
    0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
*       iconc2         ncell2           jun3          ipow2
             0              1             39              0
*       iqptr2         iqpsv2        nqptb2        nqpsv2        nqprf2
             0              0              0              0              0
*       radin2            th2        houtl2        houtv2        toutl2
    1.2150E-01     9.5000E-03     0.0000E+00     5.6800E+00     2.9500E+02
*       toutv2
    2.9500E+02
*        qpin2         qpoff2        rqpmx2        qpscl2
    0.0000E+00     0.0000E+00     0.0000E+00     0.0000E+00
*
* dx    * f   2.7370E+00e
* vol   * f   1.0870E+00e
* fa    * f   3.9700E-01e
* fric  *     2.0000E-01r02 1.0e-06     1.2400E-01e
* grav  *    -5.5060E-01r03 0.0000E+00e
* hd    * f   7.1100E-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * f   5.7900E+02e
* tv    * f   5.7900E+02e
* p     * f   1.5000E+07e
* pa    * f   0.0000E+00e
* qppp  * f   0.0000E+00e
* matid *  f              7e
```

```
7707 * tw    * f   5.7900E+02e
7708 *
7709 * dx    *     1.0000E-01e
7710 * vol   *     2.3000E-04e
7711 * fa    * f   2.3000E-03e
7712 * fric  * f   1.0e-06 e
7713 * grav  * f   0.0000E+00e
7714 * hd    * f   5.4100E-02e
7715 * icflg * f            0e
7716 * nff   * f            1e
7717 * alp   *     0.0000E+00e
7718 * vl    * f   0.0000E+00e
7719 * vv    * f   0.0000E+00e
7720 * tl    *     5.7900E+02e
7721 * tv    *     5.7900E+02e
7722 * p     *     1.5000E+07e
7723 * pa    *     0.0000E+00e
7724 * qppp  *     0.0000E+00e
7725 * matid *  f            7e
7726 * tw    *     5.7900E+02e
7727 *
7728 ************************************************************************
7729 *******   type          num          id        ctitle
7730 tee          63      63 $63$ loop b loop seals
7731 *        jcell         nodes         ichf          cost          epsw
7732             1             1            1   -1.0000E+00    0.0000E+00
7733 *       iconc1        ncell1          jun1          jun2         ipow1
7734             0             4            3            63             0
7735 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7736             0             0            0             0             0
7737 *       radin1           th1        houtl1        houtv1        toutl1
7738    3.5550E-01    5.7000E-02    0.0000E+00    5.8600E+00    2.9500E+02
7739 *       toutv1
7740    2.9500E+02
7741 *        qpin1        qpoff1        rqpmx1        qpscl1
7742    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7743 *       iconc2        ncell2          jun3         ipow2
7744             0             3          163             0
7745 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7746             0             0            0             0             0
7747 *       radin2           th2        houtl2        houtv2        toutl2
7748    3.5550E-01    5.7000E-02    0.0000E+00    5.8600E+00    2.9500E+02
7749 *       toutv2
7750    2.9500E+02
7751 *        qpin2        qpoff2        rqpmx2        qpscl2
7752    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7753 *
7754 * dx    *     5.9000E-01    2.0000E+00    4.0000E+00    4.5690E+00e
7755 * vol   *  0.4685  0.794  1.588  1.814 e
7756 * fa    *     1.70      r04 3.9700E-01e
7757 * fric  *  1.0e-06  0.1  f 1.0e-06 e
7758 * grav  *    -4.1900E-01   -6.0700E-01r03 1.0000E+00e
7759 * hd    * 1.47 f   7.1100E-01e
7760 * icflg * f            0e
7761 * nff   * f            1e
7762 * alp   * f   0.0000E+00e
7763 * vl    * f   0.0000E+00e
7764 * vv    * f   0.0000E+00e
7765 * tl    * f   5.7900E+02e
7766 * tv    * f   5.7900E+02e
7767 * p     * f   1.5000E+07e
7768 * pa    * f   0.0000E+00e
7769 * qppp  * f   0.0000E+00e
7770 * matid *  f            7e
7771 * tw    * f   5.7900E+02e
7772 *
7773 * dx    *     2.0000E+00    4.0000E+00    4.5690E+00e
7774 * vol   *  0.794  1.588  1.814 e
7775 * fa    * f   3.9700E-01e
7776 * fric  *  0.1  f   1.0e-06 e
7777 * grav  *    -6.0700E-01r03 1.0000E+00e
7778 * hd    * f   7.1100E-01e
7779 * icflg * f            0e
```



```
7780 * nff   * f            1e
7781 * alp   * f   0.0000E+00e
7782 * vl    * f   0.0000E+00e
7783 * vv    * f   0.0000E+00e
7784 * tl    * f   5.7900E+02e
7785 * tv    * f   5.7900E+02e
7786 * p     * f   1.5000E+07e
7787 * pa    * f   0.0000E+00e
7788 * qppp  * f   0.0000E+00e
7789 * matid *  f            7e
7790 * tw    * f   5.7900E+02e
7791 *
7792 ************************************************************************
7793 *******   type          num          id        ctitle
7794 tee          73      73 $73$ loop a loop seals
7795 *        jcell         nodes         ichf          cost          epsw
7796             1             1            1   -1.0000E+00    0.0000E+00
7797 *       iconc1        ncell1          jun1          jun2         ipow1
7798             0             4           13            73             0
7799 *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
7800             0             0            0             0             0
7801 *       radin1           th1        houtl1        houtv1        toutl1
7802    3.5550E-01    5.7000E-02    0.0000E+00    5.8600E+00    2.9500E+02
7803 *       toutv1
7804    2.9500E+02
7805 *        qpin1        qpoff1        rqpmx1        qpscl1
7806    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7807 *       iconc2        ncell2          jun3         ipow2
7808             0             3           83             0
7809 *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
7810             0             0            0             0             0
7811 *       radin2           th2        houtl2        houtv2        toutl2
7812    3.5550E-01    5.7000E-02    0.0000E+00    5.8600E+00    2.9500E+02
7813 *       toutv2
7814    2.9500E+02
7815 *        qpin2        qpoff2        rqpmx2        qpscl2
7816    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
7817 *
7818 * dx    *     5.9000E-01    2.0000E+00    4.0000E+00    4.5690E+00e
7819 * vol   *  0.4685  0.794  1.588  1.814 e
7820 * fa    *     1.70      r04 3.9700E-01e
7821 * fric  *  1.0e-06  0.1  f 1.0e-06 e
7822 * grav  *    -4.1900E-01   -6.0700E-01r03 1.0000E+00e
7823 * hd    * 1.47 f   7.1100E-01e
7824 * icflg * f            0e
7825 * nff   * f            1e
7826 * alp   * f   0.0000E+00e
7827 * vl    * f   0.0000E+00e
7828 * vv    * f   0.0000E+00e
7829 * tl    * f   5.7900E+02e
7830 * tv    * f   5.7900E+02e
7831 * p     * f   1.5000E+07e
7832 * pa    * f   0.0000E+00e
7833 * qppp  * f   0.0000E+00e
7834 * matid *  f            7e
7835 * tw    * f   5.7900E+02e
7836 *
7837 * dx    *     2.0000E+00    4.0000E+00    4.5690E+00e
7838 * vol   *  0.794  1.588  1.814 e
7839 * fa    * f   3.9700E-01e
7840 * fric  *  0.1  f   1.0e-06 e
7841 * grav  *    -6.0700E-01r03 1.0000E+00e
7842 * hd    * f   7.1100E-01e
7843 * icflg * f            0e
7844 * nff   * f            1e
7845 * alp   * f   0.0000E+00e
7846 * vl    * f   0.0000E+00e
7847 * vv    * f   0.0000E+00e
7848 * tl    * f   5.7900E+02e
7849 * tv    * f   5.7900E+02e
7850 * p     * f   1.5000E+07e
7851 * pa    * f   0.0000E+00e
7852 * qppp  * f   0.0000E+00e
```

```
* matid *  f              7e
* tw    * f   5.7900E+02e
*
*************************************************************************
*******   type            num            id        ctitle
fill            9        9 $9$ loop b1 hpis
*         jun1           ifty          ioff
            9              8             0
*         iftr           ifsv          nftb          nfsv          nfrf
           55          -1196             0             0             0
*       twtold           rfmx        concin          felv
    0.0000E+00    1.0000E+03    0.0000E+00    0.0000E+00
*         dxin          volin         alpin          vlin          tlin
    1.0000E-01    3.1670E-04    0.0000E+00    0.0000E+00    2.9430E+02
*          pin           pain        flowin          vvin          tvin
    1.5169E+07    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
*************************************************************************
*******   type            num            id        ctitle
fill           18       18 $18$ makeup/letdown flow
*         jun1           ifty          ioff
           18              8             0
*         iftr           ifsv          nftb          nfsv          nfrf
           13           -226             0             0             0
*       twtold           rfmx        concin          felv
    0.0000E+00    1.0000E+03    0.0000E+00    0.0000E+00
*         dxin          volin         alpin          vlin          tlin
    1.0000E-01    3.1670E-04    0.0000E+00    0.0000E+00    3.1100E+02
*          pin           pain        flowin          vvin          tvin
    1.5169E+07    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
*************************************************************************
*******   type            num            id        ctitle
fill           19       19 $19$ loop a1 hpis
*         jun1           ifty          ioff
           19              8             0
*         iftr           ifsv          nftb          nfsv          nfrf
           55          -1188             0             0             0
*       twtold           rfmx        concin          felv
    0.0000E+00    1.0000E+03    0.0000E+00    0.0000E+00
*         dxin          volin         alpin          vlin          tlin
    1.0000E-01    3.1670E-04    0.0000E+00    0.0000E+00    2.9430E+02
*          pin           pain        flowin          vvin          tvin
    1.5169E+07    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
*************************************************************************
*******   type            num            id        ctitle
tee            20       20 $20$ hpi/makeup-letdown header
*
* jcell      nodes       ichf        cost        epsw            cd 2
    1          0           1         0.0       1.0e-05
* iconc1     ncell1      jun1        jun2        ipow1           cd 3
    0          1          18          19          0
* radin1     th1         houtl1      houtv1      toutl1          cd 6
  0.0        0.0         0.0         0.0         0.0
* toutv1     pwin1       pwoff1      rpwmx1      pwscl1          cd 7
   0.0       0.0         0.0        1.0e20       1.0
* iconc2     ncell2      jun3        ipow2                       cd 9
    0          1          20          0
* radin2     th2         houtl2      houtv2      toutl2          cd 12
  0.0        0.0         0.0         0.0         0.0
* toutv2     pwin2       pwoff2      rpwmx2      pwscl2          cd 13
   0.0       0.0         0.0        1.0e20       1.0
*    main-cell arrays
* dx    *     1.0000E-01e
* vol   *     2.3000E-04e
* fa    * f   2.3000E-03e
* fric  * f   1.0e-06 e
* grav  * f   0.0000E+00e
* hd    * f   5.4100E-02e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000E+00e
```



```
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    *     5.7900E+02e
* tv    *     5.7900E+02e
* p     *     1.5000E+07e
* pa    *     0.0000E+00e
*
*    side-cell arrays
* dx    *     1.0000E-01e
* vol   *     2.3000E-04e
* fa    * f   2.3000E-03e
* fric  * f   1.0e-06 e
* grav  * f   0.0000E+00e
* hd    * f   5.4100E-02e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    *     5.7900E+02e
* tv    *     5.7900E+02e
* p     *     1.5000E+07e
* pa    *     0.0000E+00e
*
*************************************************************************
*******   type            num            id        ctitle
fill           39       39 $39$ loop a2 hpis
*         jun1           ifty          ioff
           39              8             0
*         iftr           ifsv          nftb          nfsv          nfrf
           55          -1192             0             0             0
*       twtold           rfmx        concin          felv
    0.0000E+00    1.0000E+03    0.0000E+00    0.0000E+00
*         dxin          volin         alpin          vlin          tlin
    1.0000E-01    3.1670E-04    0.0000E+00    0.0000E+00    2.9430E+02
*          pin           pain        flowin          vvin          tvin
    1.5169E+07    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
*************************************************************************
*******   type            num            id        ctitle
fill           59       59 $59$ loop b2 hpis
*         jun1           ifty          ioff
          159              8             0
*         iftr           ifsv          nftb          nfsv          nfrf
           55          -1198             0             0             0
*       twtold           rfmx        concin          felv
    0.0000E+00    1.0000E+03    0.0000E+00    0.0000E+00
*         dxin          volin         alpin          vlin          tlin
    1.0000E-01    3.1670E-04    0.0000E+00    0.0000E+00    2.9430E+02
*          pin           pain        flowin          vvin          tvin
    1.5169E+07    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*
*************************************************************************
*******   type            num            id        ctitle
tee            78       78 $78$ lpis b header
*
* jcell      nodes       ichf        cost        epsw            cd 2
    1          0           1         0.0       1.0e-05
* iconc1     ncell1      jun1        jun2        ipow1           cd 3
    0          1          80          78          0
* radin1     th1         houtl1      houtv1      toutl1          cd 6
  0.0        0.0         0.0         0.0         0.0
* toutv1     pwin1       pwoff1      rpwmx1      pwscl1          cd 7
   0.0       0.0         0.0        1.0e20       1.0
* iconc2     ncell2      jun3        ipow2                       cd 9
    0          1          79          0
* radin2     th2         houtl2      houtv2      toutl2          cd 12
  0.0        0.0         0.0         0.0         0.0
* toutv2     pwin2       pwoff2      rpwmx2      pwscl2          cd 13
   0.0       0.0         0.0        1.0e20       1.0
*    main-cell arrays
* dx    *  f 1.0 e
* vol   *  f 0.067 e
```

```
7999 * fa    *  f 0.067 e
8000 * fric  * f   1.0e-06 e
8001 * grav  * f   0.0000E+00e
8002 * hd    *  f 0.292 e
8003 * icflg * f            0e
8004 * nff   * f            1e
8005 * alp   *     0.0000E+00e
8006 * vl    * f   0.0000E+00e
8007 * vv    * f   0.0000E+00e
8008 * tl    *     5.6500E+02e
8009 * tv    *     5.6500E+02e
8010 * p     *     1.5000E+07e
8011 * pa    *     0.0000E+00e
8012 *    side-cell arrays
8013 * dx    *  f 1.0 e
8014 * vol   *  f 0.067 e
8015 * fa    *  f 0.067 e
8016 * fric  * f   1.0e-06 e
8017 * grav  * f   0.0000E+00e
8018 * hd    *  f 0.292 e
8019 * icflg * f            0e
8020 * nff   * f            1e
8021 * alp   *     0.0000E+00e
8022 * vl    * f   0.0000E+00e
8023 * vv    * f   0.0000E+00e
8024 * tl    *     5.6500E+02e
8025 * tv    *     5.6500E+02e
8026 * p     *     1.5000E+07e
8027 * pa    *     0.0000E+00e
8028 *
8029 ************************************************************************
8030 *******   type          num          id        ctitle
8031 fill            79      79 $79$ loop b lpis
8032 *         jun1         ifty         ioff
8033             79            8            0
8034 *         iftr         ifsv         nftb         nfsv         nfrf
8035             13           78            6            0            0
8036 *       twtold         rfmx       concin         felv
8037    0.0000E+00    1.0000E+03    0.0000E+00    0.0000E+00
8038 *         dxin        volin        alpin         vlin         tlin
8039    1.0000E-01    3.1670E-04    0.0000E+00    0.0000E+00    2.9430E+02
8040 *          pin         pain       flowin         vvin         tvin
8041    1.5000E+06    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
8042 *        vmscl        vvscl
8043    1.0000E+00    0.0000E+00
8044 *
8045 * vmtb  *     0.0000E+00    2.5146E+02    7.8600E+05    1.8860E+02    1.1030E+06
8046 * vmtb  *     1.2573E+02    1.2000E+06    9.4300E+01    1.3500E+06    6.2860E+01
8047 * vmtb  *     1.4750E+06    0.0000E+00e
8048 *
8049 ************************************************************************
8050 *******   type          num          id        ctitle
8051 valve           80      80 $80$ accum valve on loop b side
8052 *       ncells         nodes         jun1         jun2         epsw
8053             5             0           81           80    0.0000E+00
8054 *         ichf        iconc         ivty         ivps        nvtb2
8055             0             0            3            4           -2
8056 *         ivtr         ivsv        nvtb1         nvsv         nvrf
8057           80             1           -2            0            0
8058 *       ivtrov       ivtyov
8059             0            0
8060 *         rvmx         rvov       fminov       fmaxov
8061    4.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
8062 *        radin           th        houtl        houtv        toutl
8063    1.4600E-01    2.0000E-02    0.0000E+00    0.0000E+00    0.0000E+00
8064 *        toutv        avlve        hvlve       favlve         xpos
8065    0.0000E+00    6.7000E-02    2.9200E-01    0.0000E+00    0.0000E+00
8066 *
8067 * dx    *     1.0000E+00    2.0000E+00    4.0000E+00    5.0000E+00    4.8600E+00
8068 e
8069 * vol   *     6.7000E-02    1.3400E-01    2.6800E-01    3.3500E-01    3.2560E-01
8070 e
8071 * fa    * f   6.7000E-02e
```



```
8072 * fric  * f   1.0e-06 e
8073 * grav  *    -1.0000E+00    5.3650E-01r04 0.0000E+00e
8074 * hd    * f   2.9200E-01e
8075 * icflg * f            0e
8076 * nff   * f            1e
8077 * alp   * f   0.0000E+00e
8078 * vl    * f   0.0000E+00e
8079 * vv    * f   0.0000E+00e
8080 * tl    * r03 3.0540E+02r02 5.6500E+02e
8081 * tv    * r03 3.0540E+02r02 5.6500E+02e
8082 * p     * r03 4.1680E+06r02 1.5000E+07e
8083 * pa    * f   0.0000E+00e
8084 * vtb1  * r02 0.0000E+00r02 1.0000E+00e
8085 * vtb2  * r02 0.0000E+00    2.0000E+00    1.0000E+00e
8086 *
8087 ************************************************************************
8088 * type       num          id          ctitle                      cd 1
8089 pipe          81       81 $81$ accumulator b
8090 *
8091 *  ncells    nodes        jun1        jun2        epsw            cd 2
8092    4         0           182          81          1.0e-04
8093 *  ichf      iconc        iacc        ipow                        cd 3
8094    0         0            1          0
8095 *  radin     th           houtl       houtv       toutl           cd 6
8096    0.100     0.0100       0.0         0.0         0.0
8097 *  toutv     powin        powoff      rpowmx      powscl          cd 7
8098    0.0       0.0          0.0         1.0e20      1.0
8099 *      cell arrays
8100 * dx    *     1.6670E+00r02 2.2950E+00    2.5000E-01e
8101 * vol   *     1.0480E+01r02 1.4433E+01    5.8400E-01e
8102 * fa    * r04 6.2900E+00    6.7000E-02e
8103 * fric  * f   1.0e-06 e
8104 * grav  * f  -1.0000E+00e
8105 * hd    * r04 2.8300E+00    2.9200E-01e
8106 * icflg * f            0e
8107 * nff   * f            1e
8108 * alp   *     1.0000E+00r03 0.0000E+00e
8109 * vl    * f   0.0000E+00e
8110 * vv    * f   0.0000E+00e
8111 * tl    * f   3.0540E+02e
8112 * tv    * f   3.0540E+02e
8113 * p     * f   4.1680E+06e
8114 * pa    * f   4.1680E+06e
8115 ************************************************************************
8116 * type       num          id          ctitle                      cd 1
8117 fill          82       82 $82$ accumulator b zero-flow boundary
8118 *
8119 *  jun1      ifty         ioff                                    cd 2
8120    182       2            0
8121 *  twold     rfmx         concin      felv                        cd 4
8122    0.0       1.0e20       0.0         0.0
8123 *  dxin      volin        alpin       vlin        tlin            cd 5
8124    0.1       0.1          0.0         0.0         548.0
8125 *  pin       pain         flowin      vvin        tvin            cd 6
8126    50.0e05   0.0          0.0         0.0         548.0
8127 *
8128 ************************************************************************
8129 *******   type          num          id          ctitle
8130 tee           88       88 $88$ lpis a header
8131 *
8132 * jcell      nodes        ichf        cost        epsw            cd 2
8133    1          0            1          0.0         1.0e-05
8134 * iconc1     ncell1       jun1        jun2        ipow1           cd 3
8135    0          1           90          88          0
8136 * radin1     th1          houtl1      houtv1      toutl1          cd 6
8137   0.0        0.0          0.0         0.0         0.0
8138 * toutv1     pwin1        pwoff1      rpwmx1      pwscl1          cd 7
8139    0.0       0.0          0.0         1.0e20      1.0
8140 * iconc2     ncell2       jun3        ipow2                       cd 9
8141    0          1           89          0
8142 * radin2     th2          houtl2      houtv2      toutl2          cd 12
8143   0.0        0.0          0.0         0.0         0.0
8144 * toutv2     pwin2        pwoff2      rpwmx2      pwscl2          cd 13
```

```
   0.0        0.0        0.0        1.0e20      1.0
*    main-cell arrays
* dx    *  f 1.0 e
* vol   *  f 0.067 e
* fa    *  f 0.067 e
* fric  * f   1.0e-06 e
* grav  * f   0.0000E+00e
* hd    *  f 0.292 e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    *     5.6500E+02e
* tv    *     5.6500E+02e
* p     *     1.5000E+07e
* pa    *     0.0000E+00e
*    side-cell arrays
* dx    *  f 1.0 e
* vol   *  f 0.067 e
* fa    *  f 0.067 e
* fric  * f   1.0e-06 e
* grav  * f   0.0000E+00e
* hd    *  f 0.292 e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    *     5.6500E+02e
* tv    *     5.6500E+02e
* p     *     1.5000E+07e
* pa    *     0.0000E+00e
*
*********************************************************************
*******   type          num          id        ctitle
fill            89      89 $89$ loop a lpis
*         jun1         ifty         ioff
            89            8            0
*         iftr         ifsv         nftb         nfsv         nfrf
            13           88            6            0            0
*       twtold         rfmx       concin         felv
    0.0000E+00   1.0000E+03   0.0000E+00   0.0000E+00
*         dxin        volin        alpin         vlin         tlin
    1.0000E-01   3.1670E-04   0.0000E+00   0.0000E+00   2.9430E+02
*          pin         pain       flowin         vvin         tvin
    1.5000E+06   0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*        vmscl        vvscl
    1.0000E+00   0.0000E+00
*
* vmtb  *     0.0000E+00   2.5146E+02   7.8600E+05   1.8860E+02   1.1030E+06
* vmtb  *     1.2573E+02   1.2000E+06   9.4300E+01   1.3500E+06   6.2860E+01
* vmtb  *     1.4750E+06   0.0000E+00e
*
*********************************************************************
*******   type          num          id        ctitle
valve           90      90 $90$ accum valve on loop a side
*       ncells        nodes         jun1         jun2         epsw
             5            0           91           90   0.0000E+00
*         ichf        iconc         ivty         ivps        nvtb2
             0            0            3            4           -2
*         ivtr         ivsv        nvtb1         nvsv         nvrf
            90            1           -2            0            0
*       ivtrov       ivtyov
             0            0
*         rvmx         rvov      fminov      fmaxov
    4.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*         radin           th        houtl        houtv        toutl
    1.4600E-01   2.0000E-02   0.0000E+00   0.0000E+00   0.0000E+00
*         toutv        avlve        hvlve       favlve         xpos
    0.0000E+00   6.7000E-02   2.9200E-01   0.0000E+00   0.0000E+00
*
* dx    *     1.0000E+00   2.0000E+00   4.0000E+00   5.0000E+00   4.8600E+00
```



```
e
* vol   *     6.7000E-02   1.3400E-01   2.6800E-01   3.3500E-01   3.2560E-01
e
* fa    * f   6.7000E-02e
* fric  * f   1.0e-06 e
* grav  *    -1.0000E+00   5.3650E-01r04 0.0000E+00e
* hd    * f   2.9200E-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * r03 3.0540E+02r02 5.6500E+02e
* tv    * r03 3.0540E+02r02 5.6500E+02e
* p     * r03 4.1680E+06r02 1.5000E+07e
* pa    * f   0.0000E+00e
* vtb1  * r02 0.0000E+00r02 1.0000E+00e
* vtb2  * r02 0.0000E+00    2.0000E+00    1.0000E+00e
*
*********************************************************************
* type        num          id          ctitle                        cd 1
pipe         91       91 $91$ accumulator a
*
*  ncells     nodes        jun1        jun2        epsw              cd 2
   4          0            192          91          1.0e-04
*  ichf       iconc        iacc        ipow                          cd 3
   0          0            1           0
*  radin      th           houtl       houtv       toutl             cd 6
   0.100      0.0100       0.0         0.0         0.0
*  toutv      powin        powoff      rpowmx      powscl            cd 7
   0.0        0.0          0.0         1.0e20      1.0
*       cell arrays
* dx    *     1.6670E+00r02 2.2950E+00    2.5000E-01e
* vol   *     1.0480E+01r02 1.4433E+01    5.8400E-01e
* fa    * r04 6.2900E+00    6.7000E-02e
* fric  * f   1.0e-06 e
* grav  * f  -1.0000E+00e
* hd    * r04 2.8300E+00    2.9200E-01e
* icflg * f            0e
* nff   * f            1e
* alp   *     1.0000E+00r03 0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * f   3.0540E+02e
* tv    * f   3.0540E+02e
* p     * f   4.1680E+06e
* pa    * f   4.1680E+06e
*********************************************************************
* type        num          id          ctitle                        cd 1
fill         92       92 $92$ accumulator a zero-flow boundary
*
*  jun1       ifty         ioff                                      cd 2
   192        2            0
*  twold      rfmx         concin      felv                          cd 4
   0.0        1.0e20       0.0         0.0
*  dxin       volin        alpin       vlin        tlin              cd 5
   0.1        0.1          0.0         0.0         548.0
*  pin        pain         flowin      vvin        tvin              cd 6
   50.0e05    0.0          0.0         0.0         548.0
*********************************************************************
*******   type          num          id        ctitle
vessel          99      99 $99$ 6-theta vessel
*         nasx         nrsx         ntsx         ncsr        ivssbf
            10            2            6           22            0
*         idcu         idcl         idcr         icru         icrl
             9            1            1            5            1
*         icrr        ilcsp        iucsp         iuhp        iconc
             1            0            0            0            0
*        igeom        nvent        nvvtb
             0            6            0
*        shelv         epsw
    0.0000E+00   0.0000E+00
* z     *     2.4628E+00   3.9222E+00   4.8951E+00   5.6247E+00   6.1112E+00
```

```
* z     *     6.6320E+00    7.3430E+00    7.8638E+00    9.6164E+00    1.1369E+01
e
* rad   *     1.9177E+00    2.1669E+00e
* th    *  60.0  120.0  180.0 s
* th    *  240.0  300.0  360.0 e
*          izv            kv          avent
             9             1     1.3243E-01
             9             2     1.3243E-01
             9             3     1.3243E-01
             9             4     1.3243E-01
             9             5     1.3243E-01
             9             6     1.3243E-01
*
*          dpcvn         dpovn         frcvn         frovn
     8.6200E+02    17.2400E+02    15.000E+04    0.3877E+00
     8.6200E+02    17.2400E+02    15.000E+04    0.3877E+00
     8.6200E+02    17.2400E+02    15.000E+04    0.3877E+00
     8.6200E+02    17.2400E+02    15.000E+04    0.3877E+00
     8.6200E+02    17.2400E+02    15.000E+04    0.3877E+00
     8.6200E+02    17.2400E+02    15.000E+04    0.3877E+00
*
*         lisrl         lisrc         lisrf         ljuns
             7             2             3             7
             7             5             3            17
             7             7             3             5
             7             9             3           105
             7            10             3            35
             7            12             3            15
             9             8             3            78
             9            11             3            88
            10             8             3             6
            10            11             3            16
             1             1             2           501
             1             2             2           502
             1             3             2           503
             1             4             2           504
             1             5             2           505
             1             6             2           506
             6             1            -2           511
             6             2            -2           512
             6             3            -2           513
             6             4            -2           514
             6             5            -2           515
             6             6            -2           516
*
* level   1
*
* cfzl-t* f   0.0000E+00e
* cfzl-z* f   0.0000E+00e
* cfzl-r* f   0.0000E+00e
* cfzv-t* f   0.0000E+00e
* cfzv-z* f   0.0000E+00e
* cfzv-r* f   0.0000E+00e
* vol   * r06 7.0000E-01r06 5.7500E-01e
* fa-t  * r06 5.0000E-01r06 3.0000E-01e
* fa-z  * r06 3.0000E-01r06 1.0000E+00e
* fa-r  * r06 1.1000E-01r06 0.0000E+00e
* hd-t  * r06 1.6400E+00r06 8.2000E-01e
* hd-z  * r06 1.4400E+00r06 8.2000E-01e
* hd-r  * r06 1.6400E+00r06 8.2000E-01e
* alpn  * f   0.0000E+00e
* vvn-t * f   0.0000E+00e
* vvn-z * f   0.0000E+00e
* vvn-r * f   0.0000E+00e
* vln-t * f   0.0000E+00e
* vln-z * f   0.0000E+00e
* vln-r * f   0.0000E+00e
* tvn   * f   5.7900E+02e
* tln   * f   5.7900E+02e
* pn    * f   1.5000E+07e
* pan   * f   0.0000E+00e
*
* level   2
```



```
*
* cfzl-t* f   0.0000E+00e
* cfzl-z* f   0.0000E+00e
* cfzl-r* f   0.0000E+00e
* cfzv-t* f   0.0000E+00e
* cfzv-z* f   0.0000E+00e
* cfzv-r* f   0.0000E+00e
* vol   * r06 5.2820E-01r06 1.0000E+00e
* fa-t  * r06 4.0000E-01r06 1.0000E+00e
* fa-z  * r06 3.6700E-01r06 1.0000E+00e
* fa-r  * f   0.0000E+00e
* hd-t  * r06 1.3380E-02r06 5.0000E-01e
* hd-z  * r06 1.5380E-02r06 5.0000E-01e
* hd-r  * r06 1.3380E-02r06 5.0000E-01e
* alpn  * f   0.0000E+00e
* vvn-t * f   0.0000E+00e
* vvn-z * f   0.0000E+00e
* vvn-r * f   0.0000E+00e
* vln-t * f   0.0000E+00e
* vln-z * f   0.0000E+00e
* vln-r * f   0.0000E+00e
* tvn   * f   5.7900E+02e
* tln   * f   5.7900E+02e
* pn    * f   1.5000E+07e
* pan   * f   0.0000E+00e
*
* level   3
*
* cfzl-t* f   0.0000E+00e
* cfzl-z* f   0.0000E+00e
* cfzl-r* f   0.0000E+00e
* cfzv-t* f   0.0000E+00e
* cfzv-z* f   0.0000E+00e
* cfzv-r* f   0.0000E+00e
* vol   * r06 5.2820E-01r06 1.0000E+00e
* fa-t  * r06 4.0000E-01r06 1.0000E+00e
* fa-z  * r06 3.6700E-01r06 1.0000E+00e
* fa-r  * f   0.0000E+00e
* hd-t  * r06 1.3380E-02r06 5.0000E-01e
* hd-z  * r06 1.5380E-02r06 5.0000E-01e
* hd-r  * r06 1.3380E-02r06 5.0000E-01e
* alpn  * f   0.0000E+00e
* vvn-t * f   0.0000E+00e
* vvn-z * f   0.0000E+00e
* vvn-r * f   0.0000E+00e
* vln-t * f   0.0000E+00e
* vln-z * f   0.0000E+00e
* vln-r * f   0.0000E+00e
* tvn   * f   5.7900E+02e
* tln   * f   5.7900E+02e
* pn    * f   1.5000E+07e
* pan   * f   0.0000E+00e
*
* level   4
*
* cfzl-t* f   0.0000E+00e
* cfzl-z* f   0.0000E+00e
* cfzl-r* f   0.0000E+00e
* cfzv-t* f   0.0000E+00e
* cfzv-z* f   0.0000E+00e
* cfzv-r* f   0.0000E+00e
* vol   * r06 5.2820E-01r06 1.0000E+00e
* fa-t  * r06 4.0000E-01r06 1.0000E+00e
* fa-z  * r06 3.6700E-01r06 1.0000E+00e
* fa-r  * f   0.0000E+00e
* hd-t  * r06 1.3380E-02r06 5.0000E-01e
* hd-z  * r06 1.5380E-02r06 5.0000E-01e
* hd-r  * r06 1.3380E-02r06 5.0000E-01e
* alpn  * f   0.0000E+00e
* vvn-t * f   0.0000E+00e
* vvn-z * f   0.0000E+00e
* vvn-r * f   0.0000E+00e
* vln-t * f   0.0000E+00e
```

```
8437 * vln-z * f   0.0000E+00e
8438 * vln-r * f   0.0000E+00e
8439 * tvn   * f   5.7900E+02e
8440 * tln   * f   5.7900E+02e
8441 * pn    * f   1.5000E+07e
8442 * pan   * f   0.0000E+00e
8443 *
8444 * level   5
8445 *
8446 * cfzl-t* f   0.0000E+00e
8447 * cfzl-z* f   0.0000E+00e
8448 * cfzl-r* f   0.0000E+00e
8449 * cfzv-t* f   0.0000E+00e
8450 * cfzv-z* f   0.0000E+00e
8451 * cfzv-r* f   0.0000E+00e
8452 * vol   * r06 5.2820E-01r06 1.0000E+00e
8453 * fa-t  * r06 4.0000E-01r06 1.0000E+00e
8454 * fa-z  * r06 2.5000E-01r06 1.0000E+00e
8455 * fa-r  * f   0.0000E+00e
8456 * hd-t  * r06 1.3380E-02r06 5.0000E-01e
8457 * hd-z  * r06 1.5380E-02r06 5.0000E-01e
8458 * hd-r  * r06 1.3380E-02r06 5.0000E-01e
8459 * alpn  * f   0.0000E+00e
8460 * vvn-t * f   0.0000E+00e
8461 * vvn-z * f   0.0000E+00e
8462 * vvn-r * f   0.0000E+00e
8463 * vln-t * f   0.0000E+00e
8464 * vln-z * f   0.0000E+00e
8465 * vln-r * f   0.0000E+00e
8466 * tvn   * f   5.7900E+02e
8467 * tln   * f   5.7900E+02e
8468 * pn    * f   1.5000E+07e
8469 * pan   * f   0.0000E+00e
8470 *
8471 * level   6
8472 *
8473 * cfzl-t* f   0.0000E+00e
8474 * cfzl-z* f   0.0000E+00e
8475 * cfzl-r* f   0.0000E+00e
8476 * cfzv-t* f   0.0000E+00e
8477 * cfzv-z* f   0.0000E+00e
8478 * cfzv-r* f   0.0000E+00e
8479 * vol   * r06 7.7510E-01r06 9.1248E-01e
8480 * fa-t  * r06 6.0000E-01r06 8.0000E-01e
8481 * fa-z  * r06 7.5000E-01r06 1.0000E+00e
8482 * fa-r  * f   0.0000E+00e
8483 * hd-t  * r06 2.7420E-01r06 5.0000E-01e
8484 * hd-z  * r06 2.7420E-01r06 5.0000E-01e
8485 * hd-r  * r06 2.7420E-01r06 5.0000E-01e
8486 * alpn  * f   0.0000E+00e
8487 * vvn-t * f   0.0000E+00e
8488 * vvn-z * f   0.0000E+00e
8489 * vvn-r * f   0.0000E+00e
8490 * vln-t * f   0.0000E+00e
8491 * vln-z * f   0.0000E+00e
8492 * vln-r * f   0.0000E+00e
8493 * tvn   * f   5.7900E+02e
8494 * tln   * f   5.7900E+02e
8495 * pn    * f   1.5000E+07e
8496 * pan   * f   0.0000E+00e
8497 *
8498 * level   7
8499 *
8500 * cfzl-t* f   0.0000E+00e
8501 * cfzl-z* f   0.0000E+00e
8502 * cfzl-r* f   0.0000E+00e
8503 * cfzv-t* f   0.0000E+00e
8504 * cfzv-z* f   0.0000E+00e
8505 * cfzv-r* f   0.0000E+00e
8506 * vol   * r06 7.7510E-01r06 9.1248E-01e
8507 * fa-t  * r06 6.0000E-01r06 8.0000E-01e
8508 * fa-z  * r06 7.5000E-01r06 1.0000E+00e
8509 * fa-r  * f   0.0000E+00e
```



```
8510 * hd-t  * r06 2.7420E-01r06 5.0000E-01e
8511 * hd-z  * r06 2.7420E-01r06 5.0000E-01e
8512 * hd-r  * r06 2.7420E-01r06 5.0000E-01e
8513 * alpn  * f   0.0000E+00e
8514 * vvn-t * f   0.0000E+00e
8515 * vvn-z * f   0.0000E+00e
8516 * vvn-r * f   0.0000E+00e
8517 * vln-t * f   0.0000E+00e
8518 * vln-z * f   0.0000E+00e
8519 * vln-r * f   0.0000E+00e
8520 * tvn   * f   5.7900E+02e
8521 * tln   * f   5.7900E+02e
8522 * pn    * f   1.5000E+07e
8523 * pan   * f   0.0000E+00e
8524 *
8525 * level   8
8526 *
8527 * cfzl-t* f   0.0000E+00e
8528 * cfzl-z* f   0.0000E+00e
8529 * cfzl-r* f   0.0000E+00e
8530 * cfzv-t* f   0.0000E+00e
8531 * cfzv-z* f   0.0000E+00e
8532 * cfzv-r* f   0.0000E+00e
8533 * vol   * r06 7.7510E-01r06 9.1248E-01e
8534 * fa-t  * r06 6.0000E-01r06 8.0000E-01e
8535 * fa-z  * r06 7.5000E-01r06 1.0000E+00e
8536 * fa-r  * f   0.0000E+00e
8537 * hd-t  * r06 2.7420E-01r06 1.9316E+00e
8538 * hd-z  * r06 2.7420E-01r06 1.9316E+00e
8539 * hd-r  * r06 2.7420E-01r06 1.9316E+00e
8540 * alpn  * f   0.0000E+00e
8541 * vvn-t * f   0.0000E+00e
8542 * vvn-z * f   0.0000E+00e
8543 * vvn-r * f   0.0000E+00e
8544 * vln-t * f   0.0000E+00e
8545 * vln-z * f   0.0000E+00e
8546 * vln-r * f   0.0000E+00e
8547 * tvn   * f   5.7900E+02e
8548 * tln   * f   5.7900E+02e
8549 * pn    * f   1.5000E+07e
8550 * pan   * f   0.0000E+00e
8551 *
8552 * level   9
8553 *
8554 * cfzl-t* f   0.0000E+00e
8555 * cfzl-z* f   21.0000E+00e
8556 * cfzl-r* f   0.0000E+00e
8557 * cfzv-t* f   0.0000E+00e
8558 * cfzv-z* f   21.0000E+00e
8559 * cfzv-r* f   0.0000E+00e
8560 * vol   * r06 7.7510E-01r06 9.1248E-01e
8561 * fa-t  * r06 6.0000E-01r06 8.0000E-01e
8562 * fa-z  * r06 1.3950E-01r06 0.0000E+00e
8563 * fa-r  * f   0.0000E+00e
8564 * hd-t  * r06 2.0000E-01r06 5.0000E-01e
8565 * hd-z  * r06 2.0000E-01r06 5.0000E-01e
8566 * hd-r  * r06 2.0000E-01r06 5.0000E-01e
8567 * alpn  * f   0.0000E+00e
8568 * vvn-t * f   0.0000E+00e
8569 * vvn-z * f   0.0000E+00e
8570 * vvn-r * f   0.0000E+00e
8571 * vln-t * f   0.0000E+00e
8572 * vln-z * f   0.0000E+00e
8573 * vln-r * f   0.0000E+00e
8574 * tvn   * f   5.7900E+02e
8575 * tln   * f   5.7900E+02e
8576 * pn    * f   1.5000E+07e
8577 * pan   * f   0.0000E+00e
8578 *
8579 * level  10
8580 *
8581 * cfzl-t* f   0.0000E+00e
8582 * cfzl-z* f   0.0000E+00e
```

```
* cfzl-r* f   0.0000E+00e
* cfzv-t* f   0.0000E+00e
* cfzv-z* f   0.0000E+00e
* cfzv-r* f   0.0000E+00e
* vol   * r06 6.5000E-01r06 4.7600E-01e
* fa-t  * r06 6.0000E-01r06 3.0000E-01e
* fa-z  * f   0.0000E+00e
* fa-r  * r06 5.0000E-01r06 0.0000E+00e
* hd-t  * r06 3.8000E-01r06 1.0000E-04e
* hd-z  * r06 3.8000E-01r06 1.0000E-04e
* hd-r  * r06 3.8000E-01r06 1.0000E-04e
* alpn  * f   0.0000E+00e
* vvn-t * f   0.0000E+00e
* vvn-z * f   0.0000E+00e
* vvn-r * f   0.0000E+00e
* vln-t * f   0.0000E+00e
* vln-z * f   0.0000E+00e
* vln-r * f   0.0000E+00e
* tvn   * f   5.9200E+02e
* tln   * f   5.9200E+02e
* pn    * f   1.5000E+07e
* pan   * f   0.0000E+00e
*************************************************************************
*  type      num         id          ctitle                        cd 1
tee          121     121 $121$ sg-a boiler region
*
* jcell      nodes       ichf        cost        epsw              cd 2
  10           0         1           0.0         1.0e-05
* iconc1     ncell1      jun1        jun2        ipow1             cd 3
  0          11           56         581         0
* radin1     th1         houtl1      houtv1      toutl1            cd 6
    0.0        0.0       0.0         0.0         0.0
* toutv1     pwin1       pwoff1      rpwmx1      pwscl1            cd 7
  0.0        0.0         0.0         1.0e20      1.0
* iconc2     ncell2      jun3        ipow2                         cd 9
  0          1           57          0
* radin2     th2         houtl2      houtv2      toutl2            cd 12
    0.0       0.0        0.0         0.0         0.0
* toutv2     pwin2       pwoff2      rpwmx2      pwscl2            cd 13
  0.0        0.0         0.0         1.0e20      1.0
*    main-cell arrays
* dx    *     5.0000E-02    1.0000E-01    2.0000E-01    4.0000E-01    1.0150E+00
* dx    * r06 1.7650E+00e
* vol   *     1.9700E-01    3.9400E-01    7.8800E-01    1.5750E+00    3.9970E+00
* vol   * r06 6.9500E+00e
* fa    * f   4.3450E+00e
* fric  *     1.0000E-02    5.0000E-04    1.0000E-03    2.0000E-03    4.0000E-03
* fric  * r06 1.0000E-02    1.0e-06 e
* grav  *     0.0000E+00r11 1.0000E+00e
* hd    *     6.0000E-03r09 4.0000E-03r02 5.0000E-03e
* icflg * f            0e
* nff   * f            1e
* alp   * r05 0.0000E+00r06 1.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * f   5.5280E+02e
* tv    * f   5.5280E+02e
* p     * f   6.2800E+06e
* pa    * f   0.0000E+00e
*    side-cell arrays
* dx    *     2.5000E-01e
* vol   *     2.5000E-01e
* fa    * f   5.0000E-01e
* fric  * f   1.0e-06 e
* grav  * f   0.0000E+00e
* hd    * f   1.0000E-01e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    *     5.5280E+02e
* tv    *     5.5280E+02e
```



```
* p     *     6.2800E+06e
* pa    *     0.0000E+00e
*************************************************************************
*  type      num         id          ctitle                        cd 1
tee          122     122 $122$ sg-a upper boiler region
*
* jcell      nodes       ichf        cost        epsw              cd 2
    2          0         1           0.0         1.0e-05
* iconc1     ncell1      jun1        jun2        ipow1             cd 3
  0           2          581         58          0
* radin1     th1         houtl1      houtv1      toutl1            cd 6
    0.0        0.0       0.0         0.0         0.0
* toutv1     pwin1       pwoff1      rpwmx1      pwscl1            cd 7
  0.0        0.0         0.0         1.0e20      1.0
* iconc2     ncell2      jun3        ipow2                         cd 9
  0          1           72          0
* radin2     th2         houtl2      houtv2      toutl2            cd 12
    0.0       0.0        0.0         0.0         0.0
* toutv2     pwin2       pwoff2      rpwmx2      pwscl2            cd 13
  0.0        0.0         0.0         1.0e20      1.0
*    main-cell arrays
* dx    * f   1.7650E+00e
* vol   * f   6.9500E+00e
* fa    * f   4.3450E+00e
* fric  * f   1.0e-06 e
* grav  * f   1.0000E+00e
* hd    * r02 5.0000E-03    6.0000E-03e
* icflg * f            0e
* nff   * f            1e
* alp   * f   1.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    * f   5.5250E+02e
* tv    * f   5.5280E+02e
* p     * f   6.2800E+06e
* pa    * f   0.0000E+00e
*    side-cell arrays
* dx    *     1.0000E+00e
* vol   *     1.6815E-02e
* fa    * f   1.6815E-02e
* fric  * f   1.0e-06 e
* grav  * f   0.0000E+00e
* hd    * f   1.4630E-01e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000E+00e
* vl    * f   0.0000E+00e
* vv    * f   0.0000E+00e
* tl    *     5.5280E+02e
* tv    *     5.5280E+02e
* p     *     6.2800E+06e
* pa    *     0.0000E+00e
*************************************************************************
*  type      num         id          ctitle                        cd 1
tee          123     123 $123$ sg-a downcomer region
*
* jcell      nodes       ichf        cost        epsw              cd 2
    1          0         1           0.0         1.0e-05
* iconc1     ncell1      jun1        jun2        ipow1             cd 3
  0          11           70         56          0
* radin1     th1         houtl1      houtv1      toutl1            cd 6
    0.0        0.0       0.0         0.0         0.0
* toutv1     pwin1       pwoff1      rpwmx1      pwscl1            cd 7
  0.0        0.0         0.0         1.0e20      1.0
* iconc2     ncell2      jun3        ipow2                         cd 9
  0          1           57          0
* radin2     th2         houtl2      houtv2      toutl2            cd 12
    0.0       0.0        0.0         0.0         0.0
* toutv2     pwin2       pwoff2      rpwmx2      pwscl2            cd 13
  0.0        0.0         0.0         1.0e20      1.0
*    main-cell arrays
* dx    *     1.7650E+00r02 8.8250E-01r03 1.7650E+00    1.0150E+00    4.0000E-01
* dx    *     2.0000E-01    1.0000E-01    5.0000E-02
```

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8729 * vol    *     3.5270E+00r02 1.7635E+00r03 3.5270E+00    2.0280E+00    7.9900E-01
8730 * vol    *     4.0000E-01    2.0000E-01    1.0000E-01e
8731 * fa     *     1.5000E-01r09 2.1670E+00    4.7000E-01    4.3450E+00e
8732 * fric   * r10 1.0e-06     1.4000E+01    1.0000E-02e
8733 * grav   *     0.0000E+00r10-1.0000E+00    0.0000E+00e
8734 * hd     *     1.0000E-01r09 6.0600E-01    1.8000E-01    6.0000E-03e
8735 * icflg  * f            0e
8736 * nff    * f            1e
8737 * alp    * r06 1.0000E+00r05 0.0000E+00e
8738 * vl     * f   0.0000E+00e
8739 * vv     * f   0.0000E+00e
8740 * tl     * f   5.1090E+02e
8741 * tv     * f   5.1090E+02e
8742 * p      * f   6.2800E+06e
8743 * pa     * f   0.0000E+00e
8744 *     side-cell arrays
8745 * dx     *     2.5000E-01e
8746 * vol    *     2.5000E-01e
8747 * fa     * f   5.0000E-01e
8748 * fric   * f   1.0e-06 e
8749 * grav   * f   0.0000E+00e
8750 * hd     * f   1.0000E-01e
8751 * icflg  * f            0e
8752 * nff    * f            1e
8753 * alp    *     0.0000E+00e
8754 * vl     * f   0.0000E+00e
8755 * vv     * f   0.0000E+00e
8756 * tl     *     5.5280E+02e
8757 * tv     *     5.5280E+02e
8758 * p      *     6.2800E+06e
8759 * pa     *     0.0000E+00e
8760 ************************************************************************
8761 *  type       num          id           ctitle                        cd 1
8762 pipe          124      124 $124$ sg-a steam exit
8763 *
8764 *  ncells     nodes        jun1         jun2         epsw             cd 2
8765    6           0            58           345          1.0e-05
8766 *  ichf       iconc        iacc         ipow                          cd 3
8767    1          0            0            0
8768 *  radin      th           houtl        houtv        toutl            cd 6
8769      0.0        0.0        0.0          0.0          0.0
8770 *  toutv      powin        powoff       rpowmx       powscl           cd 7
8771    0.0        0.0          0.0          1.0e20       1.0
8772 *   cell arrays
8773 * dx     * r03 7.0000E-01r03 1.7650E+00e
8774 * vol    *     2.0000E+00    1.6000E+00    1.2000E+00r03 2.9400E+00e
8775 * fa   *    4.3450E+00   3.6800E+00   3.0000E+00r03 2.1670E+00   5.8580E-01 e
8776 * fric   * f   1.0e-06 e
8777 * grav   *    1.0000E+00   7.0700E-01  -7.0700E-01r03-1.0000E+00   0.0000E+00 e
8778 * hd     *     6.0000E-03r05 6.0960E-01  0.8636 e
8779 * icflg  * f            0e
8780 * nff    * r6  1       1e
8781 * alp    * f   1.0000E+00e
8782 * vl     * f   0.0000E+00e
8783 * vv     * f   0.0000E+00e
8784 * tl     * f   5.5280E+02e
8785 * tv     * f   5.5280E+02e
8786 * p      * f   6.2800E+06e
8787 * pa     * f   0.0000E+00e
8788 ************************************************************************
8789 * type       num          id           ctitle                        cd 1
8790 valve        148          148 $148$  sg a fw switchover valve
8791 *
8792 * ncells     nodes        jun1         jun2         epsw             cd 2
8793    4          0            147          149          1.0e-05
8794 * ichf       iconc        ivty         ivps         nvtb2            cd 3
8795    1          0            3            3            0
8796 * ivtr       ivsv         nvtb1        nvsv         nvrf             cd 4
8797    50         1            -2           0            0
8798 * ivtrov     ivtyov                                                  cd 6
8799    0          0
8800 * rvmx       rvov         fminov       fmaxov                        cd 7
8801    1.0        1.0          0.0          1.0
```



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8802 * radin      th           houtl        houtv        toutl            cd 8
8803    0.0        0.0          0.0          0.0          0.0
8804 * toutv      avlve        hvlve        favlve       xpos             cd 9
8805    0.0        0.016815     0.1463       0.0          0.0
8806 *
8807 *    cell arrays
8808 * dx     *  f 6.795 e
8809 * vol    *  f 0.114258 e
8810 * fa     *  f 0.016815 e
8811 * fric   *  f 1.0e-06
8812 * grav   *  0.0  r3 1.0  0.0 e
8813 * hd     *  f 0.1463 e
8814 * icflg  *  f 0 e
8815 * nff    *  r2 1  -1  f 1 e
8816 * alp    *  f 0.0 e
8817 * vl     *  f 0.0 e
8818 * vv     *  f 0.0 e
8819 * tl     *  f 510.9 e
8820 * tv     *  f 510.9 e
8821 * p      *  f 6.3e06 e
8822 * pa     *  f 0.0 e
8823 *
8824 * vtb1   *  0.0  0.0  5.0  1.0 e
8825 *
8826 ************************************************************************
8827 * type       num          id           ctitle                        cd 1
8828 valve          150      150 $150$ efw line a check valve
8829 *       ncells          nodes          jun1          jun2          epsw
8830                2            0            149          151    0.0000E+00
8831 *         ichf          iconc          ivty          ivps         nvtb2
8832                0            0             3             2             0
8833 *         ivtr           ivsv         nvtb1          nvsv          nvrf
8834             -150            1            -2             0             0
8835 *       ivtrov         ivtyov
8836                0            0
8837 *         rvmx           rvov        fminov        fmaxov
8838    4.0000E+00    4.0000E+00    0.0000E+00    0.0000E+00
8839 *        radin             th         houtl         houtv         toutl
8840    0.0           0.0           0.0000E+00    0.0000E+00    0.0000E+00
8841 *        toutv         avlve         hvlve        favlve          xpos
8842    0.0000E+00    0.016815      0.1463        0.0000E+00    0.0000E+00
8843 *
8844 * dx     *  f 6.795 e
8845 * vol    *  f 0.114258 e
8846 * fa     *  f 0.016815 e
8847 * fric   *  1.0e-06  0.02222  1.0e-06 e
8848 * grav   *  f 0.0 e
8849 * hd     *  f 0.1463 e
8850 * icflg  *  f 0 e
8851 * nff    *  1  -1  1 e
8852 * alp    *  f 0.0 e
8853 * vl     *  f 0.0 e
8854 * vv     *  f 0.0 e
8855 * tl     *  f 510.9 e
8856 * tv     *  f 510.9 e
8857 * p      *  f 6.3e06 e
8858 * pa     *  f 0.0 e
8859 *
8860 * vtb1   *  0.0  0.0  0.5  1.0 e
8861 *
8862 ************************************************************************
8863 *  type       num          id           ctitle                        cd 1
8864 tee           152          152 $152$ sg a efw inlet line
8865 *
8866 * jcell      nodes        ichf         cost         epsw             cd 2
8867    2          0            1            0.0          1.0e-05
8868 * iconc1     ncell1       jun1         jun2         ipow1            cd 3
8869    0          10           151          72           0
8870 * radin1     th1          houtl1       houtv1       toutl1           cd 6
8871    0.0        0.0          0.0          0.0          0.0
8872 * toutv1     pwin1        pwoff1       rpwmx1       pwscl1           cd 7
8873    0.0        0.0          0.0          1.0e20       1.0
8874 * iconc2     ncell2       jun3         ipow2                         cd 9
```

```
     0          1          153          0
 * radin2     th2         houtl2       houtv2       toutl2          cd 12
   0.0         0.0         0.0          0.0          0.0
 * toutv2     pwin2       pwoff2       rpwmx2       pwscl2          cd 13
    0.0        0.0         0.0         1.0e20        1.0
 *    main-cell arrays
 * dx     *  f 7.798 e
 * vol    *  f 0.131123 e
 * fa     *  f 0.016815 e
 * fric   *  f 1.e-6 e
 * grav   *  f 0.0 e
 * hd     *  f 0.1463 e
 * icflg  *  f 0 e
 * nff    *  f 1 e
 * alp    *  f 0.0 e
 * vl     *  f 0.0 e
 * vv     *  f 0.0 e
 * tl     *  f 380.0 e
 * tv     *  f 380.0 e
 * p      *  f 6.3e06 e
 * pa     *  f 0.0 e
 *    side-cell arrays
 * dx     *  f 7.798 e
 * vol    *  f 0.1311 e
 * fa     *  f 0.016815 e
 * fric   *  f 1.0e-06 e
 * grav   *  f 0.0 e
 * hd     *  f 0.1463 e
 * icflg  *  f 0 e
 * nff    *  f 1 e
 * alp    *  f 0.0 e
 * vl     *  f 0.0 e
 * vv     *  f 0.0 e
 * tl     *  f 372.03 e
 * tv     *  f 372.03 e
 * p      *  f 6.3e06 e
 * pa     *  f 0.0 e
 *
 ************************************************************************
 *  type       num         id          ctitle                          cd 1
 tee          154         154 $154$ sg a efw header
 *
 * jcell      nodes       ichf        cost        epsw                 cd 2
    1          0           1          0.0        1.0e-05
 * iconc1     ncell1      jun1        jun2        ipow1               cd 3
    0          1          157         155          0
 * radin1     th1         houtl1      houtv1      toutl1              cd 6
   0.0         0.0         0.0         0.0         0.0
 * toutv1     pwin1       pwoff1      rpwmx1      pwscl1              cd 7
    0.0        0.0         0.0        1.0e20       1.0
 * iconc2     ncell2      jun3        ipow2                           cd 9
    0          1          153          0
 * radin2     th2         houtl2      houtv2      toutl2              cd 12
   0.0         0.0         0.0         0.0         0.0
 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2              cd 13
    0.0        0.0         0.0        1.0e20       1.0
 *    main-cell arrays
 * dx     *  f 7.798 e
 * vol    *  f 0.1311 e
 * fa     *  f 0.016815 e
 * fric   *  f 1.e-6 e
 * grav   *  f 0.0 e
 * hd     *  f 0.1463 e
 * icflg  *  f 0 e
 * nff    *  f 1 e
 * alp    *  f 0.0 e
 * vl     *  f 0.0 e
 * vv     *  f 0.0 e
 * tl     *  f 380.0 e
 * tv     *  f 380.0 e
 * p      *  f 6.3e06 e
 * pa     *  f 0.0 e
 *    side-cell arrays
```



```
 * dx     *  f 7.798 e
 * vol    *  f 0.1311 e
 * fa     *  f 0.016815 e
 * fric   *  f 1.0e-06 e
 * grav   *  f 0.0 e
 * hd     *  f 0.1463 e
 * icflg  *  f 0 e
 * nff    *  f 1 e
 * alp    *  f 0.0 e
 * vl     *  f 0.0 e
 * vv     *  f 0.0 e
 * tl     *  f 372.03 e
 * tv     *  f 372.03 e
 * p      *  f 6.3e06 e
 * pa     *  f 0.0 e
 *
 ************************************************************************
 *******   type          num          id        ctitle
 fill          156      156 $156$ sg a md efw
 *         jun1         ifty         ioff
            155           5            0
 *         iftr         ifsv         nftb         nfsv         nfrf
            0          -1697          0            0            0
 *       twtold         rfmx        concin        felv
     9.0000E-01    1.0000E+03    0.0000E+00    0.0000E+00
 *         dxin         volin        alpin        vlin         tlin
     1.0000E+00    1.8200E-02    0.0000E+00    0.0000E+00    2.9430E+02
 *          pin         pain        flowin        vvin         tvin
     6.5000E+06    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
 *
 ************************************************************************
 *******   type          num          id        ctitle
 fill          158      158 $158$ sg a td efw
 *         jun1         ifty         ioff
            157           5            0
 *         iftr         ifsv         nftb         nfsv         nfrf
            0          -1794          0            0            0
 *       twtold         rfmx        concin        felv
     9.0000E-01    1.0000E+03    0.0000E+00    0.0000E+00
 *         dxin         volin        alpin        vlin         tlin
     1.0000E+00    1.8200E-02    0.0000E+00    0.0000E+00    2.9430E+02
 *          pin         pain        flowin        vvin         tvin
     6.5000E+06    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
 *
 ************************************************************************
 *  type       num         id          ctitle                          cd 1
 tee          201      201 $201$ sg-b boiler region
 *
 * jcell      nodes       ichf        cost        epsw                 cd 2
    10          0           1          0.0        1.0e-05
 * iconc1     ncell1      jun1        jun2        ipow1               cd 3
    0          11          46         481          0
 * radin1     th1         houtl1      houtv1      toutl1              cd 6
    0.0        0.0         0.0         0.0         0.0
 * toutv1     pwin1       pwoff1      rpwmx1      pwscl1              cd 7
    0.0        0.0         0.0        1.0e20       1.0
 * iconc2     ncell2      jun3        ipow2                           cd 9
    0          1           47          0
 * radin2     th2         houtl2      houtv2      toutl2              cd 12
    0.0        0.0         0.0         0.0         0.0
 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2              cd 13
    0.0        0.0         0.0        1.0e20       1.0
 *    main-cell arrays
 * dx     *     5.0000E-02    1.0000E-01    2.0000E-01    4.0000E-01    1.0150E+00
 * dx     * r06 1.7650E+00e
 * vol    *     1.9700E-01    3.9400E-01    7.8800E-01    1.5750E+00    3.9970E+00
 * vol    * r06 6.9500E+00e
 * fa     * f   4.3450E+00e
 * fric   *     1.0000E-02    5.0000E-04    1.0000E-03    2.0000E-03    4.0000E-03
 * fric   * r06 1.0000E-02    1.0e-06 e
 * grav   *     0.0000E+00r11 1.0000E+00e
 * hd     *     6.0000E-03r09 4.0000E-03r02 5.0000E-03e
 * icflg * f            0e
```

```
9021 * nff    * f            1e
9022 * alp    * r05 0.0000E+00r06 1.0000E+00e
9023 * vl     * f   0.0000E+00e
9024 * vv     * f   0.0000E+00e
9025 * tl     * f   5.5280E+02e
9026 * tv     * f   5.5280E+02e
9027 * p      * f   6.2800E+06e
9028 * pa     * f   0.0000E+00e
9029 *    side-cell arrays
9030 * dx     *     2.5000E-01e
9031 * vol    *     2.5000E-01e
9032 * fa     * f   5.0000E-01e
9033 * fric   * f   1.0e-06 e
9034 * grav   * f   0.0000E+00e
9035 * hd     * f   1.0000E-01e
9036 * icflg  * f            0e
9037 * nff    * f            1e
9038 * alp    *     0.0000E+00e
9039 * vl     * f   0.0000E+00e
9040 * vv     * f   0.0000E+00e
9041 * tl     *     5.5280E+02e
9042 * tv     *     5.5280E+02e
9043 * p      *     6.2800E+06e
9044 * pa     *     0.0000E+00e
9045 ************************************************************************
9046 *  type      num         id          ctitle                        cd 1
9047 tee          202      202 $202$ sg-b upper boiler region
9048 *
9049 * jcell      nodes       ichf        cost        epsw            cd 2
9050    2           0          1           0.0         1.0e-05
9051 * iconc1     ncell1      jun1        jun2        ipow1           cd 3
9052   0            2          481         48          0
9053 * radin1     th1         houtl1      houtv1      toutl1          cd 6
9054     0.0        0.0        0.0         0.0         0.0
9055 * toutv1     pwin1       pwoff1      rpwmx1      pwscl1          cd 7
9056   0.0        0.0        0.0         1.0e20      1.0
9057 * iconc2     ncell2      jun3        ipow2                       cd 9
9058   0          1          62          0
9059 * radin2     th2         houtl2      houtv2      toutl2          cd 12
9060     0.0        0.0        0.0         0.0         0.0
9061 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2          cd 13
9062   0.0        0.0        0.0         1.0e20      1.0
9063 *    main-cell arrays
9064 * dx     * f   1.7650E+00e
9065 * vol    * f   6.9500E+00e
9066 * fa     * f   4.3450E+00e
9067 * fric   * f   1.0e-06 e
9068 * grav   * f   1.0000E+00e
9069 * hd     * r02 5.0000E-03    6.0000E-03e
9070 * icflg  * f            0e
9071 * nff    * f            1e
9072 * alp    * f   1.0000E+00e
9073 * vl     * f   0.0000E+00e
9074 * vv     * f   0.0000E+00e
9075 * tl     * f   5.5250E+02e
9076 * tv     * f   5.5280E+02e
9077 * p      * f   6.2800E+06e
9078 * pa     * f   0.0000E+00e
9079 *    side-cell arrays
9080 * dx     *     1.0000E+00e
9081 * vol    *     1.6815E-02e
9082 * fa     * f   1.6815E-02e
9083 * fric   * f   1.0e-06 e
9084 * grav   * f   0.0000E+00e
9085 * hd     * f   1.4630E-01e
9086 * icflg  * f            0e
9087 * nff    * f            1e
9088 * alp    *     0.0000E+00e
9089 * vl     * f   0.0000E+00e
9090 * vv     * f   0.0000E+00e
9091 * tl     *     5.5280E+02e
9092 * tv     *     5.5280E+02e
9093 * p      *     6.2800E+06e
```



```
9094 * pa     *     0.0000E+00e
9095 ************************************************************************
9096 *  type      num         id          ctitle                        cd 1
9097 tee          203      203 $203$ sg-b downcomer region
9098 *
9099 * jcell      nodes       ichf        cost        epsw            cd 2
9100    1           0          1           0.0         1.0e-05
9101 * iconc1     ncell1      jun1        jun2        ipow1           cd 3
9102   0          11          60          46          0
9103 * radin1     th1         houtl1      houtv1      toutl1          cd 6
9104     0.0        0.0        0.0         0.0         0.0
9105 * toutv1     pwin1       pwoff1      rpwmx1      pwscl1          cd 7
9106   0.0        0.0        0.0         1.0e20      1.0
9107 * iconc2     ncell2      jun3        ipow2                       cd 9
9108   0          1          47          0
9109 * radin2     th2         houtl2      houtv2      toutl2          cd 12
9110     0.0        0.0        0.0         0.0         0.0
9111 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2          cd 13
9112   0.0        0.0        0.0         1.0e20      1.0
9113 *    main-cell arrays
9114 * dx     *     1.7650E+00r02 8.8250E-01r03 1.7650E+00    1.0150E+00    4.0000E-01
9115 * dx     *     2.0000E-01    1.0000E-01    5.0000E-02e
9116 * vol    *     3.5270E+00r02 1.7635E+00r03 3.5270E+00    2.0280E+00    7.9900E-01
9117 * vol    *     4.0000E-01    2.0000E-01    1.0000E-01e
9118 * fa     *     1.5000E-01r09 2.1670E+00    4.7000E-01    4.3450E+00e
9119 * fric   * r10 1.0e-06     1.4000E+01    1.0000E-02e
9120 * grav   *     0.0000E+00r10-1.0000E+00    0.0000E+00e
9121 * hd     *     1.0000E-01r09 6.0600E-01    1.8000E-01    6.0000E-03e
9122 * icflg  * f            0e
9123 * nff    * f            1e
9124 * alp    * r06 1.0000E+00r05 0.0000E+00e
9125 * vl     * f   0.0000E+00e
9126 * vv     * f   0.0000E+00e
9127 * tl     * f   5.1090E+02e
9128 * tv     * f   5.1090E+02e
9129 * p      * f   6.2800E+06e
9130 * pa     * f   0.0000E+00e
9131 *    side-cell arrays
9132 * dx     *     2.5000E-01e
9133 * vol    *     2.5000E-01e
9134 * fa     * f   5.0000E-01e
9135 * fric   * f   1.0e-06 e
9136 * grav   * f   0.0000E+00e
9137 * hd     * f   1.0000E-01e
9138 * icflg  * f            0e
9139 * nff    * f            1e
9140 * alp    *     0.0000E+00e
9141 * vl     * f   0.0000E+00e
9142 * vv     * f   0.0000E+00e
9143 * tl     *     5.5280E+02e
9144 * tv     *     5.5280E+02e
9145 * p      *     6.2800E+06e
9146 * pa     *     0.0000E+00e
9147 ************************************************************************
9148 *  type      num         id          ctitle                        cd 1
9149 pipe         204      204 $204$ sg-b steam exit
9150 *
9151 *  ncells    nodes       jun1        jun2        epsw            cd 2
9152    6          0          48          445         1.0e-05
9153 *  ichf      iconc       iacc        ipow                        cd 3
9154    1          0          0           0
9155 *  radin     th          houtl       houtv       toutl           cd 6
9156      0.0       0.0        0.0         0.0         0.0
9157 *  toutv     powin       powoff      rpowmx      powscl          cd 7
9158    0.0       0.0        0.0         1.0e20      1.0
9159 *   cell arrays
9160 * dx     * r03 7.0000E-01r03 1.7650E+00e
9161 * vol    *     2.0000E+00    1.6000E+00    1.2000E+00r03 2.9400E+00e
9162 * fa     *    4.3450E+00   3.6800E+00   3.0000E+00r03 2.1670E+00   5.8580E-01 e
9163 * fric   * f   1.0e-06 e
9164 * grav   *    1.0000E+00   7.0700E-01  -7.0700E-01r03-1.0000E+00   0.0000E+00 e
9165 * hd     *     6.0000E-03r05 6.0960E-01   0.8636 e
9166 * icflg  * f            0e
```

```
* nff    * r6  1        1e
* alp    * f   1.0000E+00e
* vl     * f   0.0000E+00e
* vv     * f   0.0000E+00e
* tl     * f   5.5280E+02e
* tv     * f   5.5280E+02e
* p      * f   6.2800E+06e
* pa     * f   0.0000E+00e
*
*************************************************************************
* type        num         id          ctitle                        cd 1
valve         248         248 $248$  sg b fw switchover valve
*
* ncells      nodes       jun1        jun2        epsw              cd 2
   4          0           247         249         1.0e-05
* ichf        iconc       ivty        ivps        nvtb2             cd 3
  1           0           3           3            0
* ivtr        ivsv        nvtb1       nvsv        nvrf              cd 4
  50          1           -2             0           0
* ivtrov      ivtyov                                                cd 6
  0            0
* rvmx        rvov        fminov      fmaxov                        cd 7
  1.0     1.0       0.0          1.0
* radin       th          houtl       houtv       toutl             cd 8
    0.0         0.0         0.0         0.0
* toutv       avlve       hvlve       favlve      xpos              cd 9
    0.0       0.016815      0.1463      0.0       0.0
*
*    cell arrays
* dx     *  f 6.795 e
* vol    *  f 0.114258 e
* fa     *  f 0.016815 e
* fric   *  f 1.0e-06
* grav   *  0.0  r3 1.0  0.0 e
* hd     *  f 0.1463 e
* icflg  *  f 0 e
* nff    *  r2 1  -1  f 1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 510.9 e
* tv     *  f 510.9 e
* p      *  f 6.3e06 e
* pa     *  f 0.0 e
*
* vtb1   *  0.0  0.0  5.0  1.0 e
*
*************************************************************************
* type        num         id          ctitle                        cd 1
valve         250       250 $250$ efw line b check valve
*       ncells          nodes          jun1          jun2          epsw
              2             0           249           251    0.0000E+00
*         ichf          iconc          ivty          ivps         nvtb2
              0             0             3             2             0
*         ivtr           ivsv         nvtb1          nvsv          nvrf
             -250            1            -2             0             0
*       ivtrov         ivtyov
              0             0
*         rvmx           rvov        fminov        fmaxov
    4.0000E+00    4.0000E+00    0.0000E+00    0.0000E+00
*         radin            th         houtl         houtv         toutl
    0.0           0.0           0.0000E+00    0.0000E+00    0.0000E+00
*         toutv         avlve         hvlve        favlve          xpos
    0.0000E+00    0.016815      0.1463        0.0000E+00    0.0000E+00
*
* dx     *  f 6.795 e
* vol    *  f 0.114258 e
* fa     *  f 0.016815 e
* fric   *  1.0e-06  0.02222  1.0e-06 e
* grav   *  f 0.0 e
* hd     *  f 0.1463 e
* icflg  *  f 0 e
* nff    *  1  -1  1 e
```



```
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 510.9 e
* tv     *  f 510.9 e
* p      *  f 6.3e06 e
* pa     *  f 0.0 e
*
* vtb1   *  0.0  0.0  0.5  1.0 e
*
*************************************************************************
*  type       num         id          ctitle                        cd 1
tee           252         252 $252$ sg b efw inlet line
*
* jcell       nodes       ichf        cost        epsw              cd 2
    1           0           1          0.0       1.0e-05
* iconc1      ncell1      jun1        jun2        ipow1             cd 3
    0           4         251         62            0
* radin1      th1         houtl1      houtv1      toutl1            cd 6
  0.0          0.0         0.0         0.0         0.0
* toutv1      pwin1       pwoff1      rpwmx1      pwscl1            cd 7
   0.0         0.0         0.0        1.0e20       1.0
* iconc2      ncell2      jun3        ipow2                         cd 9
    0           1         253           0
* radin2      th2         houtl2      houtv2      toutl2            cd 12
  0.0          0.0         0.0         0.0         0.0
* toutv2      pwin2       pwoff2      rpwmx2      pwscl2            cd 13
   0.0         0.0         0.0        1.0e20       1.0
*    main-cell arrays
* dx     *  f 6.27 e
* vol    *  f 0.10543 e
* fa     *  f 0.016815 e
* fric   *  f 1.e-6 e
* grav   *  f 0.0 e
* hd     *  f 0.1463 e
* icflg  *  f 0 e
* nff    *  f 1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 380.0 e
* tv     *  f 380.0 e
* p      *  f 6.3e06 e
* pa     *  f 0.0 e
*    side-cell arrays
* dx     *  f 6.27 e
* vol    *  f 0.10543 e
* fa     *  f 0.016815 e
* fric   *  f 1.0e-06 e
* grav   *  f 0.0 e
* hd     *  f 0.1463 e
* icflg  *  f 0 e
* nff    *  f 1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 372.03 e
* tv     *  f 372.03 e
* p      *  f 6.3e06 e
* pa     *  f 0.0 e
*
*************************************************************************
*  type       num         id          ctitle                        cd 1
tee           254         254 $254$ sg b efw header
*
* jcell       nodes       ichf        cost        epsw              cd 2
    1           0           1          0.0       1.0e-05
* iconc1      ncell1      jun1        jun2        ipow1             cd 3
    0           1         257         255           0
* radin1      th1         houtl1      houtv1      toutl1            cd 6
  0.0          0.0         0.0         0.0         0.0
* toutv1      pwin1       pwoff1      rpwmx1      pwscl1            cd 7
   0.0         0.0         0.0        1.0e20       1.0
```

```
9313 * iconc2     ncell2      jun3        ipow2                       cd 9
9314     0         1          253          0
9315 * radin2     th2         houtl2      houtv2      toutl2          cd 12
9316   0.0         0.0         0.0         0.0         0.0
9317 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2          cd 13
9318    0.0        0.0         0.0        1.0e20       1.0
9319 *    main-cell arrays
9320 * dx    *  f 6.27 e
9321 * vol   *  f 0.10543 e
9322 * fa    *  f 0.016815 e
9323 * fric  *  f 1.e-6 e
9324 * grav  *  f 0.0 e
9325 * hd    *  f 0.1463 e
9326 * icflg *  f 0 e
9327 * nff   *  f 1 e
9328 * alp   *  f 0.0 e
9329 * vl    *  f 0.0 e
9330 * vv    *  f 0.0 e
9331 * tl    *  f 380.0 e
9332 * tv    *  f 380.0 e
9333 * p     *  f 6.3e06 e
9334 * pa    *  f 0.0 e
9335 *    side-cell arrays
9336 * dx    *  f 6.27 e
9337 * vol   *  f 0.10543 e
9338 * fa    *  f 0.016815 e
9339 * fric  *  f 1.0e-06 e
9340 * grav  *  f 0.0 e
9341 * hd    *  f 0.1463 e
9342 * icflg *  f 0 e
9343 * nff   *  f 1 e
9344 * alp   *  f 0.0 e
9345 * vl    *  f 0.0 e
9346 * vv    *  f 0.0 e
9347 * tl    *  f 372.03 e
9348 * tv    *  f 372.03 e
9349 * p     *  f 6.3e06 e
9350 * pa    *  f 0.0 e
9351 *
9352 ************************************************************************
9353 *******   type          num          id        ctitle
9354 fill          256      256 $256$ sg b md efw
9355 *         jun1         ifty         ioff
9356            255            5            0
9357 *         iftr         ifsv         nftb         nfsv         nfrf
9358            0          -1698            0            0            0
9359 *       twtold         rfmx       concin         felv
9360     9.0000E-01   1.0000E+03   0.0000E+00   0.0000E+00
9361 *         dxin        volin        alpin         vlin         tlin
9362     1.0000E+00   1.8200E-02   0.0000E+00   0.0000E+00   2.9430E+02
9363 *          pin         pain       flowin         vvin         tvin
9364     6.5000E+06   0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
9365 *
9366 ************************************************************************
9367 *******   type          num          id        ctitle
9368 fill          258      258 $258$ sg b td efw
9369 *         jun1         ifty         ioff
9370            257            5            0
9371 *         iftr         ifsv         nftb         nfsv         nfrf
9372            0          -1795            0            0            0
9373 *       twtold         rfmx       concin         felv
9374     9.0000E-01   1.0000E+03   0.0000E+00   0.0000E+00
9375 *         dxin        volin        alpin         vlin         tlin
9376     1.0000E+00   1.8200E-02   0.0000E+00   0.0000E+00   2.9430E+02
9377 *          pin         pain       flowin         vvin         tvin
9378     6.5000E+06   0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
9379 *
9380 ************************************************************************
9381 *  type      num         id         ctitle                        cd 1
9382 tee     345     345     $345$ main steam line a to safety valves
9383 *
9384 *        jcell        nodes         ichf         cost         epsw
9385            3            1            0   0.0000e+00   4.5720e-05
```



```
9386 *       iconc1       ncell1         jun1         jun2        ipow1
9387            0            5          345          350            0
9388 *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
9389            0            0            0            0            0
9390 *       radin1          th1       houtl1       houtv1       toutl1
9391       0.4318       0.0175   0.0000e+00   0.0000e+00        295.0
9392 *       toutv1
9393        295.0
9394 *        qpin1       qpoff1       rqpmx1       qpscl1
9395    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
9396 *       iconc2       ncell2         jun3        ipow2
9397            0            1          365            0
9398 *       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
9399            0            0            0            0            0
9400 *       radin2          th2       houtl2       houtv2       toutl2
9401        0.05         0.01   0.0000e+00   0.0000e+00        295.0
9402 *       toutv2
9403        295.0
9404 *        qpin2       qpoff2       rqpmx2       qpscl2
9405    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
9406 *
9407 * dx    * f   6.096  e
9408 * vol   * f   3.571 e
9409 * fa    * f   0.5858 e
9410 * fric  * f   1.0000e-06e
9411 * grav  * f   0.0 e
9412 * hd    * f   0.8636 e
9413 * icflg * f   0 e
9414 * nff   *  f 1 e
9415 * alp   * f   1.0 e
9416 * vl    * f  0.0 e
9417 * vv    * f  0.0 e
9418 * tl    * f   610.0 e
9419 * tv    * f   610.0 e
9420 * p     * f   6.274e+06 e
9421 * pa    * f   0.0000e+00e
9422 * qppp  * f   0.0000E+00e
9423 * matid *  f              7e
9424 * tw    * f   610.0 e
9425 *
9426 * dx    *       f 1.0 e
9427 * vol   *     f 0.3728 e
9428 * fa    *   f 0.3728 e
9429 * fric  * f   1.0000e-06e
9430 * grav  * f   1.0000e+00e
9431 * hd    * f   1.0893e-01e
9432 * icflg * f   0e
9433 * nff   * f   1e
9434 * alp   *     1.0000e+00e
9435 * vl    * f   0.0000e+00e
9436 * vv    * f   0.0000e+00e
9437 * tl    * f   610.0 e
9438 * tv    * f   610.0 e
9439 * p     * f   6.274e+06 e
9440 * pa    *     0.0000e+00e
9441 * qppp  * f   0.0000E+00e
9442 * matid *  f              7e
9443 * tw    * f   610.0 e
9444 *
9445 ************************************************************************
9446 *  type      num         id         ctitle                        cd 1
9447 tee          350        350  $350$  loop a main steam line
9448 *        jcell        nodes         ichf         cost         epsw
9449           14            1            0   0.0000e+00   4.5720e-05
9450 *       iconc1       ncell1         jun1         jun2        ipow1
9451            0           14          350          355            0
9452 *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
9453            0            0            0            0            0
9454 *       radin1          th1       houtl1       houtv1       toutl1
9455       0.4318       0.0175          0.0          0.0        295.0
9456 *       toutv1
9457        295.0
9458 *        qpin1       qpoff1       rqpmx1       qpscl1
```

```
9459      0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9460  *        iconc2        ncell2          jun3          ipow2
9461               0             1           370              0
9462  *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
9463               0             0             0             0             0
9464  *        radin2           th2        houtl2        houtv2        toutl2
9465            0.05          0.01           0.0           0.0         295.0
9466  *        toutv2
9467             295.0
9468  *         qpin2        qpoff2        rqpmx2        qpscl2
9469      0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9470  *
9471  * dx     * f   7.088 e
9472  * vol    * f   4.1522 e
9473  * fa     * f   0.5858 e
9474  * fric   *  1.0e-06  r13 0.0190  1.0e-06 e
9475  * grav   * f   0.0 e
9476  * hd     * f   0.8636 e
9477  * icflg  * f            0e
9478  * nff    * f   1 e
9479  * alp    * f   1.0000e+00e
9480  * vl     *  f 0.0 e
9481  * vv     *  f 0.0 e
9482  * tl     *  f 610.0 e
9483  * tv     *  f 610.0 e
9484  * p      *  f 6.274e06 e
9485  * pa     * f   0.0 e
9486  * qppp   * f   0.0000E+00e
9487  * matid  *  f              7e
9488  * tw     * f   6.1000E+02e
9489  *
9490  * dx     *       f 1.0 e
9491  * vol    *     f 0.0932 e
9492  * fa     *   f 0.0932 e
9493  * fric   * f   1.0000e-06e
9494  * grav   * f   0.0000e+00e
9495  * hd     * f   1.0893e-01e
9496  * icflg  * f            0e
9497  * nff    * f            1e
9498  * alp    * f   1.0000e+00e
9499  * vl     * f   0.0000e+00e
9500  * vv     * f   0.0000e+00e
9501  * tl     *  f 610.0 e
9502  * tv     *  f 610.0 e
9503  * p      *  f 6.274e06 e
9504  * pa     * f   0.0000e+00e
9505  * qppp   * f   0.0000E+00e
9506  * matid  *  f              7e
9507  * tw     * f   6.1000E+02e
9508  *
9509  ************************************************************************
9510  *******   type          num           id        ctitle
9511  valve          355      355 $355$  sg a turbine stop valve
9512  *       ncells        nodes         jun1          jun2          epsw
9513               1            0          355           360    0.0000E+00
9514  *         ichf        iconc         ivty          ivps         nvtb2
9515               0            0            4             2             0
9516  *         ivtr         ivsv        nvtb1          nvsv          nvrf
9517              45            1           -2             0             0
9518  *       ivtrov       ivtyov
9519               0            0
9520  *         rvmx         rvov       fminov       fmaxov
9521      1.0000       1.0000    0.0000E+00    0.0000E+00
9522  *        radin           th        houtl        houtv        toutl
9523      0.0          0.0000    0.0000E+00    0.0000E+00    0.0000E+00
9524  *        toutv        avlve        hvlve        favlve         xpos
9525      0.0000E+00    0.15675       0.44674    1.0000E+00    1.0000E+00
9526  *
9527  * dx     * f   7.088 e
9528  * vol    * f   4.1522 e
9529  * fa     * f   0.5858 e
9530  * fric   * f   1.0000e-06e
9531  * grav   * f   0.0 e
```



```
9532  * hd     * f   0.8636 e
9533  * icflg  * f            0e
9534  * nff    *  1  -1 e
9535  * alp    * f   1.0000e+00e
9536  * vl     *  f 0.0 e
9537  * vv     *  f 0.0 e
9538  * tl     *  f 610.0 e
9539  * tv     *  f 610.0 e
9540  * p      *  f 6.274e06 e
9541  * pa     * f   0.0 e
9542  *
9543  * vtbl   * 0.0    1.0     1.0     0.0 e
9544  *
9545  ************************************************************************
9546  *******   type          num           id        ctitle
9547  break          360      360 $360$ loop a steam exit boundary
9548  *         jun1         ibty         isat         ioff
9549             360            0            0            0
9550  *         dxin        volin        alpin          tin          pin
9551        7.0880    4.1522         1.0000E+00    5.5200E+02    5.8641E+06
9552  *         pain       concin         rbmx         poff         belv
9553      0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9554  *
9555  ************************************************************************
9556  *******   type          num           id        ctitle
9557  valve          365      365 $365$ sl-a safety relief valves
9558  *       ncells        nodes         jun1          jun2          epsw
9559               1            0          365           367    0.0000E+00
9560  *         ichf        iconc         ivty          ivps         nvtb2
9561               0            0            3             2             0
9562  *         ivtr         ivsv        nvtb1          nvsv          nvrf
9563              13         -388            0             0             0
9564  *       ivtrov       ivtyov
9565               0            0
9566  *         rvmx         rvov       fminov       fmaxov
9567      1.0000E+02    0.0000E+00    0.0000E+00    0.0000E+00
9568  *        radin           th        houtl        houtv        toutl
9569      3.1750E-02    5.0000E-01    0.0000E+00    0.0000E+00    0.0000E+00
9570  *        toutv        avlve        hvlve        favlve         xpos
9571      0.0000E+00    0.07456       0.10893    0.0        -1.0
9572  *
9573  * dx     *       f 1.0 e
9574  * vol    *     f 0.3728 e
9575  * fa     *   f 0.3728 e
9576  * fric   * f   1.0000e-06e
9577  * grav   * f   1.0000e+00e
9578  * hd     * f   1.0893e-01e
9579  * icflg  * 0   1e
9580  * nff    * 1  -1e
9581  * alp    *     1.0000e+00e
9582  * vl     * f   0.0000e+00e
9583  * vv     * f   0.0000e+00e
9584  * tl     * f   565.7 e
9585  * tv     * f   565.7 e
9586  * p      * f   6.274e+06 e
9587  * pa     *     0.0000e+00e
9588  *
9589  ************************************************************************
9590  *******   type          num           id        ctitle
9591  break          367      367 $367$ sl-a srv boundary
9592  *         jun1         ibty         isat         ioff
9593             367            0            0            0
9594  *         dxin        volin        alpin          tin          pin
9595      0.1000E+00    0.3728         1.0000E+00    3.0540E+02    1.01323+05
9596  *         pain       concin         rbmx         poff         belv
9597      0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9598  *
9599  ************************************************************************
9600  *******   type          num           id        ctitle
9601  valve          370      370 $370$ sl-a turbine bypass valves
9602  *       ncells        nodes         jun1          jun2          epsw
9603               1            0          370           372    0.0000E+00
9604  *         ichf        iconc         ivty          ivps         nvtb2
```

```
              0            0            3            2            0
*         ivtr         ivsv        nvtb1         nvsv         nvrf
             12        -3388            0            0            0
*       ivtrov       ivtyov
              0            0
*         rvmx         rvov       fminov       fmaxov
    1.0000E+00   1.0000E+00   0.0000E+00   0.0000E+00
*        radin           th        houtl        houtv        toutl
    3.1750E-02   5.0000E-01   0.0000E+00   0.0000E+00   0.0000E+00
*        toutv        avlve        hvlve       favlve         xpos
    0.0000E+00   0.01864     0.10893    0.0          -1.0
*
* dx     *       f 1.0 e
* vol    *     f 0.0932 e
* fa     *   f 0.0932 e
* fric   * f   1.0000e-06e
* grav   * f   0.0000e+00e
* hd     * f   1.0893e-01e
* icflg  * 0   1e
* nff    * 1  -1e
* alp    *     1.0000e+00e
* vl     * f   0.0000e+00e
* vv     * f   0.0000e+00e
* tl     * f   565.7 e
* tv     * f   565.7 e
* p      * f   6.274e+06 e
* pa     *     0.0000e+00e
*
************************************************************************
*******   type          num          id        ctitle
break          372      372 $372$ sl-a tbv boundary
*         jun1         ibty         isat         ioff
             372            0            0            0
*         dxin        volin        alpin          tin          pin
    0.1000E+00   0.0932      1.0000E+00   3.0540E+02   1.01323+05
*         pain       concin         rbmx         poff         belv
    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*
************************************************************************
*******   type          num          id        ctitle
tee     445     445     $445$ main steam line a to safety valves
*
*        jcell        nodes         ichf         cost         epsw
             3            1            0   0.0000e+00   4.5720e-05
*       iconc1        ncell1         jun1         jun2         ipow1
             0            5          445          450            0
*       iqptr1        iqpsv1       nqptb1       nqpsv1       nqprf1
             0            0            0            0            0
*       radin1           th1       houtl1       houtv1       toutl1
      0.4318       0.0175       0.0000e+00   0.0000e+00       295.0
*       toutv1
         295.0
*        qpin1       qpoff1       rqpmx1       qpscl1
    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*       iconc2        ncell2         jun3         ipow2
             0            1          465            0
*       iqptr2        iqpsv2       nqptb2       nqpsv2       nqprf2
             0            0            0            0            0
*       radin2           th2       houtl2       houtv2       toutl2
         0.05         0.01       0.0000e+00   0.0000e+00       295.0
*       toutv2
         295.0
*        qpin2       qpoff2       rqpmx2       qpscl2
    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*
* dx     * f   6.096  e
* vol    * f   3.571 e
* fa     * f   0.5858 e
* fric   * f   1.0000e-06e
* grav   * f   0.0 e
* hd     * f   0.8636 e
* icflg  * f   0 e
* nff    *  f 1 e
```



```
* alp    * f   1.0 e
* vl     * f  0.0 e
* vv     * f  0.0 e
* tl     * f   610.0 e
* tv     * f   610.0 e
* p      * f   6.274e+06 e
* pa     * f   0.0000e+00e
* qppp   * f   0.0000E+00e
* matid  *  f              7e
* tw     * f   610.0 e
*
* dx     *       f 1.0 e
* vol    *     f 0.3728 e
* fa     *   f 0.3728 e
* fric   * f   1.0000e-06e
* grav   * f   1.0000e+00e
* hd     * f   1.0893e-01e
* icflg  * f   0e
* nff    * f   1e
* alp    *     1.0000e+00e
* vl     * f   0.0000e+00e
* vv     * f   0.0000e+00e
* tl     * f   610.0 e
* tv     * f   610.0 e
* p      * f   6.274e+06 e
* pa     *     0.0000e+00e
* qppp   * f   0.0000E+00e
* matid  *  f              7e
* tw     * f   610.0 e
*
************************************************************************
*  type      num         id          ctitle                        cd 1
tee          450        450  $450$  loop a main steam line
*        jcell        nodes         ichf         cost         epsw
            14            1            0   0.0000e+00   4.5720e-05
*       iconc1        ncell1         jun1         jun2         ipow1
             0           14          450          455            0
*       iqptr1        iqpsv1       nqptb1       nqpsv1       nqprf1
             0            0            0            0            0
*       radin1           th1       houtl1       houtv1       toutl1
      0.4318       0.0175       0.0          0.0          295.0
*       toutv1
         295.0
*        qpin1       qpoff1       rqpmx1       qpscl1
    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*       iconc2        ncell2         jun3         ipow2
             0            1          470            0
*       iqptr2        iqpsv2       nqptb2       nqpsv2       nqprf2
             0            0            0            0            0
*       radin2           th2       houtl2       houtv2       toutl2
         0.05         0.01       0.0          0.0          295.0
*       toutv2
         295.0
*        qpin2       qpoff2       rqpmx2       qpscl2
    0.0000E+00   0.0000E+00   0.0000E+00   0.0000E+00
*
* dx     * f   7.088 e
* vol    * f   4.1522 e
* fa     * f   0.5858 e
* fric   *  1.0e-06  r13 0.0190  1.0e-06 e
* grav   * f   0.0 e
* hd     * f   0.8636 e
* icflg  * f           0e
* nff    * f   1 e
* alp    * f   1.0000e+00e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 610.0 e
* tv     *  f 610.0 e
* p      *  f 6.274e06 e
* pa     * f   0.0 e
* qppp   * f   0.0000E+00e
* matid  *  f              7e
```

```
9751 * tw    * f   6.1000E+02e
9752 *
9753 * dx    *       f 1.0 e
9754 * vol   *     f 0.0932 e
9755 * fa    *   f 0.0932 e
9756 * fric  * f   1.0000e-06e
9757 * grav  * f   0.0000e+00e
9758 * hd    * f   1.0893e-01e
9759 * icflg * f            0e
9760 * nff   * f            1e
9761 * alp   * f   1.0000e+00e
9762 * vl    * f   0.0000e+00e
9763 * vv    * f   0.0000e+00e
9764 * tl    *  f 610.0 e
9765 * tv    *  f 610.0 e
9766 * p     *  f 6.274e06 e
9767 * pa    * f   0.0000e+00e
9768 * qppp  * f   0.0000E+00e
9769 * matid *  f              7e
9770 * tw    * f   6.1000E+02e
9771 *
9772 ************************************************************************
9773 *******   type            num            id        ctitle
9774 valve          455      455 $455$  sg b turbine stop valve
9775 *       ncells          nodes          jun1          jun2          epsw
9776              1              0           455           460    0.0000E+00
9777 *         ichf          iconc          ivty          ivps         nvtb2
9778              0              0             4             2             0
9779 *         ivtr           ivsv         nvtb1          nvsv          nvrf
9780             45              1            -2             0             0
9781 *       ivtrov         ivtyov
9782              0              0
9783 *         rvmx           rvov        fminov        fmaxov
9784    1.0000         1.0000        0.0000E+00    0.0000E+00
9785 *        radin             th         houtl         houtv         toutl
9786    0.0            0.0000        0.0000E+00    0.0000E+00    0.0000E+00
9787 *        toutv          avlve         hvlve         favlve          xpos
9788    0.0000E+00     0.15675       0.44674       1.0000E+00    1.0000E+00
9789 *
9790 * dx    * f   7.088 e
9791 * vol   * f   4.1522 e
9792 * fa    * f   0.5858 e
9793 * fric  * f   1.0000e-06e
9794 * grav  * f   0.0 e
9795 * hd    * f   0.8636 e
9796 * icflg * f            0e
9797 * nff   *  1  -1 e
9798 * alp   * f   1.0000e+00e
9799 * vl    *  f 0.0 e
9800 * vv    *  f 0.0 e
9801 * tl    *  f 610.0 e
9802 * tv    *  f 610.0 e
9803 * p     *  f 6.274e06 e
9804 * pa    * f   0.0 e
9805 *
9806 * vtb1  * 0.0    1.0     1.0     0.0 e
9807 *
9808 ************************************************************************
9809 *******   type            num            id        ctitle
9810 break          460      460 $460$ loop a steam exit boundary
9811 *         jun1           ibty          isat          ioff
9812             460              0             0             0
9813 *         dxin          volin         alpin           tin           pin
9814        7.0880    4.1522        1.0000E+00    5.5200E+02    5.8681E+06
9815 *         pain         concin          rbmx          poff          belv
9816    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9817 *
9818 ************************************************************************
9819 *******   type            num            id        ctitle
9820 valve          465      465 $465$ sl-b safety relief valves
9821 *       ncells          nodes          jun1          jun2          epsw
9822              1              0           465           467    0.0000E+00
9823 *         ichf          iconc          ivty          ivps         nvtb2
```



```
9824              0              0              3              2              0
9825 *         ivtr           ivsv         nvtb1          nvsv          nvrf
9826             13           -488             0              0              0
9827 *       ivtrov         ivtyov
9828              0              0
9829 *         rvmx           rvov        fminov        fmaxov
9830    1.0000E+02    0.0000E+00    0.0000E+00    0.0000E+00
9831 *        radin             th         houtl         houtv         toutl
9832    3.1750E-02    5.0000E-01    0.0000E+00    0.0000E+00    0.0000E+00
9833 *        toutv          avlve         hvlve         favlve          xpos
9834    0.0000E+00     0.07456       0.10893    0.0           -1.0
9835 *
9836 * dx    *       f 1.0 e
9837 * vol   *     f 0.3728 e
9838 * fa    *   f 0.3728 e
9839 * fric  * f   1.0000e-06e
9840 * grav  * f   1.0000e+00e
9841 * hd    * f   1.0893e-01e
9842 * icflg * 0   1e
9843 * nff   * 1  -1e
9844 * alp   *     1.0000e+00e
9845 * vl    * f   0.0000e+00e
9846 * vv    * f   0.0000e+00e
9847 * tl    * f   565.7 e
9848 * tv    * f   565.7 e
9849 * p     * f   6.274e+06 e
9850 * pa    *     0.0000e+00e
9851 *
9852 ************************************************************************
9853 *******   type            num            id        ctitle
9854 break          467      467 $467$ sl-b srv boundary
9855 *         jun1           ibty          isat          ioff
9856             467              0             0             0
9857 *         dxin          volin         alpin           tin           pin
9858    0.1000E+00    0.3728        1.0000E+00    3.0540E+02    1.01323+05
9859 *         pain         concin          rbmx          poff          belv
9860    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9861 *
9862 ************************************************************************
9863 *******   type            num            id        ctitle
9864 valve          470      470 $470$ sl-b turbine bypass valves
9865 *       ncells          nodes          jun1          jun2          epsw
9866              1              0           470           472    0.0000E+00
9867 *         ichf          iconc          ivty          ivps         nvtb2
9868              0              0              3              2              0
9869 *         ivtr           ivsv         nvtb1          nvsv          nvrf
9870             12           -3488             0              0              0
9871 *       ivtrov         ivtyov
9872              0              0
9873 *         rvmx           rvov        fminov        fmaxov
9874    1.0000E+00    1.0000E+00    0.0000E+00    0.0000E+00
9875 *        radin             th         houtl         houtv         toutl
9876    3.1750E-02    5.0000E-01    0.0000E+00    0.0000E+00    0.0000E+00
9877 *        toutv          avlve         hvlve         favlve          xpos
9878    0.0000E+00     0.01864       0.10893    0.0           -1.0
9879 *
9880 * dx    *       f 1.0 e
9881 * vol   *     f 0.0932 e
9882 * fa    *   f 0.0932 e
9883 * fric  * f   1.0000e-06e
9884 * grav  * f   0.0000e+00e
9885 * hd    * f   1.0893e-01e
9886 * icflg * 0   1e
9887 * nff   * 1  -1e
9888 * alp   *     1.0000e+00e
9889 * vl    * f   0.0000e+00e
9890 * vv    * f   0.0000e+00e
9891 * tl    * f   565.7 e
9892 * tv    * f   565.7 e
9893 * p     * f   6.274e+06 e
9894 * pa    *     0.0000e+00e
9895 *
9896 ************************************************************************
```

```
9897 *******   type          num           id        ctitle
9898 break          472      472 $472$ sl-b tbv boundary
9899 *         jun1          ibty          isat          ioff
9900             472             0             0             0
9901 *         dxin         volin         alpin           tin           pin
9902     0.1000E+00    0.0932          1.0000E+00    3.0540E+02    1.01323+05
9903 *         pain        concin          rbmx          poff          belv
9904     0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
9905 *
9906 ************************************************************************
9907 * type       num          id          ctitle                        cd 1
9908 pipe         501      501 $501$ core bypass pipe 1
9909 *
9910 *  ncells    nodes        jun1        jun2        epsw              cd 2
9911    4          0           501         511         1.0e-05
9912 *  ichf      iconc        iacc        ipow                          cd 3
9913    0         0            0           0
9914 *  radin     th           houtl       houtv       toutl             cd 6
9915      0.0       0.0        0.0         0.0         0.0
9916 *  toutv     powin        powoff      rpowmx      powscl            cd 7
9917    0.0       0.0          0.0         1.0e20      1.0
9918 *   cell arrays
9919 * dx     *  1.4594  0.9729  0.7296  0.4865 e
9920 * vol    *  0.0766  0.0511  0.0383  0.0255 e
9921 * fa     *  f 0.0525 e
9922 * fric   *  f 0.00123 e
9923 * grav   *  f 1.0 e
9924 * hd     *  f 0.049 e
9925 * icflg  *  f 0 e
9926 * nff    *  f 1 e
9927 * alp    *  f 0.0 e
9928 * vl     *  f 0.0 e
9929 * vv     *  f 0.0 e
9930 * tl     *  f 579.0 e
9931 * tv     *  f 579.0 e
9932 * p      *  f 150.0e05 e
9933 * pa     *  f 0.0 e
9934 *
9935 ************************************************************************
9936 * type       num          id          ctitle                        cd 1
9937 pipe         502      502 $502$ core bypass pipe 2
9938 *
9939 *  ncells    nodes        jun1        jun2        epsw              cd 2
9940    4          0           502         512         1.0e-05
9941 *  ichf      iconc        iacc        ipow                          cd 3
9942    0         0            0           0
9943 *  radin     th           houtl       houtv       toutl             cd 6
9944      0.0       0.0        0.0         0.0         0.0
9945 *  toutv     powin        powoff      rpowmx      powscl            cd 7
9946    0.0       0.0          0.0         1.0e20      1.0
9947 *   cell arrays
9948 * dx     *  1.4594  0.9729  0.7296  0.4865 e
9949 * vol    *  0.0766  0.0511  0.0383  0.0255 e
9950 * fa     *  f 0.0525 e
9951 * fric   *  f 0.00123 e
9952 * grav   *  f 1.0 e
9953 * hd     *  f 0.049 e
9954 * icflg  *  f 0 e
9955 * nff    *  f 1 e
9956 * alp    *  f 0.0 e
9957 * vl     *  f 0.0 e
9958 * vv     *  f 0.0 e
9959 * tl     *  f 579.0 e
9960 * tv     *  f 579.0 e
9961 * p      *  f 150.0e05 e
9962 * pa     *  f 0.0 e
9963 *
9964 ************************************************************************
9965 * type       num          id          ctitle                        cd 1
9966 pipe         503      503 $503$ core bypass pipe 3
9967 *
9968 *  ncells    nodes        jun1        jun2        epsw              cd 2
9969    4          0           503         513         1.0e-05
```



```
9970 *  ichf      iconc        iacc        ipow                          cd 3
9971    0         0            0           0
9972 *  radin     th           houtl       houtv       toutl             cd 6
9973      0.0       0.0        0.0         0.0         0.0
9974 *  toutv     powin        powoff      rpowmx      powscl            cd 7
9975    0.0       0.0          0.0         1.0e20      1.0
9976 *   cell arrays
9977 * dx     *  1.4594  0.9729  0.7296  0.4865 e
9978 * vol    *  0.0766  0.0511  0.0383  0.0255 e
9979 * fa     *  f 0.0525 e
9980 * fric   *  f 0.00123 e
9981 * grav   *  f 1.0 e
9982 * hd     *  f 0.049 e
9983 * icflg  *  f 0 e
9984 * nff    *  f 1 e
9985 * alp    *  f 0.0 e
9986 * vl     *  f 0.0 e
9987 * vv     *  f 0.0 e
9988 * tl     *  f 579.0 e
9989 * tv     *  f 579.0 e
9990 * p      *  f 150.0e05 e
9991 * pa     *  f 0.0 e
9992 *
9993 ************************************************************************
9994 * type       num          id          ctitle                        cd 1
9995 pipe         504      504 $504$ core bypass pipe 4
9996 *
9997 *  ncells    nodes        jun1        jun2        epsw              cd 2
9998    4          0           504         514         1.0e-05
9999 *  ichf      iconc        iacc        ipow                          cd 3
10000   0         0            0           0
10001 *  radin     th           houtl       houtv       toutl             cd 6
10002     0.0       0.0        0.0         0.0         0.0
10003 *  toutv     powin        powoff      rpowmx      powscl            cd 7
10004   0.0       0.0          0.0         1.0e20      1.0
10005 *   cell arrays
10006 * dx     *  1.4594  0.9729  0.7296  0.4865 e
10007 * vol    *  0.0766  0.0511  0.0383  0.0255 e
10008 * fa     *  f 0.0525 e
10009 * fric   *  f 0.00123 e
10010 * grav   *  f 1.0 e
10011 * hd     *  f 0.049 e
10012 * icflg  *  f 0 e
10013 * nff    *  f 1 e
10014 * alp    *  f 0.0 e
10015 * vl     *  f 0.0 e
10016 * vv     *  f 0.0 e
10017 * tl     *  f 579.0 e
10018 * tv     *  f 579.0 e
10019 * p      *  f 150.0e05 e
10020 * pa     *  f 0.0 e
10021 *
10022 ************************************************************************
10023 * type       num          id          ctitle                        cd 1
10024 pipe         505      505 $505$ core bypass pipe 5
10025 *
10026 *  ncells    nodes        jun1        jun2        epsw              cd 2
10027   4          0           505         515         1.0e-05
10028 *  ichf      iconc        iacc        ipow                          cd 3
10029   0         0            0           0
10030 *  radin     th           houtl       houtv       toutl             cd 6
10031     0.0       0.0        0.0         0.0         0.0
10032 *  toutv     powin        powoff      rpowmx      powscl            cd 7
10033   0.0       0.0          0.0         1.0e20      1.0
10034 *   cell arrays
10035 * dx     *  1.4594  0.9729  0.7296  0.4865 e
10036 * vol    *  0.0766  0.0511  0.0383  0.0255 e
10037 * fa     *  f 0.0525 e
10038 * fric   *  f 0.00123 e
10039 * grav   *  f 1.0 e
10040 * hd     *  f 0.049 e
10041 * icflg  *  f 0 e
10042 * nff    *  f 1 e
```

```
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 579.0 e
* tv     *  f 579.0 e
* p      *  f 150.0e05 e
* pa     *  f 0.0 e
*
*************************************************************************
* type        num          id          ctitle                        cd 1
pipe          506      506 $506$ core bypass pipe 6
*
*  ncells     nodes        jun1        jun2        epsw              cd 2
   4           0            506         516        1.0e-05
*  ichf       iconc        iacc        ipow                          cd 3
   0          0            0           0
*  radin      th           houtl       houtv       toutl             cd 6
     0.0        0.0        0.0         0.0         0.0
*  toutv      powin        powoff      rpowmx      powscl            cd 7
   0.0        0.0          0.0         1.0e20      1.0
*   cell arrays
* dx     *  1.4594  0.9729  0.7296  0.4865 e
* vol    *  0.0766  0.0511  0.0383  0.0255 e
* fa     *  f 0.0525 e
* fric   *  f 0.00123 e
* grav   *  f 1.0 e
* hd     *  f 0.049 e
* icflg  *  f 0 e
* nff    *  f 1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 579.0 e
* tv     *  f 579.0 e
* p      *  f 150.0e05 e
* pa     *  f 0.0 e
*
*************************************************************************
*******   type          num          id          ctitle
break     730         730 $730$ condenser hotwell boundary
*
*  pressure boundary at 10342.1 Pa
*
*  jun1       ibty         isat        ioff                          cd 2
   731        0            0           0
*  dxin       volin        alpin       tin         pin               cd 5
  0.1909    2.12376       0.0         305.372     10342.1
*  pain       concin       rbmx        poff        belv              cd 6
   0.0        0.0          1.0e20      0.0         0.0
*
*************************************************************************
* type        num          id          ctitle                        cd 1
pump        734         734 $734$ hotwell pump
*
*   oconee pump curves input from relap deck
*
*   ncells     nodes      jun1       jun2       epsw                 cd 2
    10         0          731        735        1.0e-05
*   ichf       iconc      ipmpty     irp        ipm                  cd 3
    0          0          2          0          1
*   ipmptr     ipmpsv     npmptx     npmpsv     npmprf               cd 4
    25         0          0          0          0
*   radin      th         houtl      houtv      toutl                cd 6
    0.0          0.0      0.0         0.0         0.0
*   toutv      effmi                                                 cd 7
    0.0        77.6731
*   tfr0       tfr1       tfr2      tfr3       tfrb                  cd 8
    0.0        153.343    0.0       0.0        0.0
*   tfrl0      tfrl1     tfrl2      tfrl3
    0.0        0.0       0.0        0.0
*   rhead      rtork      rflow      rrho       romega               cd 12
    1494.53    5111.43    0.804691   999.552    123.569
*   omegan     omgoff     romgmx     omgscl     npmpsd               cd 13
```



```
      123.569   0.0   50.0  0.0
*   option                                                          cd 15
    0
*   ndata(1)  ndata(2)  ndata(3)  ndata(4)  ndata(5)
        7         6         2        2        7
*   ndata(6)  ndata(7)  ndata(8)  ndata(9)  ndata(10)
          6         2         2        2        6
*   ndata(11) ndata(12) ndata(13) ndata(14) ndata(15)
      2         2         2        6        2
*   ndata(16) nhdm      ntdm
      2        11        11
* hsp1  *  -1.000  1.236   0.0    1.236  s
* hsp1  *   0.2    1.225   0.4    1.202 s
* hsp1  *   0.6    1.157   0.8    1.056  s
* hsp1  *   1.0    1.0  e
* hsp2  *  0.0 -0.3     0.5 0.0 s
* hsp2  *   0.625 0.277  0.714 0.424 s
* hsp2  *  0.833 0.648  1.0 1.0 e
* hsp3  *   -1.0  1.236  0.0  0.75 e
* hsp4  *  -1.0  0.0  1.0  0.0 e
* repeat hsp1 - hsp4 for htp1 - htp4
* htp1  *  -1.000  1.236   0.0    1.236  s
* htp1  *   0.2    1.225   0.4    1.202 s
* htp1  *   0.6    1.157   0.8    1.056  s
* htp1  *   1.0    1.0  e
* htp2  *  0.0 -0.3     0.5 0.0 s
* htp2  *   0.625 0.277  0.714 0.424 s
* htp2  *  0.833 0.648  1.0 1.0 e
* htp3  *   -1.0  1.236  0.0  0.75 e
* htp4  *  -1.0  0.0  1.0  0.0 e
* tsp1  *  -1.0 1.0        1.0 1.0 e
* tsp2  *  0.0 -0.150   0.5 0.25  s
* tsp2  *   0.625 0.391  0.714 0.510 s
* tsp2  *  0.833 0.694  1.0 1.0  e
* tsp3  *  -1.0 1.0     0.0 0.75    e
* tsp4  *  -1.0  0.0  1.0  0.0 e
* repeat tsp1 - tps4 for ttp1 - ttp4
* ttp1  *  -1.0 1.0        1.0 1.0 e
* ttp2  *  0.0 -0.150   0.5 0.25  s
* ttp2  *   0.625 0.391  0.714 0.510 s
* ttp2  *  0.833 0.694  1.0 1.0  e
* ttp3  *  -1.0 1.0     0.0 0.75    e
* ttp4  *  -1.0  0.0  1.0  0.0 e
* hdm   *  0.0 0.0      0.100 0.000 s
* hdm   *    0.150 0.050  0.240 0.800 s
* hdm   *  0.300 0.960  0.400 0.980 s
* hdm   *   0.600 0.970  0.800 0.900 s
* hdm   *  0.900 0.800  0.960 0.500  s
* hdm   *   1.000 0.000 e
* tdm   *  0.0 0.0      0.100 0.000 s
* tdm   *    0.150 0.050  0.240 0.800 s
* tdm   *  0.300 0.960  0.400 0.980 s
* tdm   *  0.600 0.970  0.800 0.900 s
* tdm   *  0.900 0.800  0.960 0.500 s
* tdm   *    1.000 0.000 e
*
* dx    * 1.909  f 9.0142 e
* vol   * f 2.12376 e
* fa    * 2.356  f 0.2356 e
* fric  *  1.0e-06  r2 0.0  f  0.12999 e
* grav  * f 0.0 e
* hd    * 1.732  f 0.5477 e
* icflg * f 0 e
* nff   * 0 f 1 e
* alp   * f 0.0 e
* vl    * f 0.0 e
* vv    * f 0.0 e
* tl    * f 305.223 e
* tv    * f 305.223 e
* p     *   f 7.5e05 e
* pa    * f 0.0 e
*
*************************************************************************
```

```
10189 *  type      num         id          ctitle                        cd 1
10190 pipe      736         736 $736$ demineralization system
10191 *
10192 *  ncells    nodes       jun1        jun2        epsw              cd 2
10193    20        0           735         737         1.0e-05
10194 *  ichf      iconc       iacc        ipow                          cd 3
10195    0         0           0           0
10196 *  radin     th          houtl       houtv       toutl             cd 6
10197    0.0       0.0         0.0         0.0         0.0
10198 *  toutv     powin       powoff      rpowmx      powscl            cd 7
10199    0.0       0.0         0.0         1.0e20      1.0
10200 *          cell arrays
10201 * dx    * f 9.014 e
10202 * vol   * f 2.124 e
10203 * fa    * f 0.2356 e
10204 * fric  *  f 0.12999 e
10205 * grav  * f 0.0 e
10206 * hd    * f 0.5477 e
10207 * icflg * f 0 e
10208 * nff   * f 1 e
10209 * alp   * f 0.0 e
10210 * vl    * f 0.0 e
10211 * vv    * f 0.0 e
10212 * tl    * r10 305.233 r10 307.98 e
10213 * tv    * r10 305.233 r10 307.98 e
10214 * p     * r10 1.0e06    r10 6.2e05   e
10215 * pa    * f 0.0 e
10216 *
10217 ************************************************************************
10218 *  type        num         id          ctitle                        cd 1
10219 pump       738         738 $738$  booster pump
10220 *
10221 *   oconee pump curves from relap deck
10222 *
10223 *   ncells    nodes     jun1      jun2      epsw                    cd 2
10224     10        0         737       739       1.0e-05
10225 *   ichf      iconc     ipmpty    irp       ipm                     cd 3
10226     0         0         2         0         1
10227 *   ipmptr    ipmpsv    npmptx    npmpsv    npmprf                  cd 4
10228     30        0         0         0         0
10229 *   radin     th        houtl     houtv     toutl                   cd 6
10230     0.0      0.0        0.0        0.0       0.0
10231 *   toutv     effmi                                                 cd 7
10232     0.0       77.6731
10233 *   tfr0      tfr1      tfr2      tfr3      tfrb                    cd 8
10234     0.0       95.5852   0.0       0.0       0.0
10235 *   tfrl0     tfrl1     tfrl2     tfrl3
10236     0.0       0.0       0.0       0.0
10237 *   rhead     rtork     rflow     rrho      romega                  cd 12
10238     2938.25   3186.17   0.805448  999.552   374.897
10239 *   omegan    omgoff    romgmx    omgscl    npmpsd                  cd 13
10240    374.897    0.0    50.0    1.0    0
10241 *   option                                                          cd 15
10242     0
10243 *   ndata(1)  ndata(2)  ndata(3)  ndata(4)  ndata(5)
10244     7         6         2         2         7
10245 *   ndata(6)  ndata(7)  ndata(8)  ndata(9)  ndata(10)
10246       6         2         2         2         6
10247 *   ndata(11) ndata(12) ndata(13) ndata(14) ndata(15)
10248       2         2         2         6         2
10249 *   ndata(16) nhdm      ntdm
10250       2         11        11
10251 * hsp1  * -1.000  1.068  s
10252 * hsp1  *   0.000  1.068   0.200  1.063 s
10253 * hsp1  *  0.400  1.058   0.600  1.047 s
10254 * hsp1  *   0.800  1.031   1.000  1.000 e
10255 * hsp2  *  0.000 -0.300   0.500  0.000 s
10256 * hsp2  *    0.625  0.288   0.714  0.430 s
10257 * hsp2  *  0.833  0.658   1.0    1.0  e
10258 * hsp3  * -1.0    1.236   0.0    0.750 e
10259 * hsp4  *  -1.0  0.0  1.0  0.0 e
10260 * repeat hsp1 - hsp4 for htp1 - htp4
10261 * htp1  * -1.000  1.068  s
```



```
10262 * htp1  *   0.000  1.068   0.200  1.063 s
10263 * htp1  *  0.400  1.058   0.600  1.047 s
10264 * htp1  *   0.800  1.031   1.000  1.000 e
10265 * htp2  *  0.000 -0.300   0.500  0.000 s
10266 * htp2  *    0.625  0.288   0.714  0.430 s
10267 * htp2  *  0.833  0.658   1.0    1.0  e
10268 * htp3  * -1.0    1.236   0.0    0.750 e
10269 * htp4  *  -1.0  0.0  1.0  0.0 e
10270 * tsp1  * -1.000  1.000   1.000  1.0 e
10271 * tsp2  *  0.000 -0.150   0.500  0.250 s
10272 * tsp2  *   0.625  0.391   0.714  0.510 s
10273 * tsp2  *  0.833  0.694   1.0    1.0 e
10274 * tsp3  * -1.0    1.0     0.0    0.75  e
10275 * tsp4  *  -1.0  0.0  1.0  0.0 e
10276 * repeat tsp1 - tsp4 for ttp1 - ttp4
10277 * ttp1  * -1.000  1.000   1.000  1.0 e
10278 * ttp2  *  0.000 -0.150   0.500  0.250 s
10279 * ttp2  *   0.625  0.391   0.714  0.510 s
10280 * ttp2  *  0.833  0.694   1.0    1.0 e
10281 * ttp3  * -1.0    1.0     0.0    0.75  e
10282 * ttp4  *  -1.0  0.0  1.0  0.0 e
10283 * hdm   *  0.000  0.000   0.100  0.000 s
10284 * hdm   *    0.150  0.050   0.240  0.800 s
10285 * hdm   *  0.300  0.960   0.400  0.980 s
10286 * hdm   *   0.600  0.970   0.800  0.900 s
10287 * hdm   *  0.900  0.800   0.960  0.500 s
10288 * hdm   *    1.000  0.000 e
10289 * tdm   *  0.000  0.000   0.100  0.000 s
10290 * tdm   *   0.150  0.050   0.240  0.800 s
10291 * tdm   *  0.300  0.960   0.400  0.980 s
10292 * tdm   *    0.600  0.970   0.800  0.900 s
10293 * tdm   *  0.900  0.800   0.960  0.500 s
10294 * tdm   *    1.000  0.000 e
10295 *
10296 * dx    * f 9.0142 e
10297 * vol   * f 2.12376 e
10298 * fa    * f 0.2356 e
10299 * fric  *  0.12999  r9 0.0  1.0e-06 e
10300 * grav  *  f 0.0 e
10301 * hd    * f 0.5477 e
10302 * icflg * f 0 e
10303 * nff   * f 1 e
10304 * alp   * f 0.0 e
10305 * vl    * f 0.0 e
10306 * vv    * f 0.0 e
10307 * tl    * f 307.674 e
10308 * tv    * f 307.674 e
10309 * p     *  6.2e05  f 2.1e06 e
10310 * pa    * f 0.0 e
10311 *
10312 ************************************************************************
10313 *  type      num         id          ctitle                        cd 1
10314 pipe         740         740 $740$ feedwater e and f lp heaters
10315 *
10316 *  ncells    nodes       jun1        jun2        epsw              cd 2
10317     20        0         739         741       1.0e-05
10318 *  ichf      iconc       iacc        ipow                          cd 3
10319     0         0           0           0
10320 *  radin     th          houtl       houtv       toutl             cd 6
10321  0.0         0.0         0.0         0.0         0.0
10322 *  toutv     powin       powoff      rpowmx      powscl            cd 7
10323     0.0       0.0         0.0         0.0         0.0
10324 *          cell arrays
10325 * dx    *    r10 17.02 r10 28.98 e
10326 * vol   *    r10 4.01  r10 3.007 e
10327 * fa    *    r11 0.2356 r09 0.1038 0.2356 e
10328 * fric  *  r20 1.0e-06  0.0478 e
10329 * grav  *    f 0.0 e
10330 * hd    *    r11 0.5477 r09 0.3635 0.5477 e
10331 * icflg *    f 0 e
10332 * nff   *    f 1 e
10333 * alp   *    f 0.0 e
10334 * vl    *    f 0.0 e
```

```
10335 * vv    *    f 0.0 e
10336 * tl    *  r10 320.0  r10 350.0 e
10337 * tv    *  r10 320.0  r10 350.0 e
10338 * p     *    r10 3.5e6 r10 3.3e6 e
10339 * pa    *    f 0.0 e
10340 *
10341 ************************************************************************
10342 *  type      num         id          ctitle                          cd 1
10343 fill         742         742 $742$ cond.drain to lp d heater
10344 *
10345 *  jun1      ifty        ioff                                        cd 2
10346    743       8           0
10347 *  iftr      ifsv        nftb        nfsv        nfrf
10348    70        1           -3          0           0
10349 *  twold     rfmx        concin      felv                            cd 4
10350    0.0     1.0e20       0.0         0.0
10351 *  dxin      volin       alpin       vlin        tlin                cd 5
10352    10.0    2.35602      0.0         0.0           372.03
10353 *  pin       pain        flowin      vvin        tvin                cd 6
10354  3.24053e6  0.0         64.42       0.0        372.03
10355 *
10356 * vmscl  vvscl
10357    1.0  1.0
10358 * vmtb *  0.0  64.42  5.0  0.000 s
10359 * vmtb *  10.0  0.000 e
10360 *
10361 ************************************************************************
10362 *  type        num         id          ctitle                          cd 1
10363 tee          746         746 $746$ feedwater lp d heater
10364 *
10365 * jcell      nodes       ichf        cost        epsw                cd 2
10366    1          0           1          0.0       1.0e-05
10367 * iconc1     ncell1      jun1        jun2        ipow1               cd 3
10368    0          10          741        747          0
10369 * radin1     th1         houtl1      houtv1      toutl1              cd 6
10370  0.0         0.0         0.0        0.0         0.0
10371 * toutv1     pwin1       pwoff1      rpwmx1      pwscl1              cd 7
10372   0.0        0.0         0.0        1.0e20       1.0
10373 * iconc2     ncell2      jun3        ipow2                           cd 9
10374    0          1           743        0
10375 * radin2     th2         houtl2      houtv2      toutl2              cd 12
10376  0.0         0.0         0.0        0.0         0.0
10377 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2              cd 13
10378   0.0        0.0         0.0        1.0e20       1.0
10379 *    main-cell arrays
10380 * dx    *  f 12.76 e
10381 * vol   *  f 3.00626 e
10382 * fa    *  f 0.2356 e
10383 * fric  *  f 0.0478 e
10384 * grav  *  f 0.0 e
10385 * hd    *  f 0.5477 e
10386 * icflg *  f 0 e
10387 * nff   *  f 1 e
10388 * alp   *  f 0.0 e
10389 * vl    *  f 0.0 e
10390 * vv    *  f 0.0 e
10391 * tl    *  f 400.0 e
10392 * tv    *  f 400.0 e
10393 * p     *  f 3.0e06 e
10394 * pa    *  f 0.0 e
10395 *    side-cell arrays
10396 * dx    *  f 1.0 e
10397 * vol   *  f 0.2356 e
10398 * fa    *  f 0.2356 e
10399 * fric  *  f 1.0e-06 e
10400 * grav  *  f -1.0 e
10401 * hd    *  f 0.5477 e
10402 * icflg *  f 0 e
10403 * nff   *  f 1 e
10404 * alp   *  f 0.0 e
10405 * vl    *  f 0.0 e
10406 * vv    *  f 0.0 e
10407 * tl    *  f 400.0 e
```



```
10408 * tv    *  f 400.0 e
10409 * p     *  f 3.0e06 e
10410 * pa    *  f 0.0 e
10411 *
10412 ************************************************************************
10413 *  type      num         id          ctitle                          cd 1
10414 fill         748         748 $748$ cond.drain to lp c heater
10415 *
10416 *  jun1      ifty        ioff                                        cd 2
10417    749       8           0
10418 *  iftr      ifsv        nftb        nfsv        nfrf
10419    70        1           -3          0           0
10420 *  twold     rfmx        concin      felv                            cd 4
10421    0.0     1.0e20       0.0         0.0
10422 *  dxin      volin       alpin       vlin        tlin                cd 5
10423    10.0    3.86662      0.0         0.0           430.49
10424 *  pin       pain        flowin      vvin        tvin                cd 6
10425  2.99922e6  0.0         534.18      0.0        430.49
10426 *
10427 * vmscl  vvscl
10428    1.0  1.0
10429 * vmtb *  0.0  534.18  5.0  0.0000 s
10430 * vmtb *  10.0  0.0000 e
10431 *
10432 ************************************************************************
10433 *  type        num         id          ctitle                          cd 1
10434 tee          750         750 $750$ feedwater lp c heater
10435 *
10436 *       models volume 1 of RELAP5 component 752
10437 *
10438 * jcell      nodes       ichf        cost        epsw                cd 2
10439    1          0           1          0.0       1.0e-05
10440 * iconc1     ncell1      jun1        jun2        ipow1               cd 3
10441    0          10          747        750          0
10442 * radin1     th1         houtl1      houtv1      toutl1              cd 6
10443  0.0         0.0         0.0        0.0         0.0
10444 * toutv1     pwin1       pwoff1      rpwmx1      pwscl1              cd 7
10445   0.0        0.0         0.0        1.0e20       1.0
10446 * iconc2     ncell2      jun3        ipow2                           cd 9
10447    0          1           749        0
10448 * radin2     th2         houtl2      houtv2      toutl2              cd 12
10449  0.0         0.0         0.0        0.0         0.0
10450 * toutv2     pwin2       pwoff2      rpwmx2      pwscl2              cd 13
10451   0.0        0.0         0.0        1.0e20       1.0
10452 *    main-cell arrays
10453 * dx    *  f 9.074 e
10454 * vol   *  f 3.50892 e
10455 * fa    *  0.2356  f 0.3867 e
10456 * fric  *  0.0478  f 0.0872 e
10457 * grav  *  f 0.0 e
10458 * hd    *  0.5477  f 0.7017 e
10459 * icflg *  f 0 e
10460 * nff   *  f 1 e
10461 * alp   *  f 0.0 e
10462 * vl    *  f 0.0 e
10463 * vv    *  f 0.0 e
10464 * tl    *  f 440.0 e
10465 * tv    *  f 440.0 e
10466 * p     *  f 2.8e6 e
10467 * pa    *  f 0.0 e
10468 *    side-cell arrays
10469 * dx    *  f 1.0 e
10470 * vol   *  f 0.3867 e
10471 * fa    *  f 0.3867 e
10472 * fric  *  f 1.0e-06 e
10473 * grav  *  f -1.0 e
10474 * hd    *  f 0.7017 e
10475 * icflg *  f 0 e
10476 * nff   *  f 1 e
10477 * alp   *  f 0.0 e
10478 * vl    *  f 0.0 e
10479 * vv    *  f 0.0 e
10480 * tl    *  f 430.5 e
```

```
* tv     *  f 430.5 e
* p      *  f 2.8e6 e
* pa     *  f 0.0 e
*
*************************************************************************
*  type        num          id          ctitle                      cd 1
tee          752         752 $752$ feedwater pump inlet header
*
*         models volume 2 of RELAP5 component 752
*
* jcell      nodes       ichf        cost        epsw                cd 2
  3          1            0.0         0.0        1.0e-05
* iconc1     ncell1      jun1        jun2        ipow1               cd 3
  0          5            754        760         0
* iqptr1        iqpsv1         nqptb1         nqpsv1         nqprf1
    0             0              0              0              0
* radin1     th1         houtl1      houtv1      toutl1              cd 6
  0.3508    0.0831     0.0         0.0         0.0
* toutv1     pwin1       pwoff1      rpwmx1      pwscl1              cd 7
  0.0        0.0         0.0         1.0e20      1.0
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
* iconc2     ncell2      jun3        ipow2                           cd 9
  0          5           750          0
*       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
             0             0             0             0             0
* radin2     th2         houtl2      houtv2      toutl2              cd 12
  0.3508    0.0831     0.0         0.0         0.0
* toutv2     pwin2       pwoff2      rpwmx2      pwscl2              cd 13
  0.0        0.0         0.0         1.0e20      1.0
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000E+00    0.0000E+00    0.0000E+00    0.0000E+00
*    main-cell arrays
* dx     *  f 8.565e
* vol    *  f 3.312e
* fa     *  0.3867  r4 0.3867  0.3867 e
* fric   *  f 1.0e-6 e
* grav   *  f 0.0 e
* hd     *  0.7017  r4 0.7017  0.7017 e
* icflg  *  f 0 e
* nff    *  f 1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 460.0 e
* tv     *  f 460.0 e
* p      *  f 2.6e06 e
* pa     *  f 0.0 e
* qppp   * f   0.0000E+00e
* matid  *  f              7e
* tw     * f   465.0 e
*    side-cell arrays
* dx     *  f 8.565 e
* vol    *  f 3.312 e
* fa     *  f 0.3867  e
* fric   *  r5 1.0e-06  0.0872 e
* grav   *  f 0.0 e
* hd     *  f 0.7017 e
* icflg  *  f 0 e
* nff    *  f 1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 460.0 e
* tv     *  f 460.0 e
* p      *  f 2.6e06 e
* pa     *  f 0.0 e
* qppp   * f   0.0000E+00e
* matid  *  f              7e
* tw     * f   460.0 e
*
*************************************************************************
*  type        num          id          ctitle                      cd 1
```



```
pump        754          754 $754$  mfw a pump
*
*   oconee pump curves input from relap deck
*
*   ncells     nodes      jun1       jun2       epsw                cd 2
    10         0          754        756        1.0e-05
*   ichf       iconc      ipmpty     irp        ipm                 cd 3
    0          0          2          0          1
*   ipmptr     ipmpsv     npmptx     npmpsv     npmprf              cd 4
    35         0          0          0          0
*   radin      th         houtl      houtv      toutl               cd 6
    0.0        0.0        0.0         0.0        0.0
*   toutv      effmi                                                cd 7
    0.0        77.6731
*   tfr0       tfr1       tfr2       tfr3       tfrb                cd 8
    0.0        298.958    0.0        0.0        0.0
*   tfr10      tfr11      tfr12      tfr13
    0.0        0.0        0.0        0.0
*   rhead      rtork      rflow      rrho       romega              cd 12
    6934.64    9965.26    0.785955   999.552    523.599
*   omegan     omgoff     romgmx     omgscl     npmpsd              cd 13
    490.4       0.0        50.0      0.0        -2920
*   option                                                          cd 15
    0
*   ndata(1)   ndata(2)   ndata(3)   ndata(4)   ndata(5)
        7          6          2          2          7
*   ndata(6)   ndata(7)   ndata(8)   ndata(9)   ndata(10)
          6          2          2          2          6
*   ndata(11)  ndata(12)  ndata(13)  ndata(14)  ndata(15)
      2          2          2          6          2
*   ndata(16)  nhdm       ntdm
        2        11         11
* hsp1   *  -1.0  1.207  0.0  1.207 s
* hsp1   *  0.2  1.099  0.4  1.052 s
* hsp1   *  0.6  1.043  0.8  1.030 s
* hsp1   *  1.0  1.0 e
* hsp2   *  0.0  -0.3  0.5  0.0 s
* hsp2   *  0.625  0.286  0.714  0.422 s
* hsp2   *  0.833  0.638  1.0  1.0  e
* hsp3   *  -1.0  1.236  0.0  0.75 e
* hsp4   *  -1.0  0.0  1.0  0.0 e
* repeat hsp1 - hsp4 for htp1 - htp4
* htp1   *  -1.0  1.207  0.0  1.207 s
* htp1   *  0.2  1.099  0.4  1.052 s
* htp1   *  0.6  1.043  0.8  1.030 s
* htp1   *  1.0  1.0 e
* htp2   *  0.0  -0.3  0.5  0.0 s
* htp2   *  0.625  0.286  0.714  0.422 s
* htp2   *  0.833  0.638  1.0  1.0  e
* htp3   *  -1.0  1.236  0.0  0.75 e
* htp4   *  -1.0  0.0  1.0  0.0 e
* tsp1   *  -1.0  1.0  1.0  1.0 e
* tsp2   *  0.0  -0.5  0.5  0.25 s
* tsp2   *  0.625  0.391  0.714  0.510 s
* tsp2   *  0.833  0.694  1.0  1.0 e
* tsp3   *  -1.0  1.0  0.0  0.75 e
* tsp4   *  -1.0  0.0  1.0  0.0 e
* repeat tsp1 - tps4 for ttp1 - ttp4
* ttp1   *  -1.0  1.0  1.0  1.0 e
* ttp2   *  0.0  -0.5  0.5  0.25 s
* ttp2   *  0.625  0.391  0.714  0.510 s
* ttp2   *  0.833  0.694  1.0  1.0 e
* ttp3   *  -1.0  1.0  0.0  0.75 e
* ttp4   *  -1.0  0.0  1.0  0.0 e
* hdm    *  0.0 0.0      0.100 0.000 s
* hdm    *    0.150 0.050  0.240 0.800 s
* hdm    *  0.300 0.960  0.400 0.980 s
* hdm    *   0.600 0.970  0.800 0.900 s
* hdm    *  0.900 0.800  0.960 0.500  s
* hdm    *   1.000 0.000 e
* tdm    *  0.0 0.0      0.100 0.000 s
* tdm    *    0.150 0.050  0.240 0.800 s
* tdm    *  0.300 0.960  0.400 0.980 s
```

```
* tdm    *  0.600 0.970  0.800 0.900 s
* tdm    *  0.900 0.800  0.960 0.500 s
* tdm    *    1.000 0.000 e
*
* dx     * 6.9857  f 16.5089  e
* vol    * r10 1.71317 e
* fa     *  0.3867  f 0.103773 e
* fric   *  1.0e-06  r2 0.0  f 0.01234 e
* grav   * f 0.0 e
* hd     * 0.7017  f 0.3635 e
* icflg  * f 0 e
* nff    *  1  r9 -1  1 e
* alp    * f 0.0 e
* vl     * f 0.0 e
* vv     * f 0.0 e
* tl     * f 470.0 e
* tv     * f 470.0 e
* p      *  2.6e06  f 7.6e06 e
* pa     * f 0.0 e
*
*************************************************************************
* type       num          id          ctitle                        cd 1
valve         756       756 $756$ mfw pump a check valve
*        ncells          nodes          jun1          jun2          epsw
               3              0           756           763    0.0000E+00
*          ichf          iconc          ivty          ivps         nvtb2
               0              0             3             3             0
*          ivtr           ivsv         nvtbl          nvsv          nvrf
            -756              1            -2             0             0
*        ivtrov         ivtyov
               0              0
*          rvmx           rvov        fminov        fmaxov
     4.0000E+00     4.0000E+00    0.0000E+00    0.0000E+00
*         radin             th         houtl         houtv         toutl
     0.0            0.0           0.0000E+00    0.0000E+00    0.0000E+00
*         toutv          avlve         hvlve         favlve          xpos
     0.0000E+00     0.2356        0.5477        0.0           0.0
*
* dx     *  r3 12.7 e
* vol    *  r3 2.992 e
* fa     *  0.103773  f 0.2356 e
* fric   * r2 0.01234  0.06  0.01234 e
* grav   *  f 0.0 e
* hd     *  0.3635   f 0.5477 e
* icflg  *  f 0 e
* nff    *  1  r2 -1  1 e
* alp    *  f 0.0 e
* vl     *  f 0.0 e
* vv     *  f 0.0 e
* tl     *  f 470.0 e
* tv     *  f 470.0 e
* p      *  f 7.3e06 e
* pa     *  f 0.0 e
*
* vtbl   *  0.0  0.0  0.5  1.0 e
*
*************************************************************************
*  type       num          id          ctitle                        cd 1
pump         760         760 $760$  mfw b pump
*
*   oconee pump curves input from relap deck
*
*   ncells     nodes      jun1       jun2       epsw                  cd 2
    10         0          760        761        1.0e-05
*   ichf       iconc      ipmpty     irp        ipm                   cd 3
    0          0          2          0          1
*   ipmptr     ipmpsv     npmptx     npmpsv     npmprf                cd 4
    36         0          0          0          0
*   radin      th         houtl      houtv      toutl                 cd 6
    0.0        0.0        0.0         0.0        0.0
*   toutv      effmi                                                  cd 7
    0.0        77.6731
*   tfr0       tfr1       tfr2       tfr3       tfrb                  cd 8
```



```
    0.0        298.958    0.0        0.0        0.0
*   tfrl0      tfrl1      tfrl2      tfrl3
    0.0        0.0        0.0        0.0
*   rhead      rtork      rflow      rrho       romega                cd 12
    6934.64    9965.26    0.785955   999.552    523.599
*   omegan     omgoff     romgmx     omgscl     npmpsd                cd 13
    490.4       0.0        50.0      0.0        -2920
*   option                                                            cd 15
    0
*   ndata(1)   ndata(2)   ndata(3)   ndata(4)   ndata(5)
        7          6          2          2          7
*   ndata(6)   ndata(7)   ndata(8)   ndata(9)   ndata(10)
        6          2          2          2          6
*   ndata(11)  ndata(12)  ndata(13)  ndata(14)  ndata(15)
        2          2          2          6          2
*   ndata(16)  nhdm       ntdm
        2          11         11
* hsp1   *  -1.0  1.207  0.0  1.207 s
* hsp1   *  0.2  1.099  0.4  1.052 s
* hsp1   *  0.6  1.043  0.8  1.030 s
* hsp1   *  1.0  1.0 e
* hsp2   *  0.0  -0.3  0.5  0.0 s
* hsp2   *  0.625  0.286  0.714  0.422 s
* hsp2   *  0.833  0.638  1.0  1.0  e
* hsp3   *  -1.0  1.236  0.0  0.75 e
* hsp4   *  -1.0  0.0  1.0  0.0 e
* repeat hsp1 - hsp4 for htp1 - htp4
* htp1   *  -1.0  1.207  0.0  1.207 s
* htp1   *  0.2  1.099  0.4  1.052 s
* htp1   *  0.6  1.043  0.8  1.030 s
* htp1   *  1.0  1.0 e
* htp2   *  0.0  -0.3  0.5  0.0 s
* htp2   *  0.625  0.286  0.714  0.422 s
* htp2   *  0.833  0.638  1.0  1.0  e
* htp3   *  -1.0  1.236  0.0  0.75 e
* htp4   *  -1.0  0.0  1.0  0.0 e
* tsp1   *  -1.0  1.0  1.0  1.0 e
* tsp2   *  0.0  -0.5  0.5  0.25 s
* tsp2   *  0.625  0.391  0.714  0.510 s
* tsp2   *  0.833  0.694  1.0  1.0 e
* tsp3   *  -1.0  1.0  0.0  0.75 e
* tsp4   *  -1.0  0.0  1.0  0.0 e
* repeat tsp1 - tps4 for ttp1 - ttp4
* ttp1   *  -1.0  1.0  1.0  1.0 e
* ttp2   *  0.0  -0.5  0.5  0.25 s
* ttp2   *  0.625  0.391  0.714  0.510 s
* ttp2   *  0.833  0.694  1.0  1.0 e
* ttp3   *  -1.0  1.0  0.0  0.75 e
* ttp4   *  -1.0  0.0  1.0  0.0 e
* hdm    *  0.0 0.0      0.100 0.000 s
* hdm    *    0.150 0.050  0.240 0.800 s
* hdm    *  0.300 0.960  0.400 0.980 s
* hdm    *   0.600 0.970  0.800 0.900 s
* hdm    *  0.900 0.800  0.960 0.500  s
* hdm    *   1.000 0.000 e
* tdm    *  0.0 0.0      0.100 0.000 s
* tdm    *    0.150 0.050  0.240 0.800 s
* tdm    *  0.300 0.960  0.400 0.980 s
* tdm    *  0.600 0.970  0.800 0.900 s
* tdm    *  0.900 0.800  0.960 0.500 s
* tdm    *    1.000 0.000 e
*
* dx     * 6.9857  f 16.5089  e
* vol    * r10 1.71317 e
* fa     *  0.3867  f 0.103773 e
* fric   *  1.0e-06  r2 0.0  f 0.01234 e
* grav   * f 0.0 e
* hd     * 0.7017  f 0.3635 e
* icflg  * f 0 e
* nff    *  1  r9 -1  1 e
* alp    * f 0.0 e
* vl     * f 0.0 e
* vv     * f 0.0 e
```

```
10773 * tl     * f 470.0 e
10774 * tv     * f 470.0 e
10775 * p      *  2.6e06  f 7.6e06 e
10776 * pa     * f 0.0 e
10777 *
10778 ************************************************************************
10779 * type       num          id          ctitle                      cd 1
10780 valve         761       761 $761$ mfw pump b check valve
10781 *       ncells          nodes          jun1          jun2          epsw
10782                3              0           761           762    0.0000E+00
10783 *         ichf          iconc          ivty          ivps         nvtb2
10784                0              0             3             3             0
10785 *         ivtr           ivsv         nvtb1          nvsv          nvrf
10786            -761              1            -2             0             0
10787 *       ivtrov         ivtyov
10788                0              0
10789 *         rvmx           rvov        fminov        fmaxov
10790     4.0000E+00     4.0000E+00    0.0000E+00    0.0000E+00
10791 *        radin             th         houtl         houtv         toutl
10792     0.0            0.0            0.0000E+00    0.0000E+00    0.0000E+00
10793 *        toutv          avlve         hvlve         favlve          xpos
10794     0.0000E+00     0.2356         0.5477        0.0           0.0
10795 *
10796 * dx     *  r3 12.7 e
10797 * vol    *  r3 2.992 e
10798 * fa     *  0.103773  f 0.2356 e
10799 * fric   * r2 0.01234  0.06  0.01234 e
10800 * grav   *  f 0.0 e
10801 * hd     *  0.3635   f 0.5477 e
10802 * icflg  *  f 0 e
10803 * nff    *  1  r2 -1  1 e
10804 * alp    *  f 0.0 e
10805 * vl     *  f 0.0 e
10806 * vv     *  f 0.0 e
10807 * tl     *  f 470.0 e
10808 * tv     *  f 470.0 e
10809 * p      *  f 7.3e06 e
10810 * pa     *  f 0.0 e
10811 *
10812 * vtbl   *  0.0  0.0  0.5  1.0 e
10813 *
10814 ************************************************************************
10815 * type       num          id          ctitle                      cd 1
10816 plenum       763          763 $763$ feedwater pump outlet header
10817 *
10818 *  add more model information here
10819 *
10820 * npljn      iconc        juns1       juns2                       cd 2
10821 4             0           2           2
10822 *  array cards  *
10823 * junj   *  763  762 764  766 e
10824 * dx     *  f 15.54 e
10825 * vol    *  f 15.54 e
10826 * grav   *  f 0.0 e
10827 * alp    *  f 0.0 e
10828 * tl     *  f 470.0 e
10829 * tv     *  f 470.0 e
10830 * p      *  f 7.2e06 e
10831 * pa     *  f 0.0 e
10832 *
10833 ************************************************************************
10834 *  type       num          id          ctitle                      cd 1
10835 pipe         764          764 $764$  a & b hp heater pipe 1
10836 *
10837 *  add more model information here
10838 *
10839 *  ncells     nodes        jun1        jun2        epsw            cd 2
10840      20         0           764         768        1.0e-05
10841 *  ichf       iconc        iacc        ipow                        cd 3
10842    1          0            0           0
10843 *  radin      th           houtl       houtv       toutl           cd 6
10844     0.0       0.0           0.0         0.0         0.0
10845 *  toutv      powin        powoff      rpowmx      powscl          cd 7
```



```
10846    0.0        0.0          0.0          1.0e20       1.0
10847 *            cell arrays
10848 * dx     *    r10 7.293 r10 5.979 e
10849 * vol    *    r10 1.718 r10 1.409 e
10850 * fa     *    f 0.2356 e
10851 * fric   *    f 0.072 e
10852 * grav   *    f 0.0 e
10853 * hd     *    f 0.5477 e
10854 * icflg  *    f 0 e
10855 * nff    *    f 1 e
10856 * alp    *    f 0. e
10857 * vl     *    f 0. e
10858 * vv     *    f 0. e
10859 * tl     *    f 480.0 e
10860 * tv     *    f 480.0 e
10861 * p      *    f 7.2e06 e
10862 * pa     *    f 0.0 e
10863 ************************************************************************
10864 *  type       num          id          ctitle                      cd 1
10865 pipe         766          766 $766$  a & b hp heater pipe 2
10866 *
10867 *  add more model information here
10868 *
10869 *  ncells     nodes        jun1        jun2        epsw            cd 2
10870      20         0           766         769        1.0e-05
10871 *  ichf       iconc        iacc        ipow                        cd 3
10872    1          0            0           0
10873 *  radin      th           houtl       houtv       toutl           cd 6
10874     0.0       0.0           0.0         0.0         0.0
10875 *  toutv      powin        powoff      rpowmx      powscl          cd 7
10876    0.0        0.0          0.0         1.0e20      1.0
10877 *            cell arrays
10878 * dx     *    r10 7.378 r10 6.243 e
10879 * vol    *    r10 1.738 r10 1.471 e
10880 * fa     *    f 0.2356 e
10881 * fric   *    f 0.072 e
10882 * grav   *    f 0.0 e
10883 * hd     *    f 0.5477 e
10884 * icflg  *    f 0 e
10885 * nff    *    f 1 e
10886 * alp    *    f 0. e
10887 * vl     *    f 0. e
10888 * vv     *    f 0. e
10889 * tl     *    f 480.0 e
10890 * tv     *    f 480.0 e
10891 * p      *    f 7.2e06 e
10892 * pa     *    f 0.0 e
10893 ************************************************************************
10894 * type       num          id          ctitle                      cd 1
10895 plenum       768          768 $768$ hp heater outlet header
10896 *
10897 *  add more model information here
10898 *
10899 * npljn      iconc        juns1       juns2                       cd 2
10900   6           0           2           4
10901 *  array cards  *
10902 * junj   *  768  769 s
10903 * junj   *   770  772 774 776  e
10904 * dx     *  f 7.8516 e
10905 * vol    *  f 7.8516 e
10906 * grav   *  f 0.0 e
10907 * alp    *  f 0.0 e
10908 * tl     *  f 510.9 e
10909 * tv     *  f 510.9 e
10910 * p      *  f 7.0e06 e
10911 * pa     *  f 0.0 e
10912 *
10913 ************************************************************************
10914 * type       num          id          ctitle                      cd 1
10915 valve        770          770 $770$  sg a mfw control valve
10916 *
10917 *  add more model information here
10918 *
```

```
10919 * ncells     nodes       jun1        jun2        epsw          cd 2
10920   2          0           770         779         1.0e-05
10921 * ichf       iconc       ivty        ivps        nvtb2         cd 3
10922   1          0           3           2           0
10923 * ivtr       ivsv        nvtb1       nvsv        nvrf          cd 4
10924   12        -2830        0           0           0
10925 * ivtrov     ivtyov                                            cd 6
10926   0          0
10927 * rvmx       rvov        fminov      fmaxov                    cd 7
10928   0.25       0.25        0.0         1.0
10929 * radin      th          houtl       houtv       toutl         cd 8
10930     0.0        0.0       0.0         0.0         0.0
10931 * toutv      avlve       hvlve       favlve      xpos          cd 9
10932   0.0     0.1649    0.4582    0.0    0.0
10933 *
10934 *    cell arrays
10935 * dx    *  f 5.0 e
10936 * vol   *  f 1.178 e
10937 * fa    *  f 0.2356 e
10938 * fric  *  1.0e-06  0.849  1.0e-06 e
10939 * grav  *  f 0.0 e
10940 * hd    *  f 0.5477 e
10941 * icflg *  f 0 e
10942 * nff   *  1  1  1 e
10943 * alp   *  f 0.0 e
10944 * vl    *  f 0.0 e
10945 * vv    *  f 0.0 e
10946 * tl    *  f 510.9 e
10947 * tv    *  f 510.9 e
10948 * p     *  f 7.0e06 e
10949 * pa    *  f 0.0 e
10950 *
10951 *
10952 ************************************************************************
10953 * type       num         id          ctitle                    cd 1
10954 valve        772         772 $772$  sg a mfw startup valve
10955 *
10956 *  add more model information here
10957 *
10958 * ncells     nodes       jun1        jun2        epsw          cd 2
10959   2          0           772         780         1.0e-05
10960 * ichf       iconc       ivty        ivps        nvtb2         cd 3
10961   1          0           3           2           0
10962 * ivtr       ivsv        nvtb1       nvsv        nvrf          cd 4
10963   12        -2820        0           0           0
10964 * ivtrov     ivtyov                                            cd 6
10965   0          0
10966 * rvmx       rvov        fminov      fmaxov                    cd 7
10967   0.25       0.25        0.0         1.0
10968 * radin      th          houtl       houtv       toutl         cd 8
10969     0.0        0.0       0.0         0.0         0.0
10970 * toutv      avlve       hvlve       favlve      xpos          cd 9
10971   0.0     0.07267    0.3042    1.0    1.0
10972 *
10973 *    cell arrays
10974 * dx    *  f 5.0 e
10975 * vol   *  f 0.5191 e
10976 * fa    *  f 0.10382 e
10977 * fric  *  1.0e-06  7.007  1.0e-06 e
10978 * grav  *  f 0.0 e
10979 * hd    *  f 0.3636 e
10980 * icflg *  f 0 e
10981 * nff   *  1  1  1 e
10982 * alp   *  f 0.0 e
10983 * vl    *  f 0.0 e
10984 * vv    *  f 0.0 e
10985 * tl    *  f 510.9 e
10986 * tv    *  f 510.9 e
10987 * p     *  f 7.0e06 e
10988 * pa    *  f 0.0 e
10989 *
10990 ************************************************************************
10991 * type       num         id          ctitle                    cd 1
```



```
10992 valve        774         774 $774$  sg b mfw control valve
10993 *
10994 *  add more model information here
10995 *
10996 * ncells     nodes       jun1        jun2        epsw          cd 2
10997   2          0           774         782         1.0e-05
10998 * ichf       iconc       ivty        ivps        nvtb2         cd 3
10999   1          0           3           2           0
11000 * ivtr       ivsv        nvtb1       nvsv        nvrf          cd 4
11001   12        -2680       0            0           0
11002 * ivtrov     ivtyov                                            cd 6
11003   0          0
11004 * rvmx       rvov        fminov      fmaxov                    cd 7
11005   0.25       0.25        0.0         1.0
11006 * radin      th          houtl       houtv       toutl         cd 8
11007     0.0        0.0       0.0         0.0         0.0
11008 * toutv      avlve       hvlve       favlve      xpos          cd 9
11009   0.0     0.1649    0.4582    0.0    0.0
11010 *
11011 *    cell arrays
11012 * dx    *  f 5.0 e
11013 * vol   *  f 1.178 e
11014 * fa    *  f 0.2356 e
11015 * fric  *  1.0e-06  0.849  1.0e-06 e
11016 * grav  *  f 0.0 e
11017 * hd    *  f 0.5477 e
11018 * icflg *  f 0 e
11019 * nff   *  1  1  1 e
11020 * alp   *  f 0.0 e
11021 * vl    *  f 0.0 e
11022 * vv    *  f 0.0 e
11023 * tl    *  f 510.9 e
11024 * tv    *  f 510.9 e
11025 * p     *  f 7.0e06 e
11026 * pa    *  f 0.0 e
11027 *
11028 ************************************************************************
11029 * type       num         id          ctitle                    cd 1
11030 valve        776         776 $776$  sg b mfw startup valve
11031 *
11032 *  add more model information here
11033 *
11034 * ncells     nodes       jun1        jun2        epsw          cd 2
11035   2          0           776         783         1.0e-05
11036 * ichf       iconc       ivty        ivps        nvtb2         cd 3
11037   1          0           3           2           0
11038 * ivtr       ivsv        nvtb1       nvsv        nvrf          cd 4
11039   12        -2670        0           0           0
11040 * ivtrov     ivtyov                                            cd 6
11041   0          0
11042 * rvmx       rvov        fminov      fmaxov                    cd 7
11043   0.25       0.25        0.0         1.0
11044 * radin      th          houtl       houtv       toutl         cd 8
11045     0.0        0.0       0.0         0.0         0.0
11046 * toutv      avlve       hvlve       favlve      xpos          cd 9
11047   0.0     0.07267    0.3042    1.0    1.0
11048 *
11049 *    cell arrays
11050 * dx    *  f 5.0 e
11051 * vol   *  f 0.5191 e
11052 * fa    *  f 0.10382 e
11053 * fric  *  1.0e-06  7.007  1.0e-06 e
11054 * grav  *  f 0.0 e
11055 * hd    *  f 0.3636 e
11056 * icflg *  f 0 e
11057 * nff   *  1  1  1 e
11058 * alp   *  f 0.0 e
11059 * vl    *  f 0.0 e
11060 * vv    *  f 0.0 e
11061 * tl    *  f 510.9 e
11062 * tv    *  f 510.9 e
11063 * p     *  f 7.0e06 e
11064 * pa    *  f 0.0 e
```

```
11065 *
11066 ************************************************************************
11067 * type       num         id          ctitle                      cd 1
11068 plenum       780         780 $780$ fw-a cv header
11069 *
11070 *   Plenum component 780 for Oconee was prepared by James Han on 4/27/00.
11071 *
11072 * npljn      iconc       juns1       juns2                       cd 2
11073     4          0           2           2
11074 *  array cards  *
11075 * junj  *  779  780  784  147 e
11076 * dx    *  f 11.804 e
11077 * vol   *  f 11.804 e
11078 * grav  *  f 0.0 e
11079 * alp   *  f 0.0 e
11080 * tl    *  f 510.9 e
11081 * tv    *  f 510.9 e
11082 * p     *  f 6.6e06 e
11083 * pa    *  f 0.0 e
11084 *
11085 ************************************************************************
11086 * type       num         id          ctitle                      cd 1
11087 plenum       782         782 $782$ fw-b cv header
11088 *
11089 *   Plenum component 782 for Oconee was prepared by James Han on 4/27/00.
11090 *
11091 * npljn      iconc       juns1       juns2                       cd 2
11092     4          0           2           2
11093 *  array cards  *
11094 * junj  *  782 783 786 247 e
11095 * dx    *  f 6.62 e
11096 * vol   *  f 6.62 e
11097 * grav  *  f 0.0 e
11098 * alp   *  f 0.0 e
11099 * tl    *  f 510.9 e
11100 * tv    *  f 510.9 e
11101 * p     *  f 6.6e06 e
11102 * pa    *  f 0.0 e
11103 *
11104 ************************************************************************
11105 * type       num         id          ctitle                      cd 1
11106 valve        784         784 $784$ fw-a isolation valve
11107 *
11108 *   This Valve Component 784 for Oconee was prepared by James Han on 4/27/00.
11109 *
11110 * ncells     nodes       jun1        jun2        epsw            cd 2
11111    2          0          784         788         1.0e-05
11112 * ichf       iconc       ivty        ivps        nvtb2           cd 3
11113   1          0           4           2           0
11114 * ivtr       ivsv        nvtb1       nvsv        nvrf            cd 4
11115    50         1         -2           0           0
11116 * ivtrov     ivtyov                                              cd 6
11117   0          0
11118 * rvmx       rvov        fminov      fmaxov                      cd 7
11119   1.0        1.0         0.0         1.0
11120 * radin      th          houtl       houtv       toutl           cd 8
11121   0.0        0.0         0.0         0.0         0.0
11122 * toutv      avlve       hvlve       favlve      xpos            cd 9
11123   0.0          0.2356     0.5477     1.0       1.0
11124 *
11125 *    cell arrays
11126 * dx    *  f 5.0 e
11127 * vol   *  f 1.178 e
11128 * fa    *  f 0.2356 e
11129 * fric  *  f 1.0e-06
11130 * grav  *  f 0.0 e
11131 * hd    *  f 0.5477 e
11132 * icflg *  f 0 e
11133 * nff   *  1  -1  1 e
11134 * alp   *  f 0.0 e
11135 * vl    *  f 0.0 e
11136 * vv    *  f 0.0 e
11137 * tl    *  f 510.9 e
```



```
11138 * tv    *  f 510.9 e
11139 * p     *  f 6.6e06 e
11140 * pa    *  f 0.0 e
11141 *
11142 * vtb1  *  0.0  1.0  10.0  0.0 e
11143 *
11144 ************************************************************************
11145 * type       num         id          ctitle                      cd 1
11146 valve        786         786 $786$ fw-b isolation valve
11147 *
11148 *   This Valve Component 786 for Oconee was prepared by James Han on 4/27/00.
11149 *
11150 * ncells     nodes       jun1        jun2        epsw            cd 2
11151    2          0          786         790         1.0e-05
11152 * ichf       iconc       ivty        ivps        nvtb2           cd 3
11153   1          0           4           2           0
11154 * ivtr       ivsv        nvtb1       nvsv        nvrf            cd 4
11155    50         1         -2           0           0
11156 * ivtrov     ivtyov                                              cd 6
11157   0          0
11158 * rvmx       rvov        fminov      fmaxov                      cd 7
11159   1.0        1.0         0.0         1.0
11160 * radin      th          houtl       houtv       toutl           cd 8
11161   0.0        0.0         0.0         0.0         0.0
11162 * toutv      avlve       hvlve       favlve      xpos            cd 9
11163   0.0          0.2356     0.5477     1.0       1.0
11164 *
11165 *    cell arrays
11166 * dx    *  f 5.0 e
11167 * vol   *  f 1.178 e
11168 * fa    *  f 0.2356 e
11169 * fric  *  f 1.0e-06
11170 * grav  *  f 0.0 e
11171 * hd    *  f 0.5477 e
11172 * icflg *  f 0 e
11173 * nff   *  1  -1  1 e
11174 * alp   *  f 0.0 e
11175 * vl    *  f 0.0 e
11176 * vv    *  f 0.0 e
11177 * tl    *  f 510.9 e
11178 * tv    *  f 510.9 e
11179 * p     *  f 6.6e06 e
11180 * pa    *  f 0.0 e
11181 *
11182 * vtb1  *  0.0  1.0  10.0  0.0 e
11183 *
11184 ************************************************************************
11185 *  type      num         id          ctitle                      cd 1
11186 pipe         788         788 $788$ sg a feedwater inlet line
11187 *
11188 *   Pipe Component 788 for Oconee was prepared by James Han on 4/27/00.
11189 *
11190 *  ncells    nodes       jun1        jun2        epsw            cd 2
11191     18         0          788         789         1.0e-05
11192 *  ichf      iconc       iacc        ipow                        cd 3
11193    1          0           0           0
11194 *  radin     th          houtl       houtv       toutl           cd 6
11195       0.0      0.0       0.0         0.0         0.0
11196 *  toutv     powin       powoff      rpowmx      powscl          cd 7
11197    0.0        0.0         0.0         1.0e20      1.0
11198 *           cell arrays
11199 * dx    *  r6 6.01  r4 6.01 s
11200 * dx    *  r4 5.81  2.37  r2 6.36  2.37 e
11201 * vol   *  r6 1.416  r4 1.416 s
11202 * vol   *  r4 0.4599  0.1876  r2 0.5034  0.1876 e
11203 * fa    *  r6 0.2356  r4 0.2356  r8 0.079153  0.1500 e
11204 * fric  *  f 1.e-6 e
11205 * grav  *  r15 0.0  r3 1.0  0.0 e
11206 * hd    *  r6 0.5477  r4 0.5477  r8 0.3175  0.100 e
11207 * icflg *  f 0 e
11208 * nff   *  f 1 e
11209 * alp   *  f 0.0 e
11210 * vl    *  f 0.0 e
```

```
11211 * vv    *  f 0.0 e
11212 * tl    *  f 510.9 e
11213 * tv    *  f 510.9 e
11214 * p     *  f 6.6e06 e
11215 * pa    *  f 0.0 e
11216 *
11217 ************************************************************************
11218 * type       num         id          ctitle                        cd 1
11219 valve         789      789 $789$ mfw line a check valve
11220 *       ncells         nodes          jun1          jun2           epsw
11221              2             0           789            70    0.0000E+00
11222 *         ichf         iconc          ivty          ivps          nvtb2
11223              0             0             3             2              0
11224 *         ivtr          ivsv         nvtb1          nvsv           nvrf
11225            -789             1            -2             0              0
11226 *       ivtrov        ivtyov
11227              0             0
11228 *         rvmx          rvov        fminov        fmaxov
11229    4.0000E+00    4.0000E+00    0.0000E+00    0.0000E+00
11230 *         radin            th         houtl         houtv         toutl
11231    0.0           0.0           0.0000E+00    0.0000E+00    0.0000E+00
11232 *         toutv         avlve         hvlve         favlve          xpos
11233    0.0000E+00    0.1500        0.1000        0.0000E+00    0.0000E+00
11234 *
11235 * dx    *  f 2.50 e
11236 * vol   *  f 0.375 e
11237 * fa    *  f 0.1500 e
11238 * fric  *  1.0e-06  0.025  1.0e-06 e
11239 * grav  *  f 0.0 e
11240 * hd    *  f 0.100 e
11241 * icflg *  f 0 e
11242 * nff   *  1  -1  1 e
11243 * alp   *  f 0.0 e
11244 * vl    *  f 0.0 e
11245 * vv    *  f 0.0 e
11246 * tl    *  f 510.9 e
11247 * tv    *  f 510.9 e
11248 * p     *  f 6.6e06 e
11249 * pa    *  f 0.0 e
11250 *
11251 * vtbl  *  0.0  0.0  0.5  1.0 e
11252 *
11253 ************************************************************************
11254 *  type       num         id          ctitle                        cd 1
11255 pipe          790         790 $790$ sb b feedwater inlet line
11256 *
11257 *  Pipe Component 790 was prepared for Oconee by James Han on 4/27/00.
11258 *
11259 *  ncells     nodes       jun1        jun2        epsw            cd 2
11260    10          0         790         791          1.0e-05
11261 *  ichf       iconc       iacc        ipow                        cd 3
11262    1          0           0           0
11263 *  radin      th          houtl       houtv       toutl           cd 6
11264    0.0        0.0          0.0         0.0         0.0
11265 *  toutv      powin       powoff      rpowmx      powscl          cd 7
11266    0.0        0.0         0.0         1.0e20      1.0
11267 *          cell arrays
11268 * dx    *  r4 4.955  r2 5.335  2.37  r2 6.36  2.37 e
11269 * vol   *  r4 1.1674  r2 1.2569  0.1876  r2 0.5034  0.1876 e
11270 * fa    *  r4 0.2356  r2 0.2356  r4 0.079153  0.1500 e
11271 * fric  * f 1.e-6 e
11272 * grav  *  r7 0.0  r3 1.0  0.0 e
11273 * hd    * r4 0.5477  r2 0.5477  r4 0.3175  0.100 e
11274 * icflg * f 0 e
11275 * nff   * f 1 e
11276 * alp   * f 0.0 e
11277 * vl    * f 0.0 e
11278 * vv    * f 0.0 e
11279 * tl    *  f 510.9 e
11280 * tv    *  f 510.9 e
11281 * p     *  f 6.6e06 e
11282 * pa    * f 0.0 e
11283 *
```



```
11284 ************************************************************************
11285 * type       num         id          ctitle                        cd 1
11286 valve         791      791 $791$ mfw line b check valve
11287 *       ncells         nodes          jun1          jun2           epsw
11288              2             0           791            60    0.0000E+00
11289 *         ichf         iconc          ivty          ivps          nvtb2
11290              0             0             3             2              0
11291 *         ivtr          ivsv         nvtb1          nvsv           nvrf
11292            -791             1            -2             0              0
11293 *       ivtrov        ivtyov
11294              0             0
11295 *         rvmx          rvov        fminov        fmaxov
11296    4.0000E+00    4.0000E+00    0.0000E+00    0.0000E+00
11297 *         radin            th         houtl         houtv         toutl
11298    0.0           0.0           0.0000E+00    0.0000E+00    0.0000E+00
11299 *         toutv         avlve         hvlve         favlve          xpos
11300    0.0000E+00    0.1500        0.1000        0.0000E+00    0.0000E+00
11301 *
11302 * dx    *  f 2.50 e
11303 * vol   *  f 0.375 e
11304 * fa    *  f 0.1500 e
11305 * fric  *  1.0e-06  0.025  1.0e-06 e
11306 * grav  *  f 0.0 e
11307 * hd    *  f 0.100 e
11308 * icflg *  f 0 e
11309 * nff   *  1  -1  1 e
11310 * alp   *  f 0.0 e
11311 * vl    *  f 0.0 e
11312 * vv    *  f 0.0 e
11313 * tl    *  f 510.9 e
11314 * tv    *  f 510.9 e
11315 * p     *  f 6.6e06 e
11316 * pa    *  f 0.0 e
11317 *
11318 * vtbl  *  0.0  0.0  0.5  1.0 e
11319 *
11320 ************************************************************************
11321 * type       num         id          ctitle                        cd 1
11322 rod           900      900 $900$ reactor-core fuel rods
11323 *         ncrx          ncrz          ittc          iext           m1d
11324              6             4             0             0             0
11325 *       nopowr         nridr         modez        liqlev        iaxcnd
11326              0             0             0             1             1
11327 *        idbci         idbco          hdri          hdro
11328              0             2    0.0000e+00    0.0000e+00
11329 *        nrods         nodes         irftr         nzmax        irftr2
11330             12             8             0            50             0
11331 *     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
11332    1.0000e+01    7.5000e+01    5.0000e-03    6.0000e+03    0.0000e+00
11333 *       irpwty         ndgx          ndhx          nrts         nhist
11334              4             6          *11* 69         10         *0* 1
11335 *         q235         q239          q238          qavg         r239pf
11336        192.9         198.5         193.9        200.37           0.6   *from updated tm
      i-mslb deck
11337 *       fisphi          rans         fp235         fp238
11338            1.0           1.0          0.98          0.01  * from updated tmi-mslb
      deck
11339 *       irpwtr        irpwsv        nrpwtb        nrpwsv        nrpwrf
11340             40             1            -3             0             0
11341 *       izpwtr        izpwsv        nzpwtb        nzpwsv        nzpwrf
11342              0             1             1             0             0
11343 *        nmwrx         nfci         nfcil
11344              1             1             1
11345 *        nzpwz         nzpwi        nfbpwt
11346              0             0             0
11347 *        react         tneut        rpwoff        rrpwmx        rpwscl
11348    0.0000e+00    1.6250e-05   -1.0000e+20    1.0000e+10    1.0000e+00
11349 *       rpowri        zpwin        zpwoff        rzpwmx
11350    2.5680e+09    1.0000e+00   -1.0000e+20    1.0000e+10
11351 *       extsou         pldr         pdrat        fucrac
11352    0.0000e+00    0.0000e+00    1.3000e+00    7.0000e-01
11353 *
11354 * nhcomo* f            99e
```

```
11355 * nhcelo*  -2  2  3  4  5 s
11356 * nhcelo*  6 e
11357 *    z  *  2.4628E+00  3.9222E+00  4.8951E+00  5.6247E+00  6.1112E+00e
11358 * grav  * f   1.0000e+00e
11359 * idrod   *  1  2  3  4  5 s
11360 * idrod   *  6 e
11361 * rdx   * f   6.1360e+03e
11362 * radrd *     0.0000E+00    1.5000E-03    3.0000E-03    4.0000E-03    4.6570E-03
11363 * radrd *     4.7850E-03    5.0000E-03    5.4600E-03e
11364 * matrd * r04          1             3r02          2e
11365 * nfax  * f            4e
11366 * rftn  * f   5.7900e+02e
11367 * rftn  * f   5.7900e+02e
11368 * rftn  * f   5.7900e+02e
11369 * rftn  * f   5.7900e+02e
11370 * rftn  * f   5.7900e+02e
11371 * rftn  * f   5.7900e+02e
11372 * rftn  * f   5.7900e+02e
11373 * rftn  * f   5.7900e+02e
11374 * rftn  * f   5.7900e+02e
11375 * rftn  * f   5.7900e+02e
11376 * rftn  * f   5.7900e+02e
11377 * rftn  * f   5.7900e+02e
11378 * rdpwr * r05 1.0000e+00r03 0.0000e+00e
11379 * cpowr * f   1.0000e+00e
11380 * rpkf     *   f 2.260 e
11381 * zpwtb *     1.0000E+00    9.8000E-01    1.0900E+00    1.0700E+00    1.0000E+00
11382 * zpwtb *     8.0000E-01e
11383 * rpwtb * r02 0.0000E+00  1.0000E+00 -5.3600E-02  1.0000E+04 -5.3600E-02 e
11384 * beta  *     1.6900E-04    8.3200E-04    2.6400E-03    1.2200E-03    1.3800E-03
11385 * beta  *     2.4700E-04e
11386 * lamda *     3.8700E+00    1.4000E+00    3.1100E-01    1.1500E-01    3.1700E-02
11387 * lamda *     1.2700E-02e
11388 * cdgn  /     6.9011E+09    9.3915E+10    1.3415E+12    1.6765E+12    6.8796E+12
11389 * cdgn  /     3.0735E+12e
11390 * lamdh /     1.7720E+00    5.7740E-01    6.7430E-02    6.2140E-03    4.7390E-04
11391 * lamdh /     4.8100E-05    5.3440E-06    5.7260E-07    1.0360E-07    2.9590E-08
11392 * lamdh /     7.5850E-10e
11393 * edh   /     2.9900E-03    8.2500E-03    1.5500E-02    1.9350E-02    1.1650E-02
11394 * edh   /     6.4500E-03    2.3100E-03    1.6400E-03    8.5000E-04    4.3000E-04
11395 * edh   /     5.7000E-04e
11396 * cdhn  /     4.3331E+06    3.6692E+07    5.9030E+08    7.9966E+09    6.3130E+10
11397 * cdhn  /     3.4436E+11    1.1100E+12    7.3551E+12    2.1069E+13    3.7318E+13
11398 * cdhn  /     1.9298E+15e
11399 * fpuo2 * f   0.0000E+00e
11400 * ftd   * f   9.2500E-01e
11401 * gmix  *     1.0000E+00r06 0.0000E+00    1.0000E+00r06 0.0000E+00    1.0000E+00
11402 * gmix  * r06 0.0000E+00    1.0000E+00r06 0.0000E+00    1.0000E+00r06 0.0000E+00
11403 * gmix  *     1.0000E+00r06 0.0000E+00e
11404 * gmles * f   2.0000E-02e
11405 * pgapt * f   5.1670E+06e
11406 * plvol * f   2.0860E-05e
11407 * pslen * f   3.6576E+00e
11408 * clenn * f   3.9576E+00e
11409 * burn  * f 2662.0 e
11410 * burn  * f 2662.0 e
11411 * burn  * f 2662.0 e
11412 * burn  * f 2662.0 e
11413 * burn  * f 2662.0 e
11414 * burn  * f 2662.0 e
11415 * burn  * f 2662.0 e
11416 * burn  * f 2662.0 e
11417 * burn  * f 2662.0 e
11418 * burn  * f 2662.0 e
11419 * burn  * f 2662.0 e
11420 * burn  * f 2662.0 e
11421 ************************************************************************
11422 *******   type          num           id        ctitle
11423 slab        910        910 $910$ vessel level 1, cells 1-6
11424 *         ncrx          ncrz          ittc          iext           m1d
11425              6             1             0             0             0
11426 *       nopowr         nridr         modez         liqlev        iaxcnd
11427              1             1             1             0             0
```



```
11428 *        idbci         idbco          hdri          hdro
11429              0             2    0.0000e+00    0.0000e+00
11430 *        width        ipatch
11431       4.0604             0
11432 *        nrods         nodes         irftr         nzmax        irftr2
11433              6             1             0             5             0
11434 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
11435    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11436 *
11437 * nhcomo*  f          99e
11438 * nhcelo*  -1  1  2 e
11439 * dz    *  f 2.4628 e
11440 * grav  *  f 1.0000e+00e
11441 * idrod *  1  2  3  4  5 s
11442 * idrod *  6 e
11443 * rdx   *  f  1.0000e+00e
11444 * radrd *  f 0.0762 e
11445 * matrd *  f           6e
11446 * nfax  *  f           0e
11447 * rftn  *  f  565.0 e
11448 * rftn  *  f  565.0 e
11449 * rftn  *  f  565.0 e
11450 * rftn  *  f  565.0 e
11451 * rftn  *  f  565.0 e
11452 * rftn  *  f  565.0 e
11453 ************************************************************************
11454 *******   type          num           id        ctitle
11455 slab        911        911 $911$ vessel level 2, cells 1-6
11456 *         ncrx          ncrz          ittc          iext           m1d
11457              6             1             0             0             0
11458 *       nopowr         nridr         modez         liqlev        iaxcnd
11459              1             1             1             0             0
11460 *        idbci         idbco          hdri          hdro
11461              0             2    0.0000e+00    0.0000e+00
11462 *        width        ipatch
11463       3.3301             0
11464 *        nrods         nodes         irftr         nzmax        irftr2
11465              6             1             0             5             0
11466 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
11467    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11468 *
11469 * nhcomo*  f          99e
11470 * nhcelo*  -2  2  3 e
11471 * dz    *  f 1.4594 e
11472 * grav  *  f 1.0000e+00e
11473 * idrod *  1  2  3  4  5 s
11474 * idrod *  6 e
11475 * rdx   *  f  1.0000e+00e
11476 * radrd *  f 0.0381 e
11477 * matrd *  f           6e
11478 * nfax  *  f           0e
11479 * rftn  *  f  565.0 e
11480 * rftn  *  f  565.0 e
11481 * rftn  *  f  565.0 e
11482 * rftn  *  f  565.0 e
11483 * rftn  *  f  565.0 e
11484 * rftn  *  f  565.0 e
11485 ************************************************************************
11486 *******   type          num           id        ctitle
11487 slab        912        912 $912$ vessel levels 3-4, cells 1-6
11488 *         ncrx          ncrz          ittc          iext           m1d
11489              6             2             0             0             0
11490 *       nopowr         nridr         modez         liqlev        iaxcnd
11491              1             1             1             0             1
11492 *        idbci         idbco          hdri          hdro
11493              0             2    0.0000e+00    0.0000e+00
11494 *        width        ipatch
11495       2.0147             0
11496 *        nrods         nodes         irftr         nzmax        irftr2
11497              6             1             0             5             0
11498 *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
11499    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11500 *
```

```
* nhcomo*  f          99e
* nhcelo*  -3  3  4  5 e
* dz    *  0.9729  0.7296 e
* grav  *  f 1.0000e+00e
* idrod *  1  2  3  4  5 s
* idrod *  6 e
* rdx   *  f  1.0000e+00e
* radrd *  f 0.0381 e
* matrd *  f           6e
* nfax  *  f           0e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
**********************************************************************
*******   type            num            id        ctitle
slab        913         913 $913$ vessel level 5, cells 1-6
*         ncrx          ncrz          ittc          iext           m1d
             6             1             0             0             0
*       nopowr         nridr         modez        liqlev        iaxcnd
             1             1             1             0             0
*        idbci         idbco          hdri          hdro
             0             2    0.0000e+00    0.0000e+00
*        width        ipatch
        5.9815             0
*        nrods         nodes         irftr         nzmax        irftr2
             6             1             0             5             0
*     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
*
* nhcomo*  f          99e
* nhcelo*  -5  5  6 e
* dz    *  f 0.4865 e
* grav  *  f 1.0000e+00e
* idrod *  1  2  3  4  5 s
* idrod *  6 e
* rdx   *  f  1.0000e+00e
* radrd *  f 0.0381 e
* matrd *  f           6e
* nfax  *  f           0e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
**********************************************************************
*******   type            num            id        ctitle
slab        914         914 $914$ vessel levels 6-9, cells 1-6
*         ncrx          ncrz          ittc          iext           m1d
             6             4             0             0             0
*       nopowr         nridr         modez        liqlev        iaxcnd
             1             1             1             0             1
*        idbci         idbco          hdri          hdro
             0             2    0.0000e+00    0.0000e+00
*        width        ipatch
       10.9430             0
*        nrods         nodes         irftr         nzmax        irftr2
             6             1             0             9             0
*     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
*
* nhcomo*  f          99e
* nhcelo*  -6  6  7  8  9 s
* nhcelo*  10 e
* dz    *  0.5208  0.7110  0.5208  1.7526 e
* grav  *  f 1.0000e+00e
* idrod *  1  2  3  4  5 s
* idrod *  6 e
* rdx   *  f  1.0000e+00e
* radrd *  f 0.0180 e
```



```
* matrd *  f           6e
* nfax  *  f           0e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
**********************************************************************
*******   type            num            id        ctitle
slab        915         915 $915$ vessel level 10, cells 1-6
*         ncrx          ncrz          ittc          iext           m1d
             6             1             0             0             0
*       nopowr         nridr         modez        liqlev        iaxcnd
             1             1             1             0             0
*        idbci         idbco          hdri          hdro
             0             2    0.0000e+00    0.0000e+00
*        width        ipatch
       12.5530             0
*        nrods         nodes         irftr         nzmax        irftr2
             6             1             0             5             0
*     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
*
* nhcomo*  f          99e
* nhcelo*  -10  10  10 e
* dz    *  f 1.7526 e
* grav  *  f 1.0000e+00e
* idrod *  1  2  3  4  5 s
* idrod *  6 e
* rdx   *  f  1.0000e+00e
* radrd *  f 0.0264 e
* matrd *  f           6e
* nfax  *  f           0e
* rftn  *  f  585.0 e
* rftn  *  f  585.0 e
* rftn  *  f  585.0 e
* rftn  *  f  585.0 e
* rftn  *  f  585.0 e
* rftn  *  f  585.0 e
**********************************************************************
*******   type            num            id        ctitle
slab        916         916 $916$ vessel level 1, cells 7-12
*         ncrx          ncrz          ittc          iext           m1d
             6             1             0             0             0
*       nopowr         nridr         modez        liqlev        iaxcnd
             1             1             1             0             0
*        idbci         idbco          hdri          hdro
             0             2    0.0000e+00    0.0000e+00
*        width        ipatch
        2.6108             0
*        nrods         nodes         irftr         nzmax        irftr2
             6             5             0             5             0
*     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
*
* nhcomo*  f          99e
* nhcelo*  -1  1  2 e
* dz    *  f 2.4628 e
* grav  *  f 1.0000e+00e
* idrod *  7  8  9  10  11 s
* idrod *  12 e
* rdx   *  f  1.0000e+00e
* radrd *  i2 0.0  0.127  0.1426 e
* matrd *  r3 9        6e
* nfax  *  f           0e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
* rftn  *  f  565.0 e
**********************************************************************
```

```
11647 *******   type           num           id        ctitle
11648 slab        917        917 $917$ vessel levels 2-5, cells 7-12
11649 *         ncrx          ncrz          ittc          iext           m1d
11650             6             4             0             0             0
11651 *       nopowr         nridr         modez        liqlev        iaxcnd
11652             1             1             1             0             1
11653 *        idbci         idbco          hdri          hdro
11654             0             2    0.0000e+00    0.0000e+00
11655 *        width        ipatch
11656       4.290             0
11657 *        nrods         nodes         irftr         nzmax        irftr2
11658             6             5             0             9             0
11659 *     dxht(1)       dxht(2)        dznht         hgapo         shelv
11660    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11661 *
11662 * nhcomo*  f          99e
11663 * nhcelo*  -2  2  3  4  5 s
11664 * nhcelo*  6 e
11665 * dz    *  1.4594  0.9729  0.7296  0.4865 e
11666 * grav  *  f 1.0000e+00e
11667 * idrod *  7  8  9  10  11 s
11668 * idrod *  12 e
11669 * rdx   *  f  1.0000e+00e
11670 * radrd *  i2 0.0  0.2143  0.2299 e
11671 * matrd *  r3 9       6e
11672 * nfax  *  f           0e
11673 * rftn  *  f  565.0 e
11674 * rftn  *  f  565.0 e
11675 * rftn  *  f  565.0 e
11676 * rftn  *  f  565.0 e
11677 * rftn  *  f  565.0 e
11678 * rftn  *  f  565.0 e
11679 ************************************************************************
11680 *******   type           num           id        ctitle
11681 slab        918        918 $918$ vessel levels 6-9, cells 7-12
11682 *         ncrx          ncrz          ittc          iext           m1d
11683             6             4             0             0             0
11684 *       nopowr         nridr         modez        liqlev        iaxcnd
11685             1             1             1             0             1
11686 *        idbci         idbco          hdri          hdro
11687             0             2    0.0000e+00    0.0000e+00
11688 *        width        ipatch
11689       2.0710             0
11690 *        nrods         nodes         irftr         nzmax        irftr2
11691             6             5             0             9             0
11692 *     dxht(1)       dxht(2)        dznht         hgapo         shelv
11693    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11694 *
11695 * nhcomo*  f          99e
11696 * nhcelo*  -6  6  7  8  9 s
11697 * nhcelo*  10 e
11698 * dz    *  0.5208  0.7110  0.5208  1.7526 e
11699 * grav  *  f 1.0000e+00e
11700 * idrod *  7  8  9  10  11 s
11701 * idrod *  12 e
11702 * rdx   *  f  1.0000e+00e
11703 * radrd *  i2 0.0  0.294  0.3096 e
11704 * matrd *  r3 9       6e
11705 * nfax  *  f           0e
11706 * rftn  *  f  565.0 e
11707 * rftn  *  f  565.0 e
11708 * rftn  *  f  565.0 e
11709 * rftn  *  f  565.0 e
11710 * rftn  *  f  565.0 e
11711 * rftn  *  f  565.0 e
11712 ************************************************************************
11713 *******   type           num           id        ctitle
11714 slab        919        919 $919$ vessel level 10, cells 7-12
11715 *         ncrx          ncrz          ittc          iext           m1d
11716             6             1             0             0             0
11717 *       nopowr         nridr         modez        liqlev        iaxcnd
11718             1             1             1             0             0
11719 *        idbci         idbco          hdri          hdro
```



```
11720             0             2    0.0000e+00    0.0000e+00
11721 *        width        ipatch
11722       2.2823             0
11723 *        nrods         nodes         irftr         nzmax        irftr2
11724             6             5             0             5             0
11725 *     dxht(1)       dxht(2)        dznht         hgapo         shelv
11726    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11727 *
11728 * nhcomo*  f          99e
11729 * nhcelo*  -10  10  10 e
11730 * dz    *  f 1.7526 e
11731 * grav  *  f 1.0000e+00e
11732 * idrod *  7  8  9  10  11 s
11733 * idrod *  12 e
11734 * rdx   *  f  1.0000e+00e
11735 * radrd *  i2 0.0  0.127  0.1426 e
11736 * matrd *  r3 9       6e
11737 * nfax  *  f           0e
11738 * rftn  *  f  585.0 e
11739 * rftn  *  f  585.0 e
11740 * rftn  *  f  585.0 e
11741 * rftn  *  f  585.0 e
11742 * rftn  *  f  585.0 e
11743 * rftn  *  f  585.0 e
11744 ************************************************************************
11745 *  type       num          id          ctitle                      cd 1
11746 rod         930        930 $930$ sg-a tube bundle hs
11747 *         ncrx          ncrz          ittc          iext           m1d
11748             1            13             0             0             0
11749 *       nopowr         nridr         modez        liqlev        iaxcnd
11750             1             0             1             0             1
11751 *        idbci         idbco          hdri          hdro
11752             2             2       0.00000       0.00000
11753 *        nrods         nodes         irftr         nzmax        irftr2
11754             1             4             0            18             0
11755 *     dxht(1)       dxht(2)        dznht         hgapo         shelv
11756    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11757 *
11758 * nhcomi* f          12e
11759 * nhceli*  -2  2  3  4  5 s
11760 * nhceli*  6  7  8  9  10 s
11761 * nhceli*  11  12  13  14  15 e
11762 * nhcomo*  r12 121  r3 122 e
11763 * nhcelo*  -1  1  2  3  4 s
11764 * nhcelo*  5  6  7  8  9 s
11765 * nhcelo*  10  11  1  2  2 e
11766 * dz    *  0.05  0.10  0.20  0.40  1.015 s
11767 * dz    *  f 1.765 e
11768 * grav  *  f 1.0 e
11769 * rdx   *  16478.0 e
11770 * radrd *  i2  0.00707  0.00793 e
11771 * matrd * f          10 e
11772 * nfax  * f           0e
11773 * rftn  * f   5.4211e+02e
11774 ************************************************************************
11775 *  type        num         id      ctitle
11776 slab         931       931 $931$ sg-a outlet plenum hs
11777 *         ncrx          ncrz          ittc          iext           m1d
11778             1             1             0             0             0
11779 *       nopowr         nridr         modez        liqlev        iaxcnd
11780             1             0             1             0             0
11781 *        idbci         idbco          hdri          hdro
11782             2             1    0.0000e+00    0.0000e+00
11783 *        width        ipatch
11784       6.3074             0
11785 *          tlo           tvo           hlo           hvo
11786    2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11787 *        nrods         nodes         irftr         nzmax        irftr2
11788             1             4             0             3             0
11789 *     dxht(1)       dxht(2)        dznht         hgapo         shelv
11790    3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11791 *
11792 * nhcomi* f          12e
```

```
11793 * nhceli*  -1  1  2 e
11794 * dz    * f 2.42 e
11795 * grav  * f   1.0000e+00e
11796 * rdx   * f   1.0000e+00e
11797 * radrd *  i2  0.0  0.2079 e
11798 * matrd * f            9e
11799 * nfax  * f            0e
11800 * rftn  * f   5.4211e+02e
11801 ***********************************************************************
11802 *  type        num        id      ctitle
11803 slab         932      932 $932$ sg-a inlet plenum hs
11804 *         ncrx          ncrz          ittc          iext           m1d
11805             1             1             0             0             0
11806 *       nopowr         nridr         modez        liqlev        iaxcnd
11807             1             0             1             0             0
11808 *        idbci         idbco          hdri          hdro
11809             2             1    0.0000e+00    0.0000e+00
11810 *        width        ipatch
11811        6.2273             0
11812 *          tlo           tvo           hlo           hvo
11813     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11814 *        nrods         nodes        irftr         nzmax       irftr2
11815             1             4            0             3            0
11816 *     dtxht(1)      dtxht(2)        dznht         hgapo        shelv
11817     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11818 *
11819 * nhcomi* f           12e
11820 * nhceli*  -15  15  15 e
11821 * dz    * f 2.42 e
11822 * grav  * f   1.0000e+00e
11823 * rdx   * f   1.0000e+00e
11824 * radrd *  i2  0.0  0.2079 e
11825 * matrd * f            9e
11826 * nfax  * f            0e
11827 * rftn  * f   5.4211e+02e
11828 ***********************************************************************
11829 *******   type          num          id        ctitle
11830 rod          933      933 $933$ sg-a lower outer shell hs
11831 *         ncrx          ncrz          ittc          iext           m1d
11832             1             9             0             0             0
11833 *       nopowr         nridr         modez        liqlev        iaxcnd
11834             1             0             1             0             1
11835 *        idbci         idbco          hdri          hdro
11836             2             1    0.0000e+00    0.0000e+00
11837 *          tlo           tvo           hlo           hvo
11838     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11839 *        nrods         nodes        irftr         nzmax       irftr2
11840             1             4            0            10            0
11841 *     dtxht(1)      dtxht(2)        dznht         hgapo        shelv
11842     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11843 *
11844 * nhcomi*  f 123 e
11845 * nhceli*  -2  2  3  4  5 s
11846 * nhceli*  6  7  8  9  10 s
11847 * nhceli*  11 e
11848 * dz    *  r2 0.8825  r3 1.765 s
11849 * dz    *  1.015  0.4  0.2  0.1 e
11850 * grav  * f  -1.0000e+00e
11851 * rdx   * f   1.0000e+00e
11852 * radrd *  i2  1.751  1.85737 e
11853 * matrd * f            9e
11854 * nfax  * f            0e
11855 * rftn  * f   5.4211e+02e
11856 ***********************************************************************
11857 *******   type          num          id        ctitle
11858 rod          934      934 $934$ sg-a upper outer shell hs
11859 *         ncrx          ncrz          ittc          iext           m1d
11860             1             5             0             0             0
11861 *       nopowr         nridr         modez        liqlev        iaxcnd
11862             1             0             1             0             1
11863 *        idbci         idbco          hdri          hdro
11864             2             1    0.0000e+00    0.0000e+00
11865 *          tlo           tvo           hlo           hvo
```



```
11866     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11867 *        nrods         nodes        irftr         nzmax       irftr2
11868             1             4            0             6            0
11869 *     dtxht(1)      dtxht(2)        dznht         hgapo        shelv
11870     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11871 *
11872 * nhcomi*  f 124 e
11873 * nhceli*  -1  1  2  3  4 s
11874 * nhceli*  5  6 e
11875 * dz    *  r3  0.7  r2 1.765 e
11876 * grav  * f  -1.0000e+00e
11877 * rdx   * f   1.0000e+00e
11878 * radrd *  i2  1.751  1.85737 e
11879 * matrd * f            9e
11880 * nfax  * f            0e
11881 * rftn  * f   5.4211e+02e
11882 ***********************************************************************
11883 *  type       num          id          ctitle                      cd 1
11884 rod         940        940 $940$ sg-b tube bundle hs
11885 *         ncrx          ncrz          ittc          iext           m1d
11886             1            13             0             0             0
11887 *       nopowr         nridr         modez        liqlev        iaxcnd
11888             1             0             1             0             1
11889 *        idbci         idbco          hdri          hdro
11890             2             2       0.00000       0.00000
11891 *        nrods         nodes        irftr         nzmax       irftr2
11892             1             4            0            18            0
11893 *     dtxht(1)      dtxht(2)        dznht         hgapo        shelv
11894     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11895 *
11896 * nhcomi* f           2e
11897 * nhceli*  -2  2  3  4  5 s
11898 * nhceli*  6  7  8  9  10 s
11899 * nhceli*  11  12  13  14  15 e
11900 * nhcomo*  r12 201  r3 202 e
11901 * nhcelo*  -1  1  2  3  4 s
11902 * nhcelo*  5  6  7  8  9 s
11903 * nhcelo*  10  11  1  2  2 e
11904 * dz    *  0.05  0.10  0.20  0.40  1.015 s
11905 * dz    *  f 1.765 e
11906 * grav  *  f 1.0 e
11907 * rdx   *  16478.0 e
11908 * radrd *  i2  0.00707  0.00793 e
11909 * matrd * f           10 e
11910 * nfax  * f            0e
11911 * rftn  * f   5.4211e+02e
11912 ***********************************************************************
11913 *  type        num        id      ctitle
11914 slab         941      941 $941$ sg-b outlet plenum hs
11915 *         ncrx          ncrz          ittc          iext           m1d
11916             1             1             0             0             0
11917 *       nopowr         nridr         modez        liqlev        iaxcnd
11918             1             0             1             0             0
11919 *        idbci         idbco          hdri          hdro
11920             2             1    0.0000e+00    0.0000e+00
11921 *        width        ipatch
11922        6.3074             0
11923 *          tlo           tvo           hlo           hvo
11924     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11925 *        nrods         nodes        irftr         nzmax       irftr2
11926             1             4            0             3            0
11927 *     dtxht(1)      dtxht(2)        dznht         hgapo        shelv
11928     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11929 *
11930 * nhcomi* f           2e
11931 * nhceli*  -1  1  2 e
11932 * dz    * f 2.42 e
11933 * grav  * f   1.0000e+00e
11934 * rdx   * f   1.0000e+00e
11935 * radrd *  i2  0.0  0.2079 e
11936 * matrd * f            9e
11937 * nfax  * f            0e
11938 * rftn  * f   5.4211e+02e
```

```
11939 ***********************************************************************
11940 *  type        num        id      ctitle
11941 slab         942       942 $942$ sg-b inlet plenum hs
11942 *         ncrx          ncrz          ittc          iext           m1d
11943              1             1             0             0             0
11944 *       nopowr         nridr         modez        liqlev        iaxcnd
11945              1             0             1             0             0
11946 *        idbci         idbco          hdri          hdro
11947              2             1    0.0000e+00    0.0000e+00
11948 *        width        ipatch
11949       6.2273             0
11950 *          tlo           tvo           hlo           hvo
11951     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11952 *        nrods         nodes         irftr         nzmax        irftr2
11953              1             4             0             3             0
11954 *     dtxht(1)      dtxht(2)        dznht         hgapo          shelv
11955     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11956 *
11957 * nhcomi* f           2e
11958 * nhceli*  -15  15  15 e
11959 * dz    * f 2.42 e
11960 * grav  * f   1.0000e+00e
11961 * rdx   * f   1.0000e+00e
11962 * radrd *  i2  0.0  0.2079 e
11963 * matrd * f            9e
11964 * nfax  * f            0e
11965 * rftn  * f   5.4211e+02e
11966 ***********************************************************************
11967 *******   type           num           id        ctitle
11968 rod          943       943 $943$ sg-b lower outer shell hs
11969 *         ncrx          ncrz          ittc          iext           m1d
11970              1             9             0             0             0
11971 *       nopowr         nridr         modez        liqlev        iaxcnd
11972              1             0             1             0             1
11973 *        idbci         idbco          hdri          hdro
11974              2             1    0.0000e+00    0.0000e+00
11975 *          tlo           tvo           hlo           hvo
11976     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
11977 *        nrods         nodes         irftr         nzmax        irftr2
11978              1             4             0            10             0
11979 *     dtxht(1)      dtxht(2)        dznht         hgapo          shelv
11980     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
11981 *
11982 * nhcomi*  f 203 e
11983 * nhceli*  -2  2  3  4  5 s
11984 * nhceli*  6  7  8  9  10 s
11985 * nhceli*  11 e
11986 * dz    *  r2 0.8825  r3 1.765 s
11987 * dz    *  1.015  0.4  0.2  0.1 e
11988 * grav  * f  -1.0000e+00e
11989 * rdx   * f   1.0000e+00e
11990 * radrd *  i2  1.751  1.85737 e
11991 * matrd * f            9e
11992 * nfax  * f            0e
11993 * rftn  * f   5.4211e+02e
11994 ***********************************************************************
11995 *******   type           num           id        ctitle
11996 rod          944       944 $944$ sg-b upper outer shell hs
11997 *         ncrx          ncrz          ittc          iext           m1d
11998              1             5             0             0             0
11999 *       nopowr         nridr         modez        liqlev        iaxcnd
12000              1             0             1             0             1
12001 *        idbci         idbco          hdri          hdro
12002              2             1    0.0000e+00    0.0000e+00
12003 *          tlo           tvo           hlo           hvo
12004     2.9500e+02    2.9500e+02    0.0000e+00    5.8600e+00
12005 *        nrods         nodes         irftr         nzmax        irftr2
12006              1             4             0             6             0
12007 *     dtxht(1)      dtxht(2)        dznht         hgapo          shelv
12008     3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
12009 *
12010 * nhcomi*  f 204 e
12011 * nhceli*  -1  1  2  3  4 s
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12012 * nhceli*  5  6 e
12013 * dz    *  r3  0.7  r2 1.765 e
12014 * grav  * f  -1.0000e+00e
12015 * rdx   * f   1.0000e+00e
12016 * radrd *  i2  1.751  1.85737 e
12017 * matrd * f            9e
12018 * nfax  * f            0e
12019 * rftn  * f   5.4211e+02e
12020 *
12021 ***********************************************************************
12022 *  type        num        id        ctitle                        cd 1
12023 rod            950       950 $950$ c736 pipe wall, cells 1-10
12024 *
12025 *  models zero power into demineralization system
12026 *
12027 *  ncrx        ncrz        ittc        iext        m1d           cd 2
12028    1           10          0           0           0
12029 *  nopowr      nridr       modez       liqlev      iaxcnd        cd 3
12030    1           0           1           0           1
12031 *  idbci       idbco       hdri        hdro                      cd 4
12032    2           0           0.5477      0.0
12033 *  nrods       nodes       irftr       nzmax       irftr2        cd 12
12034    1           5             0         21          0
12035 *  dtxht(1)    dtxht(2)    dznht       hgapo       shelv         cd 13
12036    3.0         10.0        0.01        6000.0
12037 * nhcomi *   f 736 e
12038 * nhceli *  -1  1  2  3  4 s
12039 * nhceli *   5  6  7  8  9 s
12040 * nhceli *   10  10 e
12041 * dz     *   f 9.014 e
12042 * grav   *   f 0.0 e
12043 * rdx    *   f 1.0 e
12044 * radrd  *  i3  0.2738628  0.3328416 e
12045 * matrd  *   f 9 e
12046 * nfax   *   f 1 e
12047 * rftn   *   f 305.233 e
12048 *
12049 ***********************************************************************
12050 *  type      num         id          ctitle                      cd 1
12051 rod            951       951 $951$ c736 power, cells 11-20
12052 *
12053 *  models power into demineralization system
12054 *
12055 *  ncrx        ncrz        ittc        iext        m1d           cd 2
12056    1           10          0           0           0
12057 *  nopowr      nridr       modez       liqlev      iaxcnd        cd 3
12058    0           0           1           0           1
12059 *  idbci       idbco       hdri        hdro                      cd 4
12060    2           0           0.0         0.0
12061 *  nrods       nodes       irftr       nzmax       irftr2        cd 12
12062    1           5             0         21          0
12063 *  dtxht(1)    dtxht(2)    dznht       hgapo       shelv         cd 13
12064    3.0         10.0        0.01        6000.0
12065 *  irpwty      ndgx        ndhx        nrts        nhist         cd 14
12066    7           0           0           10          0
12067 *  irpwtr      irpwsv      nrpwtb      nrpwsv      nrpwrf        cd 17
12068      70            1        -2           0           0
12069 *  izpwtr      izpwsv      nzpwtb      nzpwsv      nzpwrf        cd 18
12070    0           1           1           0           0
12071 *  nmwrz       nfci        nfcil       ipwrad      ipwdep        cd 19
12072    0           0           0           0           0
12073 *  nzpwz       nzpwi       nfbpwt      nrpwr       nrpwi         cd 20
12074    0           0           0           0           0
12075 *  react       tneut       rpwoff      rrpwmx      rpwscl        cd 21
12076    0.0         0.0         -1.0e20     1.0e20      1.0
12077 *  rpowri      zpwin       zpwoff      rzpwmx                    cd 22
12078   11.1665e06  0.0         0.0         1.0e20
12079 *  extsou      pldr        pdrat       fucrac                    cd 23
12080    0.0         0.0         0.0         0.0
12081 * nhcomi *   f 736 e
12082 * nhceli *  -11 11 12 13 14 s
12083 * nhceli *   15 16 17 18 19 s
12084 * nhceli *   20 20 e
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12085 * dz      *   f 9.014 e
12086 * grav    *   f 0.0 e
12087 * rdx     *   f 10.83865 e
12088 * radrd   *  i3  0.2738628  0.3191256 e
12089 * matrd   *   f 9 e
12090 * nfax    *   f 1 e
12091 * rftn    *   f 307.98 e
12092 * rdpwr   *   f 1.0 e
12093 * cpowr   *   f 1.0 e
12094 * zpwtb   *  0.0  f 1.0 e
12095 * rpwtb   *  0.0  11.1665e06  0.5  0.0 e
12096 * fpuo2   *  f 0.0 e
12097 * ftd     *  f 1.0 e
12098 * gmix    *  f 0.0 e
12099 * gmles   *  f 0.0 e
12100 * pgapt   *  f 0.0 e
12101 * plvol   *  f 0.0 e
12102 * pslen   *  f 0.0 e
12103 * clenn   *  f 0.0 e
12104 * burn    *  f 0.0 e
12105 *
12106 ************************************************************************
12107 * type        num          id          ctitle                      cd 1
12108 rod             952          952 $952$ lp f heater power
12109 *
12110 * couples to component 740, cells 1-10
12111 *
12112 *  ncrx        ncrz        ittc        iext        m1d            cd 2
12113      1          10           0           0           0
12114 *  nopowr      nridr       modez       liqlev      iaxcnd         cd 3
12115      0           0           1           0           1
12116 *  idbci       idbco       hdri        hdro                       cd 4
12117      2           0         0.0         0.0
12118 *  nrods       nodes       irftr       nzmax       irftr2         cd 12
12119      1           5           0          21           0
12120 *  dtxht(1)    dtxht(2)    dznht       hgapo       shelv          cd 13
12121    3.0         10.0        0.01       6000.0        0.0
12122 *  irpwty      ndgx        ndhx        nrts        nhist          cd 14
12123      7           0           0          10           0
12124 *  irpwtr      irpwsv      nrpwtb      nrpwsv      nrpwrf         cd 17
12125     70           1          -2           0           0
12126 *  izpwtr      izpwsv      nzpwtb      nzpwsv      nzpwrf         cd 18
12127      0           1           1           0           0
12128 *  nmwrz       nfci        nfcil       ipwrad      ipwdep         cd 19
12129      0           0           0           0           0
12130 *  nzpwz       nzpwi       nfbpwt      nrpwr       nrpwi          cd 20
12131      0           0           0           0           0
12132 *  react       tneut       rpwoff      rrpwmx      rpwscl         cd 21
12133    0.0         0.0         0.0        1.0e20       1.0
12134 *  rpowri      zpwin       zpwoff      rzpwmx                     cd 22
12135   1.3834e08    0.0         0.0       1.0e20
12136 *  extsou      pldr        pdrat       fucrac                     cd 23
12137    0.0         0.0         0.0         0.0
12138 *  array input
12139 * nhcomi *  f 740 e
12140 * nhceli *  -1     1     2     3     4 s
12141 * nhceli *   5     6     7     8     9 s
12142 * nhceli *  10    10 e
12143 * dz      *  r10 17.02 e
12144 * grav    *  f 0.0 e
12145 * rdx     *  19.9847 e
12146 * radrd   *  i3  0.2738628  0.2759354 e
12147 * matrd   *  f 9 e
12148 * nfax    *  f 1 e
12149 * rftn    *  f 320.0 e
12150 * rdpwr   *  f 1.0 e
12151 * cpowr   *  f 1.0 e
12152 * zpwtb   *  0.0 f 1.0 e
12153 * rpwtb   *  0.0  1.3834e08  0.5  0.0 e
12154 * fpuo2   *  f 0.0 e
12155 * ftd     *  f 1.0 e
12156 * gmix    *  f 0.0 e
12157 * gmles   *  f 0.0 e
```



```
12158 * pgapt   *  f 0.0 e
12159 * plvol   *  f 0.0 e
12160 * pslen   *  f 0.0 e
12161 * clenn   *  f 0.0 e
12162 * burn    *  f 0.0 e
12163 *
12164 ************************************************************************
12165 *  type        num          id          ctitle                      cd 1
12166 rod             953        953 $953$ lp e heater power
12167 *
12168 * couples to component 740, cells 11-20
12169 *
12170 *  ncrx        ncrz        ittc        iext        m1d            cd 2
12171      1          10           0           0           0
12172 *  nopowr      nridr       modez       liqlev      iaxcnd         cd 3
12173      0           0           1           0           1
12174 *  idbci       idbco       hdri        hdro                       cd 4
12175      2           0         0.0         0.0
12176 *  nrods       nodes       irftr       nzmax       irftr2         cd 12
12177      1           5           0          21           0
12178 *  dtxht(1)    dtxht(2)    dznht       hgapo       shelv          cd 13
12179    3.0         10.0        0.01       6000.0        0.0
12180 *  irpwty      ndgx        ndhx        nrts        nhist          cd 14
12181      7           0           0          10           0
12182 *  irpwtr      irpwsv      nrpwtb      nrpwsv      nrpwrf         cd 17
12183     70           1          -2           0           0
12184 *  izpwtr      izpwsv      nzpwtb      nzpwsv      nzpwrf         cd 18
12185      0           1           1           0           0
12186 *  nmwrz       nfci        nfcil       ipwrad      ipwdep         cd 19
12187      0           0           0           0           0
12188 *  nzpwz       nzpwi       nfbpwt      nrpwr       nrpwi          cd 20
12189      0           0           0           0           0
12190 *  react       tneut       rpwoff      rrpwmx      rpwscl         cd 21
12191    0.0         0.0         0.0        1.0e20       1.0
12192 *  rpowri      zpwin       zpwoff      rzpwmx                     cd 22
12193   1.4994e08    0.0         0.0       1.0e20
12194 *  extsou      pldr        pdrat       fucrac                     cd 23
12195    0.0         0.0         0.0         0.0
12196 *  array input
12197 * nhcomi *  f 740 e
12198 * nhceli *  -11    11    12    13    14 s
12199 * nhceli *  15    16    17    18    19 s
12200 * nhceli *  20    20 e
12201 * dz      *  r10 28.98 e
12202 * grav    *  f 0.0 e
12203 * rdx     *  11.790 e
12204 * radrd   *  i3  0.1817522  0.1836725 e
12205 * matrd   *  f 9 e
12206 * nfax    *  f 1 e
12207 * rftn    *  f 350.0 e
12208 * rdpwr   *  f 1.0 e
12209 * cpowr   *  f 1.0 e
12210 * zpwtb   *  0.0 f 1.0 e
12211 * rpwtb   *   0.0  1.4994e08  0.5  0.0 e
12212 * fpuo2   *  f 0.0 e
12213 * ftd     *  f 1.0 e
12214 * gmix    *  f 0.0 e
12215 * gmles   *  f 0.0 e
12216 * pgapt   *  f 0.0 e
12217 * plvol   *  f 0.0 e
12218 * pslen   *  f 0.0 e
12219 * clenn   *  f 0.0 e
12220 * burn    *  f 0.0 e
12221 *
12222 ************************************************************************
12223 *  type        num          id          ctitle                      cd 1
12224 rod             954        954 $954$ lp d heater power
12225 *
12226 *          couples to component 746
12227 *
12228 *  ncrx        ncrz        ittc        iext        m1d            cd 2
12229      1          10           0           0           0
12230 *  nopowr      nridr       modez       liqlev      iaxcnd         cd 3
```

```
      0          0          1          0          1
*  idbci      idbco      hdri       hdro                        cd 4
     2          0        0.0        0.0
*  nrods      nodes      irftr      nzmax      irftr2           cd 12
     1          5          0         21          0
*  dtxht(1)   dtxht(2)   dznht      hgapo      shelv            cd 13
   3.0        10.0       0.01      6000.0       0.0
*  irpwty     ndgx       ndhx       nrts       nhist            cd 14
     7          0          0         10          0
*  irpwtr     irpwsv     nrpwtb     nrpwsv     nrpwrf           cd 17
    70          1         -2          0          0
*  izpwtr     izpwsv     nzpwtb     nzpwsv     nzpwrf           cd 18
     0          1          1          0          0
*  nmwrz      nfci       nfcil      ipwrad     ipwdep           cd 19
     0          0          0          0          0
*  nzpwz      nzpwi      nfbpwt     nrpwr      nrpwi            cd 20
     0          0          0          0          0
*  react      tneut      rpwoff     rrpwmx     rpwscl           cd 21
   0.0        0.0        0.0        1.0e20      1.0
*  rpowri     zpwin      zpwoff     rzpwmx                      cd 22
   1.6579e08  0.0        0.0       1.0e20
*  extsou     pldr       pdrat      fucrac                      cd 23
   0.0        0.0        0.0        0.0
*  array input
* nhcomi *  f 746 e
* nhceli *  -1     1     2     3     4 s
* nhceli *   5     6     7     8     9 s
* nhceli *  10    10 e
* dz     *  r10 12.76 e
* grav   *  f 0.0 e
* rdx    *  17.771 e
* radrd  *  i3  0.2738628  0.2756916 e
* matrd  *  f 9 e
* nfax   *  f 1 e
* rftn   *  f 400.0 e
* rdpwr  *  f 1.0 e
* cpowr  *  f 1.0 e
* zpwtb  *  0.0 f 1.0 e
* rpwtb  *   0.0  1.6579e08  0.5  0.0 e
* fpuo2  *  f 0.0 e
* ftd    *  f 1.0 e
* gmix   *  f 0.0 e
* gmles  *  f 0.0 e
* pgapt  *  f 0.0 e
* plvol  *  f 0.0 e
* pslen  *  f 0.0 e
* clenn  *  f 0.0 e
* burn   *  f 0.0 e
*
*************************************************************************
*  type       num          id          ctitle                      cd 1
rod            955          955 $955$ lp c heater power
*
*          couples to component 750, which is
*          volume 1 of RELAP5 component 752
*
*  ncrx       ncrz       ittc       iext       m1d              cd 2
     1         10          0          0          0
*  nopowr     nridr      modez      liqlev     iaxcnd           cd 3
     0          0          1          0          1
*  idbci      idbco      hdri       hdro                        cd 4
     2          0        0.0        0.0
*  nrods      nodes      irftr      nzmax      irftr2           cd 12
     1          5          0         21          0
*  dtxht(1)   dtxht(2)   dznht      hgapo      shelv            cd 13
   3.0        10.0       0.01      6000.0       0.0
*  irpwty     ndgx       ndhx       nrts       nhist            cd 14
     7          0          0         10          0
*  irpwtr     irpwsv     nrpwtb     nrpwsv     nrpwrf           cd 17
    70          1         -2          0          0
*  izpwtr     izpwsv     nzpwtb     nzpwsv     nzpwrf           cd 18
     0          1          1          0          0
*  nmwrz      nfci       nfcil      ipwrad     ipwdep           cd 19
```



```
      0          0          0          0          0
*  nzpwz      nzpwi      nfbpwt     nrpwr      nrpwi            cd 20
     0          0          0          0          0
*  react      tneut      rpwoff     rrpwmx     rpwscl           cd 21
   0.0        0.0        0.0        1.0e20      1.0
*  rpowri     zpwin      zpwoff     rzpwmx                      cd 22
   2.6805e08  0.0        0.0       1.0e20
*  extsou     pldr       pdrat      fucrac                      cd 23
   0.0        0.0        0.0        0.0
*  array input
* nhcomi *  f 750 e
* nhceli *  -1     1     2     3     4 s
* nhceli *   5     6     7     8     9 s
* nhceli *  10    10 e
* dz     *  r10 9.074 e
* grav   *  f 0.0 e
* rdx    *  19.50 e
* radrd  *  i3  0.3508248  0.3529584 e
* matrd  *  f 9 e
* nfax   *  f 1 e
* rftn   *  f 440.0 e
* rdpwr  *  f 1.0 e
* cpowr  *  f 1.0 e
* zpwtb  *  0.0 f 1.0 e
* rpwtb  *   0.0  2.6805e08  0.5  0.0 e
* fpuo2  *  f 0.0 e
* ftd    *  f 1.0 e
* gmix   *  f 0.0 e
* gmles  *  f 0.0 e
* pgapt  *  f 0.0 e
* plvol  *  f 0.0 e
* pslen  *  f 0.0 e
* clenn  *  f 0.0 e
* burn   *  f 0.0 e
*
*************************************************************************
*  type       num          id          ctitle                      cd 1
rod            956          956 $956$ hp heater a-1 power
*
*          couples to component 764, cells 1-10
*
*  ncrx       ncrz       ittc       iext       m1d              cd 2
     1         10          0          0          0
*  nopowr     nridr      modez      liqlev     iaxcnd           cd 3
     0          0          1          0          1
*  idbci      idbco      hdri       hdro                        cd 4
     2          0        0.0        0.0
*  nrods      nodes      irftr      nzmax      irftr2           cd 12
     1          5          0         21          0
*  dtxht(1)   dtxht(2)   dznht      hgapo      shelv            cd 13
   3.0        10.0       0.01      6000.0       0.0
*  irpwty     ndgx       ndhx       nrts       nhist            cd 14
     7          0          0         10          0
*  irpwtr     irpwsv     nrpwtb     nrpwsv     nrpwrf           cd 17
    70          1         -2          0          0
*  izpwtr     izpwsv     nzpwtb     nzpwsv     nzpwrf           cd 18
     0          1          1          0          0
*  nmwrz      nfci       nfcil      ipwrad     ipwdep           cd 19
     0          0          0          0          0
*  nzpwz      nzpwi      nfbpwt     nrpwr      nrpwi            cd 20
     0          0          0          0          0
*  react      tneut      rpwoff     rrpwmx     rpwscl           cd 21
   0.0        0.0        0.0        1.0e20      1.0
*  rpowri     zpwin      zpwoff     rzpwmx                      cd 22
   8.1163e07    0.0        0.0       1.0e20
*  extsou     pldr       pdrat      fucrac                      cd 23
   0.0        0.0        0.0        0.0
*  array input
* nhcomi *  f 764 e
* nhceli *  -1     1     2     3     4 s
* nhceli *   5     6     7     8     9 s
* nhceli *  10    10 e
* dz     *  r10 7.293 e
```

```
12377 * grav    *  f 0.0 e
12378 * rdx     *  16.2759 e
12379 * radrd   *  i3  0.2738628  0.2781943 e
12380 * matrd   *  f 9 e
12381 * nfax    *  f 1 e
12382 * rftn    *  f 480.0 e
12383 * rdpwr   *  f 1.0 e
12384 * cpowr   *  f 1.0 e
12385 * zpwtb   *  0.0 f 1.0 e
12386 * rpwtb   *   0.0  8.1163e07  0.5  0.0 e
12387 * fpuo2   *  f 0.0 e
12388 * ftd     *  f 1.0 e
12389 * gmix    *  f 0.0 e
12390 * gmles   *  f 0.0 e
12391 * pgapt   *  f 0.0 e
12392 * plvol   *  f 0.0 e
12393 * pslen   *  f 0.0 e
12394 * clenn   *  f 0.0 e
12395 * burn    *  f 0.0 e
12396 *
12397 ************************************************************************
12398 *  type       num          id          ctitle                          cd 1
12399 rod             957          957 $957$ hp heater b-1 power
12400 *
12401 *          couples to component 764, cells 11-20
12402 *
12403 *  ncrx        ncrz        ittc        iext        m1d             cd 2
12404      1          10           0           0           0
12405 *  nopowr      nridr       modez       liqlev      iaxcnd          cd 3
12406      0           0           1           0           1
12407 *  idbci       idbco       hdri        hdro                        cd 4
12408      2           0         0.0         0.0
12409 *  nrods       nodes       irftr       nzmax       irftr2          cd 12
12410      1           5           0          21           0
12411 *  dtxht(1)    dtxht(2)    dznht       hgapo       shelv           cd 13
12412     3.0         10.0       0.01       6000.0        0.0
12413 *  irpwty      ndgx        ndhx        nrts        nhist           cd 14
12414      7           0           0          10           0
12415 *  irpwtr      irpwsv      nrpwtb      nrpwsv      nrpwrf          cd 17
12416     70           1          -2           0           0
12417 *  izpwtr      izpwsv      nzpwtb      nzpwsv      nzpwrf          cd 18
12418      0           1           1           0           0
12419 *  nmwrz       nfci        nfcil       ipwrad      ipwdep          cd 19
12420      0           0           0           0           0
12421 *  nzpwz       nzpwi       nfbpwt      nrpwr       nrpwi           cd 20
12422      0           0           0           0           0
12423 *  react       tneut       rpwoff      rrpwmx      rpwscl          cd 21
12424     0.0         0.0         0.0       1.0e20       1.0
12425 *  rpowri      zpwin       zpwoff      rzpwmx                      cd 22
12426    6.9533e07     0.0         0.0       1.0e20
12427 *  extsou      pldr        pdrat       fucrac                      cd 23
12428     0.0         0.0         0.0         0.0
12429 *  array input
12430 * nhcomi *  f 764 e
12431 * nhceli *  -11    11    12    13    14 s
12432 * nhceli *  15    16    17    18    19 s
12433 * nhceli *  20    20 e
12434 * dz     *  r10 5.979 e
12435 * grav   *  f 0.0 e
12436 * rdx    *  18.2067 e
12437 * radrd  *  i3  0.2738628  0.2781943 e
12438 * matrd  *  f 9 e
12439 * nfax   *  f 1 e
12440 * rftn   *  f 480.0 e
12441 * rdpwr  *  f 1.0 e
12442 * cpowr  *  f 1.0 e
12443 * zpwtb  *  0.0 f 1.0 e
12444 * rpwtb  *   0.0  6.9533e07  0.5  0.0 e
12445 * fpuo2  *  f 0.0 e
12446 * ftd    *  f 1.0 e
12447 * gmix   *  f 0.0 e
12448 * gmles  *  f 0.0 e
12449 * pgapt  *  f 0.0 e
```



```
12450 * plvol   *  f 0.0 e
12451 * pslen   *  f 0.0 e
12452 * clenn   *  f 0.0 e
12453 * burn    *  f 0.0 e
12454 *
12455 ************************************************************************
12456 *  type       num          id          ctitle                          cd 1
12457 rod             958          958 $958$ hp heater a-2 power
12458 *
12459 *          couples to component 766, cells 1-10
12460 *
12461 *  ncrx        ncrz        ittc        iext        m1d             cd 2
12462      1          10           0           0           0
12463 *  nopowr      nridr       modez       liqlev      iaxcnd          cd 3
12464      0           0           1           0           1
12465 *  idbci       idbco       hdri        hdro                        cd 4
12466      2           0         0.0         0.0
12467 *  nrods       nodes       irftr       nzmax       irftr2          cd 12
12468      1           5           0          21           0
12469 *  dtxht(1)    dtxht(2)    dznht       hgapo       shelv           cd 13
12470     3.0         10.0       0.01       6000.0        0.0
12471 *  irpwty      ndgx        ndhx        nrts        nhist           cd 14
12472      7           0           0          10           0
12473 *  irpwtr      irpwsv      nrpwtb      nrpwsv      nrpwrf          cd 17
12474     70           1          -2           0           0
12475 *  izpwtr      izpwsv      nzpwtb      nzpwsv      nzpwrf          cd 18
12476      0           1           1           0           0
12477 *  nmwrz       nfci        nfcil       ipwrad      ipwdep          cd 19
12478      0           0           0           0           0
12479 *  nzpwz       nzpwi       nfbpwt      nrpwr       nrpwi           cd 20
12480      0           0           0           0           0
12481 *  react       tneut       rpwoff      rrpwmx      rpwscl          cd 21
12482     0.0         0.0         0.0       1.0e20       1.0
12483 *  rpowri      zpwin       zpwoff      rzpwmx                      cd 22
12484    8.1163e07     0.0         0.0       1.0e20
12485 *  extsou      pldr        pdrat       fucrac                      cd 23
12486     0.0         0.0         0.0         0.0
12487 *  array input
12488 * nhcomi *  f 766 e
12489 * nhceli *  -1     1     2     3     4 s
12490 * nhceli *   5     6     7     8     9 s
12491 * nhceli *  10    10 e
12492 * dz     *  r10 7.378 e
12493 * grav   *  f 0.0 e
12494 * rdx    *  16.1736 e
12495 * radrd  *  i3  0.2738628  0.2781943 e
12496 * matrd  *  f 9 e
12497 * nfax   *  f 1 e
12498 * rftn   *  f 480.0 e
12499 * rdpwr  *  f 1.0 e
12500 * cpowr  *  f 1.0 e
12501 * zpwtb  *  0.0 f 1.0 e
12502 * rpwtb  *   0.0  8.1163e07  0.5  0.0 e
12503 * fpuo2  *  f 0.0 e
12504 * ftd    *  f 1.0 e
12505 * gmix   *  f 0.0 e
12506 * gmles  *  f 0.0 e
12507 * pgapt  *  f 0.0 e
12508 * plvol  *  f 0.0 e
12509 * pslen  *  f 0.0 e
12510 * clenn  *  f 0.0 e
12511 * burn   *  f 0.0 e
12512 *
12513 ************************************************************************
12514 *  type       num          id          ctitle                          cd 1
12515 rod             959          959 $959$ hp heater b-2 power
12516 *
12517 *          couples to component 766, cells 11-20
12518 *
12519 *  ncrx        ncrz        ittc        iext        m1d             cd 2
12520      1          10           0           0           0
12521 *  nopowr      nridr       modez       liqlev      iaxcnd          cd 3
12522      0           0           1           0           1
```

```
12523 *  idbci        idbco        hdri         hdro                      cd 4
12524      2            0          0.0          0.0
12525 *  nrods        nodes        irftr        nzmax        irftr2       cd 12
12526      1            5            0           21            0
12527 *  dtxht(1)     dtxht(2)     dznht        hgapo        shelv        cd 13
12528     3.0          10.0        0.01        6000.0         0.0
12529 *  irpwty       ndgx         ndhx         nrts         nhist        cd 14
12530      7            0            0           10            0
12531 *  irpwtr       irpwsv       nrpwtb       nrpwsv       nrpwrf       cd 17
12532     70            1           -2            0            0
12533 *  izpwtr       izpwsv       nzpwtb       nzpwsv       nzpwrf       cd 18
12534      0            1            1            0            0
12535 *  nmwrz        nfci         nfcil        ipwrad       ipwdep       cd 19
12536      0            0            0            0            0
12537 *  nzpwz        nzpwi        nfbpwt       nrpwr        nrpwi        cd 20
12538      0            0            0            0            0
12539 *  react        tneut        rpwoff       rrpwmx       rpwscl       cd 21
12540     0.0          0.0          0.0         1.0e20        1.0
12541 *  rpowri       zpwin        zpwoff       rzpwmx                    cd 22
12542    6.9533e07      0.0          0.0         1.0e20
12543 *  extsou       pldr         pdrat        fucrac                    cd 23
12544     0.0          0.0          0.0          0.0
12545 *  array input
12546 * nhcomi *  f 766 e
12547 * nhceli *  -11    11   12    13    14 s
12548 * nhceli *  15    16   17    18    19 s
12549 * nhceli *  20    20 e
12550 * dz     *  r10 6.243 e
12551 * grav   *  f 0.0 e
12552 * rdx    *  17.7540 e
12553 * radrd  *  i3  0.2738628  0.2781943 e
12554 * matrd  *  f 9 e
12555 * nfax   *  f 1 e
12556 * rftn   *  f 480.0 e
12557 * rdpwr  *  f 1.0 e
12558 * cpowr  *  f 1.0 e
12559 * zpwtb  *  0.0 f 1.0 e
12560 * rpwtb  *   0.0  6.9533e07  0.5  0.0 e
12561 * fpuo2  *  f 0.0 e
12562 * ftd    *  f 1.0 e
12563 * gmix   *  f 0.0 e
12564 * gmles  *  f 0.0 e
12565 * pgapt  *  f 0.0 e
12566 * plvol  *  f 0.0 e
12567 * pslen  *  f 0.0 e
12568 * clenn  *  f 0.0 e
12569 * burn   *  f 0.0 e
12570 *
12571 ************************************************************************
12572 *  type        num          id           ctitle                    cd 1
12573 rod            960        960 $960$ c788 pipe wall
12574 *
12575 *  models pipe wall
12576 *
12577 *  ncrx        ncrz         ittc         iext         m1d          cd 2
12578    1           10           0            0            0
12579 *  nopowr      nridr        modez        liqlev       iaxcnd       cd 3
12580    1           0            1            0            1
12581 *  idbci       idbco        hdri         hdro                      cd 4
12582    2           0            0.0          0.0
12583 *  nrods       nodes        irftr        nzmax        irftr2       cd 12
12584    1           5              0          21           0
12585 *  dtxht(1)    dtxht(2)     dznht        hgapo        shelv        cd 13
12586    3.0         10.0         0.01         6000.0
12587 * nhcomi *   f 788 e
12588 * nhceli *  -1  1  2  3  4 s
12589 * nhceli *   5  6  7  8  9 s
12590 * nhceli *   10  10  e
12591 * dz     *   f 6.01 e
12592 * grav   *   f 0.0 e
12593 * rdx    *   f 1.0 e
12594 * radrd  *  i3  0.2738628  0.3502152 e
12595 * matrd  *   f 9 e
```



```
12596 * nfax   *   f 1 e
12597 * rftn   *   f 510.9 e
12598 *
12599 ************************************************************************
12600 *  type        num          id           ctitle                    cd 1
12601 rod            961        961 $961$ c790 pipe wall
12602 *
12603 *  models pipe wall
12604 *
12605 *  ncrx        ncrz         ittc         iext         m1d          cd 2
12606    1           6            0            0            0
12607 *  nopowr      nridr        modez        liqlev       iaxcnd       cd 3
12608    1           0            1            0            1
12609 *  idbci       idbco        hdri         hdro                      cd 4
12610    2           0            0.0          0.0
12611 *  nrods       nodes        irftr        nzmax        irftr2       cd 12
12612    1           5              0          21           0
12613 *  dtxht(1)    dtxht(2)     dznht        hgapo        shelv        cd 13
12614    3.0         10.0         0.01         6000.0
12615 * nhcomi *   f 790 e
12616 * nhceli *  -1  1  2  3  4 s
12617 * nhceli *   5  6  6 e
12618 * dz     *   r4 4.955  r2 5.335 e
12619 * grav   *   f 0.0 e
12620 * rdx    *   f 1.0 e
12621 * radrd  *  i3  0.2738628  0.3502152 e
12622 * matrd  *   f 9 e
12623 * nfax   *   f 1 e
12624 * rftn   *   f 510.9 e
12625 *
12626 end
12627 *
12628 ******************
12629 * time-step data *
12630 ******************
12631 *
12632 *        dtmin         dtmax         tend         rtwfp
12633     1.0000E-05          1.0        1000.0     1.0000E+01
12634 *        edint         gfint        dmpint        sedint
12635     10.000E+01    1.0000E+00    10.000E+01    10.000E+01
12636 *
12637 ******************
12638 * time-step data *
12639 ******************
12640 *
12641 *      endflag
12642    -1.0000E+00
```

APPENDIX B

TRAC-M Version 3782 Input Listings for Transient Calculations

Appendix B-1

TRAC-M Version 3782 Input Listing for Transient Calculation – A Turbine Bypass Valve "A" Stuck Open Scenario in the Oconee Unit 1 Plant

```
free format
*
*  This is a Rev. 15 input deck for transient calc. of turbine bypass valve A st
uck open scenario in the Oconee Unit 1 Plant. 6/2001.
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
            1             0              1             0
Transient input rev. 15 for reactor trip with stuck-open turbine bypass valve
*
*****************
* namelist data *
*****************
*
 &inopts
  icflow=2, nhtstr=33, noair=0, dtstrt=0.1,
 imfr=3, nlt=11,
 &end
*
*        dstep         timet
            -1            0.
*       stdyst        transi         ncomp          njun          ipak
             0             1           141           126             1
*         epso          epss
    1.0000E-03    1.0000E-04
*       oitmax        sitmax        isolut        ncontr
            10            10             0             0
*         ntsv          ntcb          ntcf          ntrp          ntcp
           284           936         64524            42             0
*
*************************
* component-number data *
*************************
*
* iorder array *
* pipe   *     1 s   * loop b hot leg candy cane
* pipe   *     2 s   * sg-b primary tube bundle
* pump   *     3 s   * loop b1 pump (intact leg)
* tee    *     4 s   * loop b1 intact cold leg
* tee    *     6 s   * loop b upper head tee
* fill   *     9 s   * loop b1 hpis
* tee    *    11 s   * loop a hot leg candy cane
* pipe   *    12 s   * sg-a primary tube bundle
* pump   *    13 s   * loop a1 pump (intact leg)
* tee    *    14 s   * loop a1 intact cold leg
* tee    *    16 s   * loop a upper head tee
* fill   *    18 s   * makeup/letdown flow
* fill   *    19 s   * loop a1 hpis
* tee    *    20 s   * hpi/makeup-letdown header
* prizer *    22 s   * pressurizer
* pump   *    23 s   * loop b2 pump
* tee    *    24 s   * loop b2 intact cold leg
* valve  *    25 s   * pressurizer porv
* break  *    26 s   * porv boundary
* pump   *    33 s   * loop a2 pump (break leg)
* tee    *    34 s   * loop a2 intact cold leg
* fill   *    39 s   * loop a2 hpis
* fill   *    59 s   * loop b2 hpis
* tee    *    63 s   * loop b loop seals
* tee    *    73 s   * loop a loop seals
* tee    *    78 s   * lpis b header
* fill   *    79 s   * lpis b
* valve  *    80 s   * accum valve on loop b side
* pipe   *    81 s   * accumulator b
* fill   *    82 s   * accumulator b zero-flow boundary
* tee    *    88 s   * lpis a header
* fill   *    89 s   * lpis a
* valve  *    90 s   * accum valve on loop a side
* pipe   *    91 s   * accumulator a
* fill   *    92 s   * accumulator a zero-flow boundary
```



```
* vessel *    99 s   * vessel
* tee    *   121 s   * sg-a boiler region
* tee    *   122 s   * sg-a upper boiler region
* tee    *   123 s   * sg-a downcomer region
* pipe   *   124 s   * sg-a steam exit
* valve  *   148 s   * sg a fw switchover valve
* valve  *   150 s   * sg a efw line check valve
* tee    *   152 s   * sg a efw inlet line
* tee    *   154 s   * sg a efw header
* fill   *   156 s   * sg a md efw
* fill   *   158 s   * sg a td efw
* tee    *   201 s   * sg-b boiler region
* tee    *   202 s   * sg-b upper boiler region
* tee    *   203 s   * sg-b downcomer region
* pipe   *   204 s   * sg-b steam exit
* valve  *   248 s   * sg b fw switchover valve
* valve  *   250 s   * sg b efw line check valve
* tee    *   252 s   * sg b efw inlet line
* tee    *   254 s   * sg b efw header
* fill   *   256 s   * sg b md efw
* fill   *   258 s   * sg b td efw
* tee    *   345 s   * sg-a steam line with srv
* tee    *   350 s   * sg-a steam line with tbv
* valve  *   355 s   * sg-a turbine stop valve
* break  *   360 s   * sg-a steam line pressure boundary
* valve  *   365 s   * sg-a steam line srv
* break  *   367 s   * sg-a srv boundary
* valve  *   370 s   * sg-a steam line tbv
* break  *   372 s   * sg-a tbv boundary
* tee    *   445 s   * sg-b steam line with srv
* tee    *   450 s   * sg-b steam line with tbv
* valve  *   455 s   * sg-b turbine stop valve
* break  *   460 s   * sg-b steam line pressure boundary
* valve  *   465 s   * sg-b steam line srv
* break  *   467 s   * sg-b srv boundary
* valve  *   470 s   * sg-b steam line tbv
* break  *   472 s   * sg-b tbv boundary
* pipe   *   501 s   * core bypass pipe 1
* pipe   *   502 s   * core bypass pipe 2
* pipe   *   503 s   * core bypass pipe 3
* pipe   *   504 s   * core bypass pipe 4
* pipe   *   505 s   * core bypass pipe 5
* pipe   *   506 s   * core bypass pipe 6
* break  *   730 s   * condenser hotwell boundary
* pump   *   734 s   * hotwell pump
* pipe   *   736 s   * demineralization system
* pump   *   738 s   * booster pump
* pipe   *   740 s   * feedwater line to lp heaters
* fill   *   742 s   * cond.drain to lp d heater
* tee    *   746 s   * feedwater lp d heater
* fill   *   748 s   * cond.drain to lp c heater
* tee    *   750 s   * feedwater lp c heater
* tee    *   752 s   * feedwater pump inlet header
* pump   *   754 s   * mfw a pump
* valve  *   756 s   * mfw a pump check valve
* pump   *   760 s   * mfw b pump
* valve  *   761 s   * mfw b pump check valve
* plenum *   763 s   * feedwater pump outlet header
* pipe   *   764 s   * a & b hp heater pipe 1
* pipe   *   766 s   * a & b hp heater pipe 2
* plenum *   768 s   * hp heater outlet header
* valve  *   770 s   * sg a mfw control valve
* valve  *   772 s   * sg a mfw startup valve
* valve  *   774 s   * sg b mfw control valve
* valve  *   776 s   * sg b mfw startup valve
* plenum *   780 s   * fw-a cv header
* plenum *   782 s   * fw-b cv header
* valve  *   784 s   * fw-a isolation valve
* valve  *   786 s   * fw-b isolation valve
* pipe   *   788 s   * sg a feedwater inlet line
* valve  *   789 s   * sg a feedwater line check valve
* pipe   *   790 s   * sb b feedwater inlet line
* valve  *   791 s   * sb b feedwater line check valve
```

```
146  * rod    *   900 s   * reactor-core fuel rods
147  * slab   *   910 s   * vessel level 1, cells 1-6
148  * slab   *   911 s   * vessel level 2, cells 1-6
149  * slab   *   912 s   * vessel levels 3-4, cells 1-6
150  * slab   *   913 s   * vessel level 5, cells 1-6
151  * slab   *   914 s   * vessel levels 6-9, cells 1-6
152  * slab   *   915 s   * vessel level 10, cells 1-6
153  * slab   *   916 s   * vessel level 1, cells 7-12
154  * slab   *   917 s   * vessel levels 2-5, cells 7-12
155  * slab   *   918 s   * vessel levels 6-9, cells 7-12
156  * slab   *   919 s   * vessel level 10, cells 7-12
157  * rod    *   930 s   * sg-a tube bundle hs
158  * slab   *   931 s   * sg-a outlet plenum hs
159  * slab   *   932 s   * sg-a inlet plenum hs
160  * rod    *   933 s   * sg-a lower outer shell hs
161  * rod    *   934 s   * sg-a upper outer shell hs
162  * rod    *   940 s   * sg-b tube bundle hs
163  * slab   *   941 s   * sg-b outlet plenum hs
164  * slab   *   942 s   * sg-b inlet plenum hs
165  * rod    *   943 s   * sg-b lower outer shell hs
166  * rod    *   944 s   * sg-b upper outer shell hs
167  * rod    *   950 s   * c736 pipe wall, cells 1-10
168  * rod    *   951 s   * c736 power, cells 11-20
169  * rod    *   952 s   * lp f heater power
170  * rod    *   953 s   * lp e heater power
171  * rod    *   954 s   * lp d heater power
172  * rod    *   955 s   * lp c heater power
173  * rod    *   956 s   * hp heater a-1 power
174  * rod    *   957 s   * hp heater b-1 power
175  * rod    *   958 s   * hp heater a-2 power
176  * rod    *   959 s   * hp heater b-2 power
177  * rod    *   960 s   * c788 pipe wall
178  * rod    *   961 e   * c790 pipe wall
179  *
180  **************************
181  * control-parameter data *
182  **************************
183  *
184  * signal variables
185    0
186  *
187  * control blocks
188  *
189    0
190  *
191  * trips
192  *  ntse  ntct  ntsf  ntdp  ntsd
193    0     5     0     0     0
194  *
195  ************************************************************************
196  * reactor trip at time zero                                            *
197  ************************************************************************
198  *
199  *         idtp          isrt          iset          itst          idsg
200              40             2             0             1           -21
201  *      setp(1)       setp(2)       setp(3)       setp(4)
202              .5            .5
203  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
204             0.0           0.0
205  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
206                0             0
207  *
208  ************************************************************************
209  * trip to initiate a sl-a tbv stuck-open transient
       *
210  * one of two turbine bypass valves of steam line a assumed
211  * to stay open after both open.
212  * currently set to not initiate a tbv stuck-open transient
213  * set idsg to -21 to model a tbv stuck-open transient in sl a
214  ************************************************************************
215  *
216  *         idtp          isrt          iset          itst          idsg
217              100            2             0             1           -21
```



```
218  *      setp(1)       setp(2)       setp(3)       setp(4)
219              .5            .5
220  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
221             0.0           0.0
222  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
223                0             0
224  *
225  ************************************************************************
226  * trip to initiate a sl-b tbv stuck-open transient signal
       *
227  * one of two turbine bypass valves of steam line b assumed
228  * to stay open after both open.
229  * currently set to not initiate a tbv stuck-open transient
230  * set idsg to -21 to model a tbv stuck-open transient in sl b
231  ************************************************************************
232  *
233  *         idtp          isrt          iset          itst          idsg
234              105            2             0             1           -20
235  *      setp(1)       setp(2)       setp(3)       setp(4)
236              .5            .5
237  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
238             0.0           0.0
239  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
240                0             0
241  *
242    0
243  *
244  * component data *
245  *
246  end
247  *
248  *****************
249  * time-step data *
250  *****************
251  *
252  *        dtmin         dtmax          tend         rtwfp
253      1.0000E-06          0.5       10000.0       1.0000E+01
254  *        edint         gfint        dmpint        sedint
255          1000.0           5.0        1000.0        1000.0
256  *
257  *****************
258  * time-step data *
259  *****************
260  *
261  *      endflag
262     -1.0000E+00
```

Appendix B-2

TRAC-M Version 3782 Input Listing for Transient Calculation – A Main Steam Line "A" Break in the Oconee Unit 1 Plant

```
free format
*
*  This is an input deck for transient calc. of Oconee Unit 1 SG A main steam line break. 7/2001 gsr.
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
            1             0              1             0
Transient restart file for a double-ended guillotine break of a 34" steam line just outside of SG A.
*
*****************
* namelist data *
*****************
*
 &inopts
  icflow=2, nhtstr=33, noair=0, imfr=3,
  nlt=12,
 &end
*
*        dstep          timet
            -1     0.0000E+00
*       stdyst         transi          ncomp          njun          ipak
             0              1            143           127             1
*         epso           epss
    1.0000E-03     1.0000E-04
*       oitmax         sitmax         isolut        ncontr
            10             10              0             0
*         ntsv           ntcb          ntcf          ntrp          ntcp
           286            867         64524            44             0
*
*************************
* component-number data *
*************************
*
* iorder array *
* pipe   *     1 s   * loop b hot leg candy cane
* pipe   *     2 s   * sg-b primary tube bundle
* pump   *     3 s   * loop b1 pump (intact leg)
* tee    *     4 s   * loop b1 intact cold leg
* tee    *     6 s   * loop b upper head tee
* fill   *     9 s   * loop b1 hpis
* tee    *    11 s   * loop a hot leg candy cane
* pipe   *    12 s   * sg-a primary tube bundle
* pump   *    13 s   * loop a1 pump (intact leg)
* tee    *    14 s   * loop a1 intact cold leg
* tee    *    16 s   * loop a upper head tee
* fill   *    18 s   * makeup/letdown flow
* fill   *    19 s   * loop a1 hpis
* tee    *    20 s   * hpi/makeup-letdown header
* prizer *    22 s   * pressurizer
* pump   *    23 s   * loop b2 pump
* tee    *    24 s   * loop b2 intact cold leg
* valve  *    25 s   * pressurizer porv
* break  *    26 s   * porv boundary
* pump   *    33 s   * loop a2 pump (break leg)
* tee    *    34 s   * loop a2 intact cold leg
* fill   *    39 s   * loop a2 hpis
* fill   *    59 s   * loop b2 hpis
* tee    *    63 s   * loop b loop seals
* tee    *    73 s   * loop a loop seals
* tee    *    78 s   * lpis b header
* fill   *    79 s   * lpis b
* valve  *    80 s   * accum valve on loop b side
* pipe   *    81 s   * accumulator b
* fill   *    82 s   * accumulator b zero-flow boundary
* tee    *    88 s   * lpis a header
* fill   *    89 s   * lpis a
* valve  *    90 s   * accum valve on loop a side
* pipe   *    91 s   * accumulator a
```



```
* fill   *    92 s   * accumulator a zero-flow boundary
* vessel *    99 s   * vessel
* tee    *   121 s   * sg-a boiler region
* tee    *   122 s   * sg-a upper boiler region
* tee    *   123 s   * sg-a downcomer region
* pipe   *   124 s   * sg-a steam exit
* valve  *   148 s   * sg a fw switchover valve
* valve  *   150 s   * sg a efw line check valve
* tee    *   152 s   * sg a efw inlet line
* tee    *   154 s   * sg a efw header
* fill   *   156 s   * sg a md efw
* fill   *   158 s   * sg a td efw
* tee    *   201 s   * sg-b boiler region
* tee    *   202 s   * sg-b upper boiler region
* tee    *   203 s   * sg-b downcomer region
* pipe   *   204 s   * sg-b steam exit
* valve  *   248 s   * sg b fw switchover valve
* valve  *   250 s   * sg b efw line check valve
* tee    *   252 s   * sg b efw inlet line
* tee    *   254 s   * sg b efw header
* fill   *   256 s   * sg b md efw
* fill   *   258 s   * sg b td efw
* tee    *   345 s   * sg-a steam line with srv
* break  *   346 s   * sg-a steam line break sg side
* break  *   347 s   * sg-a steam line break turbine side
* tee    *   350 s   * sg-a steam line with tbv
* valve  *   355 s   * sg-a turbine stop valve
* break  *   360 s   * sg-a steam line pressure boundary
* valve  *   365 s   * sg-a steam line srv
* break  *   367 s   * sg-a srv boundary
* valve  *   370 s   * sg-a steam line tbv
* break  *   372 s   * sg-a tbv boundary
* tee    *   445 s   * sg-b steam line with srv
* tee    *   450 s   * sg-b steam line with tbv
* valve  *   455 s   * sg-b turbine stop valve
* break  *   460 s   * sg-b steam line pressure boundary
* valve  *   465 s   * sg-b steam line srv
* break  *   467 s   * sg-b srv boundary
* valve  *   470 s   * sg-b steam line tbv
* break  *   472 s   * sg-b tbv boundary
* pipe   *   501 s   * core bypass pipe 1
* pipe   *   502 s   * core bypass pipe 2
* pipe   *   503 s   * core bypass pipe 3
* pipe   *   504 s   * core bypass pipe 4
* pipe   *   505 s   * core bypass pipe 5
* pipe   *   506 s   * core bypass pipe 6
* break  *   730 s   * condenser hotwell boundary
* pump   *   734 s   * hotwell pump
* pipe   *   736 s   * demineralization system
* pump   *   738 s   * booster pump
* pipe   *   740 s   * feedwater line to lp heaters
* fill   *   742 s   * cond.drain to lp d heater
* tee    *   746 s   * feedwater lp d heater
* fill   *   748 s   * cond.drain to lp c heater
* tee    *   750 s   * feedwater lp c heater
* tee    *   752 s   * feedwater pump inlet header
* pump   *   754 s   * mfw a pump
* valve  *   756 s   * mfw a pump check valve
* pump   *   760 s   * mfw b pump
* valve  *   761 s   * mfw b pump check valve
* plenum *   763 s   * feedwater pump outlet header
* pipe   *   764 s   * a & b hp heater pipe 1
* pipe   *   766 s   * a & b hp heater pipe 2
* plenum *   768 s   * hp heater outlet header
* valve  *   770 s   * sg a mfw control valve
* valve  *   772 s   * sg a mfw startup valve
* valve  *   774 s   * sg b mfw control valve
* valve  *   776 s   * sg b mfw startup valve
* plenum *   780 s   * fw-a cv header
* plenum *   782 s   * fw-b cv header
* valve  *   784 s   * fw-a isolation valve
* valve  *   786 s   * fw-b isolation valve
* pipe   *   788 s   * sg a feedwater inlet line
```

```
* valve  *   789 s   * sg a feedwater line check valve
* pipe   *   790 s   * sb b feedwater inlet line
* valve  *   791 s   * sb b feedwater line check valve
* rod    *   900 s   * reactor-core fuel rods
* slab   *   910 s   * vessel level 1, cells 1-6
* slab   *   911 s   * vessel level 2, cells 1-6
* slab   *   912 s   * vessel levels 3-4, cells 1-6
* slab   *   913 s   * vessel level 5, cells 1-6
* slab   *   914 s   * vessel levels 6-9, cells 1-6
* slab   *   915 s   * vessel level 10, cells 1-6
* slab   *   916 s   * vessel level 1, cells 7-12
* slab   *   917 s   * vessel levels 2-5, cells 7-12
* slab   *   918 s   * vessel levels 6-9, cells 7-12
* slab   *   919 s   * vessel level 10, cells 7-12
* rod    *   930 s   * sg-a tube bundle hs
* slab   *   931 s   * sg-a outlet plenum hs
* slab   *   932 s   * sg-a inlet plenum hs
* rod    *   933 s   * sg-a lower outer shell hs
* rod    *   934 s   * sg-a upper outer shell hs
* rod    *   940 s   * sg-b tube bundle hs
* slab   *   941 s   * sg-b outlet plenum hs
* slab   *   942 s   * sg-b inlet plenum hs
* rod    *   943 s   * sg-b lower outer shell hs
* rod    *   944 s   * sg-b upper outer shell hs
* rod    *   950 s   * c736 pipe wall, cells 1-10
* rod    *   951 s   * c736 power, cells 11-20
* rod    *   952 s   * lp f heater power
* rod    *   953 s   * lp e heater power
* rod    *   954 s   * lp d heater power
* rod    *   955 s   * lp c heater power
* rod    *   956 s   * hp heater a-1 power
* rod    *   957 s   * hp heater b-1 power
* rod    *   958 s   * hp heater a-2 power
* rod    *   959 s   * hp heater b-2 power
* rod    *   960 s   * c788 pipe wall
* rod    *   961 e   * c790 pipe wall
*
*************************
* control-parameter data *
*************************
*
* signal variables
*
  0
*
* control blocks
*
  0
*
* trips
*  ntse  ntct  ntsf  ntdp  ntsd
   0     5     0     0     0
*
*
  0
*
* component data *
*
*************************************************************************
*  type      num         id          ctitle                        cd 1
pipe         124     124 $124$ sg-a steam exit
*
*  ncells    nodes       jun1        jun2        epsw              cd 2
   6          0           58          346        1.0e-05
*  ichf      iconc       iacc        ipow                          cd 3
   1         0           0           0
*  radin     th          houtl       houtv       toutl             cd 6
     0.0       0.0        0.0         0.0         0.0
*  toutv     powin       powoff      rpowmx      powscl            cd 7
   0.0       0.0         0.0         1.0e20      1.0
*   cell arrays
* dx    * r03 7.0000E-01r03 1.7650E+00e
* vol   *     2.0000E+00    1.6000E+00    1.2000E+00r03 2.9400E+00e
```



```
* fa    *    4.3450E+00   3.6800E+00   3.0000E+00r03 2.1670E+00   5.8580E-01 e
* fric  * f   1.0e-06 e
* grav  *    1.0000E+00   7.0700E-01  -7.0700E-01r03-1.0000E+00   0.0000E+00 e
* hd    *     6.0000E-03r05 6.0960E-01  0.8636 e
* icflg * r6  0       1e
* nff   * r6  1      -1e
* alp   * f   1.0000E+00e
* vl    * f   3.9983E+00e
* vv    * f   5.4138E+00e
* tl    * f   5.5280E+02e
* tv    * f   5.8000E+02e
* p     * f   6.3700E+06e
* pa    * f   0.0000E+00e
*************************************************************************
*******   type          num            id        ctitle
break      346      346 $346$ mslb break sg side
*         jun1         ibty          isat          ioff
           346            1             3             0
*         ibtr         ibsv          nbtb          nbsf          nbrf
             0            1             4             0             0
*         dxin        volin         alpin           tin           pin
       0.08237      0.48253    1.0000E+00    5.5400E+02      6.28E+06
*         pain       concin          rbmx          poff          belv
    0.0000E+00   0.0000E+00    1.0000E+10    0.0000E+00    0.0000E+00
* pscl *   1.0
           0.0    6.28e06 s
          0.001   6.28e06 s
          0.011     1.01325e05 s
       10000.0      1.01325e05 e
*
*************************************************************************
*
*************************************************************************
*******   type          num            id        ctitle
break      347      347 $347$ mslb break turbine side
*         jun1         ibty          isat          ioff
           345            1             3             0
*         ibtr         ibsv          nbtb          nbsf          nbrf
             0            1             4             0             0
*         dxin        volin         alpin           tin           pin
           2.8      0.48253    1.0000E+00    5.5400E+02      6.28E+06
*         pain       concin          rbmx          poff          belv
    0.0000E+00   0.0000E+00    1.0000E+10    0.0000E+00    0.0000E+00
* pscl *   1.0
           0.0    6.28e06 s
          0.001   6.28e06 s
          0.011     1.01325e05 s
       10000.0      1.01325e05 e
*
*************************************************************************
*
end
*
******************
* time-step data *
******************
*
*        dtmin         dtmax          tend          rtwfp
    1.0000E-05    0.5          10000.0        1.0000E+01
*        edint         gfint        dmpint         sedint
   1000.0   5.0   1000.0   1000.0
*
******************
* time-step data *
******************
*
*      endflag
   -1.0000E+00
```

Appendix B-3

TRAC-M Version 3782 Input Listing for Transient Calculation – Overfeed to Steam Generators to 96 Percent of the Operating Range in the Oconee Unit 1 Plant

```
free format
*
*  This is an input deck for transient calc. of SG overfeed to 96 % of operating
 range in the Oconee Unit 1 Plant. 5/2001.
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
            2             0              1             0
Transient restart file for overfeed transient scenario 1
efw level control failure with operator action control to 96% or.
*
*****************
* namelist data *
*****************
*
 &inopts
  icflow=2, nhtstr=33, noair=0, imfr=3,
  nlt=11,
 &end
*
*        dstep          timet
            -1     0.0000E+00
*       stdyst         transi          ncomp          njun          ipak
             0              1           141           126             1
*         epso           epss
     1.0000E-03     1.0000E-04
*       oitmax         sitmax         isolut        ncontr
            10             10              0             0
*         ntsv           ntcb           ntcf          ntrp          ntcp
           284            933          64524            42             0
*
*************************
* component-number data *
*************************
*
* iorder array *
* pipe   *     1 s   * loop b hot leg candy cane
* pipe   *     2 s   * sg-b primary tube bundle
* pump   *     3 s   * loop b1 pump (intact leg)
* tee    *     4 s   * loop b1 intact cold leg
* tee    *     6 s   * loop b upper head tee
* fill   *     9 s   * loop b1 hpis
* tee    *    11 s   * loop a hot leg candy cane
* pipe   *    12 s   * sg-a primary tube bundle
* pump   *    13 s   * loop a1 pump (intact leg)
* tee    *    14 s   * loop a1 intact cold leg
* tee    *    16 s   * loop a upper head tee
* fill   *    18 s   * makeup/letdown flow
* fill   *    19 s   * loop a1 hpis
* tee    *    20 s   * hpi/makeup-letdown header
* prizer *    22 s   * pressurizer
* pump   *    23 s   * loop b2 pump
* tee    *    24 s   * loop b2 intact cold leg
* valve  *    25 s   * pressurizer porv
* break  *    26 s   * porv boundary
* pump   *    33 s   * loop a2 pump (break leg)
* tee    *    34 s   * loop a2 intact cold leg
* fill   *    39 s   * loop a2 hpis
* fill   *    59 s   * loop b2 hpis
* tee    *    63 s   * loop b loop seals
* tee    *    73 s   * loop a loop seals
* tee    *    78 s   * lpis b header
* fill   *    79 s   * lpis b
* valve  *    80 s   * accum valve on loop b side
* pipe   *    81 s   * accumulator b
* fill   *    82 s   * accumulator b zero-flow boundary
* tee    *    88 s   * lpis a header
* fill   *    89 s   * lpis a
* valve  *    90 s   * accum valve on loop a side
* pipe   *    91 s   * accumulator a
```



```
* fill   *    92 s   * accumulator a zero-flow boundary
* vessel *    99 s   * vessel
* tee    *   121 s   * sg-a boiler region
* tee    *   122 s   * sg-a upper boiler region
* tee    *   123 s   * sg-a downcomer region
* pipe   *   124 s   * sg-a steam exit
* valve  *   148 s   * sg a fw switchover valve
* valve  *   150 s   * sg a efw line check valve
* tee    *   152 s   * sg a efw inlet line
* tee    *   154 s   * sg a efw header
* fill   *   156 s   * sg a md efw
* fill   *   158 s   * sg a td efw
* tee    *   201 s   * sg-b boiler region
* tee    *   202 s   * sg-b upper boiler region
* tee    *   203 s   * sg-b downcomer region
* pipe   *   204 s   * sg-b steam exit
* valve  *   248 s   * sg b fw switchover valve
* valve  *   250 s   * sg b efw line check valve
* tee    *   252 s   * sg b efw inlet line
* tee    *   254 s   * sg b efw header
* fill   *   256 s   * sg b md efw
* fill   *   258 s   * sg b td efw
* tee    *   345 s   * sg-a steam line with srv
* tee    *   350 s   * sg-a steam line with tbv
* valve  *   355 s   * sg-a turbine stop valve
* break  *   360 s   * sg-a steam line pressure boundary
* valve  *   365 s   * sg-a steam line srv
* break  *   367 s   * sg-a srv boundary
* valve  *   370 s   * sg-a steam line tbv
* break  *   372 s   * sg-a tbv boundary
* tee    *   445 s   * sg-b steam line with srv
* tee    *   450 s   * sg-b steam line with tbv
* valve  *   455 s   * sg-b turbine stop valve
* break  *   460 s   * sg-b steam line pressure boundary
* valve  *   465 s   * sg-b steam line srv
* break  *   467 s   * sg-b srv boundary
* valve  *   470 s   * sg-b steam line tbv
* break  *   472 s   * sg-b tbv boundary
* pipe   *   501 s   * core bypass pipe 1
* pipe   *   502 s   * core bypass pipe 2
* pipe   *   503 s   * core bypass pipe 3
* pipe   *   504 s   * core bypass pipe 4
* pipe   *   505 s   * core bypass pipe 5
* pipe   *   506 s   * core bypass pipe 6
* break  *   730 s   * condenser hotwell boundary
* pump   *   734 s   * hotwell pump
* pipe   *   736 s   * demineralization system
* pump   *   738 s   * booster pump
* pipe   *   740 s   * feedwater line to lp heaters
* fill   *   742 s   * cond.drain to lp d heater
* tee    *   746 s   * feedwater lp d heater
* fill   *   748 s   * cond.drain to lp c heater
* tee    *   750 s   * feedwater lp c heater
* tee    *   752 s   * feedwater pump inlet header
* pump   *   754 s   * mfw a pump
* valve  *   756 s   * mfw a pump check valve
* pump   *   760 s   * mfw b pump
* valve  *   761 s   * mfw b pump check valve
* plenum *   763 s   * feedwater pump outlet header
* pipe   *   764 s   * a & b hp heater pipe 1
* pipe   *   766 s   * a & b hp heater pipe 2
* plenum *   768 s   * hp heater outlet header
* valve  *   770 s   * sg a mfw control valve
* valve  *   772 s   * sg a mfw startup valve
* valve  *   774 s   * sg b mfw control valve
* valve  *   776 s   * sg b mfw startup valve
* plenum *   780 s   * fw-a cv header
* plenum *   782 s   * fw-b cv header
* valve  *   784 s   * fw-a isolation valve
* valve  *   786 s   * fw-b isolation valve
* pipe   *   788 s   * sg a feedwater inlet line
* valve  *   789 s   * sg a feedwater line check valve
* pipe   *   790 s   * sb b feedwater inlet line
```

```
146  * valve   *   791 s   * sb b feedwater line check valve
147  * rod     *   900 s   * reactor-core fuel rods
148  * slab    *   910 s   * vessel level 1, cells 1-6
149  * slab    *   911 s   * vessel level 2, cells 1-6
150  * slab    *   912 s   * vessel levels 3-4, cells 1-6
151  * slab    *   913 s   * vessel level 5, cells 1-6
152  * slab    *   914 s   * vessel levels 6-9, cells 1-6
153  * slab    *   915 s   * vessel level 10, cells 1-6
154  * slab    *   916 s   * vessel level 1, cells 7-12
155  * slab    *   917 s   * vessel levels 2-5, cells 7-12
156  * slab    *   918 s   * vessel levels 6-9, cells 7-12
157  * slab    *   919 s   * vessel level 10, cells 7-12
158  * rod     *   930 s   * sg-a tube bundle hs
159  * slab    *   931 s   * sg-a outlet plenum hs
160  * slab    *   932 s   * sg-a inlet plenum hs
161  * rod     *   933 s   * sg-a lower outer shell hs
162  * rod     *   934 s   * sg-a upper outer shell hs
163  * rod     *   940 s   * sg-b tube bundle hs
164  * slab    *   941 s   * sg-b outlet plenum hs
165  * slab    *   942 s   * sg-b inlet plenum hs
166  * rod     *   943 s   * sg-b lower outer shell hs
167  * rod     *   944 s   * sg-b upper outer shell hs
168  * rod     *   950 s   * c736 pipe wall, cells 1-10
169  * rod     *   951 s   * c736 power, cells 11-20
170  * rod     *   952 s   * lp f heater power
171  * rod     *   953 s   * lp e heater power
172  * rod     *   954 s   * lp d heater power
173  * rod     *   955 s   * lp c heater power
174  * rod     *   956 s   * hp heater a-1 power
175  * rod     *   957 s   * hp heater b-1 power
176  * rod     *   958 s   * hp heater a-2 power
177  * rod     *   959 s   * hp heater b-2 power
178  * rod     *   960 s   * c788 pipe wall
179  * rod     *   961 e   * c790 pipe wall
180  *
181  **************************
182  * control-parameter data *
183  **************************
184  *
185  * signal variables
186  *
187    0
188  *
189  * control blocks
190  *
191    0
192  *
193  * trips
194  *  ntse  ntct  ntsf  ntdp  ntsd
195     0     5     0     0     0
196  *
197  ************************************************************************
198  * MFW pump a trip                                                      *
199  ************************************************************************
200  *
201  *         idtp          isrt          iset          itst          idsg
202              35             2             0             1           -21
203  *      setp(1)       setp(2)       setp(3)       setp(4)
204               .5            .5
205  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
206              0.0           0.0
207  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
208                0             0
209  *
210  ************************************************************************
211  * MFW pump b trip                                                      *
212  ************************************************************************
213  *
214  *         idtp          isrt          iset          itst          idsg
215              36             2             0             1           -21
216  *      setp(1)       setp(2)       setp(3)       setp(4)
217               .5            .5
218  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
```



```
219              0.0           0.0
220  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
221                0             0
222  *
223  ************************************************************************
224  * trip to model efw level control failure followed by operator level *
225  * control to 96% OR; currently ISET always = 0, i.e. efw failure is  *
226  * turned off; to turn this option on, change idsg from -20 to -21    *
227  ************************************************************************
228  *
229  *         idtp          isrt          iset          itst          idsg
230              118            2             0             1           -21
231  *      setp(1)       setp(2)       setp(3)       setp(4)
232               -.5           .5
233  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
234              0.0           0.0
235  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
236                0             0
237  *
238  ************************************************************************
239  * trip to model efw level control failure with no operator            *
240  * intervention; efw will stay on until the boiler section level is    *
241  * 52 ft; currently ISET always = 0, i.e. efw failure is turned off;   *
242  * to turn this option on, change idsg from -20 to -21                 *
243  ************************************************************************
244  *
245  *         idtp          isrt          iset          itst          idsg
246              119            2             0             1           -20
247  *      setp(1)       setp(2)       setp(3)       setp(4)
248               -.5           .5
249  *      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
250              0.0           0.0
251  *      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
252                0             0
253  *
254    0
255  *
256  * component data *
257  *
258  end
259  *
260  ******************
261  * time-step data *
262  ******************
263  *
264  *        dtmin         dtmax         tend          rtwfp
265      1.0000E-05    0.5          10000.0       1.0000E+01
266  *        edint         gfint         dmpint        sedint
267     1000.0   5.0   1000.0   1000.0
268  *
269  ******************
270  * time-step data *
271  ******************
272  *
273  *      endflag
274     -1.0000E+00
```