APPENDIX L

CODE-DATA COMPARISON FOR FLECHT-SEASET TEST 31504 WITH NEWRFD=1

The calculation results for the reflood option newrfd=1, without and with grid spacers modeled, are presented in this appendix. The same set of plots that are presented in the main body of the report for the reflood option newrfd=3 are also presented for the reflood option newrfd=1. For reference purposes, the figure numbers for the two reflood options are listed below.

Without Grid Spacers		With Grid Spacers	
newrfd=1	newrfd=3	newrfd=1	newrfd=3
L-1	4.8-7	L-26	4.8-32
L-2	4.8-8	L-27	4.8-33
L-3	4.8-9	L-28	4.8-34
L-4	4.8-10	L-29	4.8-35
L-5	4.8-11	L-30	4.8-36
L-6	4.8-12	L-31	4.8-37
L-7	4.8-13	L-32	4.8-38
L-8	4.8-14	L-33	4.8-39
L-9	4.8-15	L-34	4.8-40
L-10	4.8-16	L-35	4.8-41
L-11	4.8-17	L-36	4.8-42
L-12	4.8-18	L-37	4.8-43
L-13	4.8-19	L-38	4.8-44
L-14	4.8-20	L-39	4.8-45
L-15	4.8-21	L-40	4.8-46
L-16	4.8-22	L-41	4.8-47
L-17	4.8-23	L-42	4.8-48
L-18	4.8-24	L-43	4.8-49
L-19	4.8-25	L-44	4.8-50
L-20	4.8-26	L-45	4.8-51
L-21	4.8-27	L-46	4.8-52
L-22	4.8-28	L-47	4.9.53
L-23	4.8-29	L-48	4.8-54
L-24	4.8-30	L-49	4.8-55
L-25	4.8-31	L-50	4.8-56

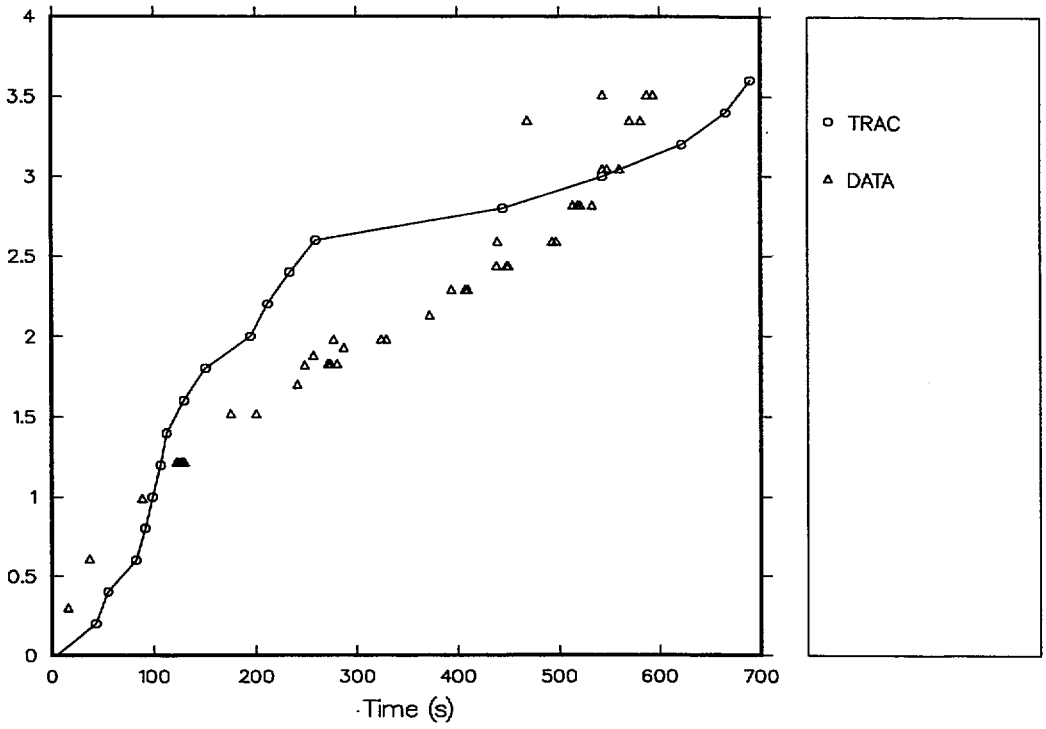


Fig. L-1. Comparison of predicted and measured cladding quench times.

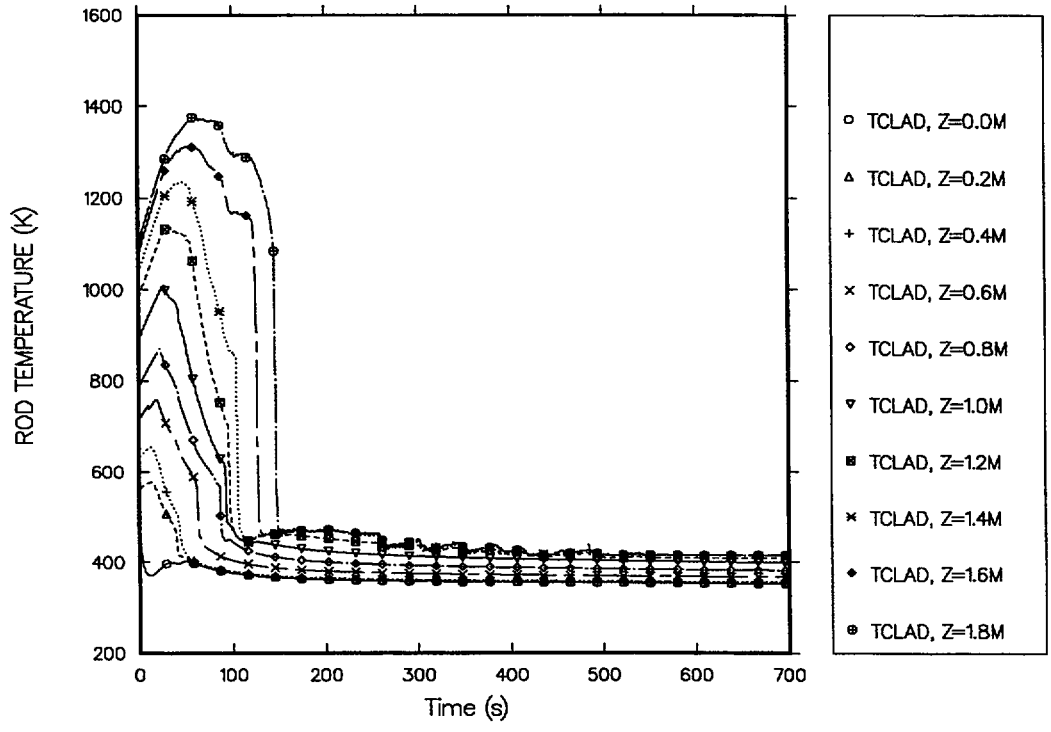


Fig. L-2. Predicted cladding temperature responses in lower half of core.

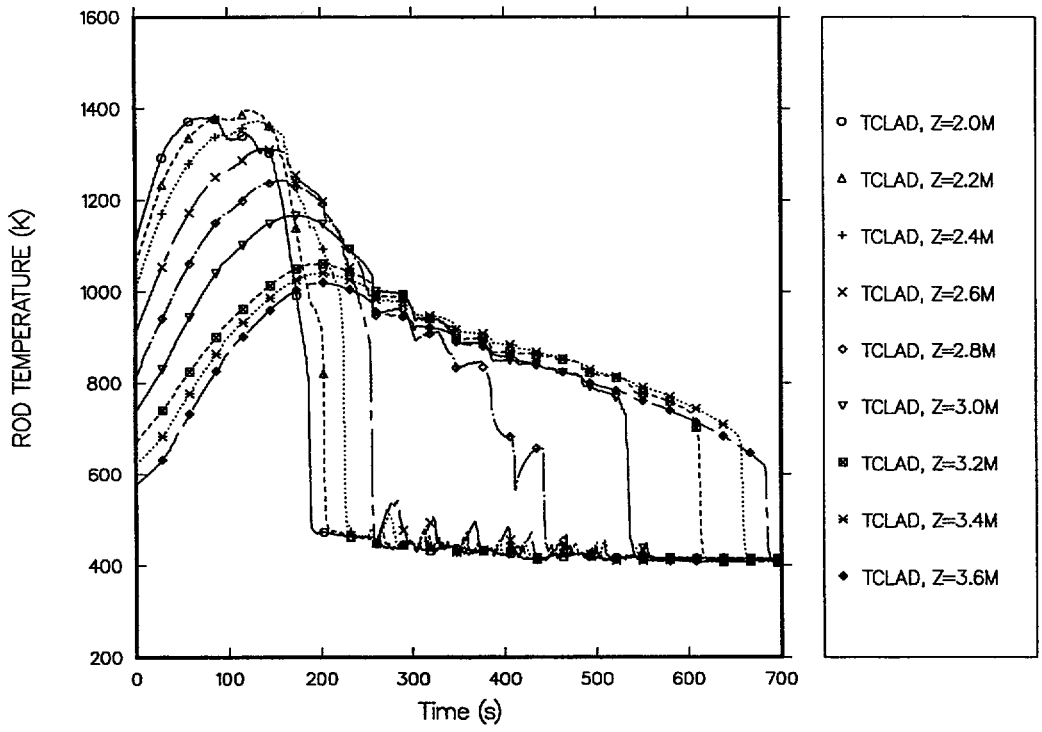


Fig. L-3. Predicted cladding temperature responses in upper half of core.

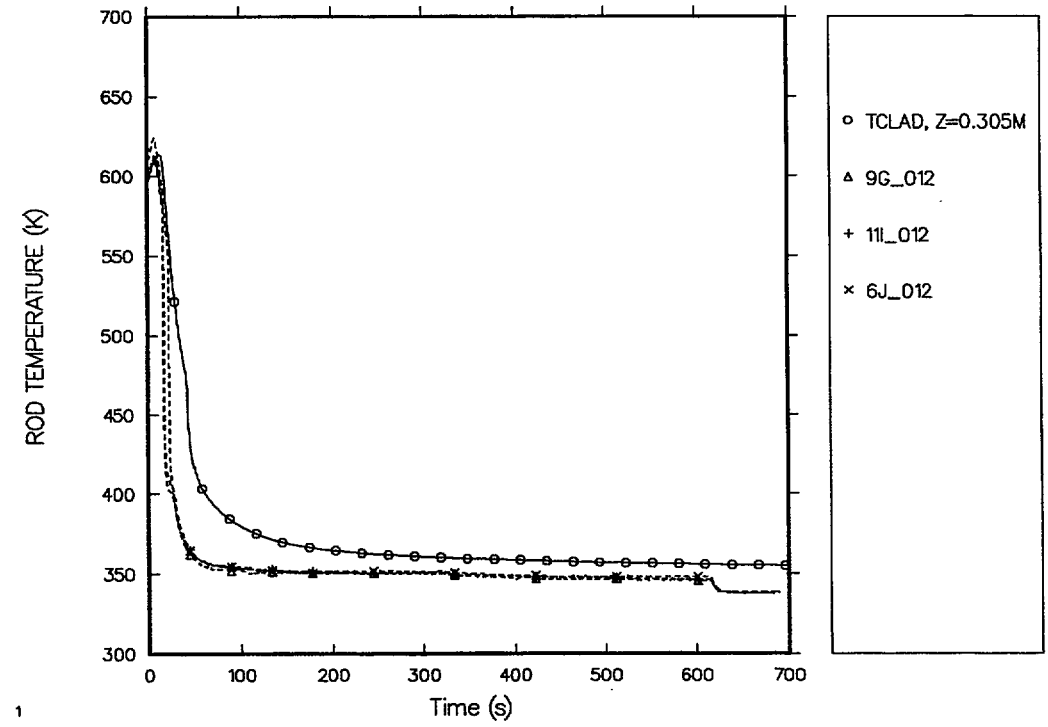


Fig. L-4. Comparison of predicted and measured heater-rod cladding temperatures at 0.3048-m elevation.

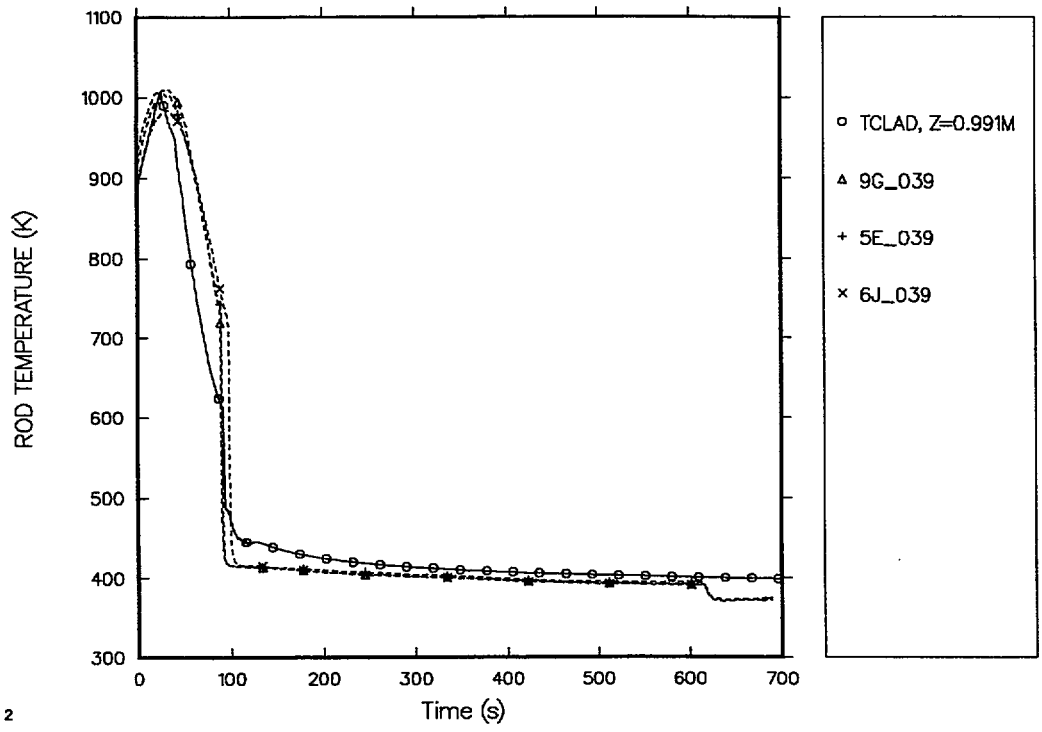


Fig. L-5. Comparison of predicted and measured heater-rod cladding temperatures at 0.9906-m elevation.

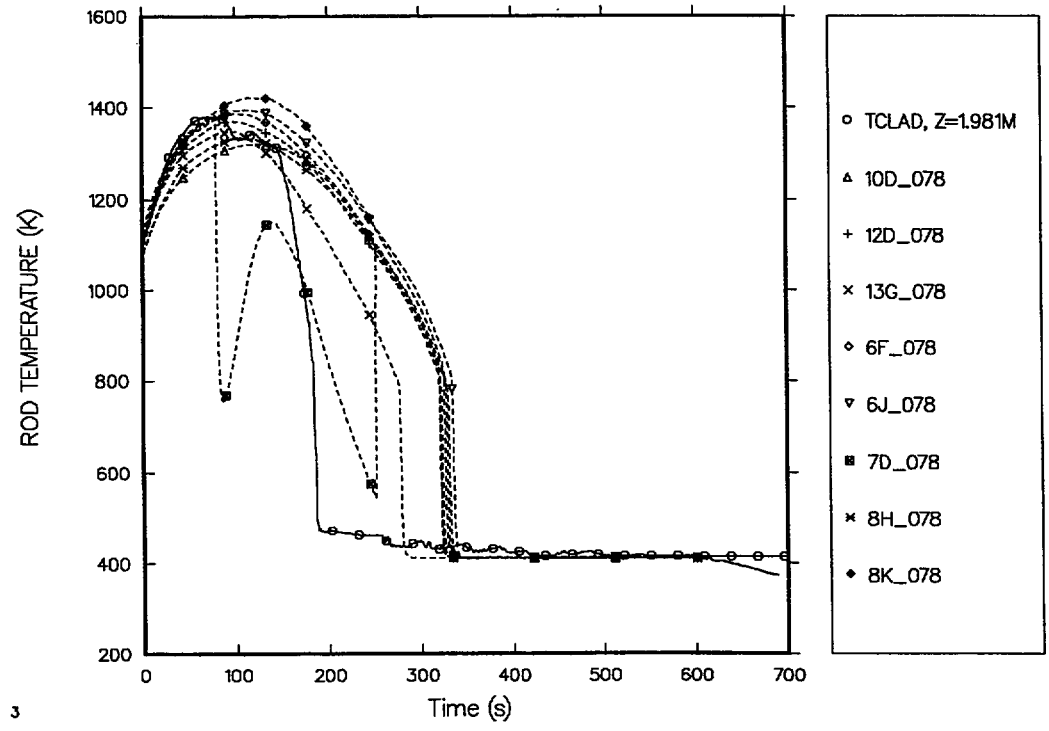


Fig. L-6. Comparison of predicted and measured heater-rod cladding temperatures at 1.9812-m elevation.

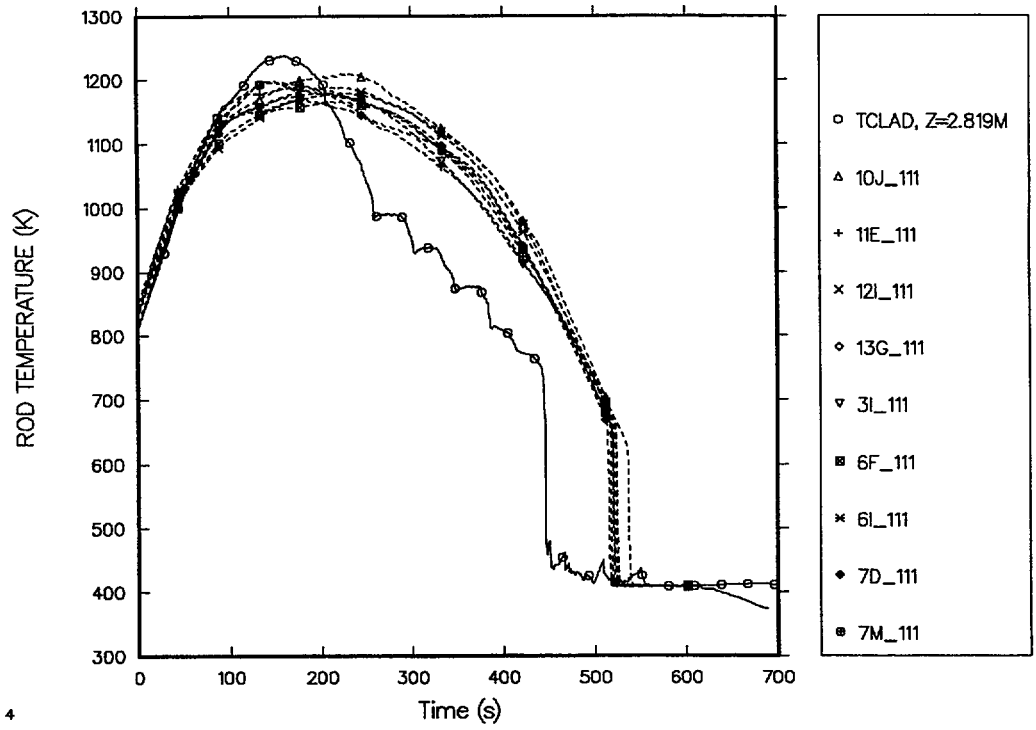


Fig. L-7. Comparison of predicted and measured heater-rod cladding temperatures at 2.8194-m elevation.

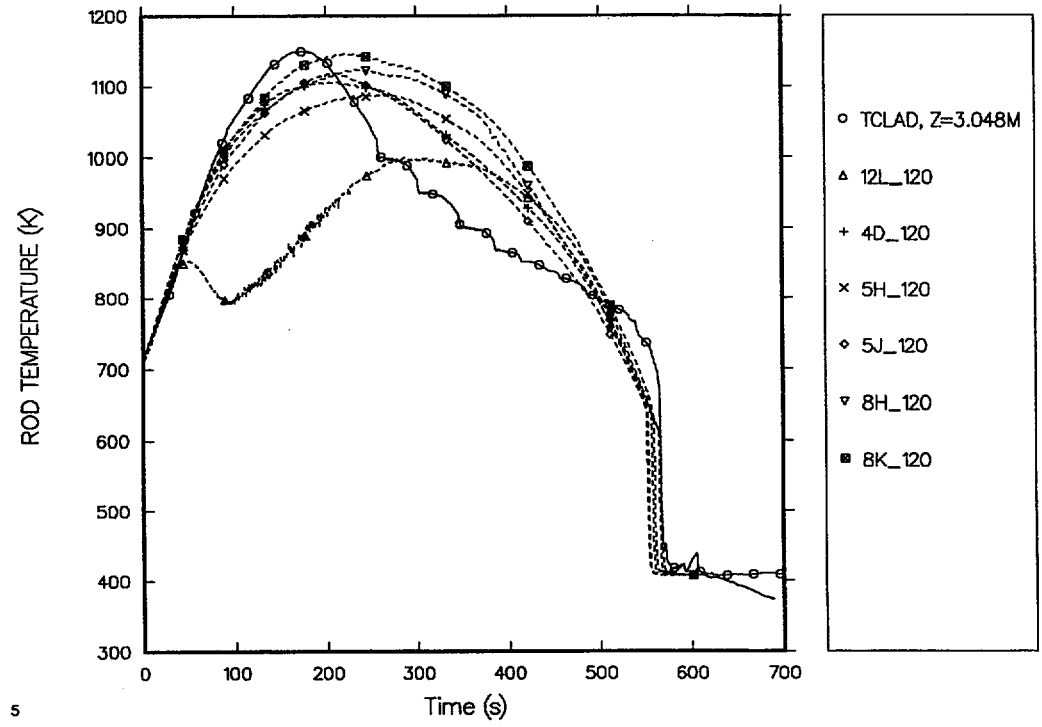


Fig. L-8. Comparison of predicted and measured heater-rod cladding temperatures at 3.0480-m elevation.

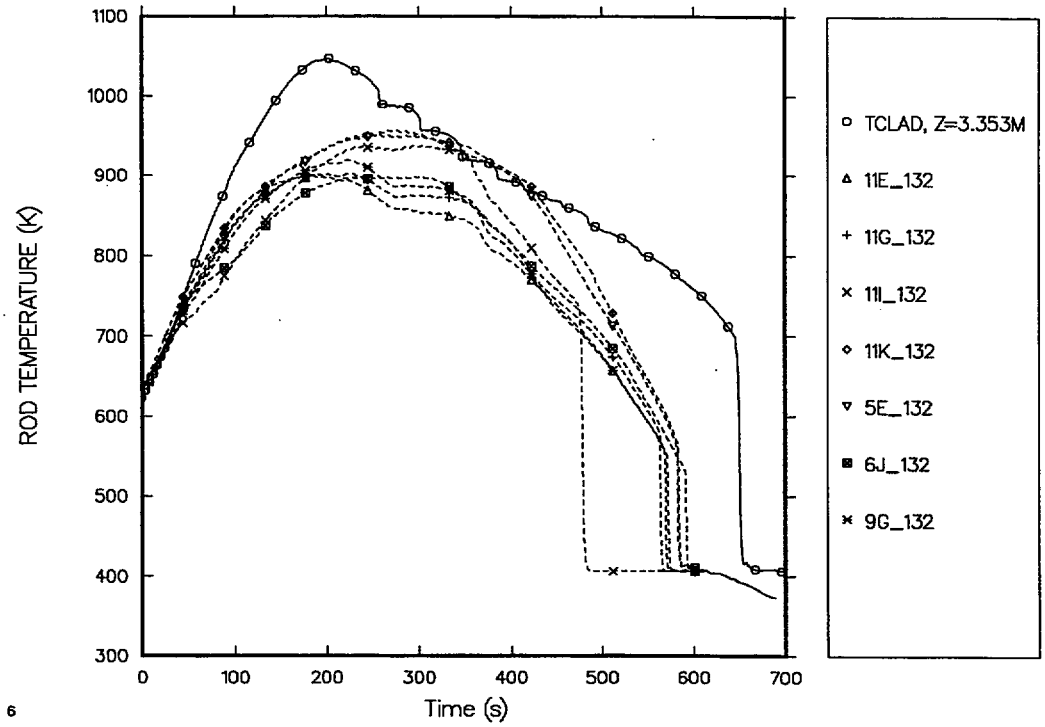


Fig. L-9. Comparison of predicted and measured heater-rod cladding temperatures at 3.3528-m elevation.

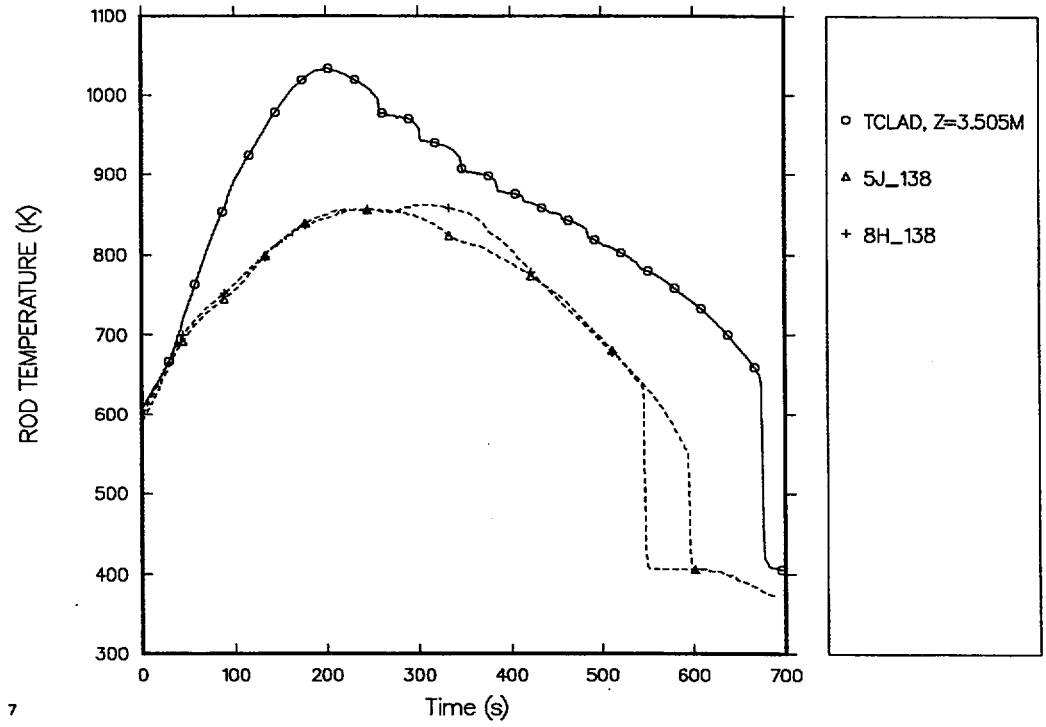


Fig. L-10. Comparison of predicted and measured heater-rod cladding temperatures at 3.5052-m elevation.

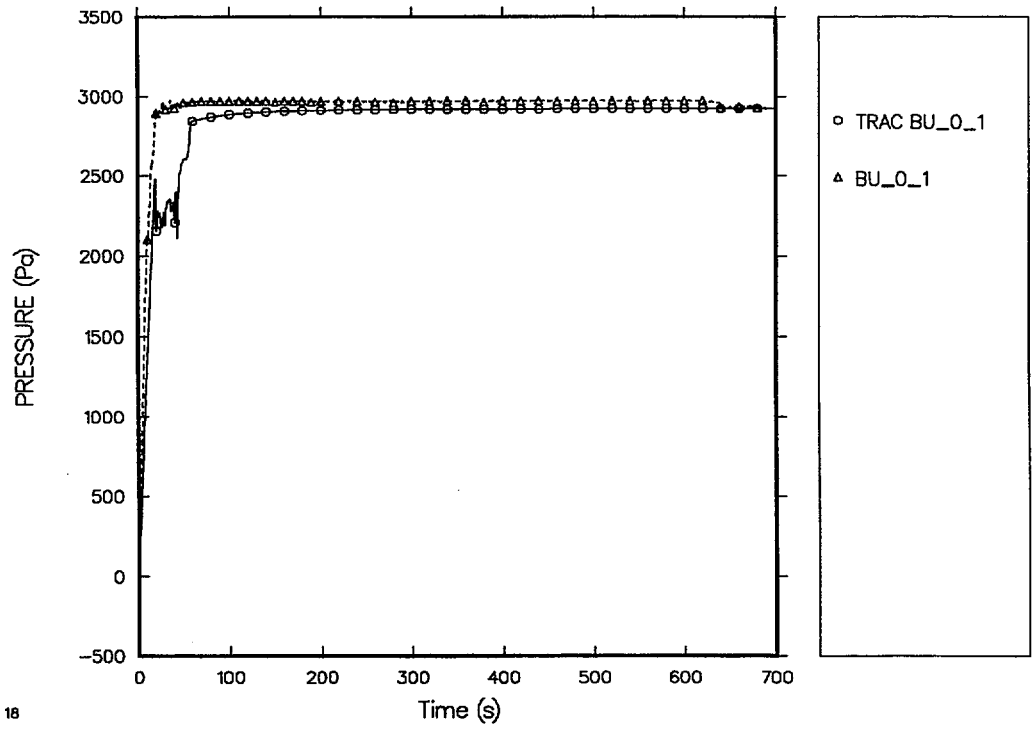


Fig. L-11. Comparison of predicted and measured differential pressures (0–1 ft).

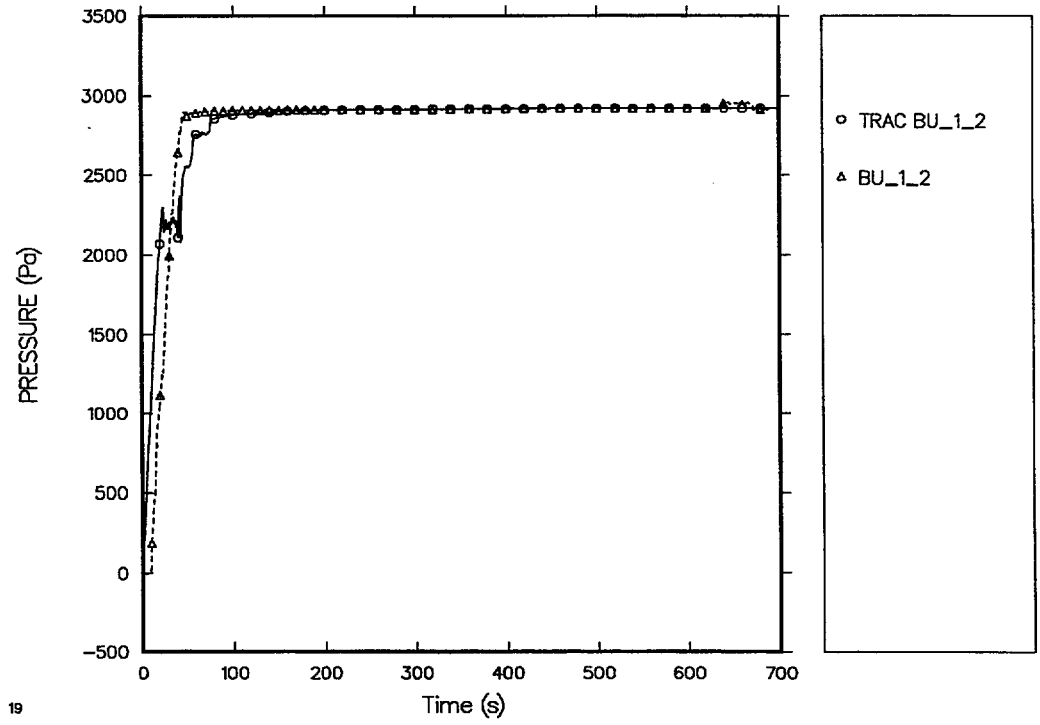


Fig. L-12. Comparison of predicted and measured differential pressures (1–2 ft).

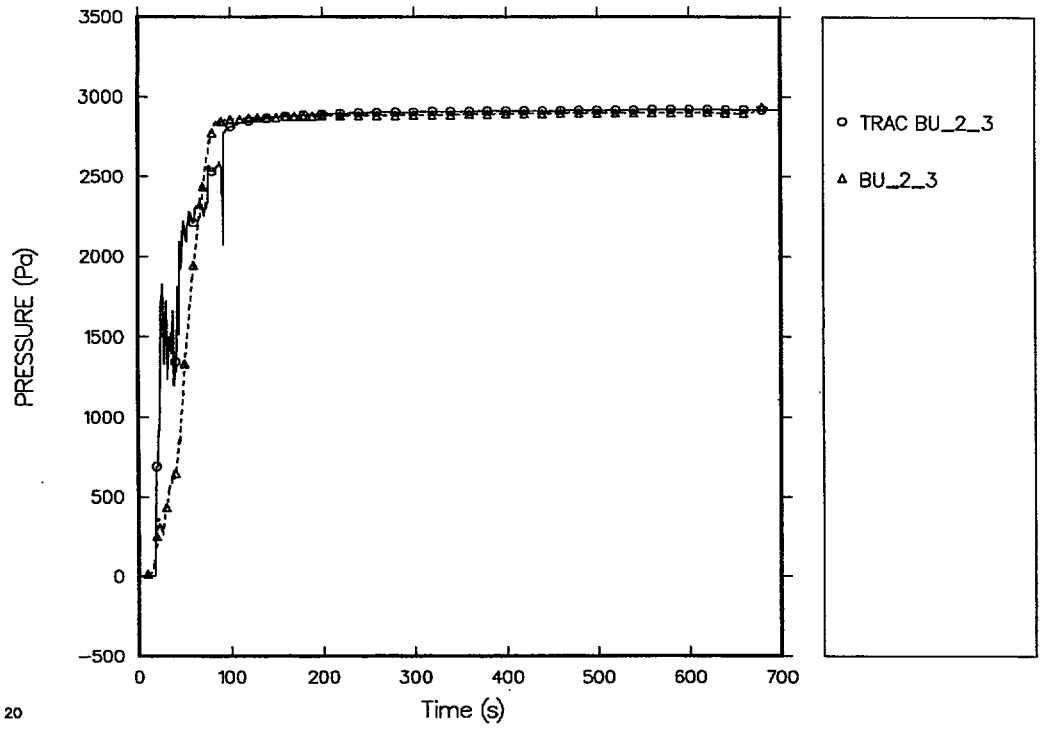


Fig. L-13. Comparison of predicted and measured differential pressures (2–3 ft).

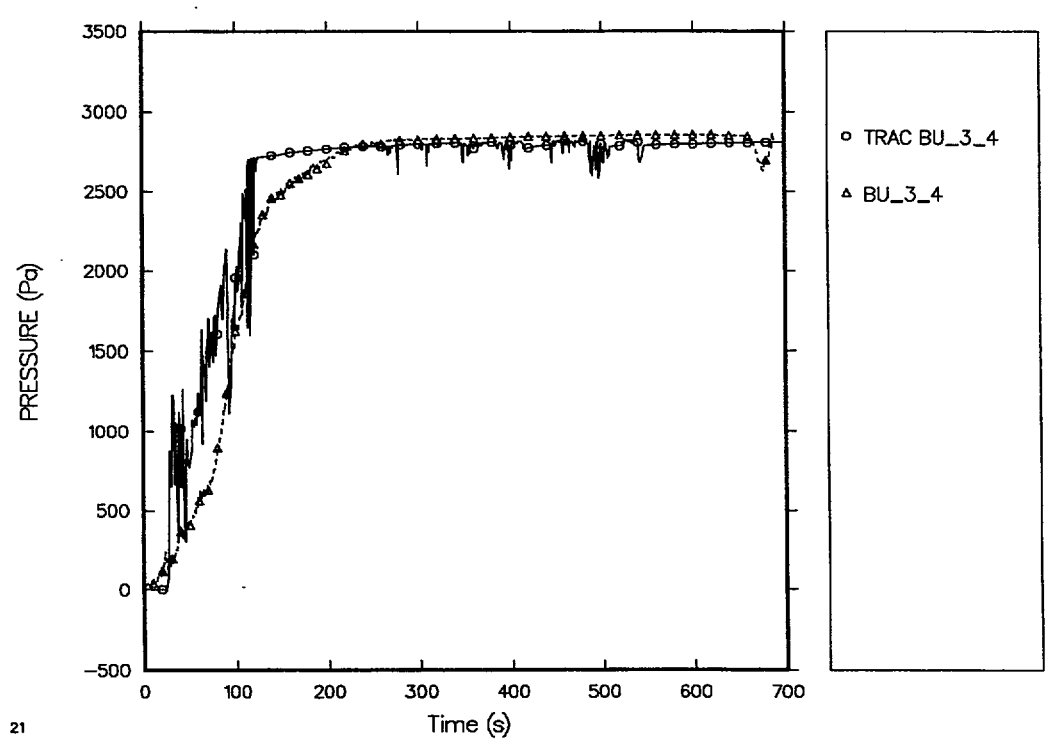


Fig. L-14. Comparison of predicted and measured differential pressures (3–4 ft).

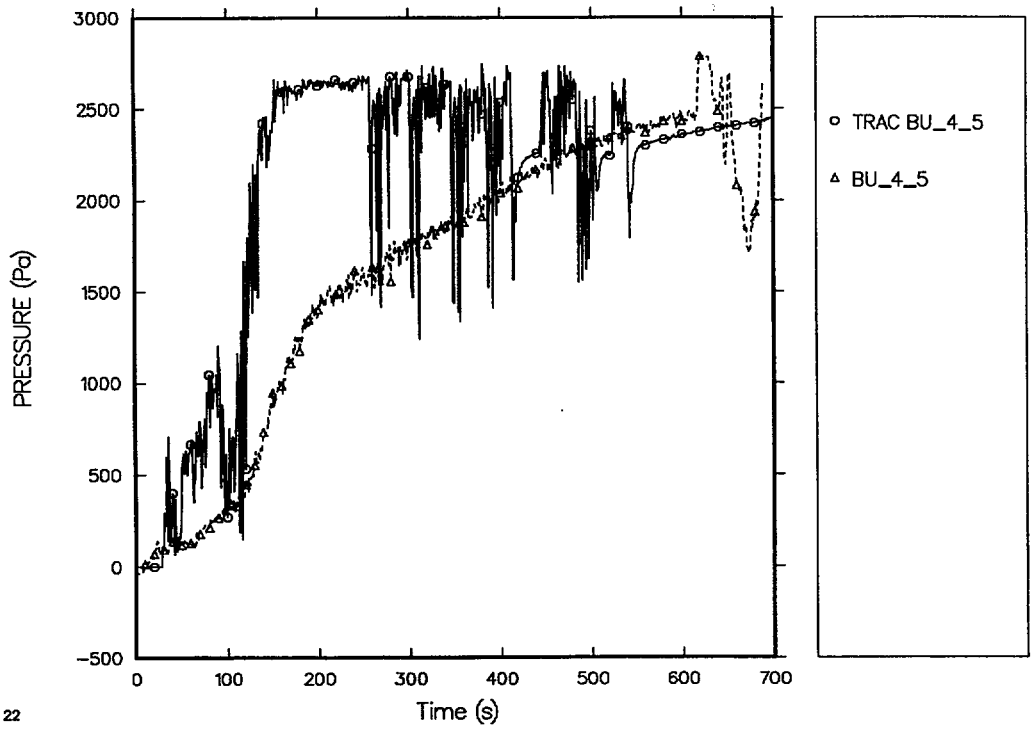


Fig. L-15. Comparison of predicted and measured differential pressures (4–5 ft).

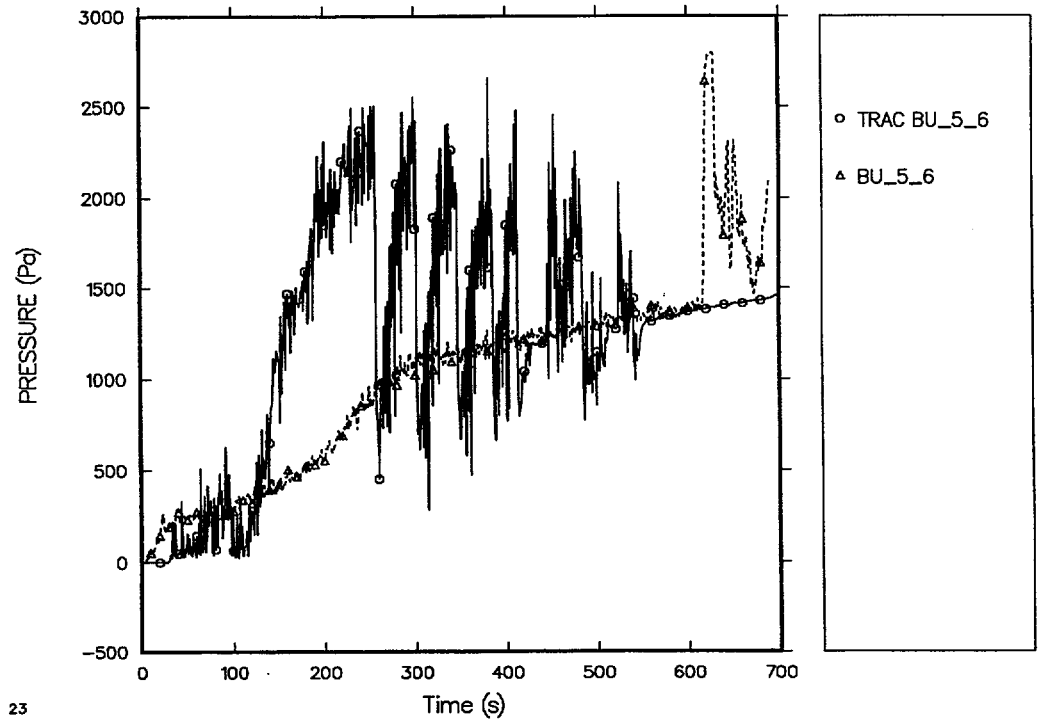


Fig. L-16. Comparison of predicted and measured differential pressures (5–6 ft).

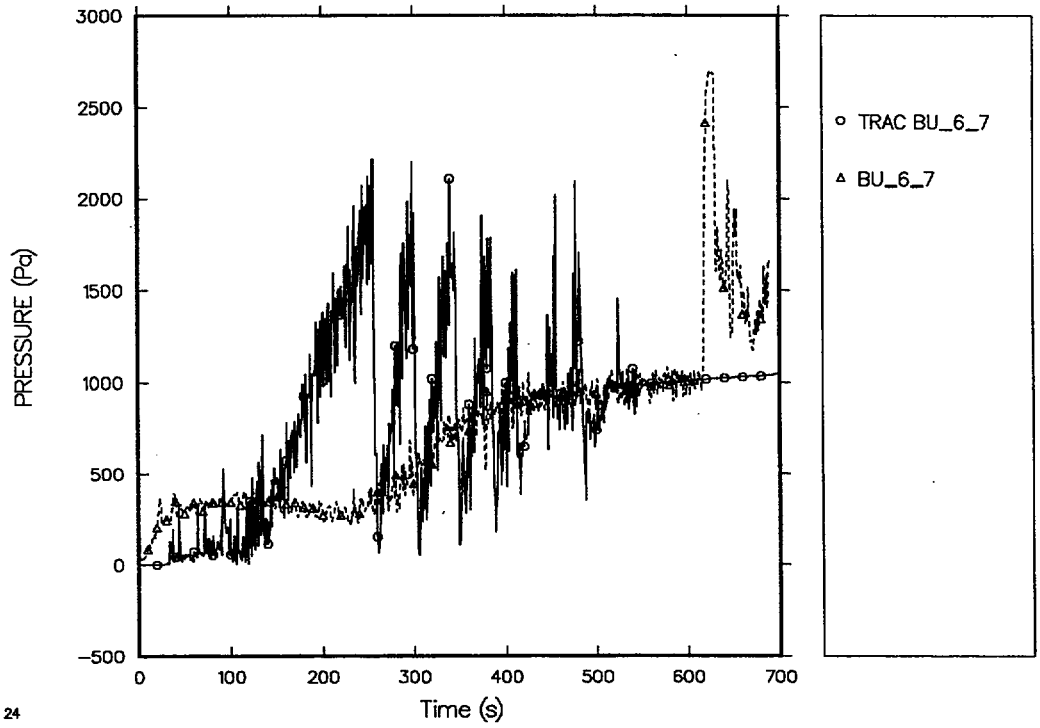


Fig. L-17. Comparison of predicted and measured differential pressures (6–7 ft).

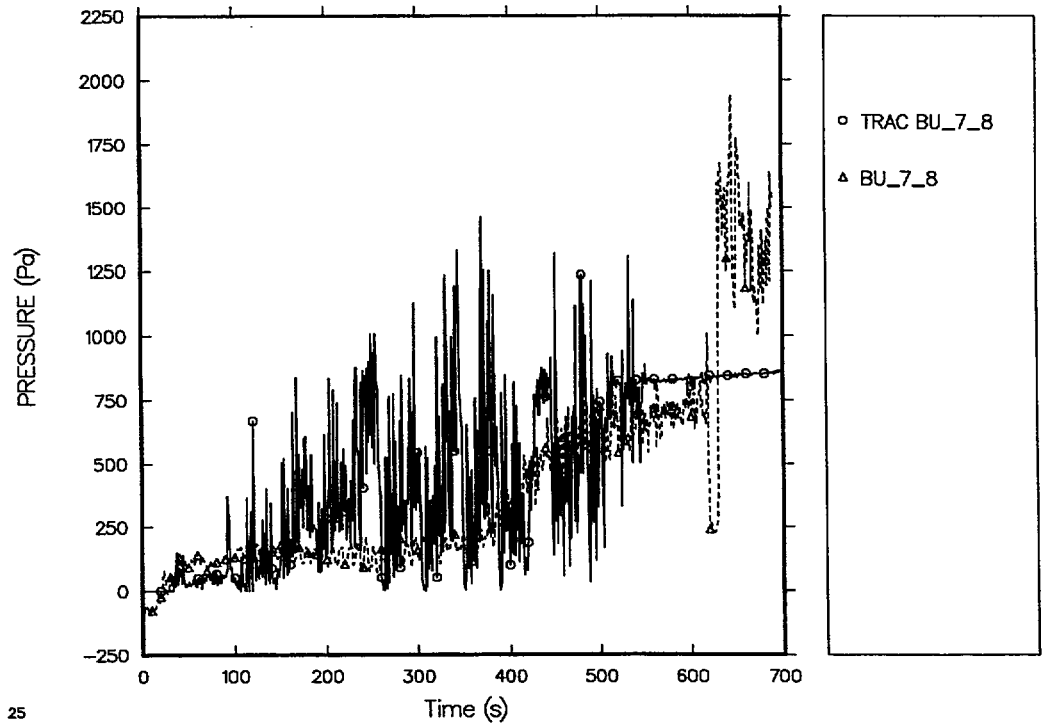


Fig. L-18. Comparison of predicted and measured differential pressures (7–8 ft).

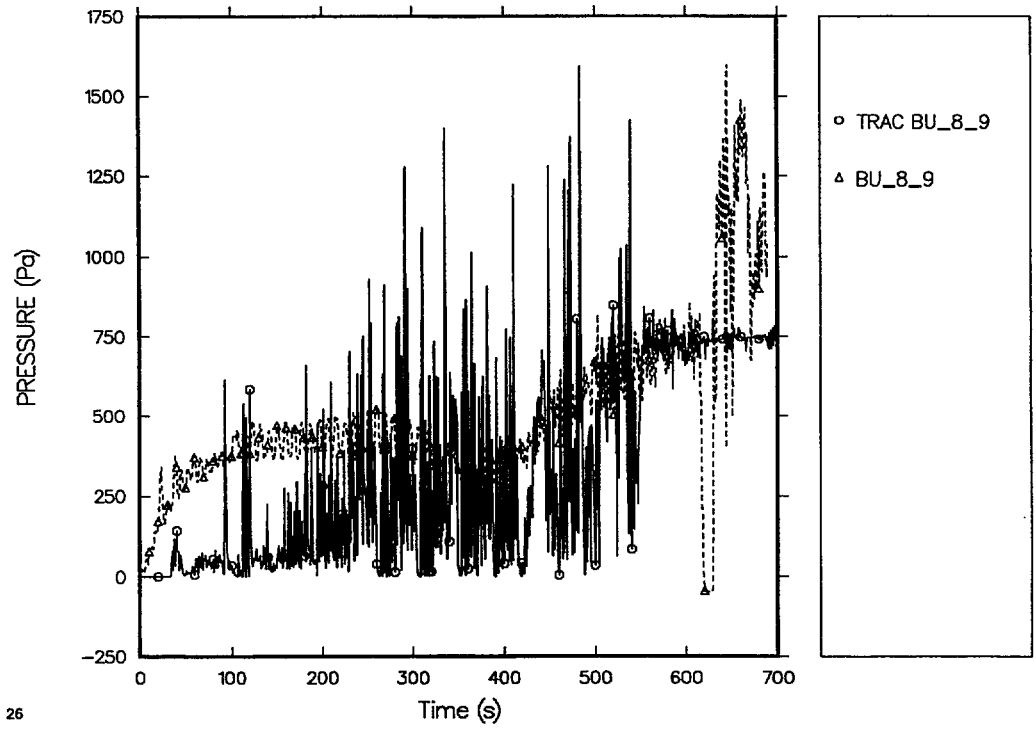


Fig. L-19. Comparison of predicted and measured differential pressures (8–9 ft).

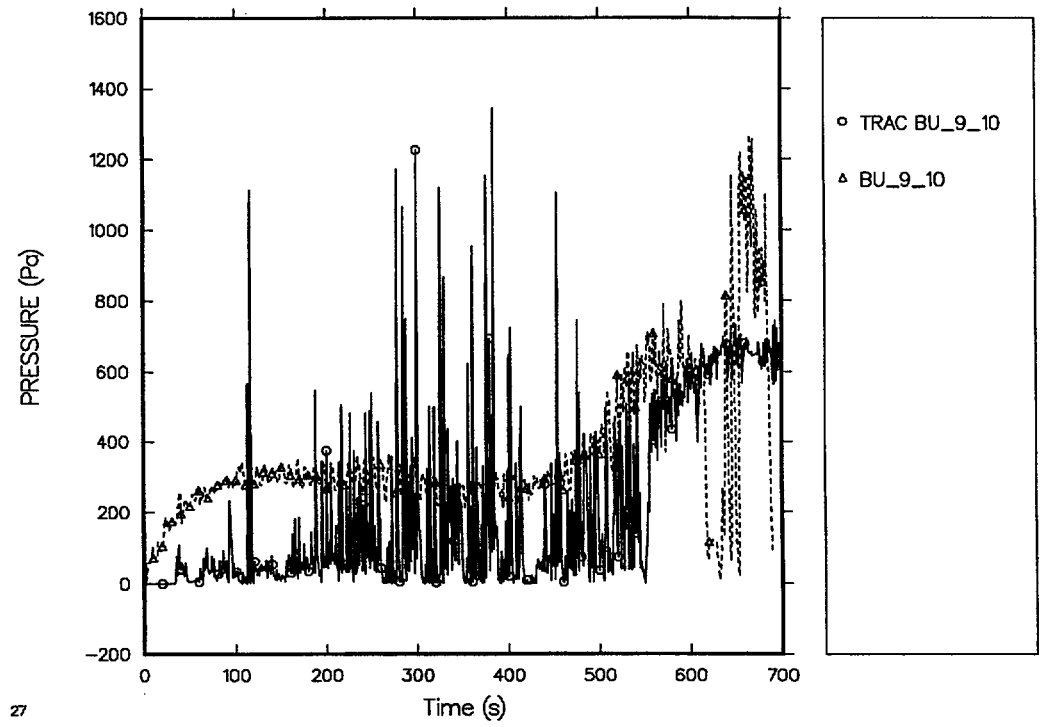


Fig. L-20. Comparison of predicted and measured differential pressures (9–10 ft).

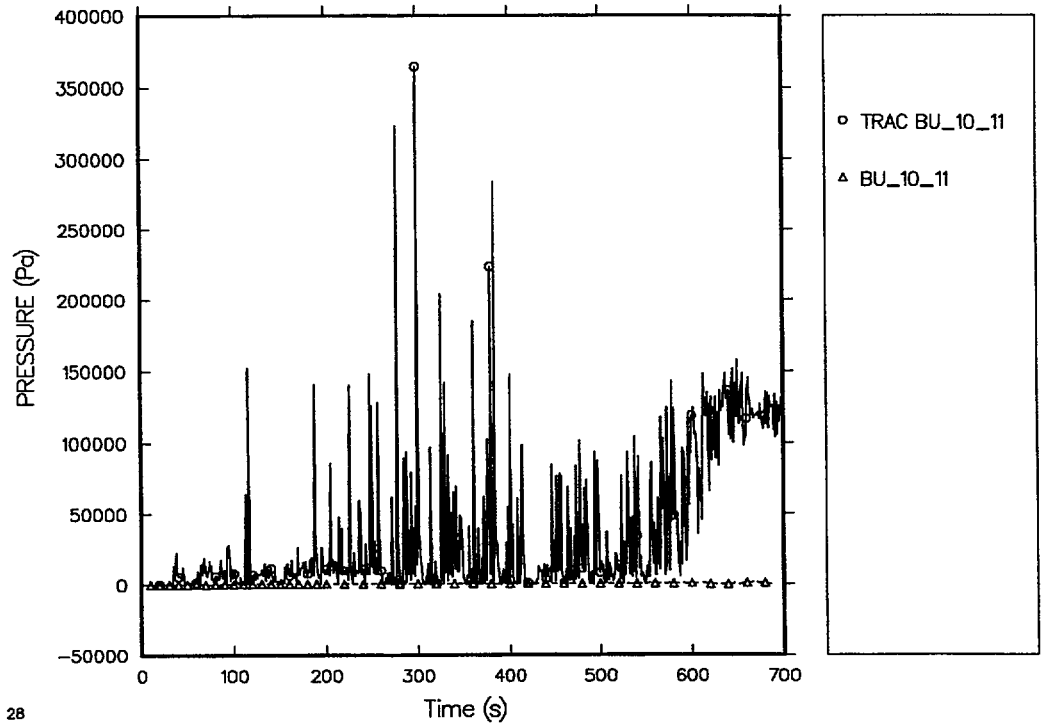


Fig. L-21. Comparison of predicted and measured differential pressures (10–11 ft).

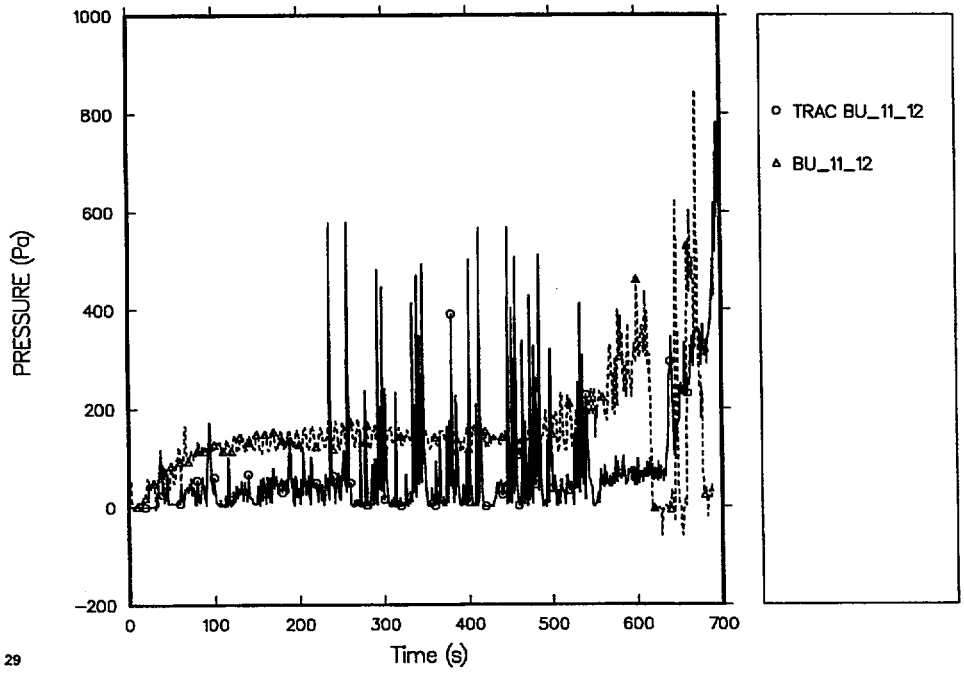


Fig. L-22. Comparison of predicted and measured differential pressures (11–12 ft).

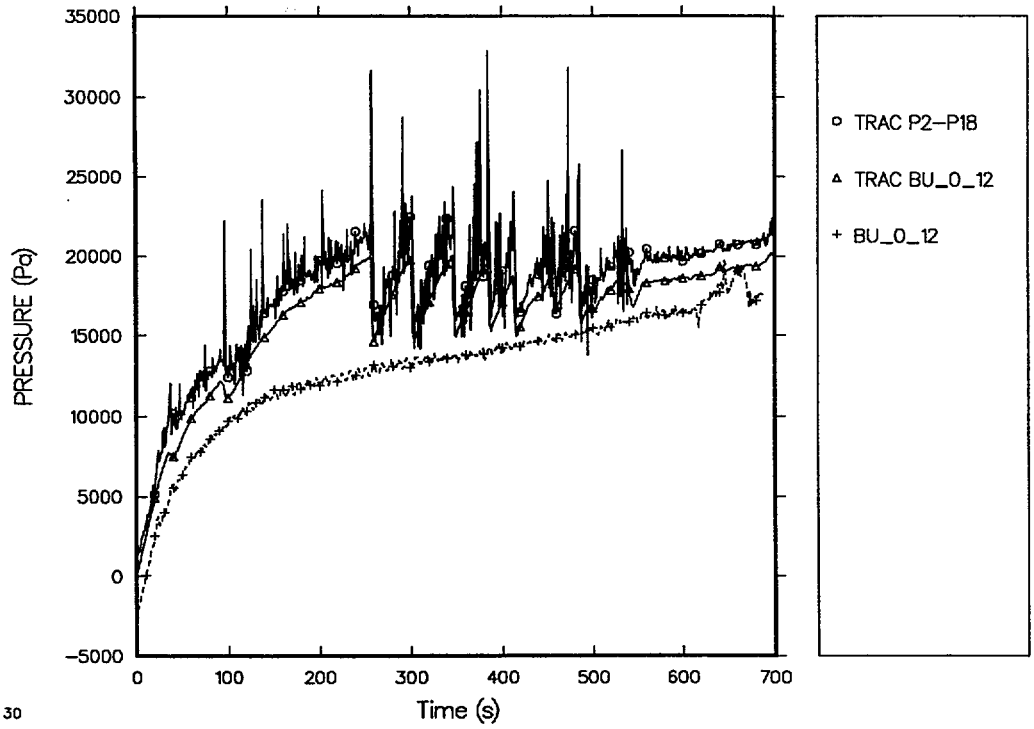


Fig. L-23. Comparison of predicted and measured total core differential pressures (0–12 ft).

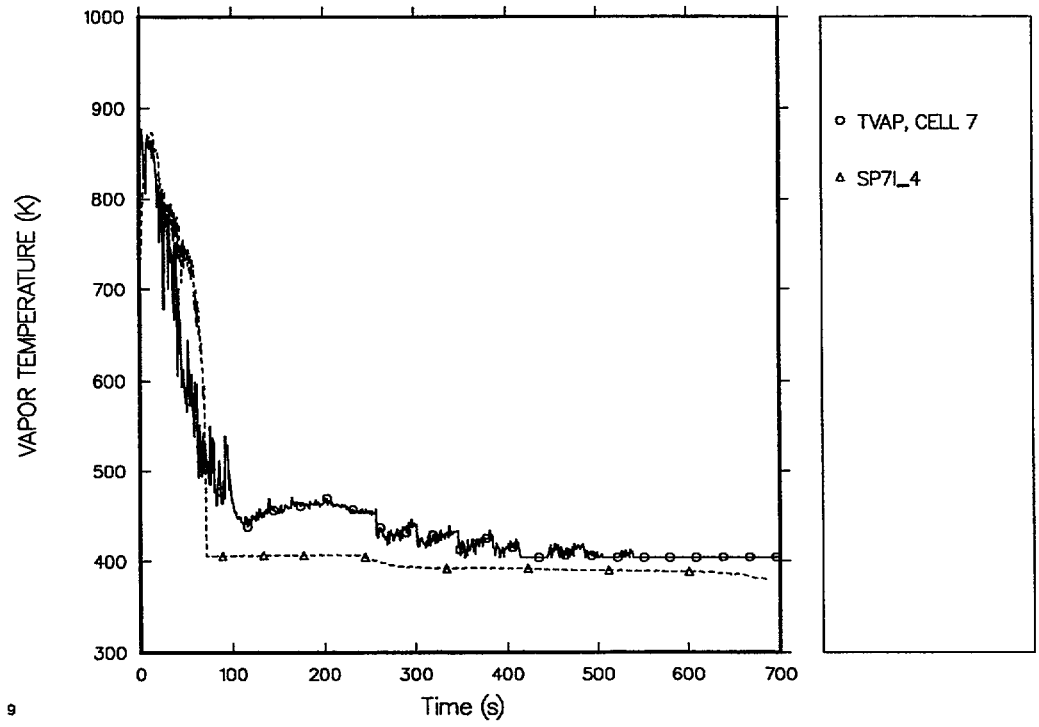


Fig. L-24. Comparison of predicted and measured vapor temperatures in cell 7.

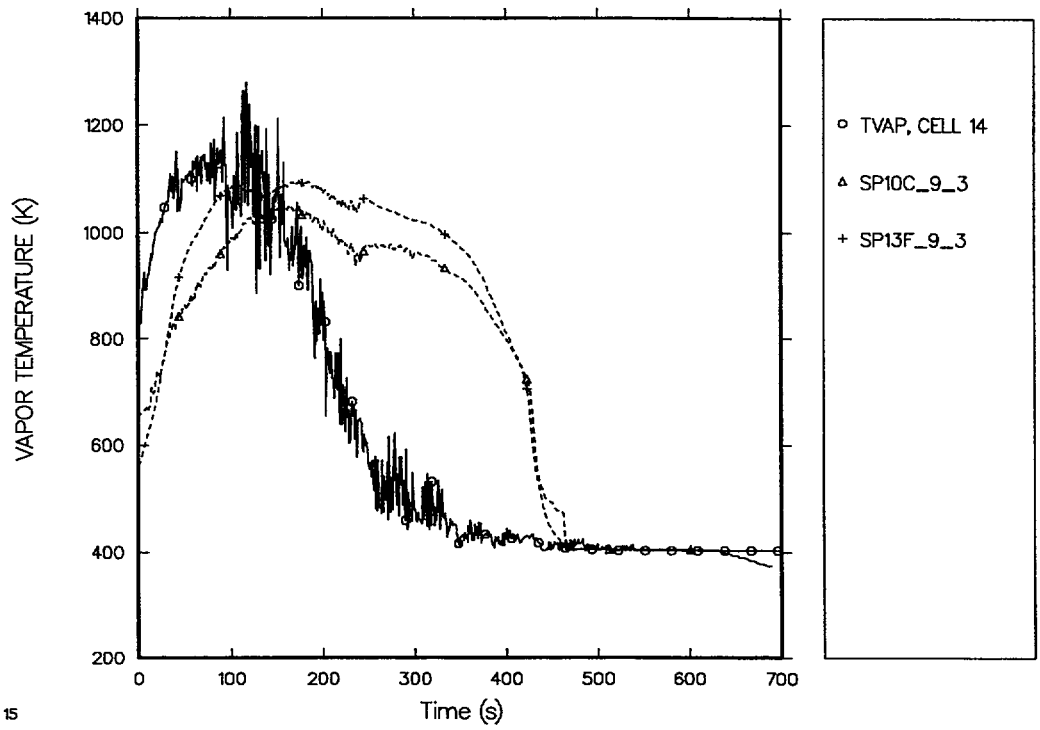


Fig. L-25. Comparison of predicted and measured vapor temperatures in cell 14.

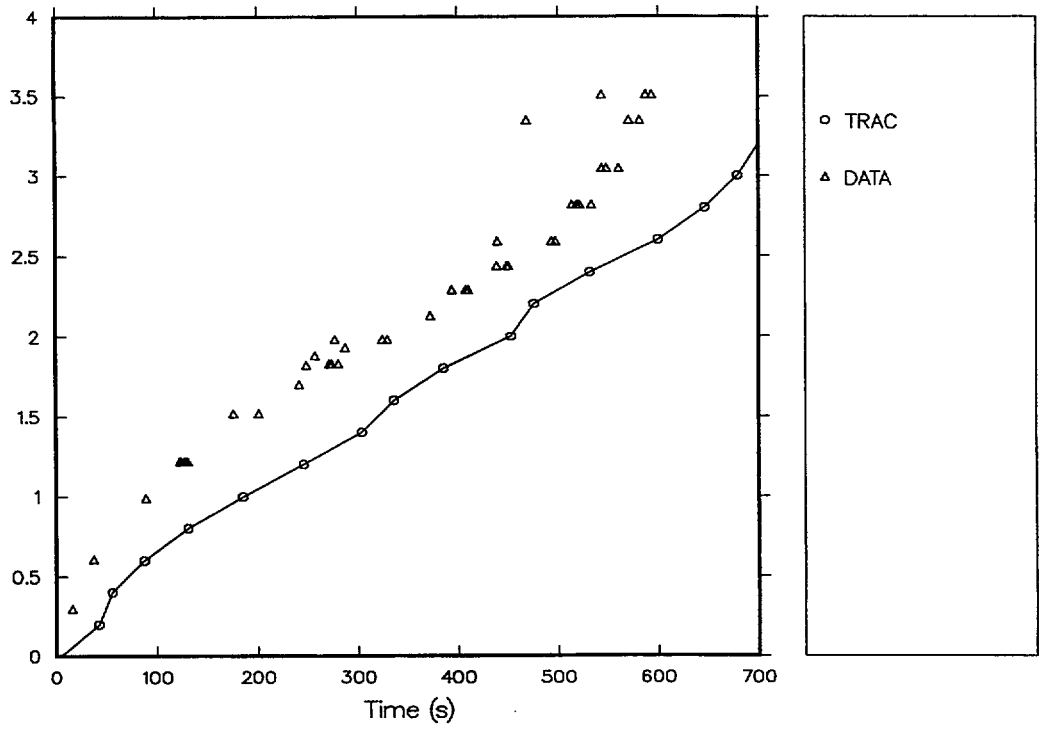


Fig. L-26. Comparison of predicted and measured cladding quench times (with grid-spacer model).

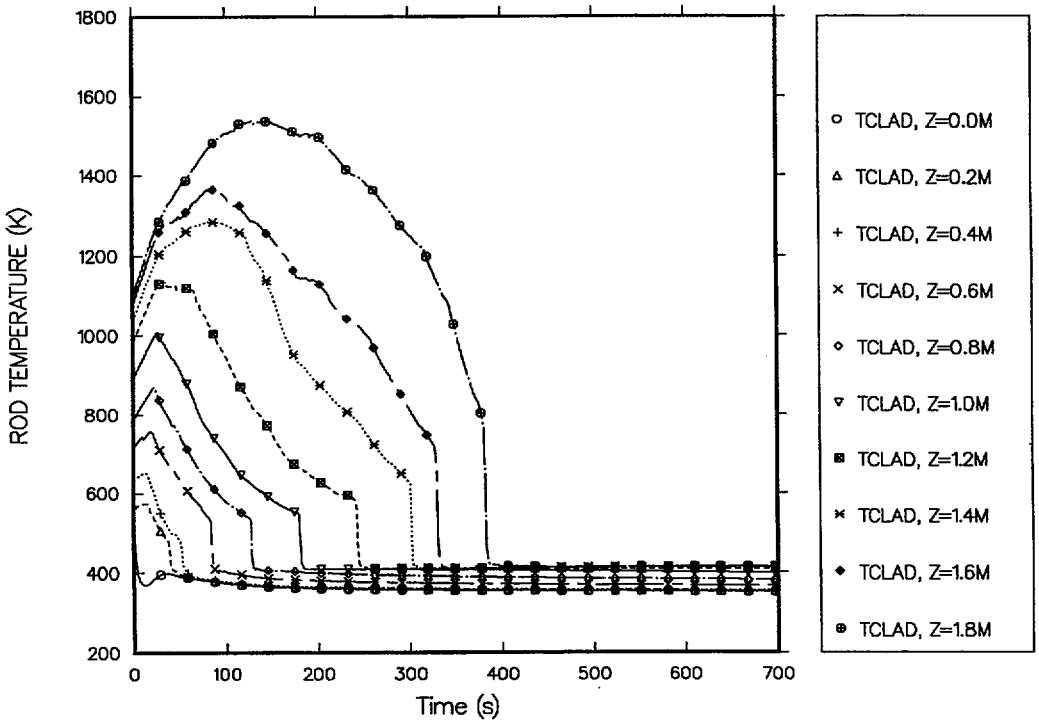


Fig. L-27. Predicted cladding temperature responses in lower half of core (with grid-spacer model).

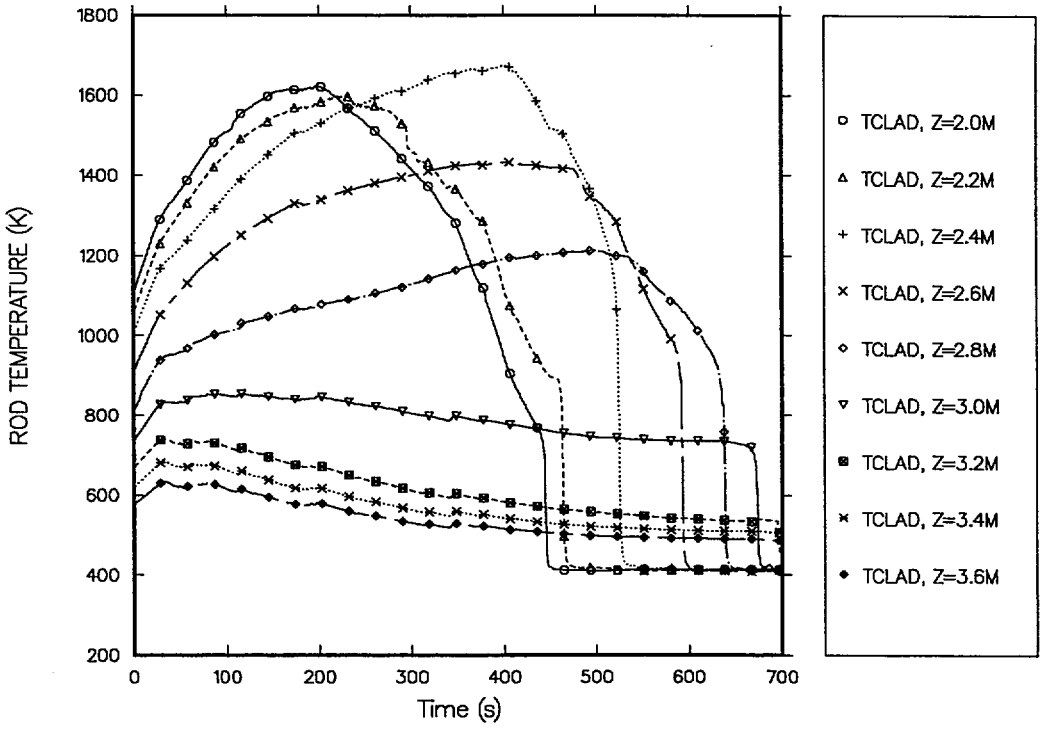


Fig. L-28. Predicted cladding temperature responses in upper half of core (with grid-spacer model).

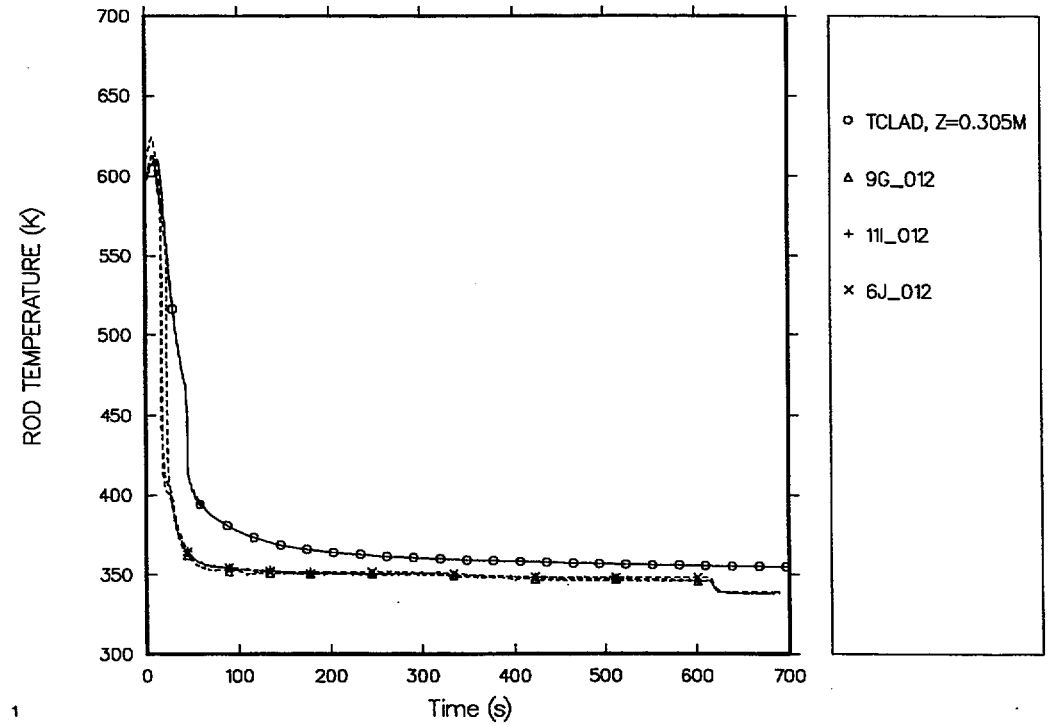


Fig. L-29. Comparison of predicted and measured heater-rod cladding temperatures at 0.3048-m elevation (with grid-spacer model).

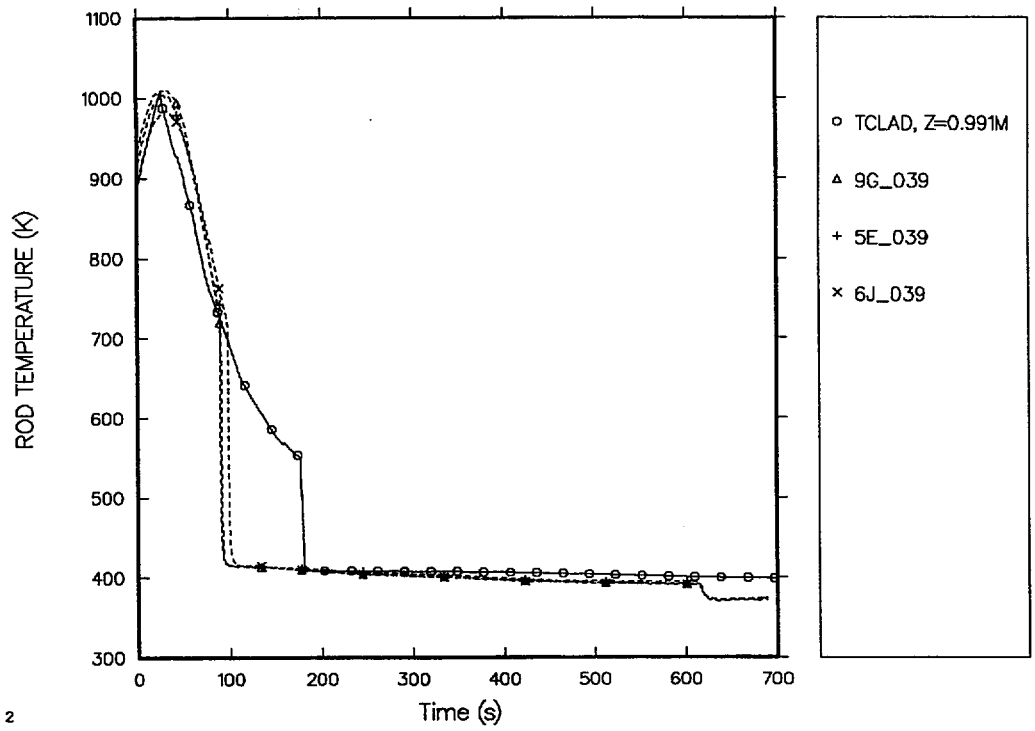


Fig. L-30. Comparison of predicted and measured heater-rod cladding temperatures at 0.9906-m elevation (with grid-spacer model).

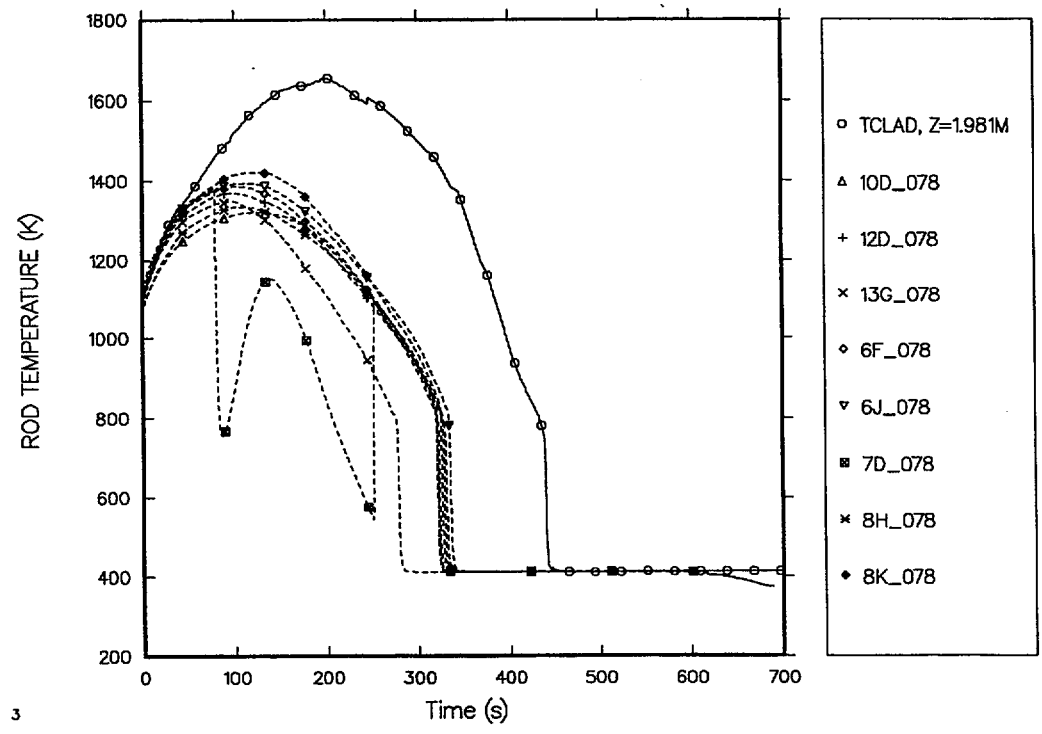


Fig. L-31. Comparison of predicted and measured heater-rod cladding temperatures at 1.9812-m elevation (with grid-spacer model).

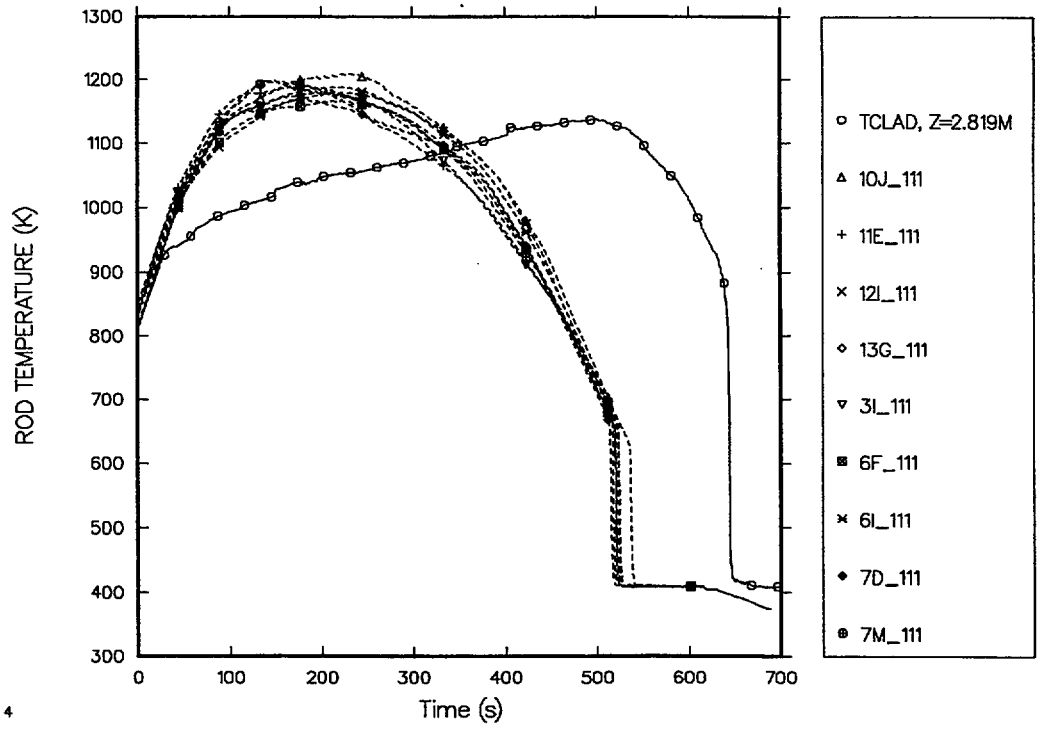


Fig. L-32. Comparison of predicted and measured heater-rod cladding temperatures at 2.8194-m elevation (with grid-spacer model).

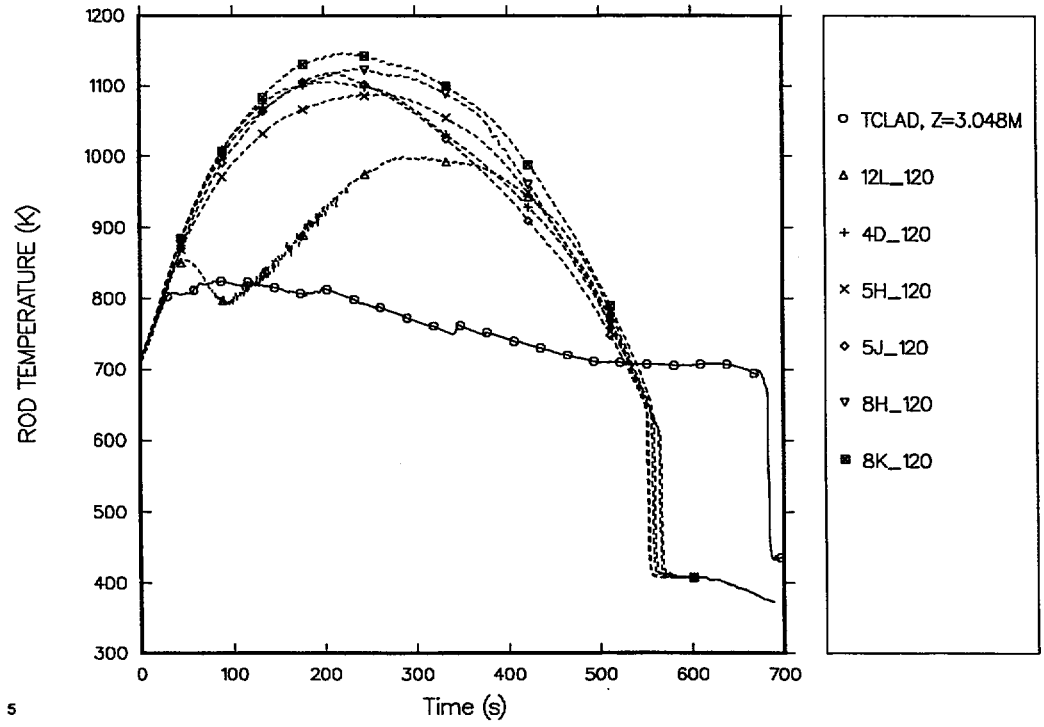


Fig. L-33. Comparison of predicted and measured heater-rod cladding temperatures at 3.0480-m elevation (with grid-spacer model).

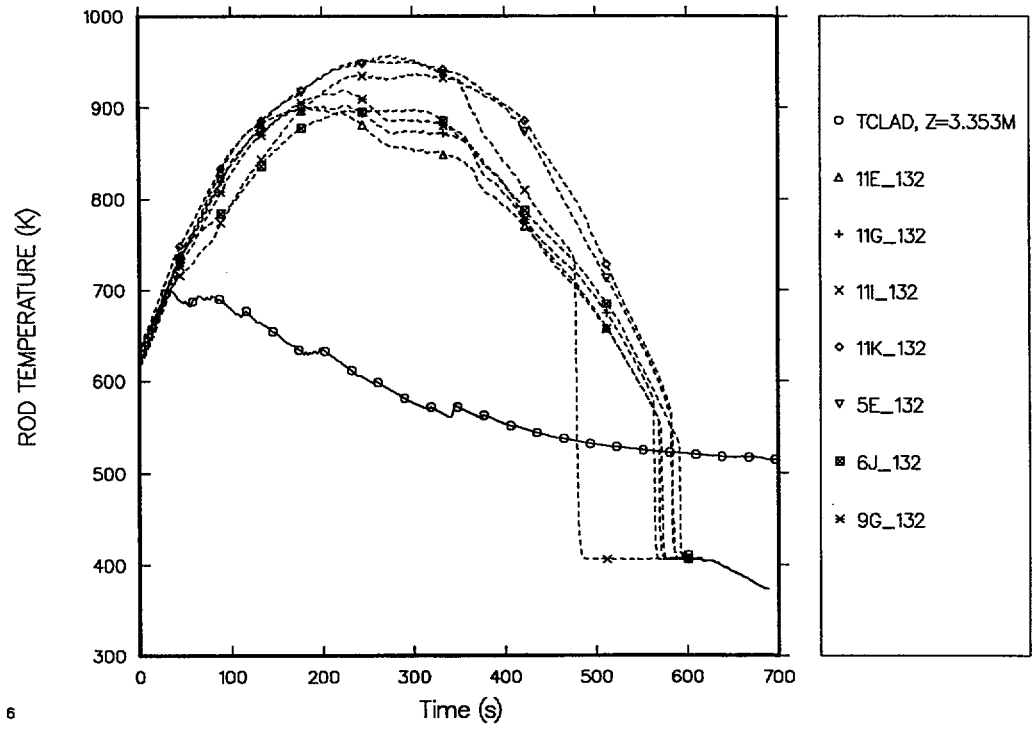


Fig. 49-34. Comparison of predicted and measured heater-rod cladding temperatures at 3.3528-m elevation (with grid-spacer model).

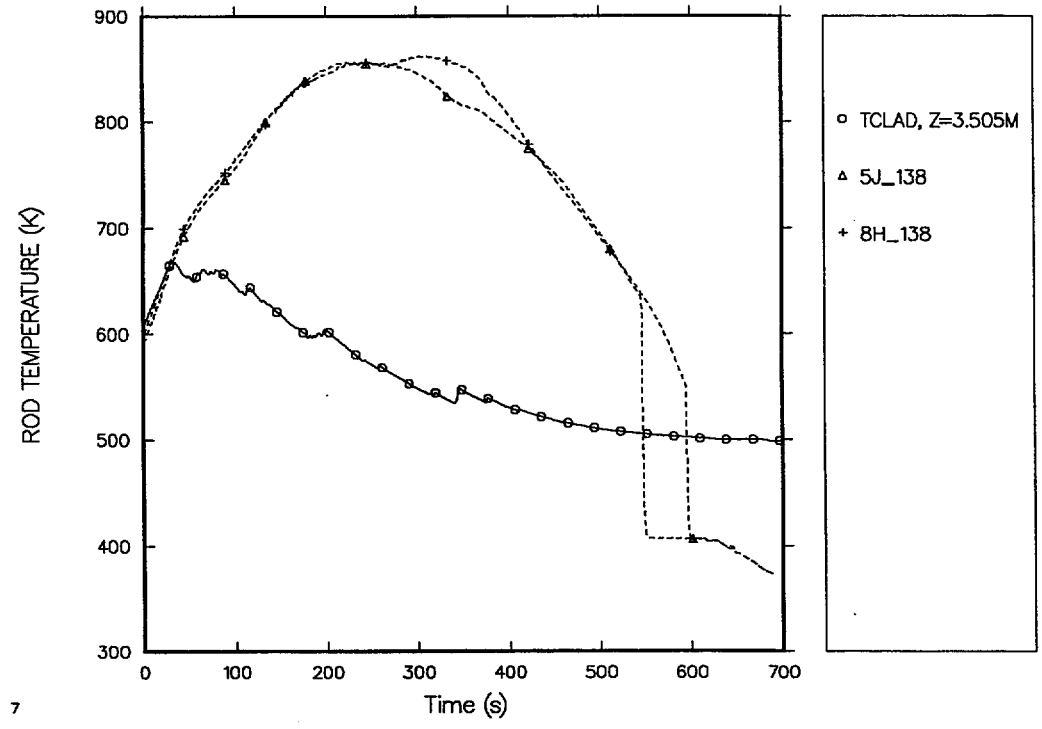


Fig. L-35. Comparison of predicted and measured heater-rod cladding temperatures at 3.5052-m elevation (with grid-spacer model).

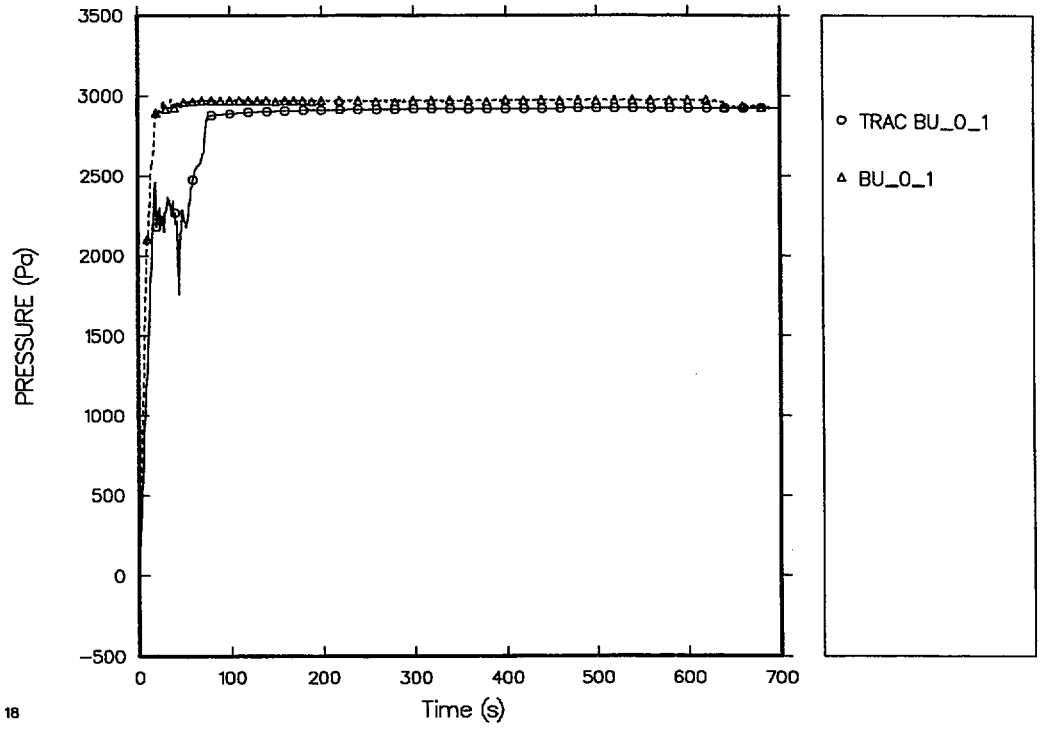


Fig. L-36. Comparison of predicted and measured differential pressures (0–1 ft, with grid-spacer model).

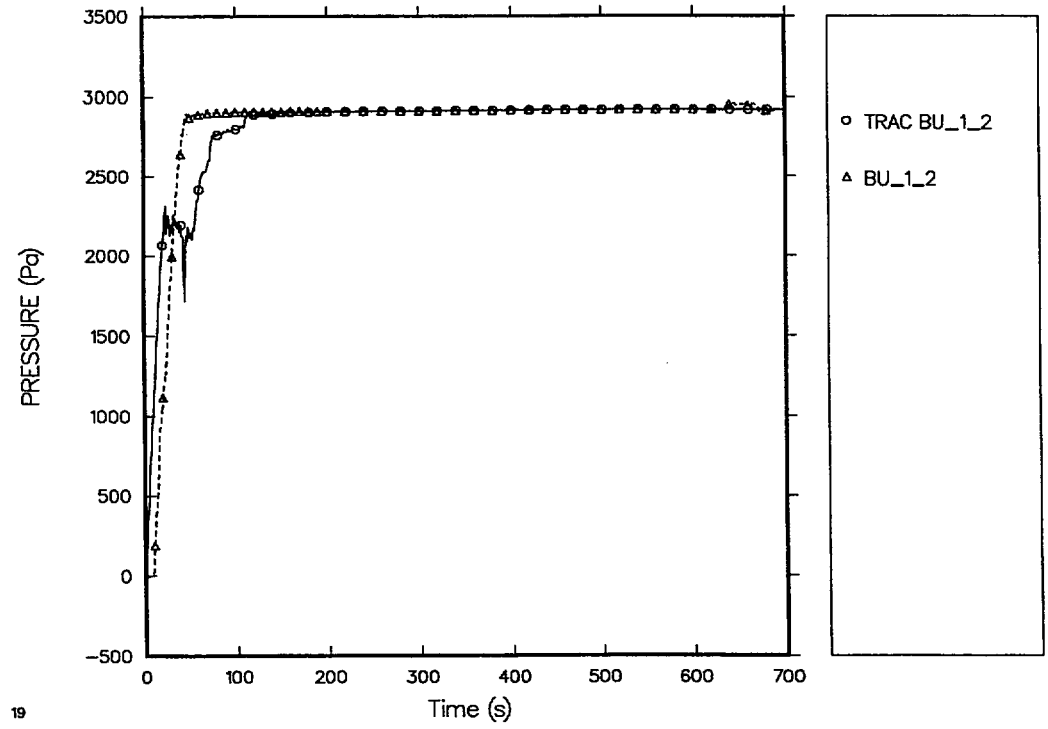


Fig. L-37. Comparison of predicted and measured differential pressures (1–2 ft, with grid-spacer model).

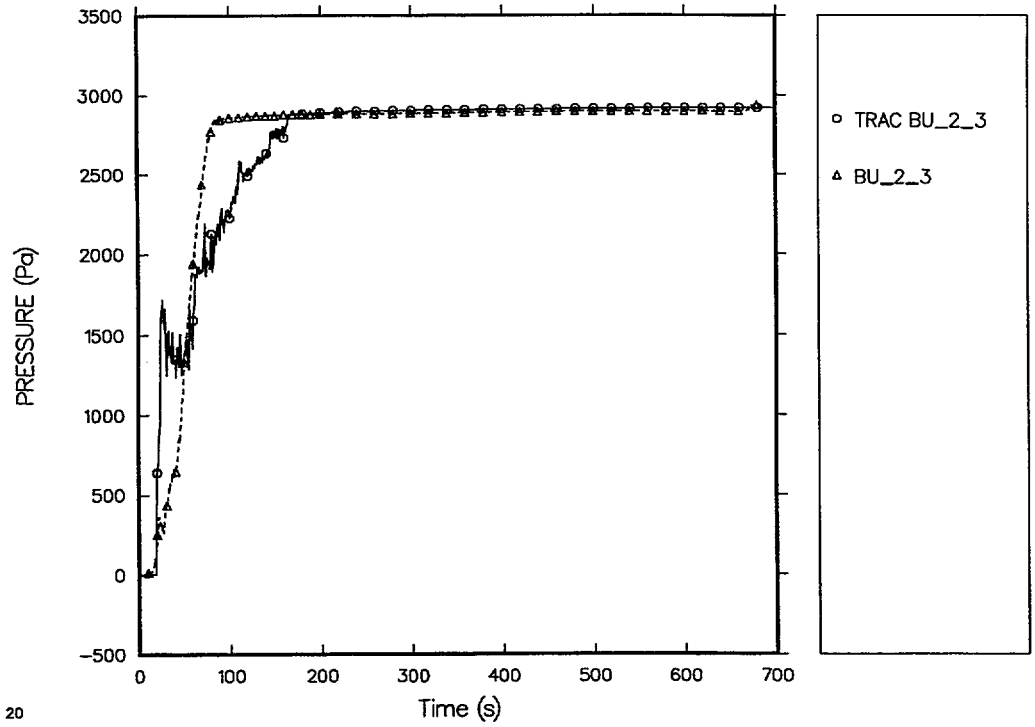


Fig. L-38. Comparison of predicted and measured differential pressures (2–3 ft, with grid-spacer model).

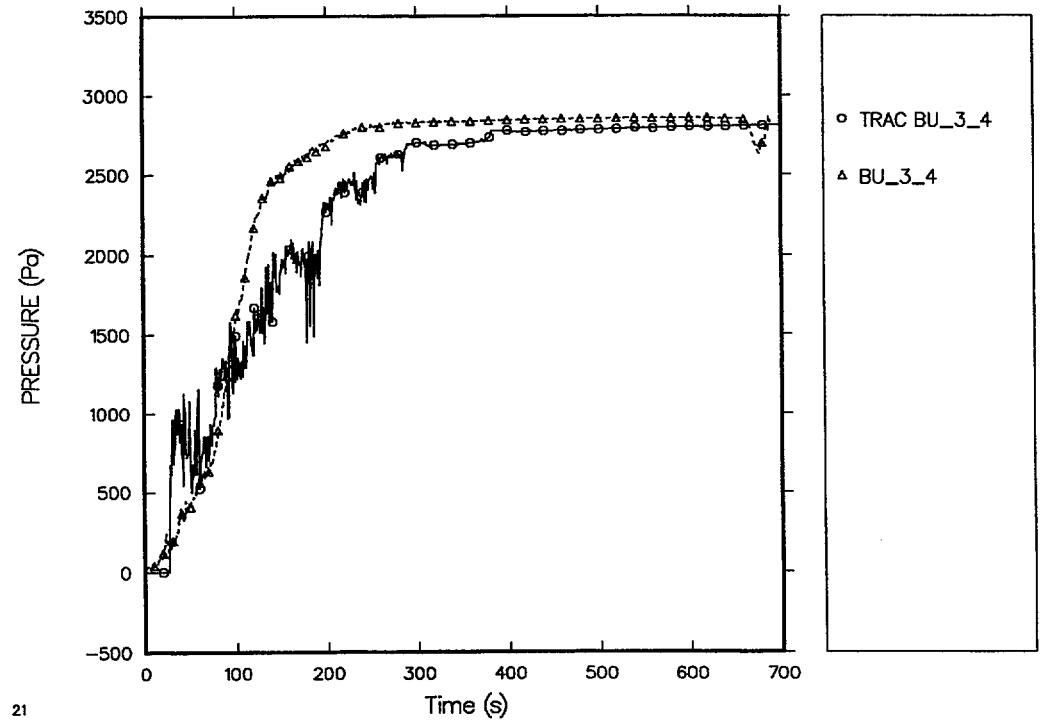


Fig. L-39. Comparison of predicted and measured differential pressures (3–4 ft, with grid-spacer model).

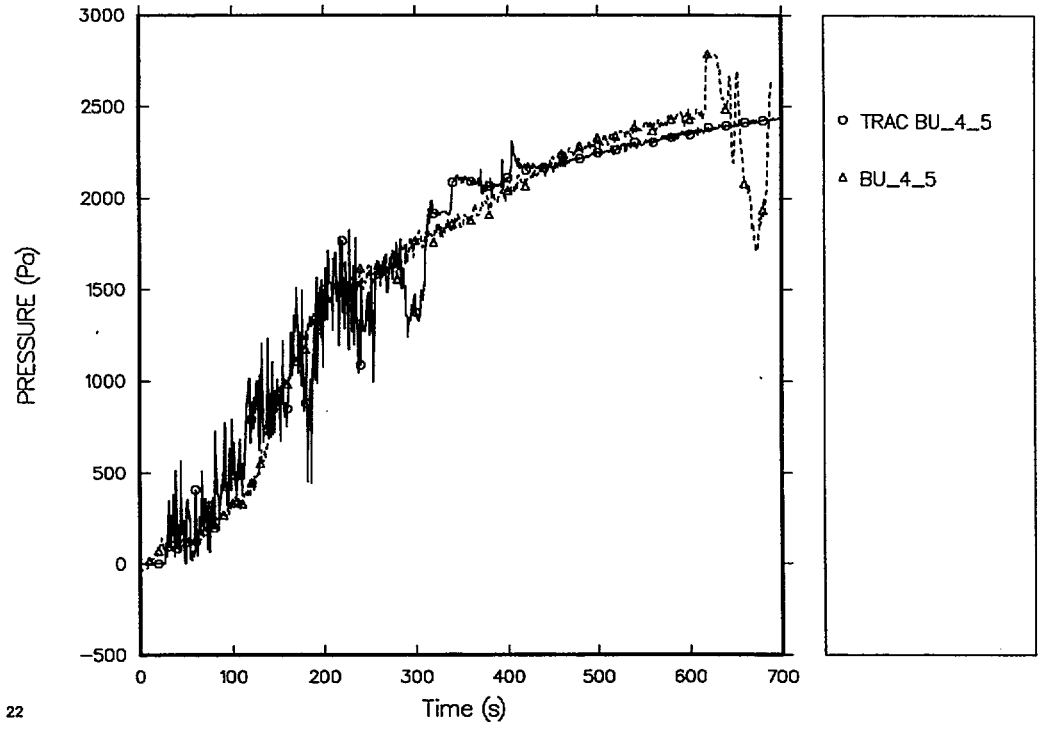


Fig. L-40. Comparison of predicted and measured differential pressures (4–5 ft, with grid-spacer model).

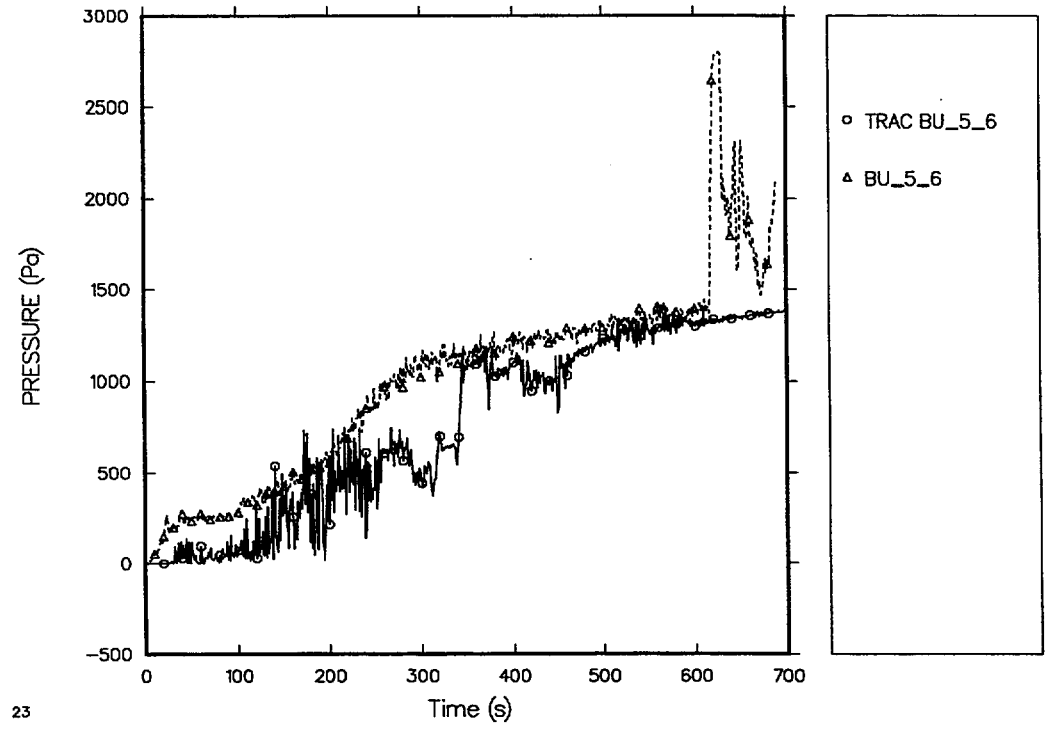


Fig. L-41. Comparison of predicted and measured differential pressures (5–6 ft, with grid-spacer model).

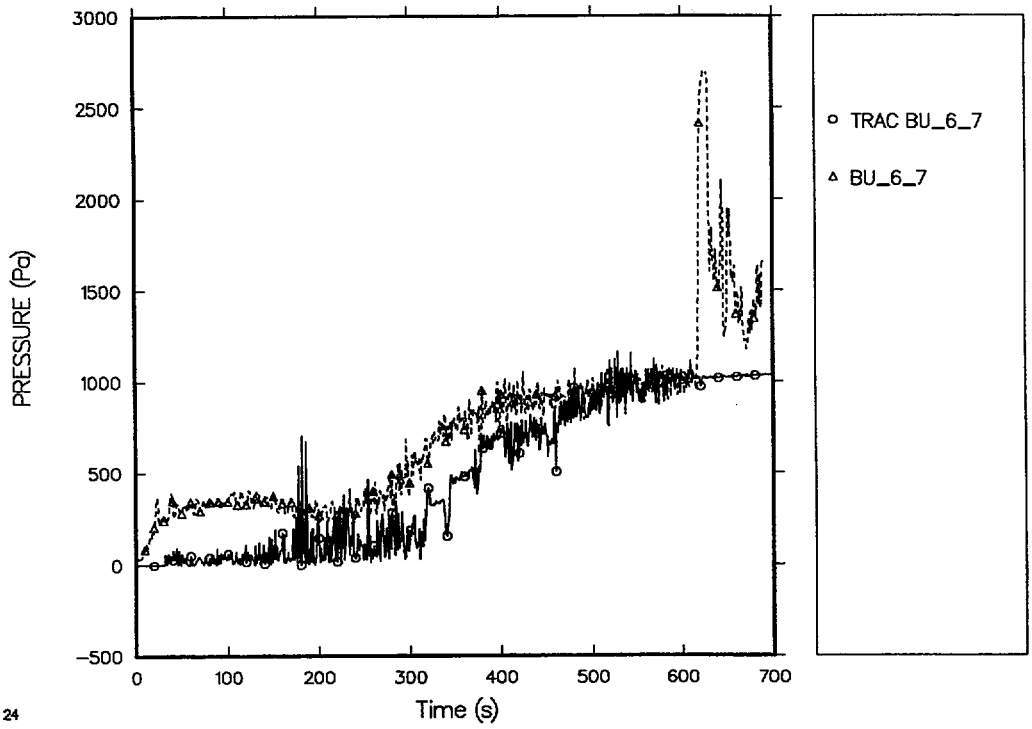


Fig. L-42. Comparison of predicted and measured differential pressures (6–7 ft, with grid-spacer model).

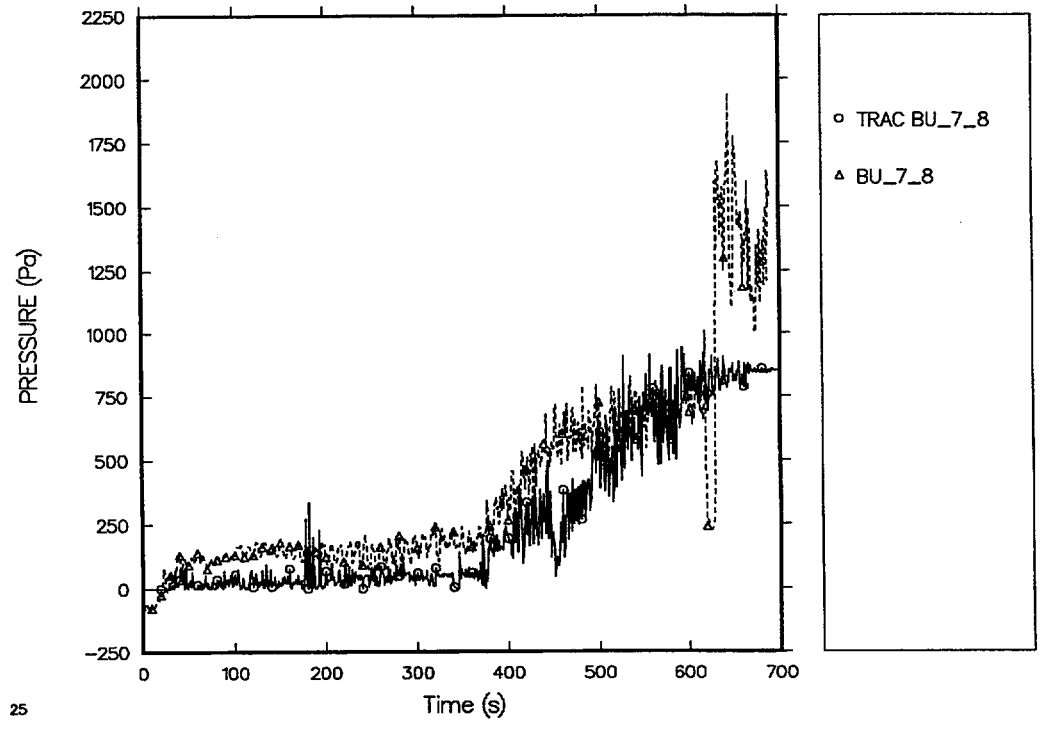


Fig. L-43. Comparison of predicted and measured differential pressures (7–8 ft, with grid-spacer model).

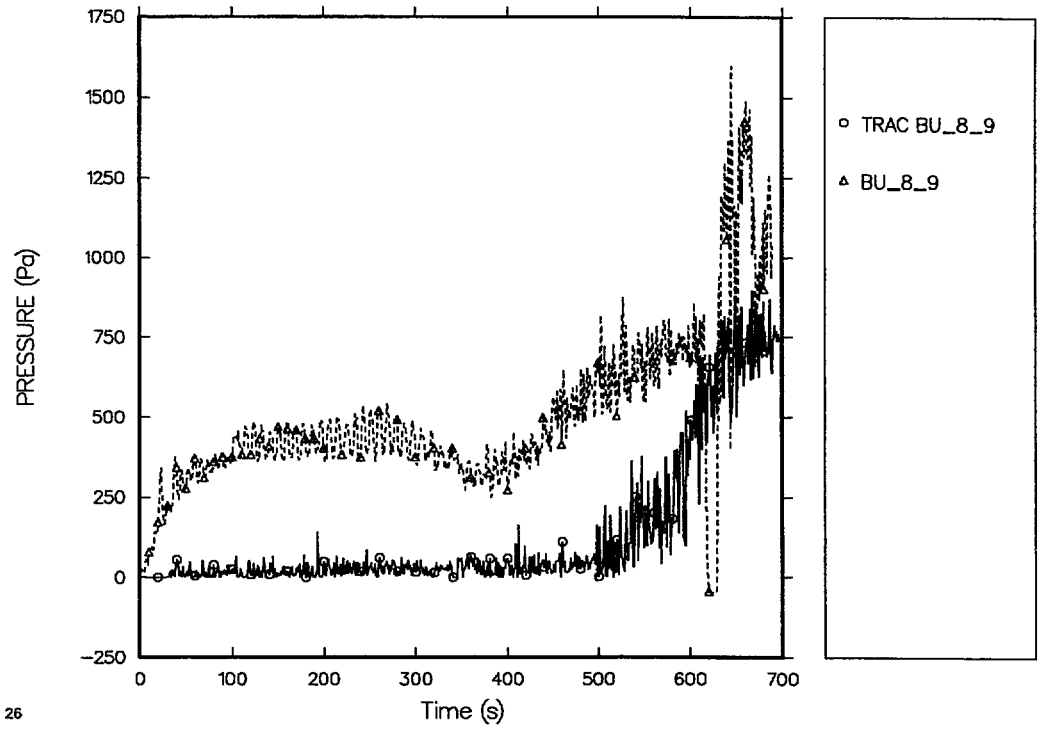


Fig. L-44. Comparison of predicted and measured differential pressures (8–9ft, with grid-spacer model).

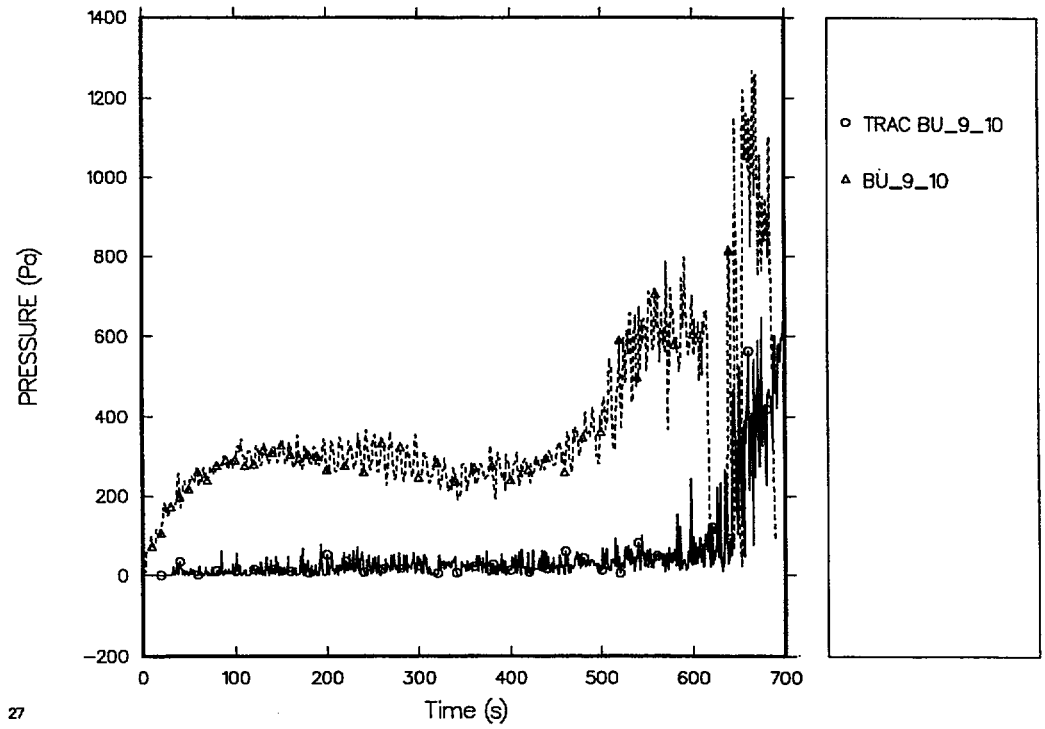


Fig. L-45. Comparison of predicted and measured differential pressures (9–10 ft, with grid-spacer model).

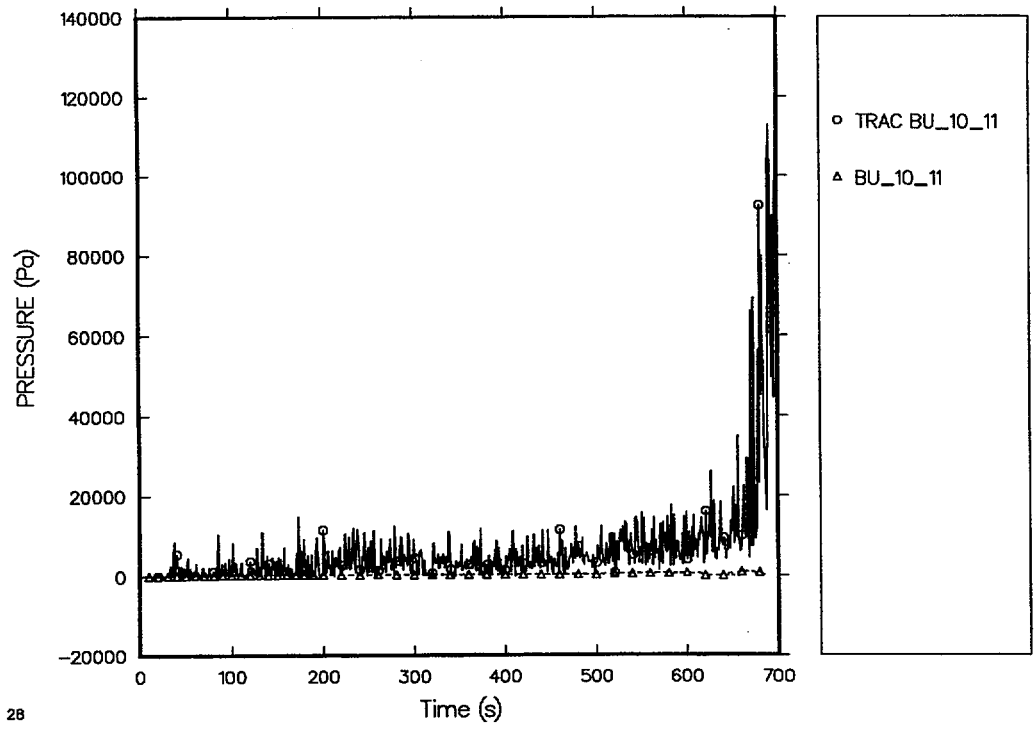


Fig. L-46. Comparison of predicted and measured differential pressures (10–11 ft, with grid-spacer model).

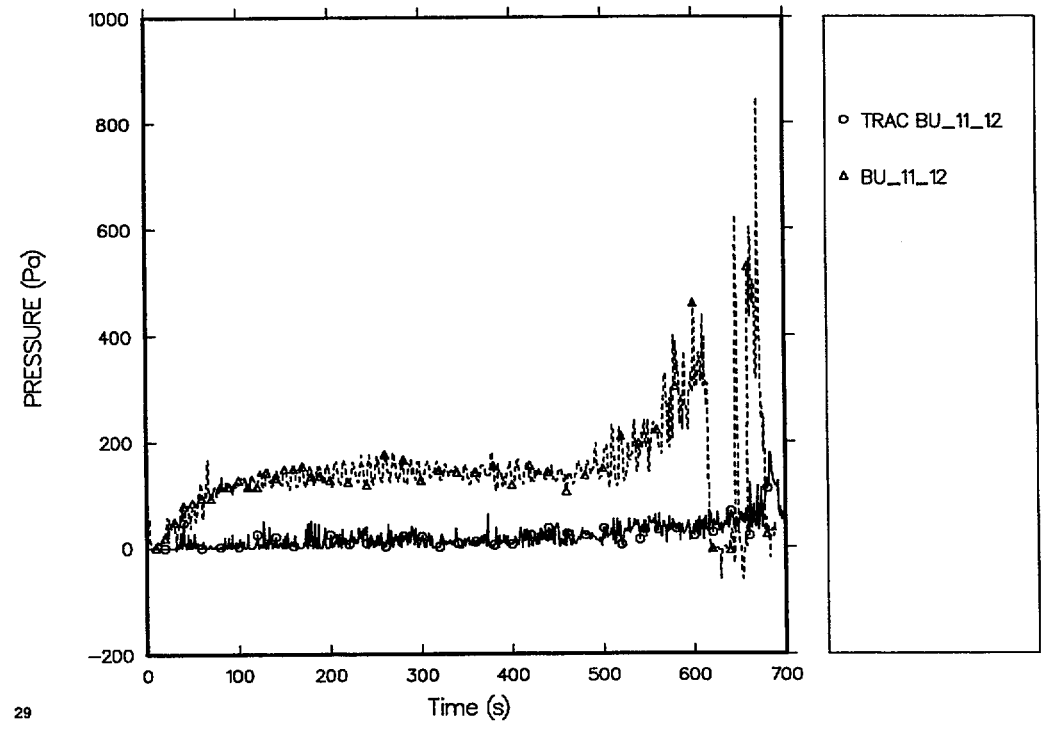


Fig. L-47. Comparison of predicted and measured differential pressures (11–12 ft, with grid-spacer model).

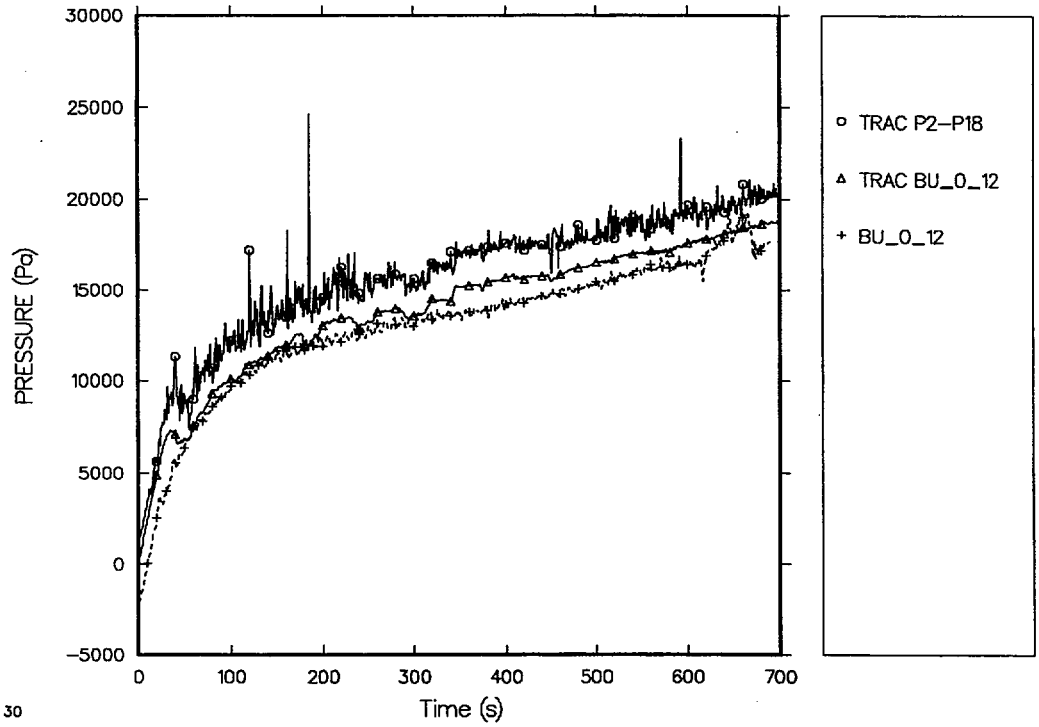


Fig. L-48. Comparison of predicted and measured total core differential pressures (0–12 ft, with grid-spacer model).

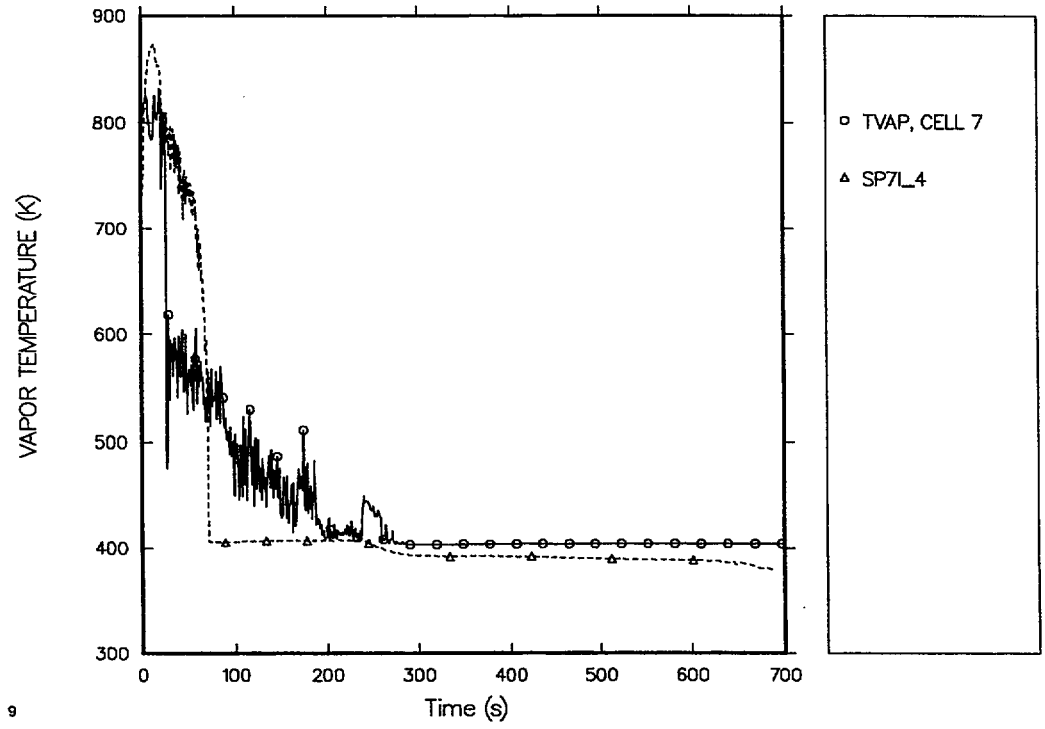


Fig. L-49. Comparison of predicted and measured vapor temperatures in cell 7 (with grid-spacer model).

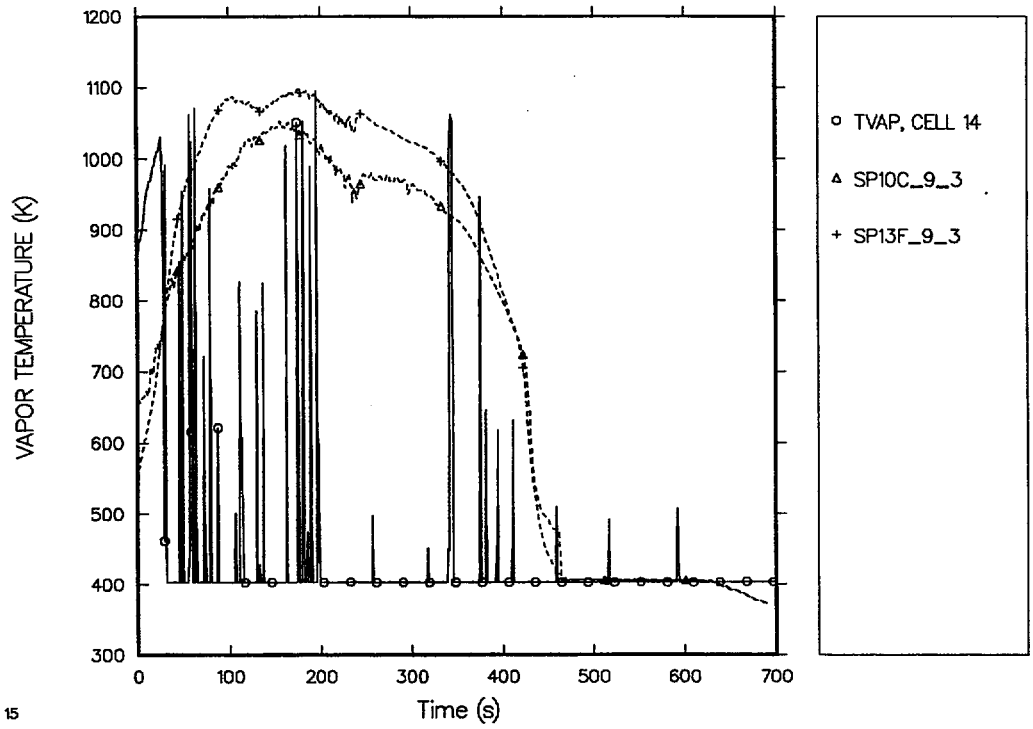


Fig. L-50. Comparison of predicted and measured vapor temperatures in cell 14 (with grid-spacer model).

APPENDIX M

FLECHT SEASET GRAVITY REFLOOD TEST 33436 INPUT LISTING

```
free format
*
*       numtcr          ieos          inopt          nmat
                2             0             1             0
flecht-seaset 161-rod unblocked-bundle run no. 33436
trac-pf1, gravity reflood, subcooling = 77.3 k
*    flecht-seaset test no. 36
*    159 heater rods powered, rods 4g and 5g disconnected
*    rod peak power = 0.70 kw/ft
*    this deck created by thad d. knight -- 3/4/82
*      modifications incorporated to circumvent a condensation
*      problem in the downcomer resulting from the injection of
*      subcooled liquid.  the input closely resembles a trac-pd2
*      input deck with the same modifications.
*    original trac-pd2 input created by thad d. knight -- 2/26/82
*    original trac-pf1 input created by thad d. knight -- 2/28/82
*      deck is as similar as possible to the trac-pd2 input deck
*    based on forced reflood deck by c. p. booker
*      tracin:/091122/flecht/pd2mod1/31504/run1/tracin
*    all input numbers have been checked with information
*      contained in "pwr flecht seaset unblocked bundle,
*      forced and gravity reflood task data report,"
*      volumes 1 and 2, epri np-1459, wcap-9699, nureg/cr-1532,
*      september 1981.
*    more detailed data will permit improved specification
*      of initial and boundary conditions.
*
*         ---------------  modeling distortions  ---------------
*
*         the carryover tank was connected to the upper plenum
*         through a 2-in std pipe approximately 1-m long.  the
*         top of the carryover tank was 2.5 in above the bottom
*         of the upper-plenum bottom plate, but the
*         connection to the tank was 7.5 in below the plate.
*         the pipe volume was added to the tank volume, and
*         an effective length was calculated.  the tank was
*         located vertically below the upper plenum.
*
*         the exhaust line consisted of a 4-in std pipe, an
*         orifice, an entrainment-separator tank, a 3-in std
*         pipe, and a pressure-control valve.  the top of the
*         downcomer was vented to the top of the entrainment-
*         separator tank.  the volume of the entrainment-
*         separator tank is significant.  however, the data
*         indicates that the pressure downstream of the orifice
*         and upstream of the pressure-control valve is constant.
*         therefore, the entrainment-separator tank, the pressure-
*         control valve, and the change in pipe size are ignored,
*         and the back-pressure is set with a constant-pressure
*         break component.
*
*         in order to eliminate a condensation problem associated
*         with the downcomer vent, the vent is represented as an
*         extension of the downcomer through pipe component 8 to
*         a constant pressure break component 9.  this modeling
*         replaces a tee connection to the exhaust line via a
*         small-diameter tube.  the original connection would have
*         been downstream of the fric value in component 6 (cell 2).
*
*
 &inopts
  ielv=0 , ikfac=1 , nfrc1=1 , newrfd=3 , nhtstr=13 , imfr=3, iadded=20,
 iblaus=1,
 &end
*
*        dstep          timet
                0           0.0
*
*       stdyst          transi          ncomp           njun          ipack
                0             1             22              8              1
*
*         epso           epss
        1.0e-04        1.0e-04
*
*       oitmax          sitmax         isolut         ncontr
                10            10             0              0
*
*         ntsv           ntcb           ntcf           ntrp           ntcp
                3             0              0              3              1
*
* iorder     +              +              +              +              +
                1             2              3              4              5
                6             7              8              9            999
```

```
           998          997          996          995s
           994          993s
           964          963          962          961          960
           959e
*
*************************************************************************
*                                                                       *
*                     signal variable data                              *
*                                                                       *
*************************************************************************
*
*       signal
*     variable  used by
*     --------  ---------------------------
*
*            1  injection fill table
*            2  power shape and power tables
*            3  trips
*
*
*
*         idsv         isvn         ilcn         icn1         icn2
             1            0            0            0            0
             2            0            0            0            0
             3            0            0            0            0
*
*************************************************************************
*                                                                       *
*                              trip data                                *
*                                                                       *
*************************************************************************
*
*       signal     trip cntr      setpoint      dump and     trip cntr
*     exp trip          trip        factor   termination     time step
*    data sets     data sets        tables         trips     data sets
*
*         ntse         ntct         ntsf         ntdp         ntsd
             0            0            0            3            0
*
*************************************************************************
* trip to start fill                                                    *
*************************************************************************
*
*         idtp         isrt         iset         itst         idsg
           1001            2            0            1            3
*      setp(1)      setp(2)      setp(3)      setp(4)
             0.0        1.e-5
*      dtsp(1)      dtsp(2)      dtsp(3)      dtsp(4)
             0.0          0.0
*      ifsp(1)      ifsp(2)      ifsp(3)      ifsp(4)
             0            0
*
*************************************************************************
* trip to start power decay                                             *
*************************************************************************
*
*         idtp         isrt         iset         itst         idsg
           1002            2            0            1            3
*      setp(1)      setp(2)      setp(3)      setp(4)
             0.0        1.e-5
*      dtsp(1)      dtsp(2)      dtsp(3)      dtsp(4)
             0.0          0.0
*      ifsp(1)      ifsp(2)      ifsp(3)      ifsp(4)
             0            0
*
*************************************************************************
* trip to start fine mesh                                               *
*************************************************************************
*
*         idtp         isrt         iset         itst         idsg
           1003            2            0            1            3
*      setp(1)      setp(2)      setp(3)      setp(4)
             0.0        1.e-5
*      dtsp(1)      dtsp(2)      dtsp(3)      dtsp(4)
             0.0          0.0
*      ifsp(1)      ifsp(2)      ifsp(3)      ifsp(4)
             0            0
*
*************************************************************************
* trip initiated restart dump and problem termination                   *
*************************************************************************
*
*         ndmp
             3
*
*      idmp(1)      idmp(2)      idmp(3)
           1001         1002         1003
*
*************************************************************************
*                                                                       *
*                         component data                                *
*                                                                       *
```

```
176 ************************************************************************
177 *
178 *                        num           id        ctitle
179 fill                     1            01   $1$ coolant injection
180 *         jun1          ifty          ioff
181              1             8             0
182 *
183 *         iftr          ifsv          nftb          nfsv          nfrf
184             1001             1             5             0             0
185 *
186 *       twtold          rfmx        concin          felv
187              0.          1.e+6            0.            0.
188 *
189 *         dxin          volin         alpin          vlin          tlin
190              1.0   1.31344e-03           0.0           0.0         324.8
191 *
192 *          pin          pain        flowin          vvin          tvin
193         2.7e+05           0.0           0.0           0.0         402.1
194 *
195 *        vmscl         vvscl
196              1.            1.
197 *
198 *
199              0.0        0.0000s                                          * vmtb
200              1.0        6.3000s                                          * vmtb
201             15.0        5.3643s                                          * vmtb
202             16.0        0.7847s                                          * vmtb
203            700.0        0.7847e                                          * vmtb
204 *
205 *         type            num           id        ctitle
206 pipe                        2           02      $2$ injection pipe
207 *
208 *       ncells          nodes          jun1          jun2          epsw
209              2              0             1             2            0.
210 *
211 *         ichf          iconc          iacc          ipow
212              0              0             0             0
213 *
214 *         radin             th         houtl         houtv         toutl
215      2.0447e-02    3.6830e-03           0.0           0.0         300.0
216 *
217 *         toutv          powin        powoff        rpowmx        powscl
218             300.0             0.            0.            0.            0.
219 *
220 f           1.0e    * dx
221 f   1.31344e-03e    * vol
222 f   1.31344e-03e    * fa
223 f           0.0e    * fric
224 f           0.0e    * grav
225 f   4.08940e-02e    * hd
226 f             -1e    * nff  changed from 4 to -1
227 f           0.0e    * alp
228 f           0.0e    * vl
229 f           0.0e    * vv
230 f          324.8e   * tl
231 f          402.1e   * tv
232 f    2.6890e+05e    * p
233 f           0.0e    * pa
234 *
235 *         type            num           id        ctitle
236 vessel                       3           03     $3$ vessel and downcomer
237 *
238 *         nasx          nrsx          ntsx          nscr         ivssbf
239              21             2             1             4              0
240 *
241 *         idcu          idcl          idcr          icru          icrl
242              21             1             1            17             2
243 *
244 *         icrr          ilcsp         iucsp         iuhp          iconc
245              1              2            17            21              0
246 *
247 *         igeom         nvent         nvvtb         nsgrid
248              1              0             0              0 * 8 *
249 *
250 *         shelv          epsw
251              0.          1.0e-05
252 *
253 * z             +             +             +             +             +
254          0.1651        0.4382        0.6211        0.8954        1.0783
255          1.2612        1.4441        1.6269        1.8098        1.9927
256          2.1756        2.3585        2.5413        2.9071        3.2729
257          3.6387        4.0958        4.3244        4.5149        5.1000
258          6.0960e
259 *
260 * rad           +             +             +             +             +
261    5.23361e-01       2.809361e
262 *
263 * th            +             +             +             +             +
264    5.23361e-01e
265 *
266 * funh          +             +             +             +             +
267             0.20          0.0e
```

```
*
* nhsca      +            +            +            +            +
             999          0e
*
* zsgrid     +            +            +            +            +
*           .4064        .9398      1.4478       1.9812       2.5146s
*         3.0226       3.5560      4.0640e
*
*         lisrl        lisrc        lisrf        ljuns
              1            2            3            2
             18            1           -2            3
             19            1            3            5
             21            2            2            7
*
* level 1 (lower plenum)
*
f            0.0e                                                    * cfzl-t
f         2.3   e                                                    * cfzl-z
f         2.0   e                                                    * cfzl-r
f            0.0e                                                    * cfzv-t
f         2.3   e                                                    * cfzv-z
f         2.0   e                                                    * cfzv-r
    9.49239e-01   1.32869e-01e                                       * vol
f            0.0e                                                    * fa-t
    5.67949e-02   9.59610e-03e                                       * fa-z
    5.51976e-02            0.0e                                     * fa-r
f            0.0e                                                    * hd-t
      1.034e-02     1.209e-01e                                       * hd-z
      7.793e-02            0.0e                                     * hd-r
f            0.0e                                                    * alpn
f            0.0e                                                    * vvn-t
f            0.0e                                                    * vvn-z
f            0.0e                                                    * vvn-r
f            0.0e                                                    * vln-t
f            0.0e                                                    * vln-z
f            0.0e                                                    * vln-r
           402.1          402.1e                                     * tvn
f          324.8e                                                    * tln
f    2.6890e+05e                                                     * pn
f            0.0e                                                    * pan
*
* level 2 (unheated length)
*
f            0.0e                                                    * cfzl-t
  0.05         0.0e                                                  * cfzl-z
f            0.0e                                                    * cfzl-r
f            0.0e                                                    * cfzv-t
  0.05         0.0e                                                  * cfzv-z
f            0.0e                                                    * cfzv-r
    5.67949e-02   9.59610e-03e                                       * vol
f            0.0e                                                    * fa-t
    5.67949e-02   9.59610e-03e                                       * fa-z
f            0.0e                                                    * fa-r
f            0.0e                                                    * hd-t
      1.034e-02     1.209e-01e                                       * hd-z
f            0.0e                                                    * hd-r
f            0.0e                                                    * alpn
f            0.0e                                                    * vvn-t
f            0.0e                                                    * vvn-z
f            0.0e                                                    * vvn-r
f            0.0e                                                    * vln-t
f            0.0e                                                    * vln-z
f            0.0e                                                    * vln-r
           402.1          402.1e                                     * tvn
f         402.07e                                                    * tln
f    2.6890e+05e                                                     * pn
f            0.0e                                                    * pan
*
* level 3 (core)
*
f            0.0e                                                    * cfzl-t
  0.05         0.0e                                                  * cfzl-z
f            0.0e                                                    * cfzl-r
f            0.0e                                                    * cfzv-t
  0.05         0.0e                                                  * cfzv-z
f            0.0e                                                    * cfzv-r
    5.67949e-02   9.59610e-03e                                       * vol
f            0.0e                                                    * fa-t
    5.67949e-02   9.59610e-03e                                       * fa-z
f            0.0e                                                    * fa-r
f            0.0e                                                    * hd-t
      1.034e-02     1.209e-01e                                       * hd-z
f            0.0e                                                    * hd-r
f            1.0e                                                    * alpn
f            0.0e                                                    * vvn-t
f            0.0e                                                    * vvn-z
f            0.0e                                                    * vvn-r
f            0.0e                                                    * vln-t
f            0.0e                                                    * vln-z
f            0.0e                                                    * vln-r
           570.0          405.0e                                     * tvn
f         402.07e                                                    * tln
```

```
f   2.6890e+05e                                                    * pn
f          0.0e                                                    * pan
*
* level 4 (core)
*
f          0.0e                                                    * cfzl-t
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                    * cfzl-r
f          0.0e                                                    * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                    * cfzv-r
   5.67949e-02   9.59610e-03e                                      * vol
f          0.0e                                                    * fa-t
   5.67949e-02   9.59610e-03e                                      * fa-z
f          0.0e                                                    * fa-r
f          0.0e                                                    * hd-t
     1.034e-02     1.209e-01e                                      * hd-z
f          0.0e                                                    * hd-r
f          1.0e                                                    * alpn
f          0.0e                                                    * vvn-t
f          0.0e                                                    * vvn-z
f          0.0e                                                    * vvn-r
f          0.0e                                                    * vln-t
f          0.0e                                                    * vln-z
f          0.0e                                                    * vln-r
          570.0          405.0e                                    * tvn
f       402.07e                                                    * tln
f   2.6890e+05e                                                    * pn
f          0.0e                                                    * pan
*
* level 5 (core)
*
f          0.0e                                                    * cfzl-t
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                    * cfzl-r
f          0.0e                                                    * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                    * cfzv-r
   5.67949e-02   9.59610e-03e                                      * vol
f          0.0e                                                    * fa-t
   5.67949e-02   9.59610e-03e                                      * fa-z
f          0.0e                                                    * fa-r
f          0.0e                                                    * hd-t
     1.034e-02     1.209e-01e                                      * hd-z
f          0.0e                                                    * hd-r
f          1.0e                                                    * alpn
f          0.0e                                                    * vvn-t
f          0.0e                                                    * vvn-z
f          0.0e                                                    * vvn-r
f          0.0e                                                    * vln-t
f          0.0e                                                    * vln-z
f          0.0e                                                    * vln-r
          571.0          405.0e                                    * tvn
f       402.07e                                                    * tln
f   2.6890e+05e                                                    * pn
f          0.0e                                                    * pan
*
* level 6 (core)
*
f          0.0e                                                    * cfzl-t
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                    * cfzl-r
f          0.0e                                                    * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                    * cfzv-r
   5.67949e-02   9.59610e-03e                                      * vol
f          0.0e                                                    * fa-t
   5.67949e-02   9.59610e-03e                                      * fa-z
f          0.0e                                                    * fa-r
f          0.0e                                                    * hd-t
     1.034e-02     1.209e-01e                                      * hd-z
f          0.0e                                                    * hd-r
f          1.0e                                                    * alpn
f          0.0e                                                    * vvn-t
f          0.0e                                                    * vvn-z
f          0.0e                                                    * vvn-r
f          0.0e                                                    * vln-t
f          0.0e                                                    * vln-z
f          0.0e                                                    * vln-r
          572.0          405.0e                                    * tvn
f       402.07e                                                    * tln
f   2.6890e+05e                                                    * pn
f          0.0e                                                    * pan
*
* level 7 (core)
*
f          0.0e                                                    * cfzl-t
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                    * cfzl-r
f          0.0e                                                    * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                    * cfzv-r
```

```
   5.67949e-02   9.59610e-03e                                  * vol
f          0.0e                                               * fa-t
   5.67949e-02   9.59610e-03e                                  * fa-z
f          0.0e                                               * fa-r
f          0.0e                                               * hd-t
     1.034e-02     1.209e-01e                                  * hd-z
f          0.0e                                               * hd-r
f          1.0e                                               * alpn
f          0.0e                                               * vvn-t
f          0.0e                                               * vvn-z
f          0.0e                                               * vvn-r
f          0.0e                                               * vln-t
f          0.0e                                               * vln-z
f          0.0e                                               * vln-r
          608.0          405.0e                               * tvn
f       402.07e                                               * tln
f   2.6890e+05e                                               * pn
f          0.0e                                               * pan
*
* level 8 (core)
*
f          0.0e                                               * cfzl-t
  0.05       0.0e                                               * cfzl-z
f          0.0e                                               * cfzl-r
f          0.0e                                               * cfzv-t
  0.05       0.0e                                               * cfzv-z
f          0.0e                                               * cfzv-r
   5.67949e-02   9.59610e-03e                                  * vol
f          0.0e                                               * fa-t
   5.67949e-02   9.59610e-03e                                  * fa-z
f          0.0e                                               * fa-r
f          0.0e                                               * hd-t
     1.034e-02     1.209e-01e                                  * hd-z
f          0.0e                                               * hd-r
f          1.0e                                               * alpn
f          0.0e                                               * vvn-t
f          0.0e                                               * vvn-z
f          0.0e                                               * vvn-r
f          0.0e                                               * vln-t
f          0.0e                                               * vln-z
f          0.0e                                               * vln-r
          653.0          405.0e                               * tvn
f       402.07e                                               * tln
f   2.6890e+05e                                               * pn
f          0.0e                                               * pan
*
* level 9 (core)
*
f          0.0e                                               * cfzl-t
  0.05       0.0e                                               * cfzl-z
f          0.0e                                               * cfzl-r
f          0.0e                                               * cfzv-t
  0.05       0.0e                                               * cfzv-z
f          0.0e                                               * cfzv-r
   5.67949e-02   9.59610e-03e                                  * vol
f          0.0e                                               * fa-t
   5.67949e-02   9.59610e-03e                                  * fa-z
f          0.0e                                               * fa-r
f          0.0e                                               * hd-t
     1.034e-02     1.209e-01e                                  * hd-z
f          0.0e                                               * hd-r
f          1.0e                                               * alpn
f          0.0e                                               * vvn-t
f          0.0e                                               * vvn-z
f          0.0e                                               * vvn-r
f          0.0e                                               * vln-t
f          0.0e                                               * vln-z
f          0.0e                                               * vln-r
          700.0          405.0e                               * tvn
f       402.07e                                               * tln
f   2.6890e+05e                                               * pn
f          0.0e                                               * pan
*
* level 10 (core)
*
f          0.0e                                               * cfzl-t
  0.05       0.0e                                               * cfzl-z
f          0.0e                                               * cfzl-r
f          0.0e                                               * cfzv-t
  0.05       0.0e                                               * cfzv-z
f          0.0e                                               * cfzv-r
   5.67949e-02   9.59610e-03e                                  * vol
f          0.0e                                               * fa-t
   5.67949e-02   9.59610e-03e                                  * fa-z
f          0.0e                                               * fa-r
f          0.0e                                               * hd-t
     1.034e-02     1.209e-01e                                  * hd-z
f          0.0e                                               * hd-r
f          1.0e                                               * alpn
f          0.0e                                               * vvn-t
f          0.0e                                               * vvn-z
f          0.0e                                               * vvn-r
```

```
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          755.0          405.0e                  * tvn
f       402.07e                                  * tln
f   2.6890e+05e                                  * pn
f          0.0e                                  * pan
*
* level 11 (core)
*
f          0.0e                                  * cfzl-t
  0.05       0.0e                                  * cfzl-z
f          0.0e                                  * cfzl-r
f          0.0e                                  * cfzv-t
  0.05       0.0e                                  * cfzv-z
f          0.0e                                  * cfzv-r
    5.67949e-02   9.59610e-03e                   * vol
f          0.0e                                  * fa-t
    5.67949e-02   9.59610e-03e                   * fa-z
f          0.0e                                  * fa-r
f          0.0e                                  * hd-t
      1.034e-02     1.209e-01e                   * hd-z
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          791.0          405.0e                  * tvn
f       402.07e                                  * tln
f   2.6890e+05e                                  * pn
f          0.0e                                  * pan
*
* level 12 (core)
*
f          0.0e                                  * cfzl-t
  0.05       0.0e                                  * cfzl-z
f          0.0e                                  * cfzl-r
f          0.0e                                  * cfzv-t
  0.05       0.0e                                  * cfzv-z
f          0.0e                                  * cfzv-r
    5.67949e-02   9.59610e-03e                   * vol
f          0.0e                                  * fa-t
    5.67949e-02   9.59610e-03e                   * fa-z
f          0.0e                                  * fa-r
f          0.0e                                  * hd-t
      1.034e-02     1.209e-01e                   * hd-z
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          902.0          405.0e                  * tvn
f       402.07e                                  * tln
f   2.6890e+05e                                  * pn
f          0.0e                                  * pan
*
* level 13 (core)
*
f          0.0e                                  * cfzl-t
  0.05       0.0e                                  * cfzl-z
f          0.0e                                  * cfzl-r
f          0.0e                                  * cfzv-t
  0.05       0.0e                                  * cfzv-z
f          0.0e                                  * cfzv-r
    5.67949e-02   9.59610e-03e                   * vol
f          0.0e                                  * fa-t
    5.67949e-02   9.59610e-03e                   * fa-z
f          0.0e                                  * fa-r
f          0.0e                                  * hd-t
      1.034e-02     1.209e-01e                   * hd-z
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          902.0          405.0e                  * tvn
f       402.07e                                  * tln
f   2.6890e+05e                                  * pn
f          0.0e                                  * pan
*
* level 14 (core)
*
f          0.0e                                  * cfzl-t
```

```
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                  * cfzl-r
f          0.0e                                                  * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                  * cfzv-r
   5.67949e-02   9.59610e-03e                                     * vol
f          0.0e                                                  * fa-t
   5.67949e-02   9.59610e-03e                                     * fa-z
f          0.0e                                                  * fa-r
f          0.0e                                                  * hd-t
    1.034e-02     1.209e-01e                                     * hd-z
f          0.0e                                                  * hd-r
f          1.0e                                                  * alpn
f          0.0e                                                  * vvn-t
f          0.0e                                                  * vvn-z
f          0.0e                                                  * vvn-r
f          0.0e                                                  * vln-t
f          0.0e                                                  * vln-z
f          0.0e                                                  * vln-r
          800.0          405.0e                                  * tvn
f       402.07e                                                  * tln
f   2.6890e+05e                                                  * pn
f          0.0e                                                  * pan
*
* level 15 (core)
*
f          0.0e                                                  * cfzl-t
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                  * cfzl-r
f          0.0e                                                  * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                  * cfzv-r
   5.67949e-02   9.59610e-03e                                     * vol
f          0.0e                                                  * fa-t
   5.67949e-02   9.59610e-03e                                     * fa-z
f          0.0e                                                  * fa-r
f          0.0e                                                  * hd-t
    1.034e-02     1.209e-01e                                     * hd-z
f          0.0e                                                  * hd-r
f          1.0e                                                  * alpn
f          0.0e                                                  * vvn-t
f          0.0e                                                  * vvn-z
f          0.0e                                                  * vvn-r
f          0.0e                                                  * vln-t
f          0.0e                                                  * vln-z
f          0.0e                                                  * vln-r
          690.0          405.0e                                  * tvn
f       402.07e                                                  * tln
f   2.6890e+05e                                                  * pn
f          0.0e                                                  * pan
*
* level 16 (core)
*
f          0.0e                                                  * cfzl-t
  0.05       0.0e                                                  * cfzl-z
f          0.0e                                                  * cfzl-r
f          0.0e                                                  * cfzv-t
  0.05       0.0e                                                  * cfzv-z
f          0.0e                                                  * cfzv-r
   5.67949e-02   9.59610e-03e                                     * vol
f          0.0e                                                  * fa-t
   5.67949e-02   9.59610e-03e                                     * fa-z
f          0.0e                                                  * fa-r
f          0.0e                                                  * hd-t
    1.034e-02     1.209e-01e                                     * hd-z
f          0.0e                                                  * hd-r
f          1.0e                                                  * alpn
f          0.0e                                                  * vvn-t
f          0.0e                                                  * vvn-z
f          0.0e                                                  * vvn-r
f          0.0e                                                  * vln-t
f          0.0e                                                  * vln-z
f          0.0e                                                  * vln-r
          609.0          405.0e                                  * tvn
f       402.07e                                                  * tln
f   2.6890e+05e                                                  * pn
f          0.0e                                                  * pan
*
* level 17 (core)
*
f          0.0e                                                  * cfzl-t
  2.1          0.0e                                            * cfzl-z
f          0.0e                                                  * cfzl-r
f          0.0e                                                  * cfzv-t
2.1        0.0e                                                  * cfzv-z
f          0.0e                                                  * cfzv-r
   5.67949e-02   9.59610e-03e                                     * vol
f          0.0e                                                  * fa-t
   5.67949e-02   9.59610e-03e                                     * fa-z
f          0.0e                                                  * fa-r
f          0.0e                                                  * hd-t
    1.034e-02     1.209e-01e                                     * hd-z
```

```
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          540.0          405.0e                  * tvn
f       402.07e                                  * tln
f    2.6890e+05e                                 * pn
f          0.0e                                  * pan
*
* level 18 (upper plenum)
*
f          0.0e                                  * cfzl-t
f          0.0e                                  * cfzl-z
f          0.0e                                  * cfzl-r
f          0.0e                                  * cfzv-t
f          0.0e                                  * cfzv-z
f          0.0e                                  * cfzv-r
    8.21163e-01   9.59610e-03e                   * vol
f          0.0e                                  * fa-t
    9.49239e-01   9.59610e-03e                   * fa-z
f          0.0e                                  * fa-r
f          0.0e                                  * hd-t
      1.034e-02     1.209e-01e                   * hd-z
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          408.0          405.0e                  * tvn
f       402.07e                                  * tln
f    2.6890e+05e                                 * pn
f          0.0e                                  * pan
*
* level 19 (upper plenum)
*
f          0.0e                                  * cfzl-t
f          0.0e                                  * cfzl-z
f          0.0e                                  * cfzl-r
f          0.0e                                  * cfzv-t
f          0.0e                                  * cfzv-z
f          0.0e                                  * cfzv-r
    9.49240e-01   9.59610e-03e                   * vol
f          0.0e                                  * fa-t
           0.0   9.59610e-03e                    * fa-z
f          0.0e                                  * fa-r
f          0.0e                                  * hd-t
      1.034e-02     1.209e-01e                   * hd-z
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          408.0          405.0e                  * tvn
f       402.07e                                  * tln
f    2.6890e+05e                                 * pn
f          0.0e                                  * pan
*
* level 20 (downcomer)
*
f          0.0e                                  * cfzl-t
f          0.0e                                  * cfzl-z
f          0.0e                                  * cfzl-r
f          0.0e                                  * cfzv-t
f          0.0e                                  * cfzv-z
f          0.0e                                  * cfzv-r
           0.0   9.59610e-03e                    * vol
f          0.0e                                  * fa-t
           0.0   9.59610e-03e                    * fa-z
f          0.0e                                  * fa-r
f          0.0e                                  * hd-t
      1.034e-02     1.209e-01e                   * hd-z
f          0.0e                                  * hd-r
f          1.0e                                  * alpn
f          0.0e                                  * vvn-t
f          0.0e                                  * vvn-z
f          0.0e                                  * vvn-r
f          0.0e                                  * vln-t
f          0.0e                                  * vln-z
f          0.0e                                  * vln-r
          402.1          405.0e                  * tvn
f       402.07e                                  * tln
f    2.6890e+05e                                 * pn
```

```
820  f          0.0e                                                    * pan
821  *
822  * level 21 (downcomer)
823  *
824  f          0.0e                                                    * cfzl-t
825  f          0.0e                                                    * cfzl-z
826  f          0.0e                                                    * cfzl-r
827  f          0.0e                                                    * cfzv-t
828  f          0.0e                                                    * cfzv-z
829  f          0.0e                                                    * cfzv-r
830             0.0   9.59610e-03e                                      * vol
831  f          0.0e                                                    * fa-t
832             0.0          0.0e                                       * fa-z
833  f          0.0e                                                    * fa-r
834  f          0.0e                                                    * hd-t
835       1.034e-02     1.209e-01e                                      * hd-z
836  f          0.0e                                                    * hd-r
837  f          1.0e                                                    * alpn
838  f          0.0e                                                    * vvn-t
839  f          0.0e                                                    * vvn-z
840  f          0.0e                                                    * vvn-r
841  f          0.0e                                                    * vln-t
842  f          0.0e                                                    * vln-z
843  f          0.0e                                                    * vln-r
844           402.1          405.0e                                     * tvn
845  f       402.07e                                                    * tln
846  f    2.6890e+05e                                                   * pn
847  f          0.0e                                                    * pan
848  *
849  *          type           num           id       ctitle
850  pipe                        4           04     $4$ carryover tank
851  *
852  *        ncells         nodes          jun1          jun2          epsw
853                5             4             4             3            0.
854  *
855  *          ichf         iconc          iacc          ipow
856                0             0             0             0
857  *
858  *        iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
859                0             1             1             0             0
860  *
861  *         radin            th         houtl         houtv         toutl
862      7.7026e-02    7.1120e-03           0.0           0.0         300.0
863  *
864  *         toutv         powin        powoff        rpowmx        powscl
865           300.0            0.            0.            0.            1.
866  *
867  *         qp3in        qp3off        rqp3mx        qp3scl
868               0.            0.            0.            1.
869  *
870  r 4         1.0s     * dx
871           0.33256e     * dx
872      1.86388e-02s     * vol
873      1.86388e-02s     * vol
874      1.86388e-02s     * vol
875      1.86388e-02s     * vol
876      6.19850e-03e     * vol
877  f   1.86388e-02e     * fa
878  f          0.0e     * fric
879  f          1.0e     * grav
880  f   1.54051e-01e     * hd
881  f            -1e     * nff  changed from 4 to -1
882  f          1.0e     * alp
883  f          0.0e     * vl
884  f          0.0e     * vv
885  f       402.07e     * tl
886  f        405.0e     * tv
887  f    2.6890e+05e     * p
888  f          0.0e     * pa
889  f          0.0e     * qppp
890  f            9e     * matid
891  f        405.0e     * tw
892  f          0.0e     * qp3tb
893  *
894  *                       num           id       ctitle
895  fill                      5           05   $5$ c-tank terminal
896  *          jun1         ifty         ioff
897                4            1            0
898  *
899  *        twtold          rfmx        concin          felv
900                0.         1.e+6           0.            0.
901  *
902  *          dxin         volin         alpin         vlin          tlin
903               1.0    1.86388e-02           1.0           0.0       402.07
904  *
905  *           pin          pain        flowin         vvin          tvin
906       2.6890e+05           0.0           0.0           0.0         402.1
907  *
908  *          type           num           id       ctitle
909  pipe                        6           06     $6$ exhaust line
910  *
911  *        ncells         nodes          jun1          jun2          epsw
```

```
912              3              4              5              6              0.
913  *
914  *         ichf          iconc           iacc           ipow
915               0              0              0              0
916  *
917  *        iqp3tr         iqp3sv         nqp3tb         nqp3sv         nqp3rf
918               0              1              1              0              0
919  *
920  *         radin             th          houtl          houtv          toutl
921      5.1130e-02     6.0198e-03            0.0            0.0          300.0
922  *
923  *         toutv          powin         powoff         rpowmx         powscl
924           300.0             0.             0.             0.             1.
925  *
926  *         qp3in         qp3off         rqp3mx         qp3scl
927               0.             0.             0.             1.
928  *
929  f        1.2586e     * dx
930  f   1.03370e-02e     * vol
931  f   8.21306e-03e     * fa
932             0.0s     * fric
933           33.5711s     * fric
934  r 2         0.0e     * fric
935  f           0.0e     * grav
936  f   1.02260e-01e     * hd
937  f            -1e     * nff  changed from 4 to -1
938  f           1.0e     * alp
939  f           0.0e     * vl
940  f           0.0e     * vv
941  f        402.07e     * tl
942  f         405.0e     * tv
943  f    2.6890e+05e     * p
944  f           0.0e     * pa
945  f           0.0e     * qppp
946  f             9e     * matid
947  f         405.0e     * tw
948  f           0.0e     * qp3tb
949  *
950  *         type           num            id        ctitle
951  break                      7            07   $7$ back pressure
952  *
953  *         jun1          ibty          isat          ioff
954               6             0             3             0
955  *
956  *         dxin          volin         alpin           tin           pin
957           1.2586   1.03370e-01           1.0         402.1    2.6890e+05
958  *
959  *         pain         concin          rbmx          poff          belv
960               0.             0.            0.            0.   0.0
961  *
962  *         type           num            id        ctitle
963  pipe                       8            08     $8$ downcomer vent
964  *
965  *        ncells         nodes          jun1          jun2          epsw
966               2             4             7             8             0.
967  *
968  *         ichf          iconc          iacc          ipow
969               0             0             0             0
970  *
971  *        iqp3tr         iqp3sv         nqp3tb         nqp3sv         nqp3rf
972               0              1             1              0              0
973  *
974  *         radin             th          houtl          houtv          toutl
975      6.0452e-02     3.0480e-03            0.0            0.0          300.0
976  *
977  *         toutv          powin         powoff         rpowmx         powscl
978           300.0             0.             0.             0.             1.
979  *
980  *         qp3in         qp3off         rqp3mx         qp3scl
981               0.             0.             0.             1.
982  *
983  f           1.0e     * dx
984  f   1.14808e-02e     * vol
985  f   1.14808e-02e     * fa
986  f           0.0e     * fric
987  f           1.0e     * grav
988  f   1.20904e-01e     * hd
989  f            -1e     * nff  changed from 4 to -1
990  f           1.0e     * alp
991  f           0.0e     * vl
992  f           0.0e     * vv
993  f        402.07e     * tl
994  f         405.0e     * tv
995  f    2.6890e+05e     * p
996  f           0.0e     * pa
997  f           0.0e     * qppp
998  f             9e     * matid
999  f         405.0e     * tw
1000 f           0.0e     * qp3tb
1001 *
1002 *         type           num            id        ctitle
1003 break                      9            09   $9$ downcomer back pressure
```

```
*
*         jun1          ibty          isat          ioff
             8             0             3             0
*
*         dxin          volin         alpin          tin           pin
             1.0   1.14808e-01           1.0         402.1    2.6884e+05
*
*         pain         concin          rbmx          poff          belv
             0.            0.            0.            0.   0.0
*
*
*         type           num            id        ctitle
rod                         999           999    $999$ fuel rods
*
*         ncrx          ncrz          ittc                                cd 2
             1            15             0
*
*       nopowr          nridr         modez         liqlev        iaxcnd   cd 3
             0             0             1              1             1
*
*         idbci         idbco         hdri          hdro                  cd 4
             0             2             0.    9.4996e-3
*
*         nrods         nodes         irftr         nzmax        irftr2   cd 9
             1             9          1003           250          1003
*
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv    cd 10
            4.            20.         5.e-3          6.e4            0.
*
*       irpwty          ndgx          ndhx          nrts          nhist    cd 11
             7             0             0         10000             0
*
*       irpwtr         irpwsv        nrpwtb        nrpwsv        nrpwrf   cd 14
          1002             2            25             0             0
*
*       izpwtr         izpwsv        nzpwtb        nzpwsv        nzpwrf   cd 15
             0             2             1             0             0
*
*         nmwrx          nfci         nfcil                               cd 16
             0             0             0
*
*         nzpwz         nzpwi         nfbpwt                              cd 17
            16             1             0
*
*         react          tneut         rpwoff        rrpwmx        rpwscl   cd 18
            0.             0.            0.          1.e10            1.
*
*       rpowri         zpowin        zpowoff        rzpwmx                 cd 19
     8.045e05             0.            0.          1.e10
*
*       extsou          pldr         pdrat         fucrac                 cd 20
            0.             0.        1.3262             1.
*
*       nhcomo
f            3e
*
*       nhcelo
            -3s
             3s
             4s
             5s
             6s
             7s
             8s
             9s
            10s
            11s
            12s
            13s
            14s
            15s
            16s
            17s
            18e
*
*       +             +             +             +             +
* dz    *           .1829         .2743         .1829         .1829s
* dz    *           .1829         .1828         .1829         .1829s
* dz    *           .1829         .1829         .1828         .3658s
* dz    *           .3658         .3658         .4571e
* grav  * f           1.e
* rdx   *          159.0e
*       +             +             +             +             +
* radrd *             0.0   6.0325e-04   1.2065e-03   1.7145e-03s
* radrd *     2.2225e-03   3.1687e-03   4.1148e-03   4.4323e-03s
* radrd *     4.7498e-03e
* matrd *              4             4             5             5s
* matrd *              4             4             8             8e
* nfax  * r15          1e
*       +             +             +             +             +
* rftn  * r 9    633.67r 9     633.67r 9     677.56r 9     721.44s
* rftn  * r 9    829.22r 9     937.00r 9     963.57r 9    1014.55s
```

```
1096  * rftn  * r 9    1065.52r 9    1095.97r 9    1117.70r 9    1067.44s
1097  * rftn  * r 9     977.74r 9     828.39r 9     674.54r 9     598.85e
1098  * rdpwr * r 2       0.0r 3       1.0r 4        0.0e
1099  * cpowr * f         1.0e
1100  *       +           +            +             +             +
1101  * zpwzt *           0.           .1829         .4572         .6401s
1102  * zpwzt *          .8230        1.0059        1.1887        1.3716s
1103  * zpwzt *         1.5545        1.7374        1.9203        2.1031s
1104  * zpwzt *         2.4689        2.8347        3.2005        3.6576e
1105  *       +           +            +             +             +
1106  * zpwtb *           0.s
1107  * zpwtb *         0.4300        0.4300        0.4300        0.6800s
1108  * zpwtb *         0.8800        1.1100        1.3000        1.4900s
1109  * zpwtb *         1.6000        1.6600        1.6600        1.5633s
1110  * zpwtb *         1.3000        0.8875        0.4856        0.4300e
1111  *       +           +            +             +             +
1112  * rpwtb *     0.            8.0777e+05    1.7500e+01    7.4443e+05s
1113  * rpwtb *     3.5000e+01    7.0349e+05    5.2500e+01    6.7295e+05s
1114  * rpwtb *     7.0000e+01    6.4958e+05    8.7500e+01    6.2645e+05s
1115  * rpwtb *     1.0500e+02    6.0800e+05    1.2250e+02    5.9035e+05s
1116  * rpwtb *     1.4000e+02    5.7625e+05    1.5750e+02    5.6351e+05s
1117  * rpwtb *     1.7500e+02    5.5247e+05    1.9250e+02    5.4288e+05s
1118  * rpwtb *     2.2000e+02    5.2773e+05    2.5500e+02    5.1234e+05s
1119  * rpwtb *     2.9000e+02    4.9832e+05    3.2500e+02    4.8655e+05s
1120  * rpwtb *     3.6000e+02    4.7608e+05    3.9500e+02    4.6649e+05s
1121  * rpwtb *     4.3000e+02    4.5754e+05    4.6500e+02    4.4956e+05s
1122  * rpwtb *     5.0000e+02    4.4287e+05    5.3500e+02    4.3570e+05s
1123  * rpwtb *     5.7000e+02    4.2950e+05    6.0500e+02    4.2369e+05s
1124  * rpwtb *     1.0000e+03    3.8310e+05e
1125  *       +           +            +             +             +
1126  * fpuo2 * f         0.0e
1127  * ftd   * f         1.0e
1128  * gmix  * f         0.0e
1129  * gmles * f         0.0e
1130  * pgapt * f         0.0e
1131  * plvol * f         0.0e
1132  * pslen * f         0.0e
1133  * clenn * f         0.0e
1134  * burn  * f         0.0e
1135  *
1136  *     type          num           id     ctitle
1137        slab          998           998     slab level   1 cell   1
1138  *         ncrx          ncrz
1139                1             1
1140  *       nopowr         nridr         modez        liqlev        iaxcnd
1141                1             1             1             0             0
1142  *        idbci         idbco
1143                0             2
1144  *        width
1145      4.7892E+00
1146  *        nrods         nodes         irftr         nzmax
1147                1             4             0             5
1148  *     dtxht(1)      dtxht(2)        dznht         hgapo
1149      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1150  *       nhcomo
1151  f           3e
1152  *       nhcelo
1153               -1             1            2e
1154  *         dz
1155  f    1.6510E-01e
1156  *        grav
1157  f    1.0000E+00e
1158  *       idrod
1159               1e
1160  *         rdx
1161  f    1.0000E+00e
1162  *       radrd
1163      0.0000E+00s
1164      2.4030E-02s
1165      2.6030E-02s
1166      2.7030E-02e
1167  * matrd * f           9e
1168  *        nfax
1169  f           1e
1170  *        rftn
1171  f     3.248E+02e
1172  *
1173  *     type          num           id     ctitle
1174        slab          997           997     slab level   1 cell   2
1175  *         ncrx          ncrz
1176                1             1
1177  *       nopowr         nridr         modez        liqlev        iaxcnd
1178                1             1             1             0             0
1179  *        idbci         idbco
1180                0             2
1181  *        width
1182      5.2592E+00
1183  *        nrods         nodes         irftr         nzmax
1184                1             4             0             5
1185  *     dtxht(1)      dtxht(2)        dznht         hgapo
1186      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1187  *       nhcomo
```

```
1188  f           3e
1189  *       nhcelo
1190              -1             1             2e
1191  *          dz
1192  f   1.6510E-01e
1193  *        grav
1194  f   1.0000E+00e
1195  *       idrod
1196              2e
1197  *         rdx
1198  f   1.0000E+00e
1199  *       radrd
1200      6.0452E-02s
1201      6.1500E-02s
1202      6.2500E-02s
1203      6.3500E-02e
1204  * matrd * f           9e
1205  *        nfax
1206  f           1e
1207  *        rftn
1208  f     3.248E+02e
1209  *
1210  *     type           num            id     ctitle
1211        slab           996           996      slab level   2 cell   1
1212  *         ncrx          ncrz
1213                1             1
1214  *       nopowr         nridr         modez        liqlev        iaxcnd
1215                1             1             1             0             0
1216  *        idbci          idbco
1217                0             2
1218  *        width
1219      6.0845E-01
1220  *        nrods         nodes         irftr         nzmax
1221                1             4             0             5
1222  *     dtxht(1)      dtxht(2)         dznht          hgapo
1223      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1224  *       nhcomo
1225  f           3e
1226  *       nhcelo
1227              -2             2             3e
1228  *          dz
1229  f   2.7310E-01e
1230  *        grav
1231  f   1.0000E+00e
1232  *       idrod
1233              1e
1234  *         rdx
1235  f   1.0000E+00e
1236  *       radrd
1237      9.6837E-02s
1238      9.9918E-02s
1239      1.0092E-01s
1240      1.0192E-01e
1241  * matrd * f           6e
1242  *        nfax
1243  f           1e
1244  *        rftn
1245  f     4.021E+02e
1246  *
1247  *     type           num            id     ctitle
1248        slab           995           995      slab level   2 cell   2
1249  *         ncrx          ncrz
1250                1             1
1251  *       nopowr         nridr         modez        liqlev        iaxcnd
1252                1             1             1             0             0
1253  *        idbci          idbco
1254                0             2
1255  *        width
1256      3.7983E-01
1257  *        nrods         nodes         irftr         nzmax
1258                1             4             0             5
1259  *     dtxht(1)      dtxht(2)         dznht          hgapo
1260      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1261  *       nhcomo
1262  f           3e
1263  *       nhcelo
1264              -2             2             3e
1265  *          dz
1266  f   2.7310E-01e
1267  *        grav
1268  f   1.0000E+00e
1269  *       idrod
1270              2e
1271  *         rdx
1272  f   1.0000E+00e
1273  *       radrd
1274      6.0452E-02s
1275      6.1500E-02s
1276      6.2500E-02s
1277      6.3500E-02e
1278  * matrd * f           9e
1279  *        nfax
```

```
1280  f           1e
1281  *         rftn
1282  f     4.021E+02e
1283  *
1284  *     type            num            id     ctitle
1285  slab                  994           994   core section of vessel wall
1286  *
1287  *         ncrx          ncrz
1288              1            15
1289  *
1290  *       nopowr         nridr         modez        liqlev        iaxcnd
1291              1             1             1             0             0
1292  *
1293  *        idbci         idbco
1294              0             2
1295  *
1296  *        width
1297     6.0845E-01
1298  *
1299  *        nrods         nodes         irftr         nzmax        irftr2
1300              1             4          1003           150          1003
1301  *
1302  *     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
1303              4.           50.   5.0000E-03   0.0000E+00          .4382
1304  *
1305  *       nhcomo
1306  f           3e
1307  *
1308  *       nhcelo             +             +             +             +
1309             -3             3             4             5             6
1310              7             8             9            10            11
1311             12            13            14            15            16
1312             17           18e
1313  *
1314  *           dz             +             +             +             +
1315          .1829         .2743         .1829         .1829         .1829
1316          .1828         .1829         .1829         .1829         .1829
1317          .1828         .3658         .3658         .3658         .4571e
1318  *
1319  *         grav
1320  f   1.0000E+00e
1321  *
1322  *        idrod
1323              1e
1324  *
1325  *          rdx
1326  f   1.0000E+00e
1327  *
1328  *        radrd
1329     9.68375E-02s
1330     9.99180E-02s
1331     1.00918E-01s
1332     1.01918E-01e
1333  *
1334  *        matrd
1335  f           6e
1336  *
1337  *         nfax
1338  f           1e
1339  *
1340  *         rftn             +             +             +             +
1341  r 4      406.4r 4      406.4r 4      406.4r 4      409.6r 4      412.8
1342  r 4      416.0r 4      419.2r 4      487.0r 4      554.8r 4      560.0
1343  r 4      554.8r 4      549.5r 4      421.7r 4      409.2r 4      409.2
1344  r 4      408.0e
1345  *
1346  *     type            num            id     ctitle
1347  slab                  993           993   core section of downcomer wall
1348  *
1349  *         ncrx          ncrz
1350              1            15
1351  *
1352  *       nopowr         nridr         modez        liqlev        iaxcnd
1353              1             1             1             0             0
1354  *
1355  *        idbci         idbco
1356              0             2
1357  *
1358  *        width
1359     3.7983E-01
1360  *
1361  *        nrods         nodes         irftr         nzmax
1362              1             4             0            31
1363  *
1364  *     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
1365              4.           50.   5.0000E-03   0.0000E+00          .4382
1366  *
1367  *       nhcomo
1368  f           3e
1369  *
1370  *       nhcelo
1371             -3             3             4             5             6
```

```
1372                7             8             9            10            11
1373               12            13            14            15            16
1374               17           18e
1375  *
1376  *            dz
1377           .1829         .2743         .1829         .1829         .1829
1378           .1828         .1829         .1829         .1829         .1829
1379           .1828         .3658         .3658         .3658         .4571e
1380  *
1381  *          grav
1382  f    1.0000E+00e
1383  *
1384  *         idrod
1385               2e
1386  *
1387  *           rdx
1388  f    1.0000E+00e
1389  *
1390  *         radrd
1391      6.04520E-02s
1392      6.15000E-02s
1393      6.25000E-02s
1394      6.35000E-02e
1395  *
1396  *         matrd
1397  f             9e
1398  *
1399  *          nfax
1400  f             1e
1401  *
1402  *          rftn             +             +             +             +
1403  f         405.0e
1404  *
1405  *      type           num           id      ctitle
1406        slab           964           964       slab level  18 cell   1
1407  *         ncrx          ncrz
1408                1             1
1409  *        nopowr         nridr         modez        liqlev        iaxcnd
1410                1             1             1             0             0
1411  *         idbci         idbco
1412                0             2
1413  *         width
1414      2.4668E+00
1415  *         nrods         nodes         irftr         nzmax
1416                1             4             0             5
1417  *      dtxht(1)      dtxht(2)         dznht         hgapo
1418      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1419  *        nhcomo
1420  f             3e
1421  *         nhcelo
1422               -18            18           19e
1423  *           dz
1424  f    2.2860E-01e
1425  *         grav
1426  f    1.0000E+00e
1427  *        idrod
1428                1e
1429  *          rdx
1430  f    1.0000E+00e
1431  *         radrd
1432      0.0000E+00s
1433      1.7191E-02s
1434      1.9191E-02s
1435      2.0191E-02e
1436  * matrd * f           9e
1437  *          nfax
1438  f             1e
1439  *          rftn
1440  f      4.080E+02e
1441  *
1442  *      type           num           id      ctitle
1443        slab           963           963       slab level  18 cell   2
1444  *          ncrx          ncrz
1445                1             1
1446  *        nopowr         nridr         modez        liqlev        iaxcnd
1447                1             1             1             0             0
1448  *         idbci         idbco
1449                0             2
1450  *         width
1451      3.7983E-01
1452  *         nrods         nodes         irftr         nzmax
1453                1             4             0             5
1454  *      dtxht(1)      dtxht(2)         dznht         hgapo
1455      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1456  *        nhcomo
1457  f             3e
1458  *         nhcelo
1459               -18            18           19e
1460  *           dz
1461  f    2.2860E-01e
1462  *         grav
1463  f    1.0000E+00e
```

```
1464  *        idrod
1465                2e
1466  *         rdx
1467  f   1.0000E+00e
1468  *        radrd
1469      6.0452E-02s
1470      6.1500E-02s
1471      6.2500E-02s
1472      6.3500E-02e
1473  * matrd * f            9e
1474  *         nfax
1475  f            1e
1476  *         rftn
1477  f     4.050E+02e
1478  *
1479  *     type           num           id     ctitle
1480        slab           962           962      slab level  19 cell   1
1481  *         ncrx          ncrz
1482                1             1
1483  *       nopowr         nridr         modez        liqlev        iaxcnd
1484                1             1             1             0             0
1485  *        idbci          idbco
1486                0             2
1487  *        width
1488      3.2931E+00
1489  *        nrods         nodes         irftr         nzmax
1490                1             4             0             5
1491  *     dtxht(1)      dtxht(2)        dznht         hgapo
1492      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1493  *       nhcomo
1494  f             3e
1495  *       nhcelo
1496                -19            19            20e
1497  *          dz
1498  f   1.9050E-01e
1499  *        grav
1500  f   1.0000E+00e
1501  *       idrod
1502                1e
1503  *         rdx
1504  f   1.0000E+00e
1505  *        radrd
1506      0.0000E+00s
1507      1.9180E-02s
1508      2.1180E-02s
1509      2.2180E-02e
1510  * matrd * f            9e
1511  *         nfax
1512  f            1e
1513  *         rftn
1514  f     4.080E+02e
1515  *
1516  *     type           num           id     ctitle
1517        slab           961           961      slab level  19 cell   2
1518  *         ncrx          ncrz
1519                1             1
1520  *       nopowr         nridr         modez        liqlev        iaxcnd
1521                1             1             1             0             0
1522  *        idbci          idbco
1523                0             2
1524  *        width
1525      3.7983E-01
1526  *        nrods         nodes         irftr         nzmax
1527                1             4             0             5
1528  *     dtxht(1)      dtxht(2)        dznht         hgapo
1529      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1530  *       nhcomo
1531  f             3e
1532  *       nhcelo
1533                -19            19            20e
1534  *          dz
1535  f   1.9050E-01e
1536  *        grav
1537  f   1.0000E+00e
1538  *       idrod
1539                2e
1540  *         rdx
1541  f   1.0000E+00e
1542  *        radrd
1543      6.0452E-02s
1544      6.1500E-02s
1545      6.2500E-02s
1546      6.3500E-02e
1547  * matrd * f            9e
1548  *         nfax
1549  f            1e
1550  *         rftn
1551  f     4.050E+02e
1552  *
1553  *     type           num           id     ctitle
1554        slab           960           960      slab level  20 cell   2
1555  *         ncrx          ncrz
```

```
1556                1               1
1557  *       nopowr          nridr           modez          liqlev          iaxcnd
1558                1               1               1               0               0
1559  *         idbci           idbco
1560                0               2
1561  *         width
1562      3.7983E-01
1563  *         nrods           nodes           irftr           nzmax
1564                1               4               0               5
1565  *      dtxht(1)        dtxht(2)          dznht           hgapo
1566      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1567  *        nhcomo
1568  f             3e
1569  *        nhcelo
1570             -20             20             21e
1571  *           dz
1572  f    5.8510E-01e
1573  *         grav
1574  f    1.0000E+00e
1575  *         idrod
1576                2e
1577  *          rdx
1578  f    1.0000E+00e
1579  *         radrd
1580      6.0452E-02s
1581      6.1500E-02s
1582      6.2500E-02s
1583      6.3500E-02e
1584  * matrd * f             9e
1585  *          nfax
1586  f             1e
1587  *          rftn
1588  f      4.050E+02e
1589  *
1590  *      type            num             id      ctitle
1591        slab            959             959       slab level  21 cell   2
1592  *          ncrx            ncrz
1593                1               1
1594  *       nopowr          nridr           modez          liqlev          iaxcnd
1595                1               1               1               0               0
1596  *         idbci           idbco
1597                0               2
1598  *         width
1599      3.7983E-01
1600  *         nrods           nodes           irftr           nzmax
1601                1               4               0               5
1602  *      dtxht(1)        dtxht(2)          dznht           hgapo
1603      3.0000E+00    1.0000E+01    5.0000E-03    0.0000E+00
1604  *        nhcomo
1605  f             3e
1606  *        nhcelo
1607             -21             21             21e
1608  *           dz
1609  f    9.9600E-01e
1610  *         grav
1611  f    1.0000E+00e
1612  *         idrod
1613                2e
1614  *          rdx
1615  f    1.0000E+00e
1616  *         radrd
1617      6.0452E-02s
1618      6.1500E-02s
1619      6.2500E-02s
1620      6.3500E-02e
1621  * matrd * f             9e
1622  *          nfax
1623  f             1e
1624  *          rftn
1625  f      4.050E+02e
1626  *
1627  end
1628  *
1629  ************************************************************************
1630  *                          time step data                              *
1631  ************************************************************************
1632  *
1633  *         dtmin           dtmax           tend           trwfp
1634          1.0e-06         0.0025           17.5             1.0
1635  *
1636  *         edint           gfint          dmpint          sedint
1637          5.0e+01         0.5            5.0e+01           50.0
1638  *
1639  *         dtmin           dtmax           tend           trwfp
1640          1.0e-06         0.0010           20.0             1.0
1641  *
1642  *         edint           gfint          dmpint          sedint
1643          2.5e+00         0.5            5.0e+01            2.5
1644  *
1645  *         dtmin           dtmax           tend           trwfp
1646          1.0e-06         0.0025          400.0             1.0
1647  *
```

```
1648  *         edint          gfint         dmpint         sedint
1649          5.0e+01            0.5       5.0e+01           50.0
1650            -1.0
```

APPENDIX N

CODE-DATA COMPARISON FOR FLECHT-SEASET TEST 33436 WITH NEWRFD=1

The calculation results for the reflood option newrfd=1, without and with grid spacers modeled, are presented in this appendix. The same set of plots that are presented in the main body of the report for the reflood option newrfd=3 are also presented for the reflood option newrfd=1. For reference purposes, the figure numbers for the two reflood options are listed below.

Without Grid Spacers		With Grid Spacers	
newrfd=1	newrfd=3	newrfd=1	newrfd=3
N-1	4.9-6	N-26	4.9-31
N-2	4.9-7	N-27	4.9-32
N-3	4.9-8	N-28	4.9-33
N-4	4.9-9	N-29	4.9-34
N-5	4.9-10	N-30	4.9-35
N-6	4.9-11	N-31	4.9-36
N-7	4.9-12	N-32	4.9-37
N-8	4.9-13	N-33	4.9-38
N-9	4.9-14	N-34	4.9-39
N-10	4.9-15	N-35	4.9-40
N-11	4.9-16	N-36	4.9-41
N-12	4.9-17	N-37	4.9-42
N-13	4.9-18	N-38	4.9-43
N-14	4.9-19	N-39	4.9-44
N-15	4.9-20	N-40	4.9-45
N-16	4.9-21	N-41	4.9-46
N-17	4.9-22	N-42	4.9-47
N-18	4.9-23	N-43	4.9-48
N-19	4.9-24	N-44	4.9-49
N-20	4.9-25	N-45	4.9-50
N-21	4.9-26	N-46	4.9-51
N-22	4.9-27	N-47	4.9-52
N-23	4.9-28	N-48	4.9.53
N-24	4.9-29	N-49	4.9.54
N-25	4.9-30	N-50	4.9.55

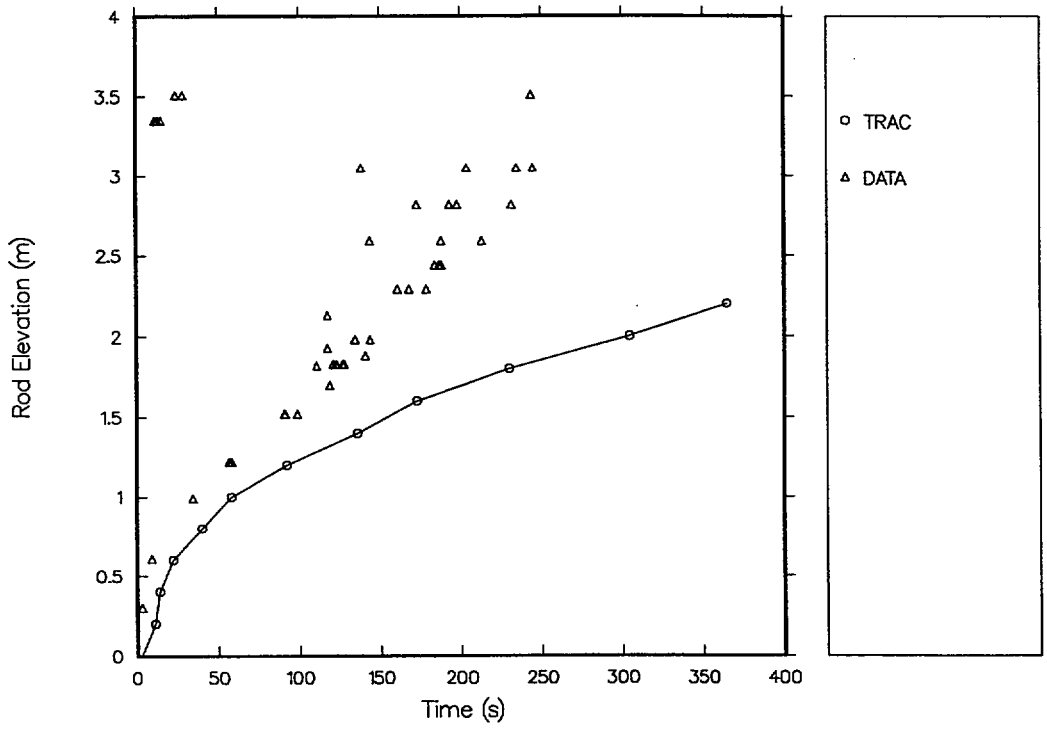


Fig. N-1. Comparison of predicted and measured cladding quench times.

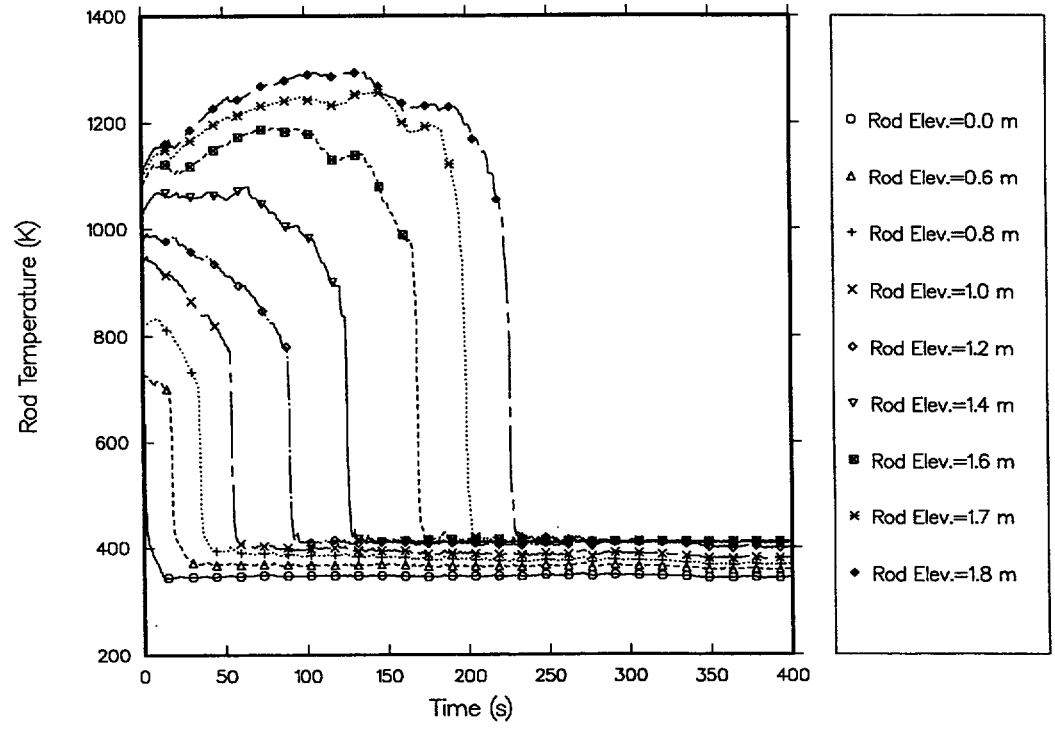


Fig. N-2. Predicted cladding temperature responses in lower half of core.

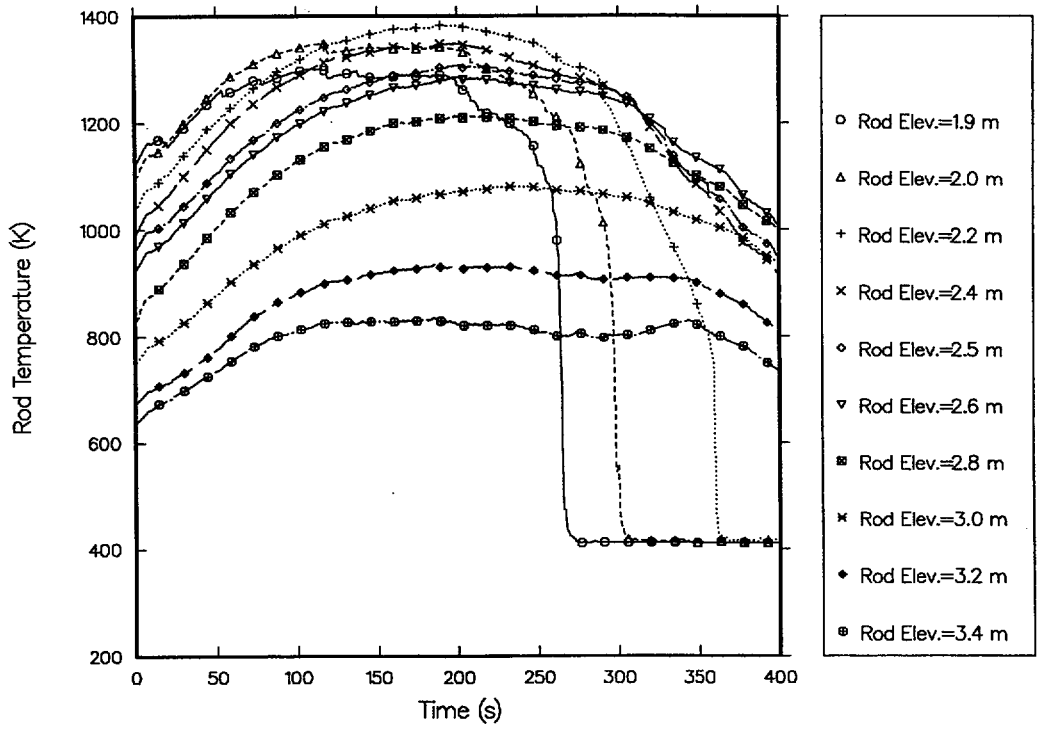


Fig. N-3. Predicted cladding temperature responses in upper half of core.

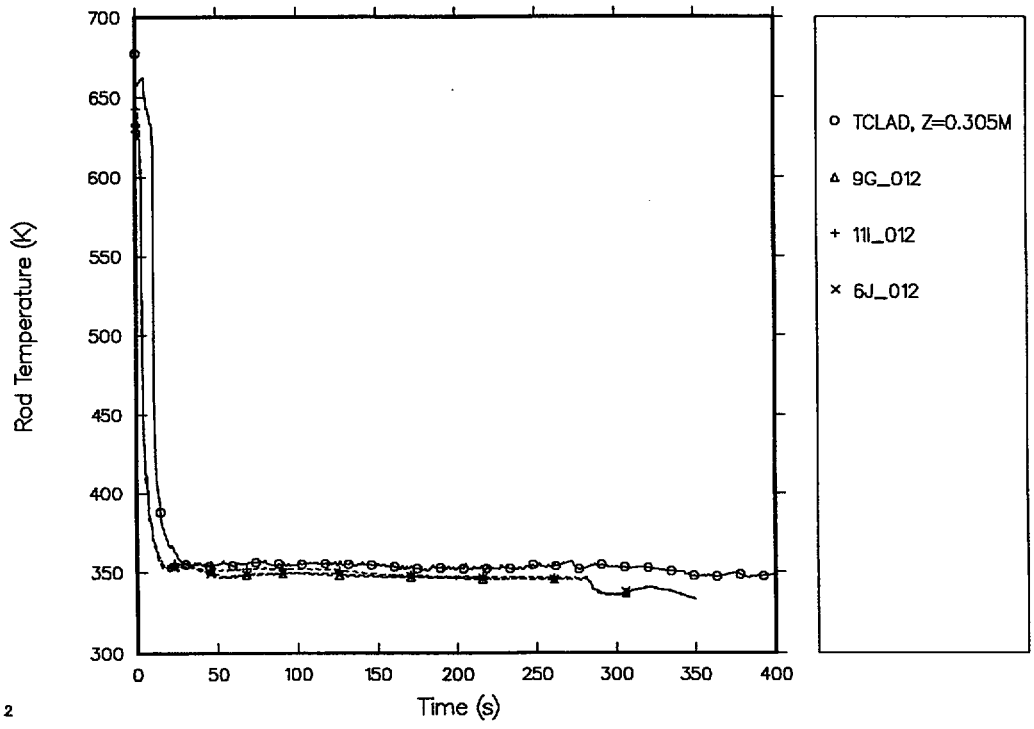


Fig. N-4. Comparison of predicted and measured heater-rod cladding temperatures at 0.3048-m elevation.

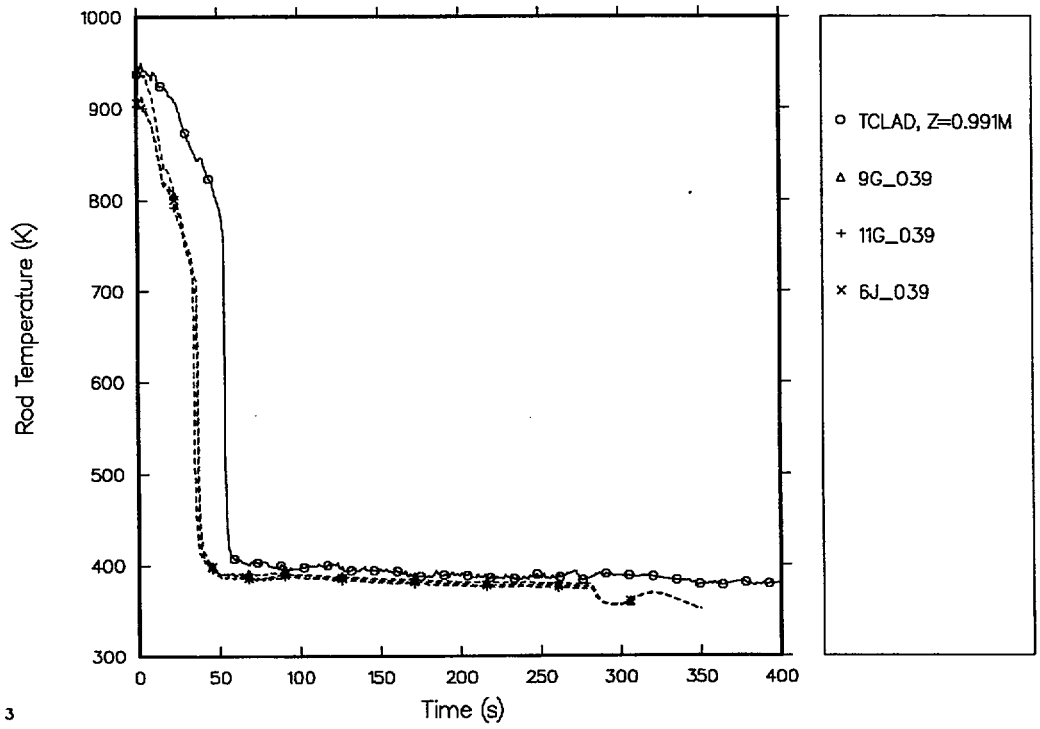


Fig. N-5. Comparison of predicted and measured heater-rod cladding temperatures at 0.9906-m elevation.

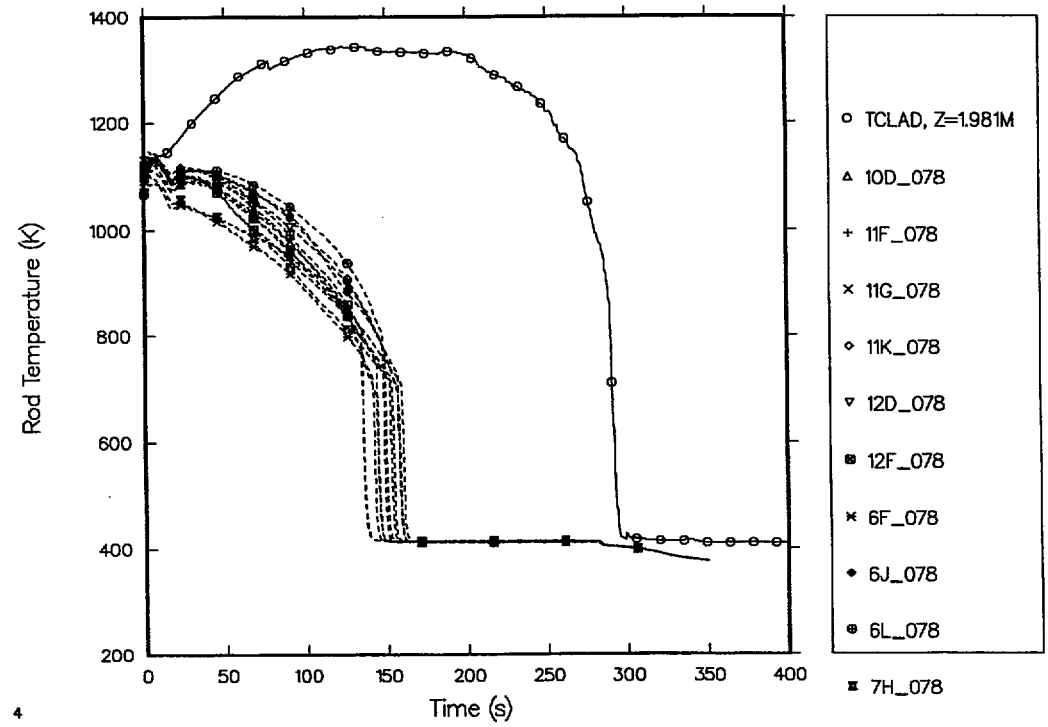


Fig. N-6. Comparison of predicted and measured heater-rod cladding temperatures at 1.9812-m elevation.

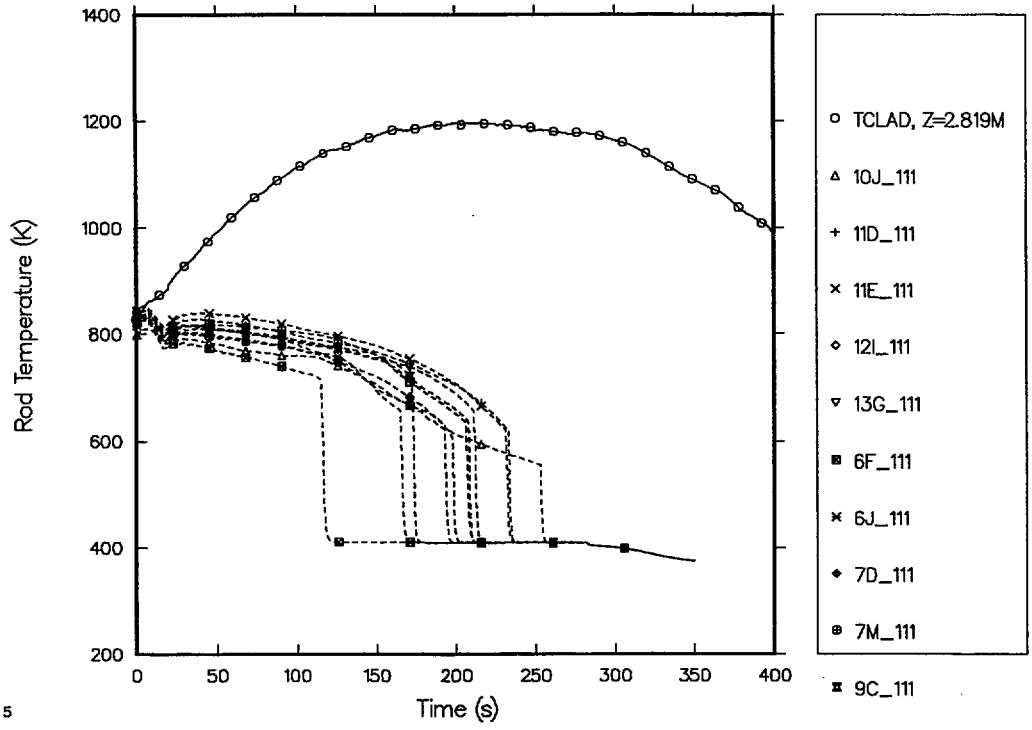


Fig. N-7. Comparison of predicted and measured heater-rod cladding temperatures at 2.8194-m elevation.

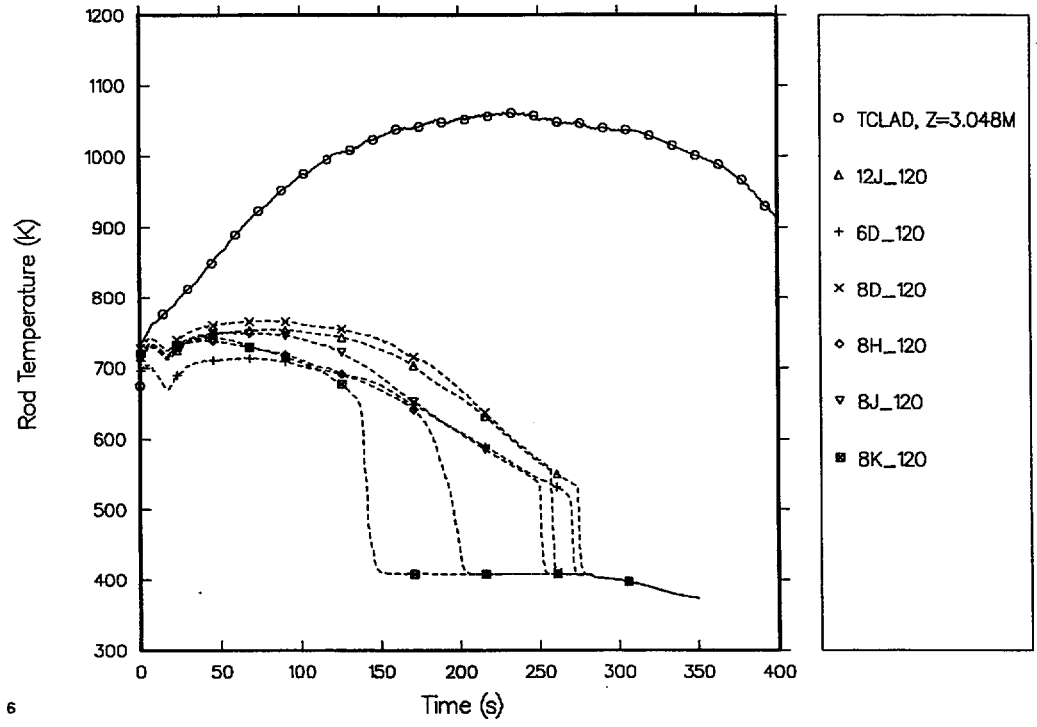
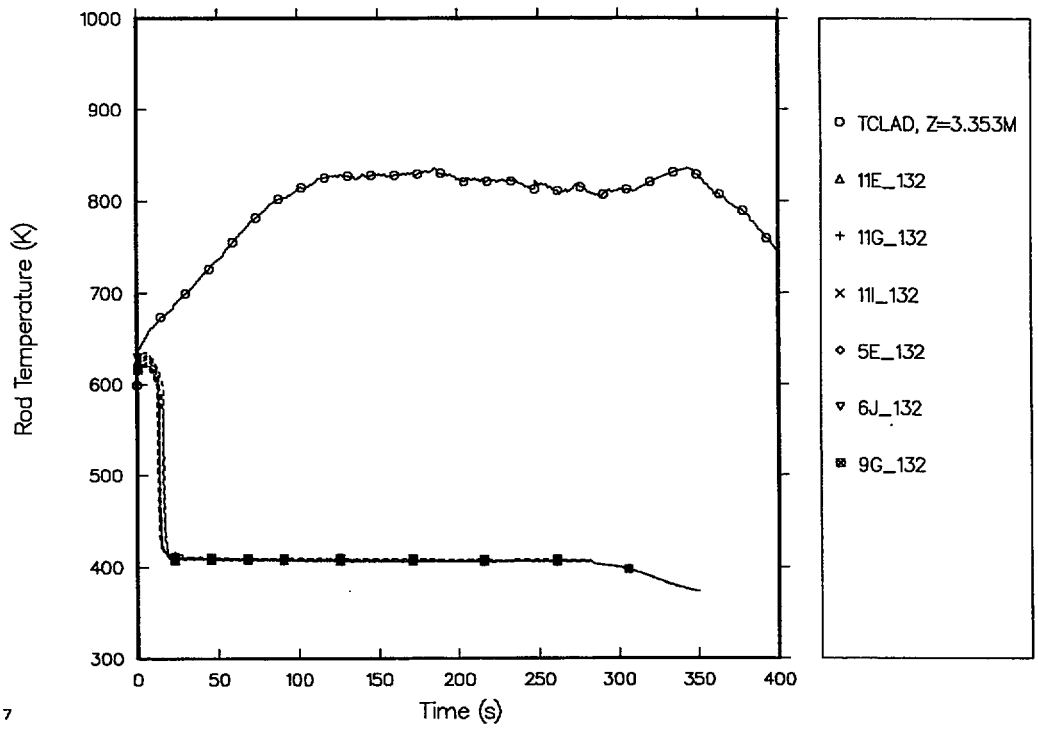
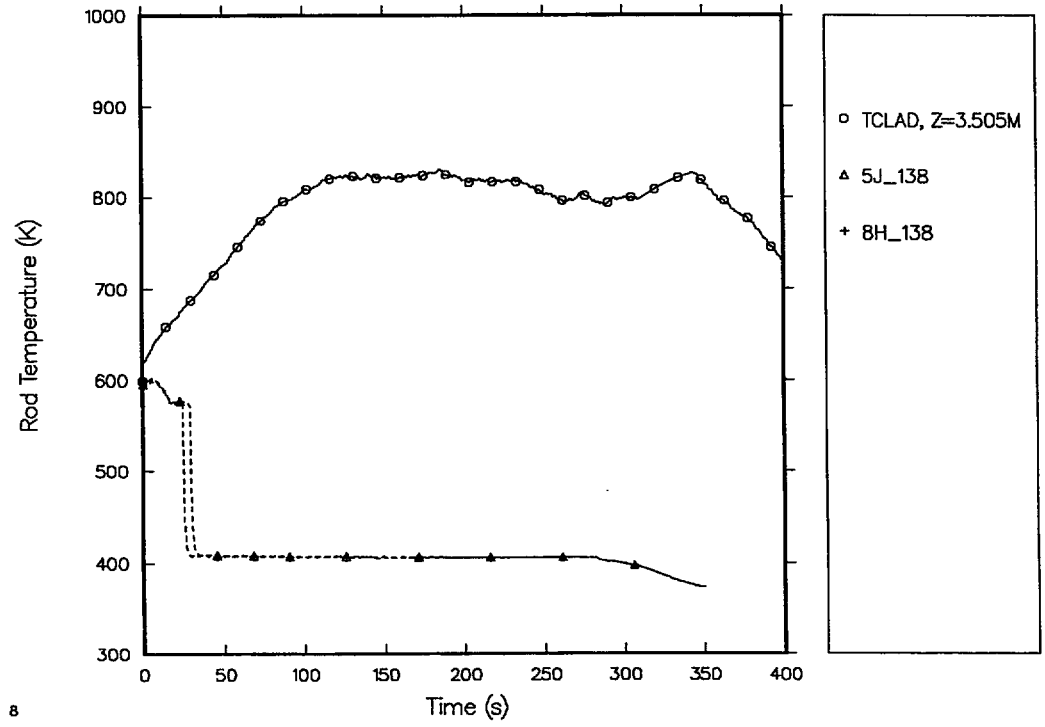


Fig. N-8. Comparison of predicted and measured heater-rod cladding temperatures at 3.0480-m elevation.



7

Fig. N-9. Comparison of predicted and measured heater-rod cladding temperatures at 3.3528-m elevation.



8

Fig. N-10. Comparison of predicted and measured heater-rod cladding temperatures at 3.5052-m elevation.

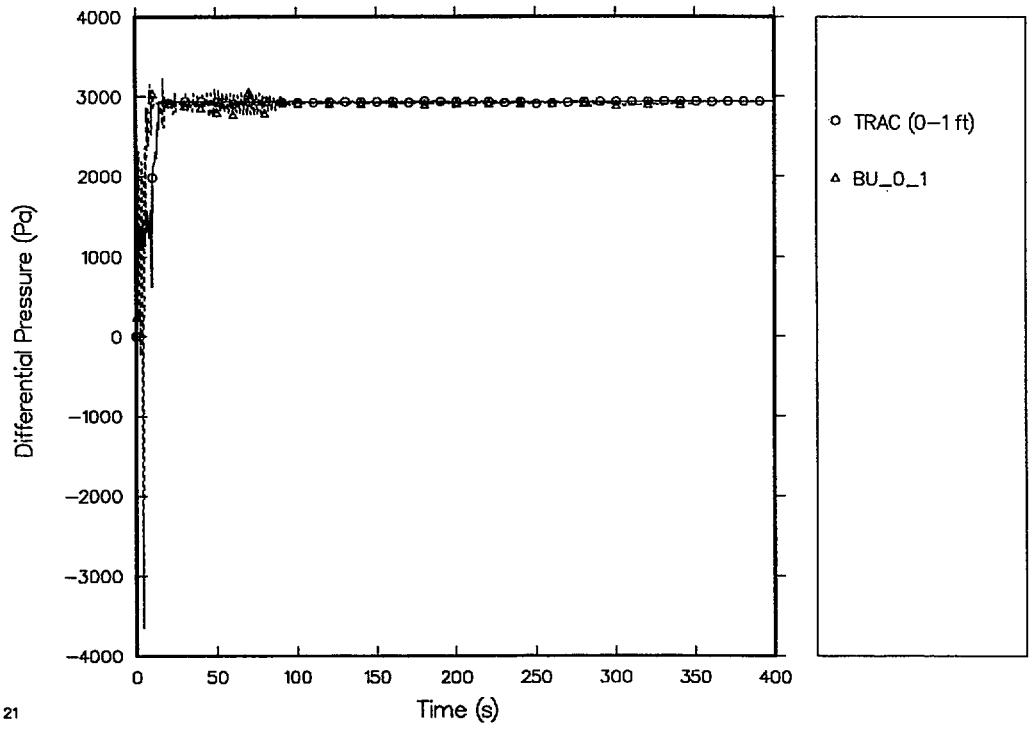


Fig. N-11. Comparison of predicted and measured differential pressures (0–1 ft).

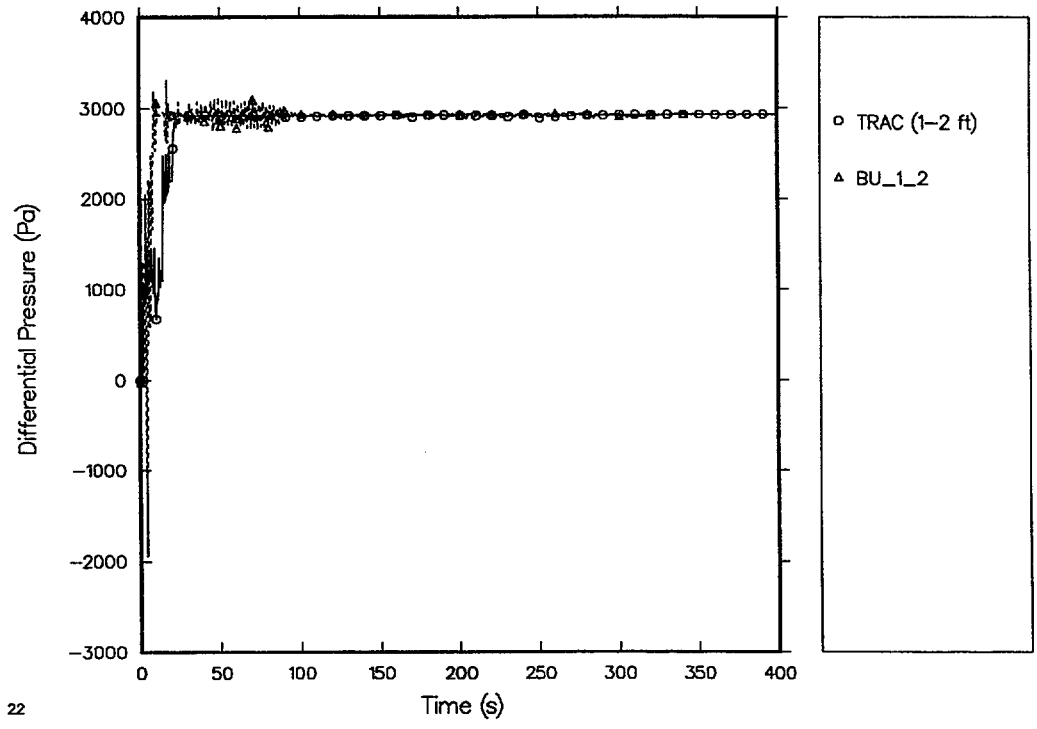


Fig. N-12. Comparison of predicted and measured differential pressures (1–2 ft).

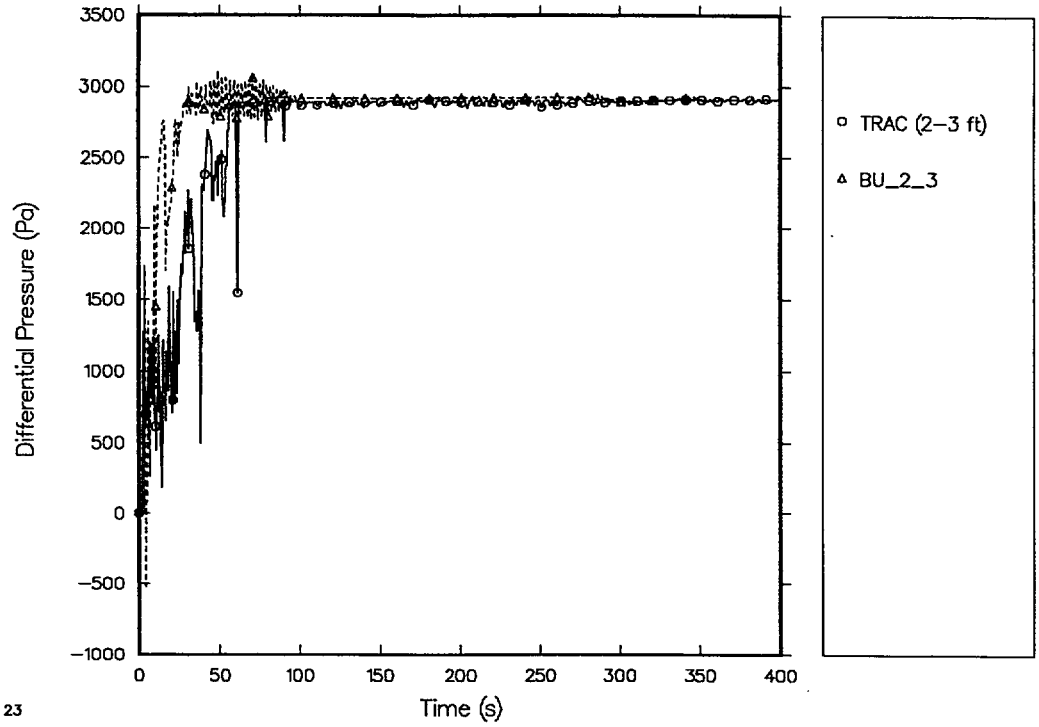


Fig. N-13. Comparison of predicted and measured differential pressures (2–3 ft).

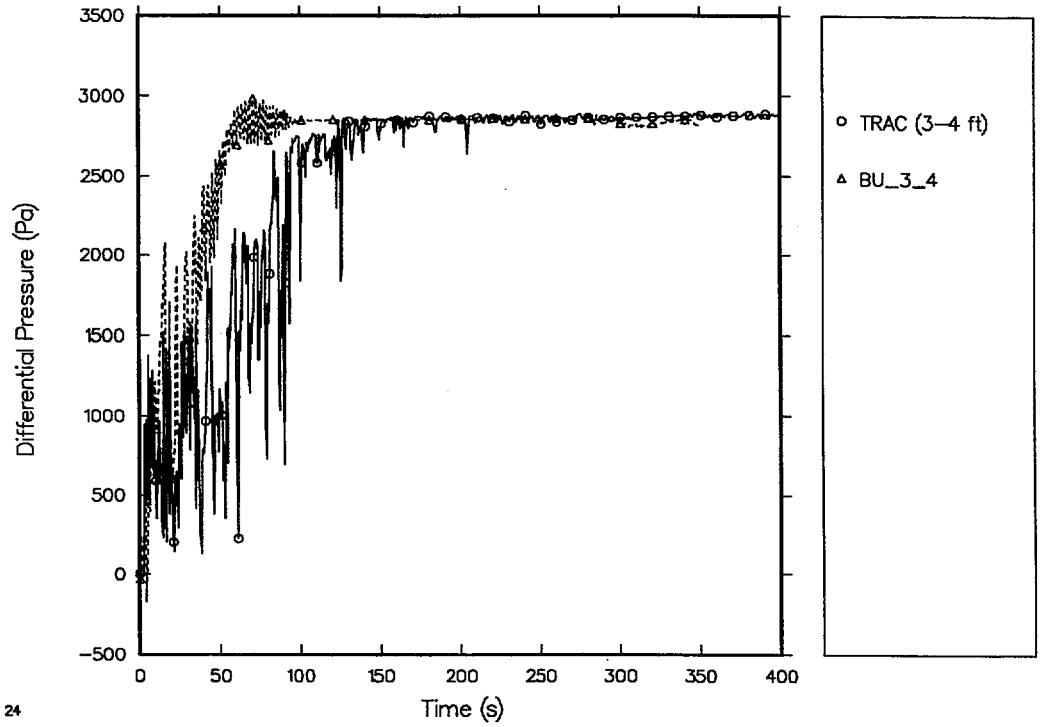


Fig. N-14. Comparison of predicted and measured differential pressures (3–4 ft).

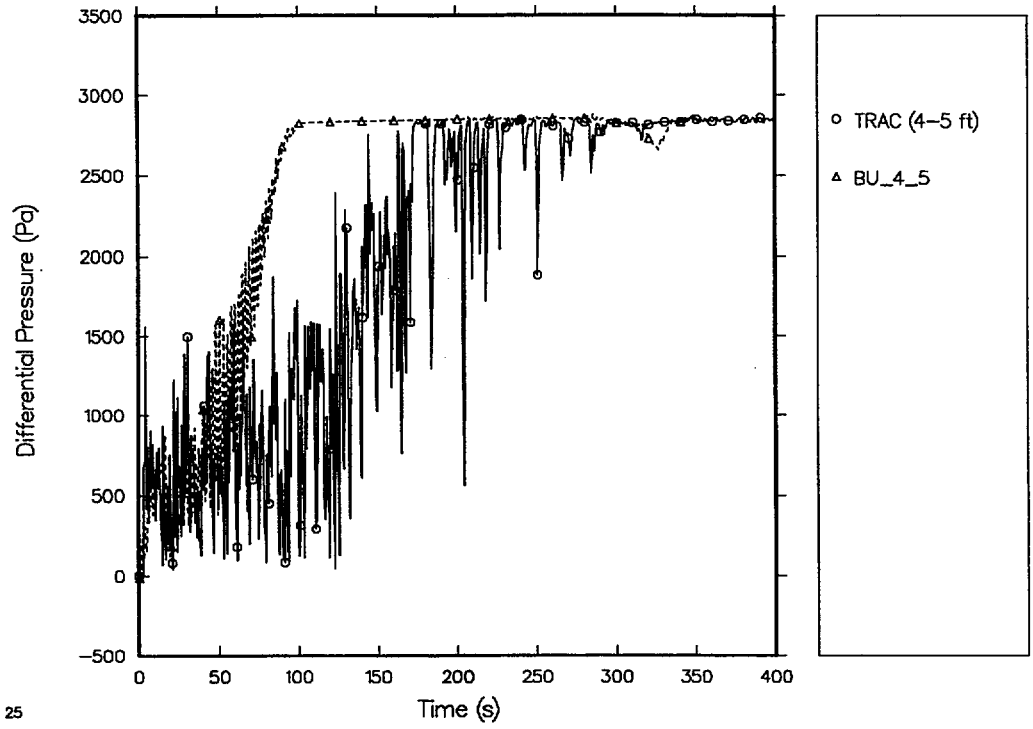


Fig. N-15. Comparison of predicted and measured differential pressures (4–5 ft).

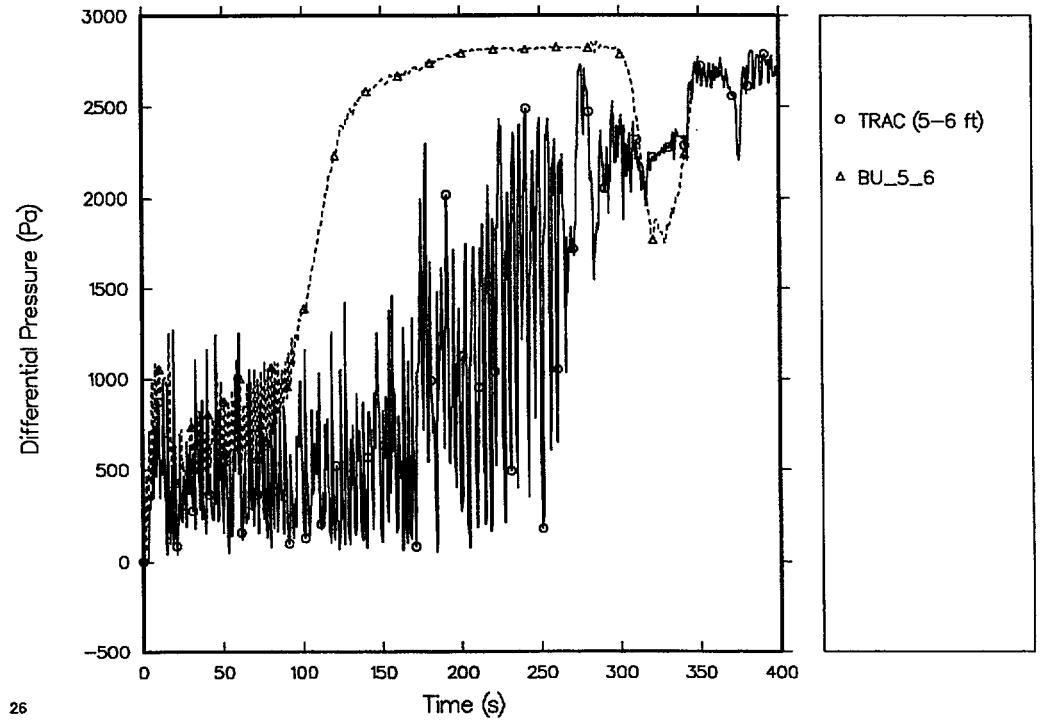


Fig. N-16. Comparison of predicted and measured differential pressures (5–6 ft).

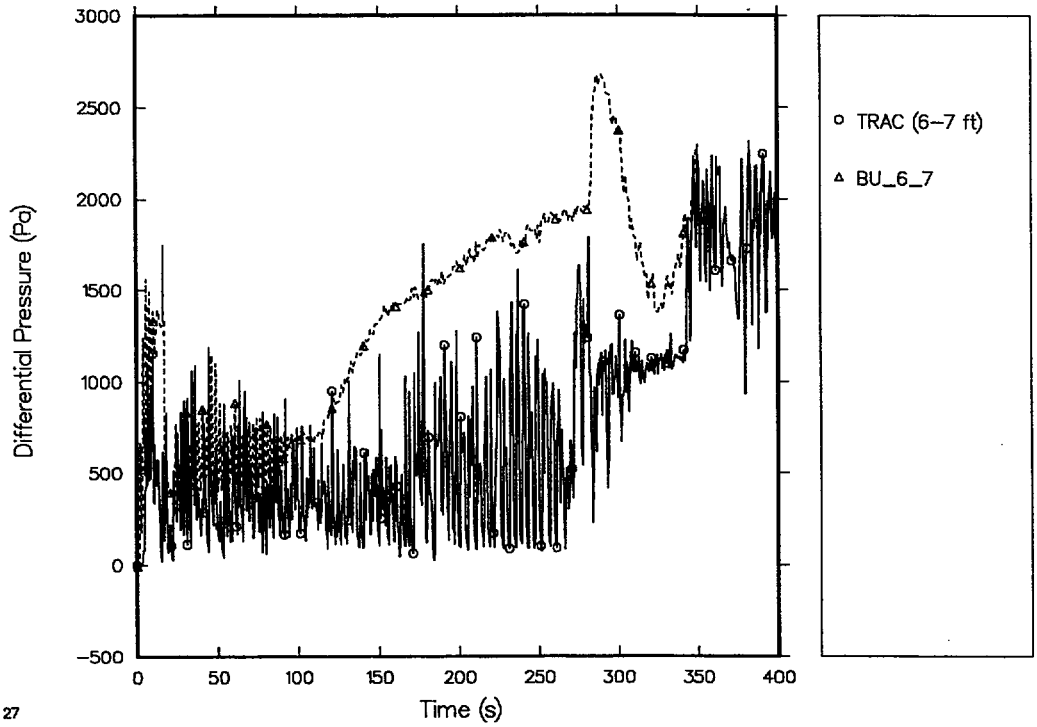


Fig. N-17. Comparison of predicted and measured differential pressures (6–7 ft).

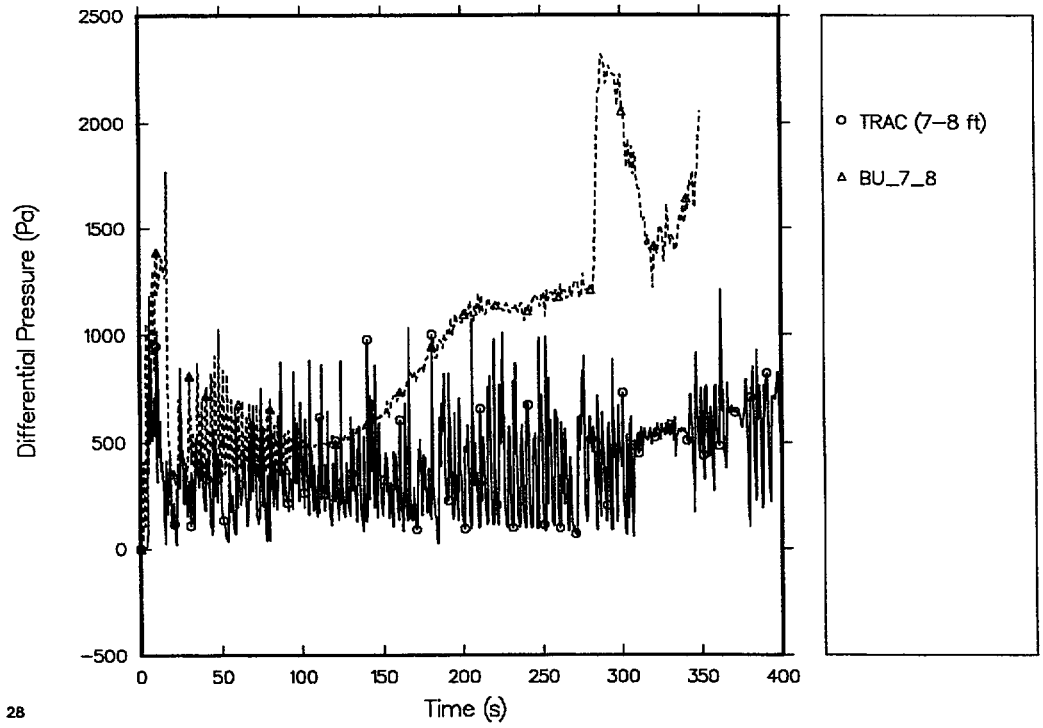


Fig. N-18. Comparison of predicted and measured differential pressures (7–8 ft).

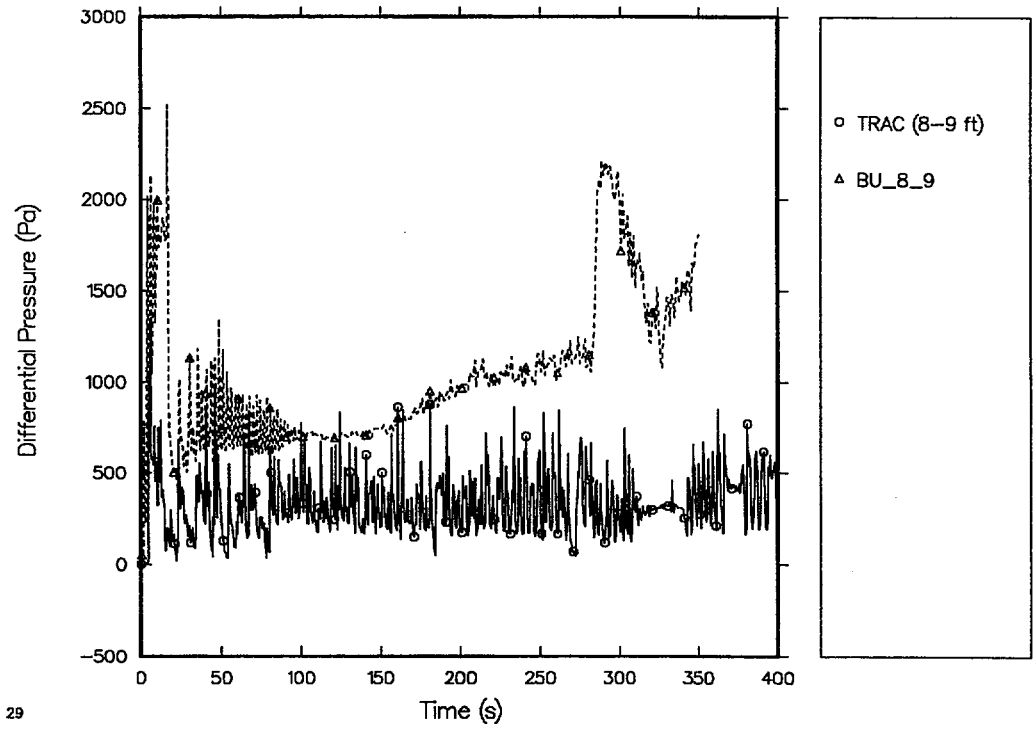


Fig. N-19. Comparison of predicted and measured differential pressures (8–9ft).

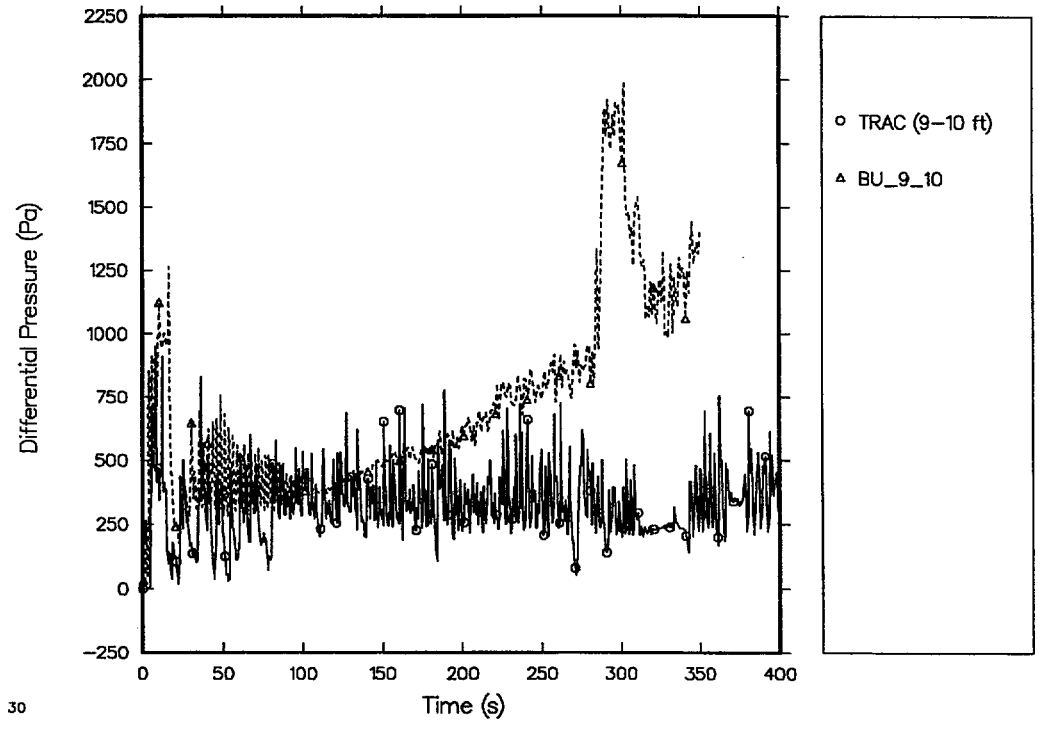


Fig. N-20. Comparison of predicted and measured differential pressures (9–10 ft).

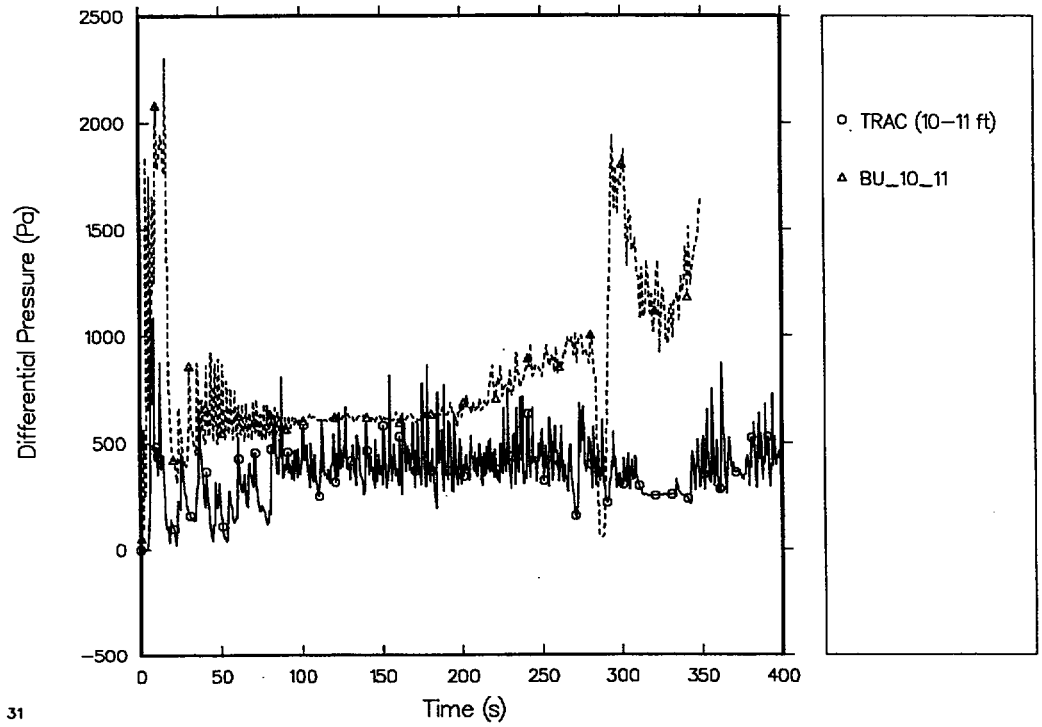


Fig. N-21. Comparison of predicted and measured differential pressures (10–11 ft).

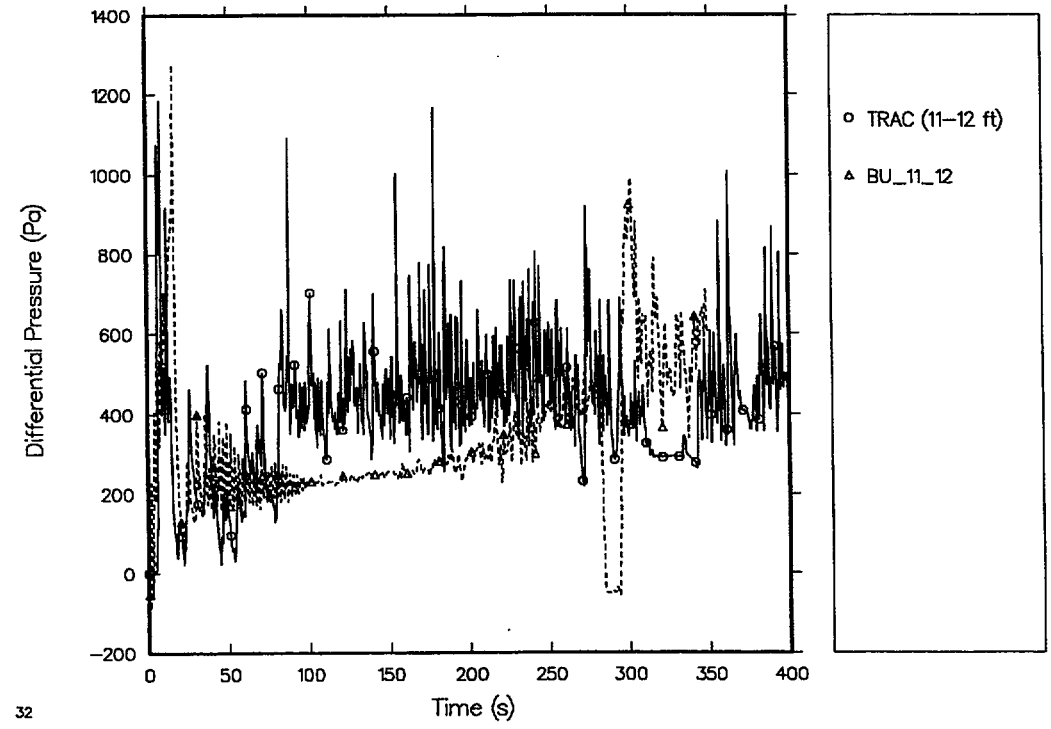


Fig. N-22. Comparison of predicted and measured differential pressures (11–12 ft).

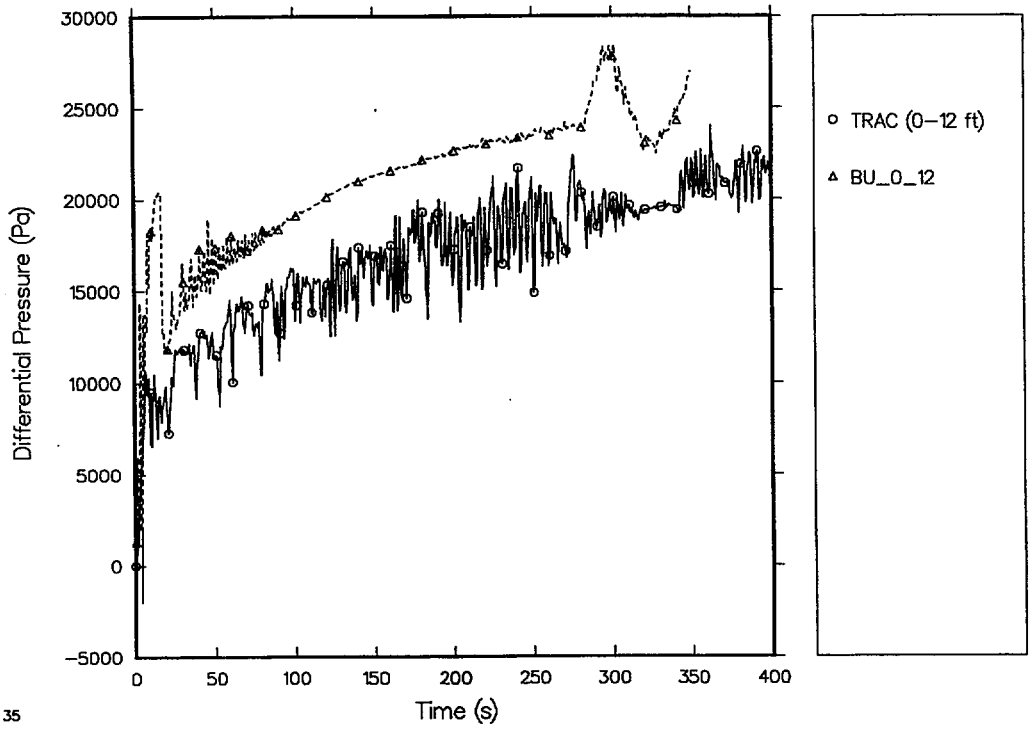


Fig. N-23. Comparison of predicted and measured total core differential pressures (0–12 ft).

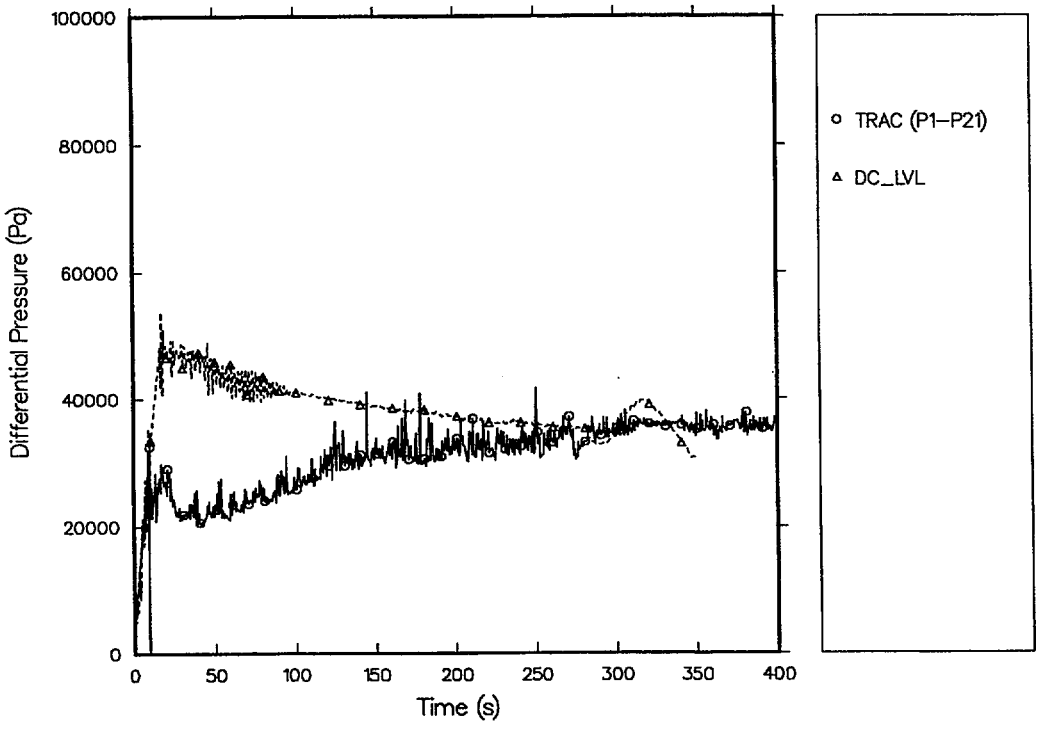


Fig. N-24. Comparison of predicted and measured downcomer differential pressures.

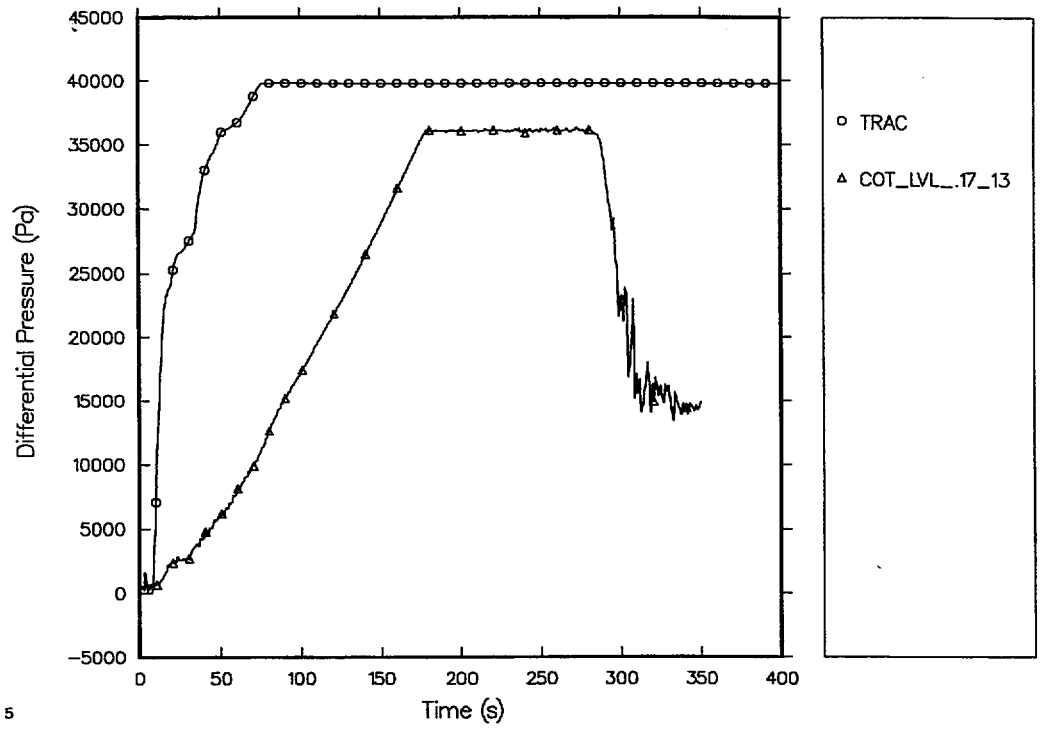


Fig. N-25. Comparison of predicted and measured carryover tank differential pressures (0–12 ft).

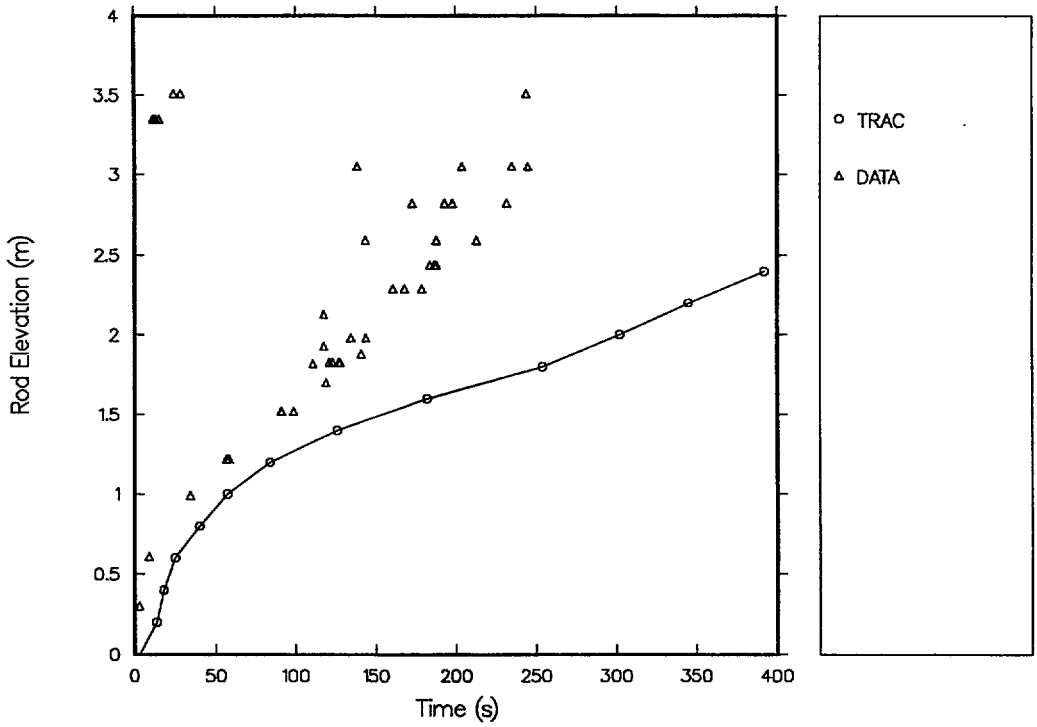


Fig. N-26. Comparison of predicted and measured cladding quench times (with grid-spacer model).

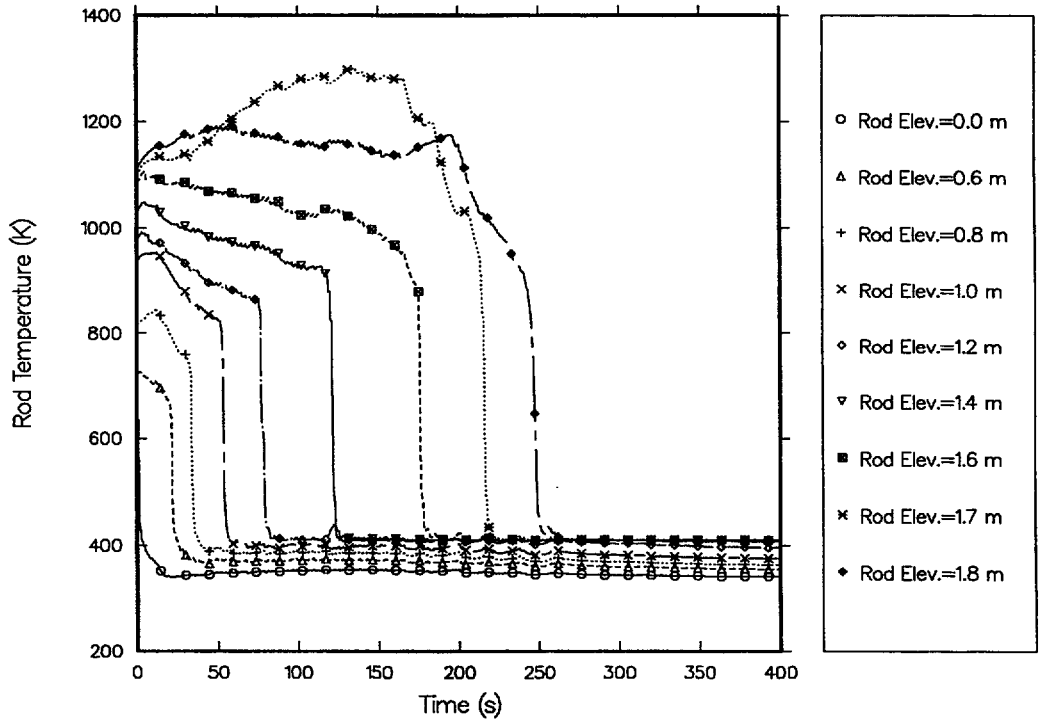


Fig. N-27. Predicted cladding temperature responses in lower half of core (with grid-spacer model).

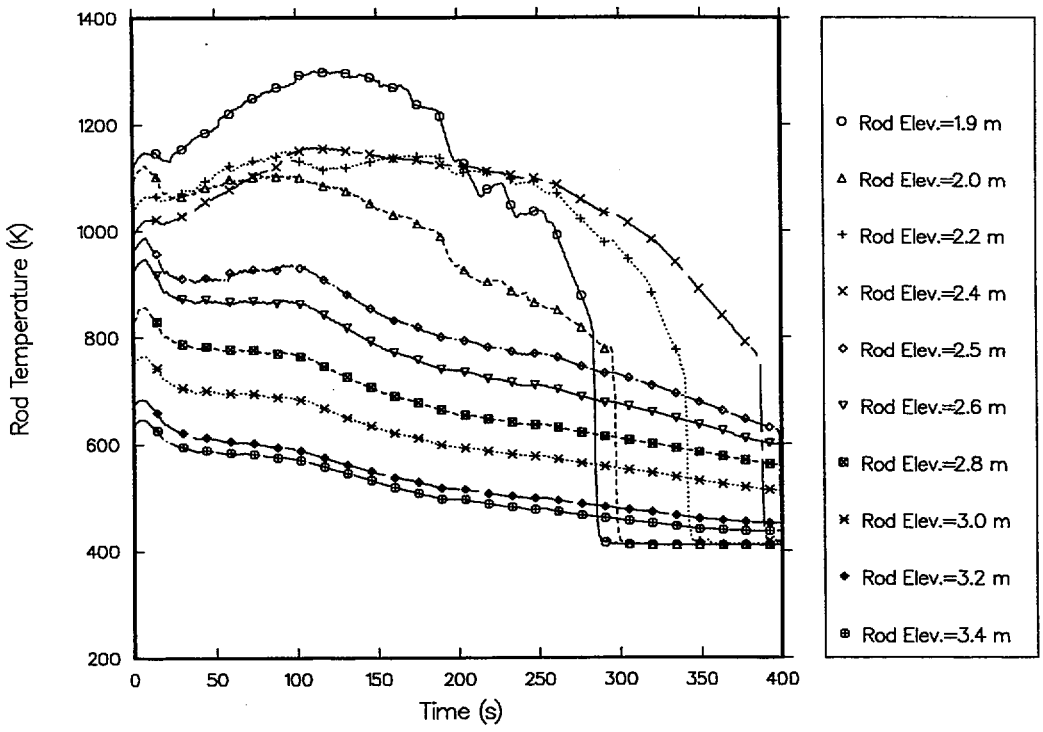


Fig. N-28. Predicted cladding temperature responses in upper half of core (with grid-spacer model).

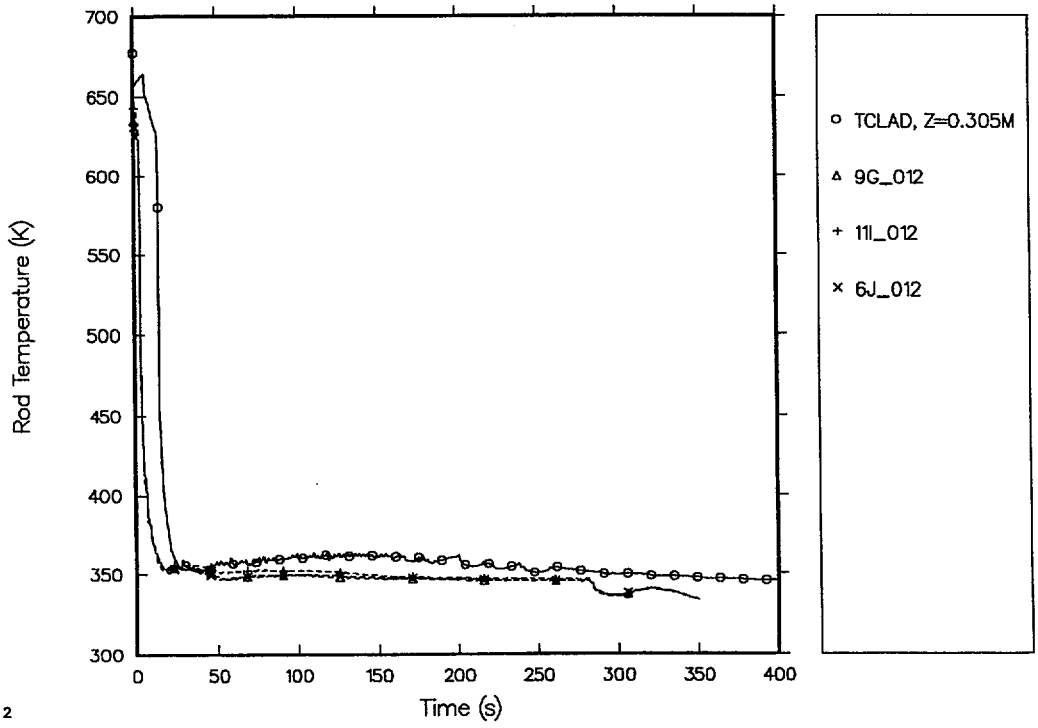


Fig. N-29. Comparison of predicted and measured heater-rod cladding temperatures at 0.3048-m elevation (with grid-spacer model).

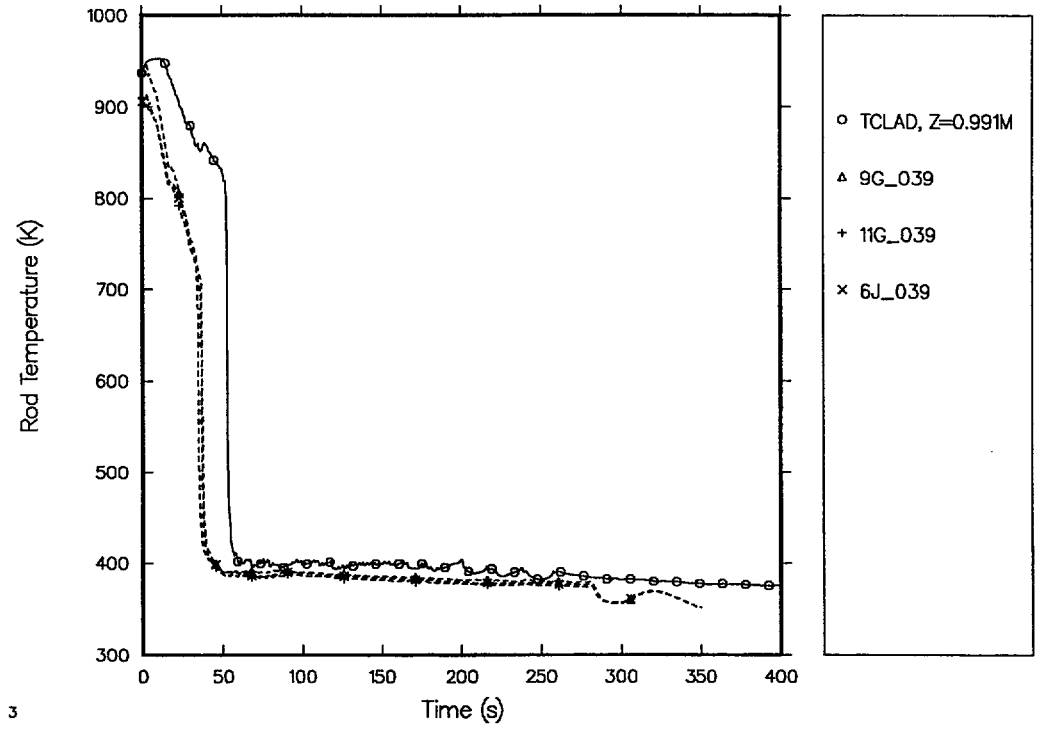


Fig. N-30. Comparison of predicted and measured heater-rod cladding temperatures at 0.9906-m elevation (with grid-spacer model).

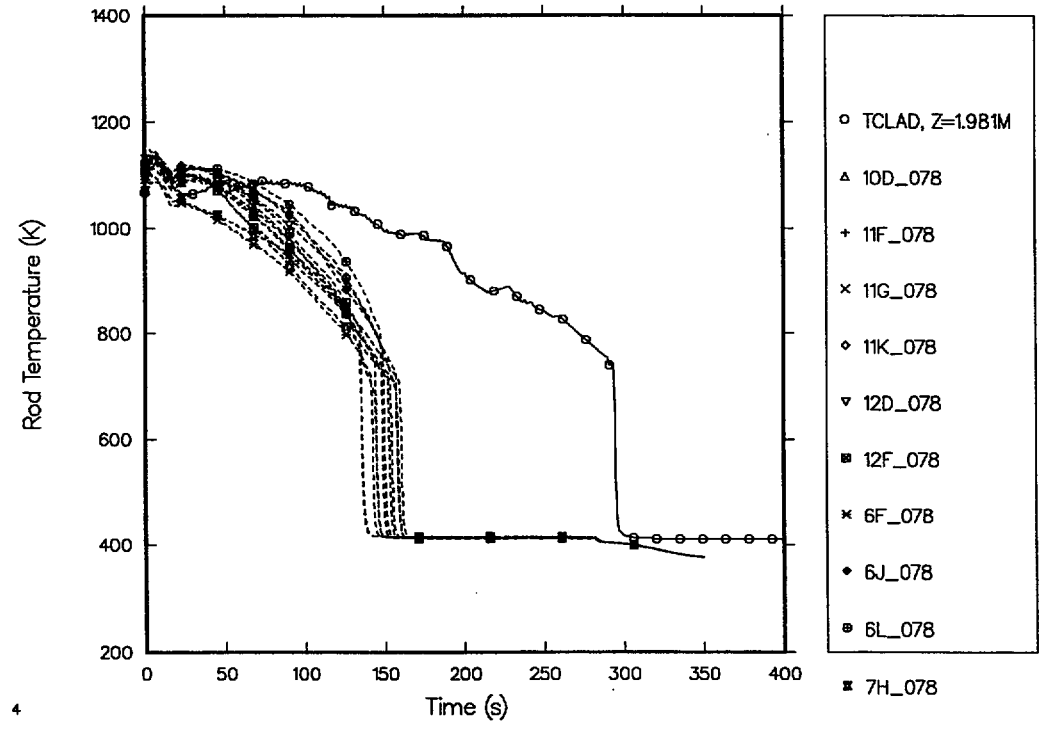


Fig. N-31. Comparison of predicted and measured heater-rod cladding temperatures at 1.9812-m elevation (with grid-spacer model).

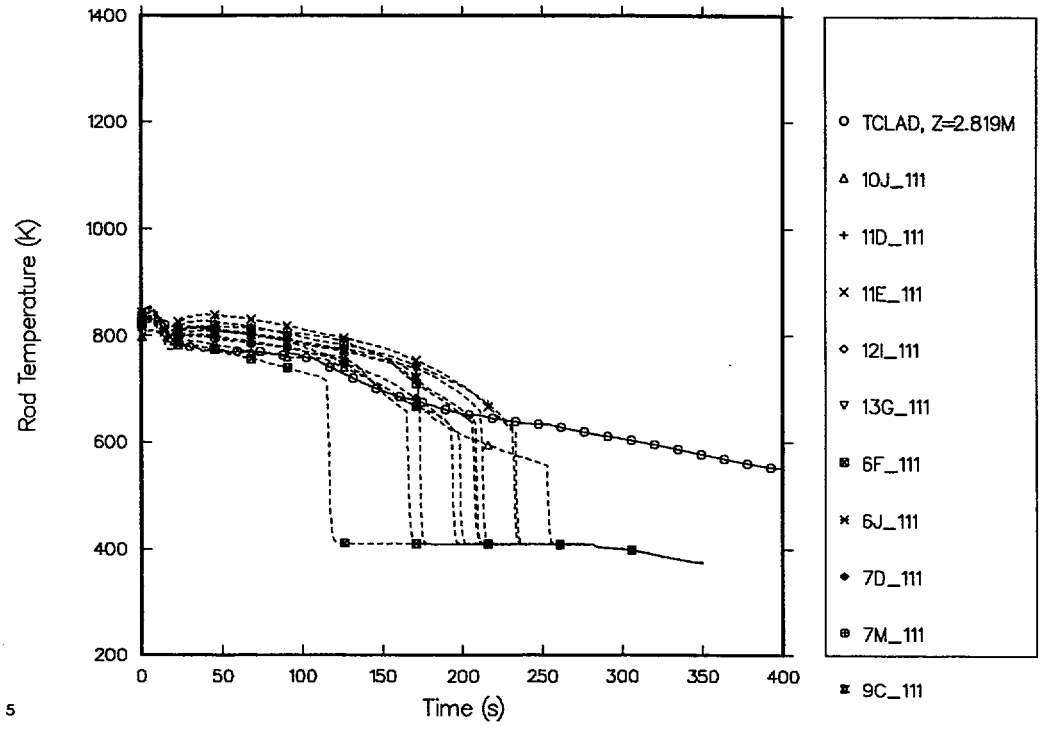


Fig. N-32. Comparison of predicted and measured heater-rod cladding temperatures at 2.8194-m elevation (with grid-spacer model).

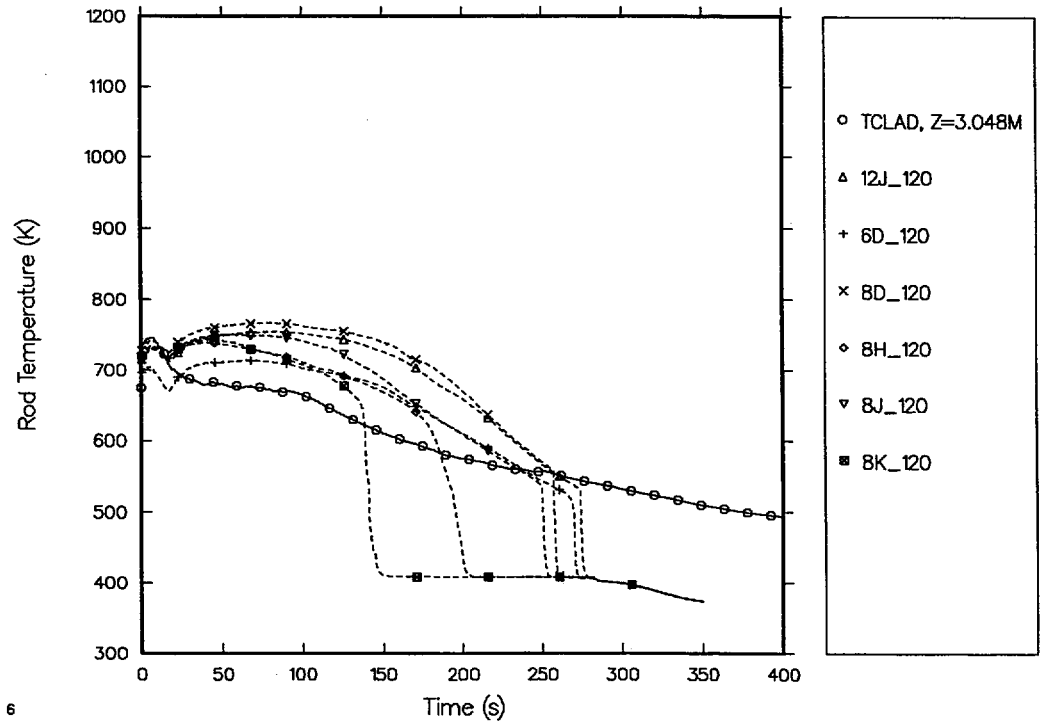


Fig. N-33. Comparison of predicted and measured heater-rod cladding temperatures at 3.0480-m elevation (with grid-spacer model).

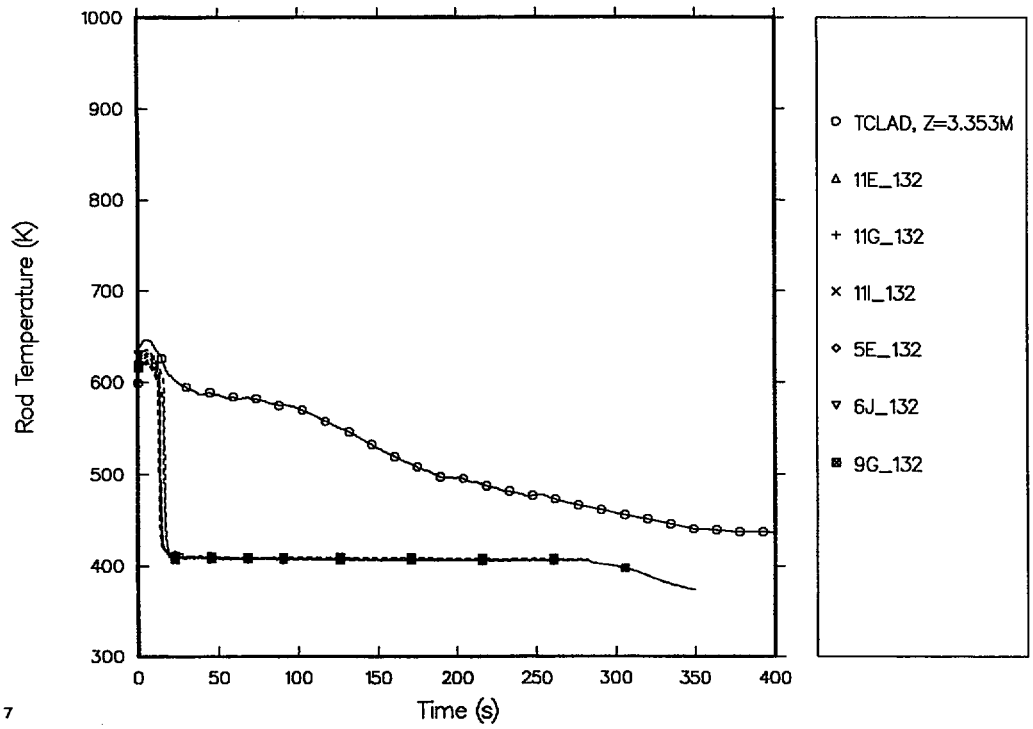


Fig. N-34. Comparison of predicted and measured heater-rod cladding temperatures at 3.3528-m elevation (with grid-spacer model).

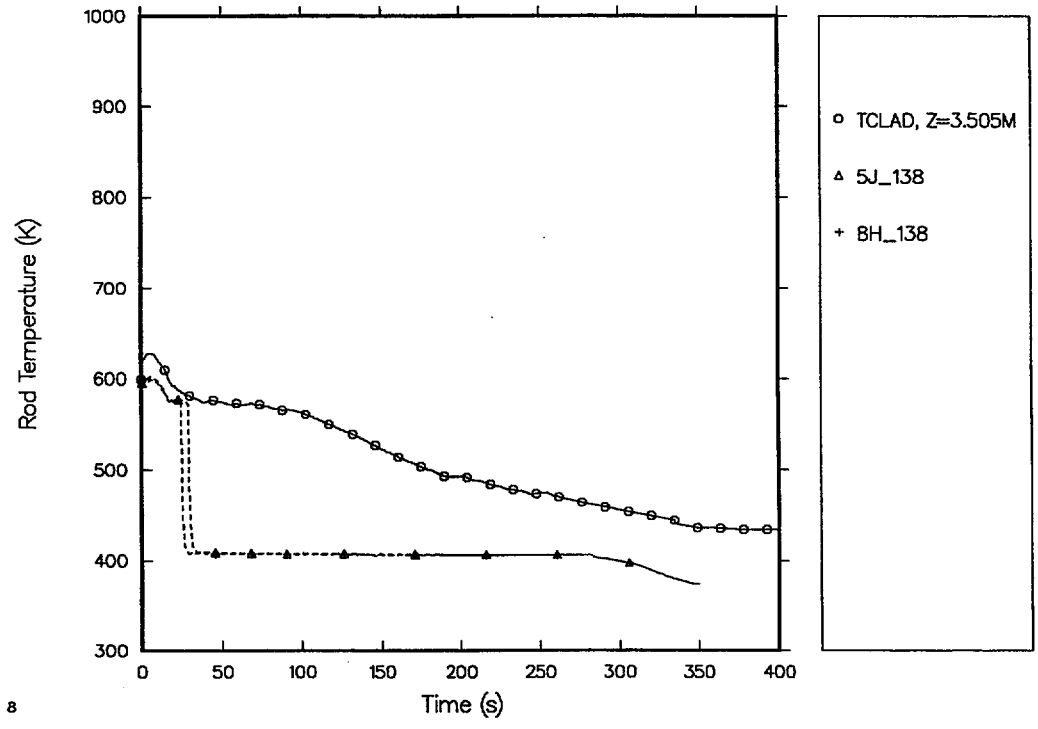


Fig. N-35. Comparison of predicted and measured heater-rod cladding temperatures at 3.5052-m elevation (with grid-spacer model).

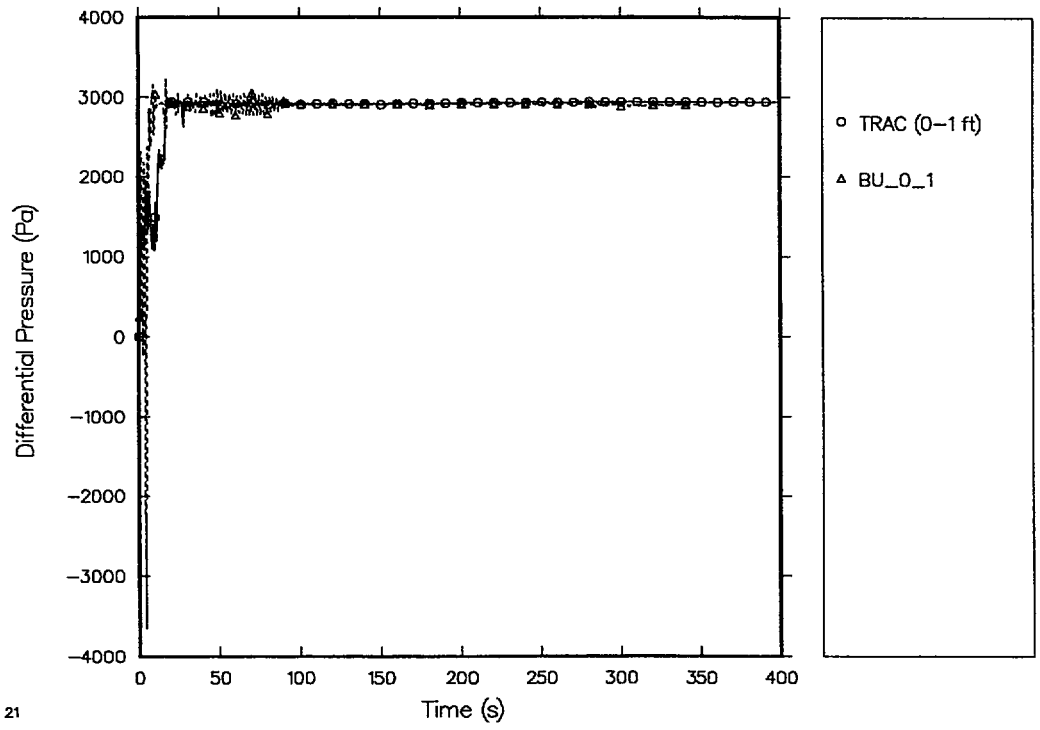


Fig. N-36. Comparison of predicted and measured differential pressures (0–1 ft, with grid-spacer model).

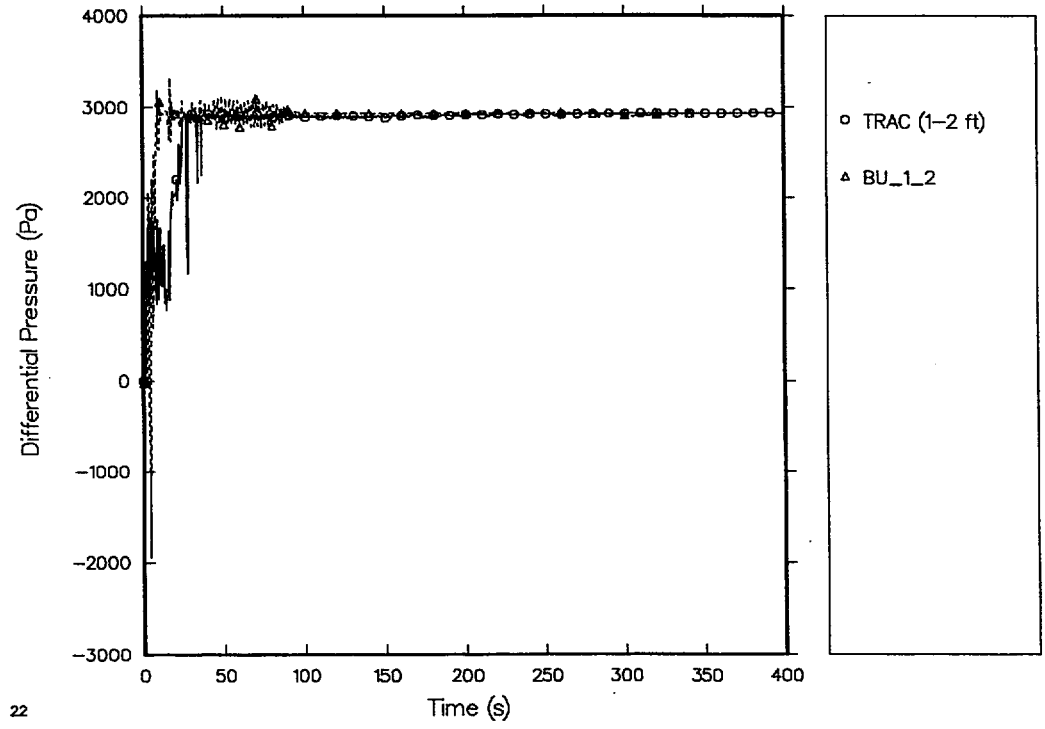


Fig. N-37. Comparison of predicted and measured differential pressures (1–2 ft, with grid-spacer model).

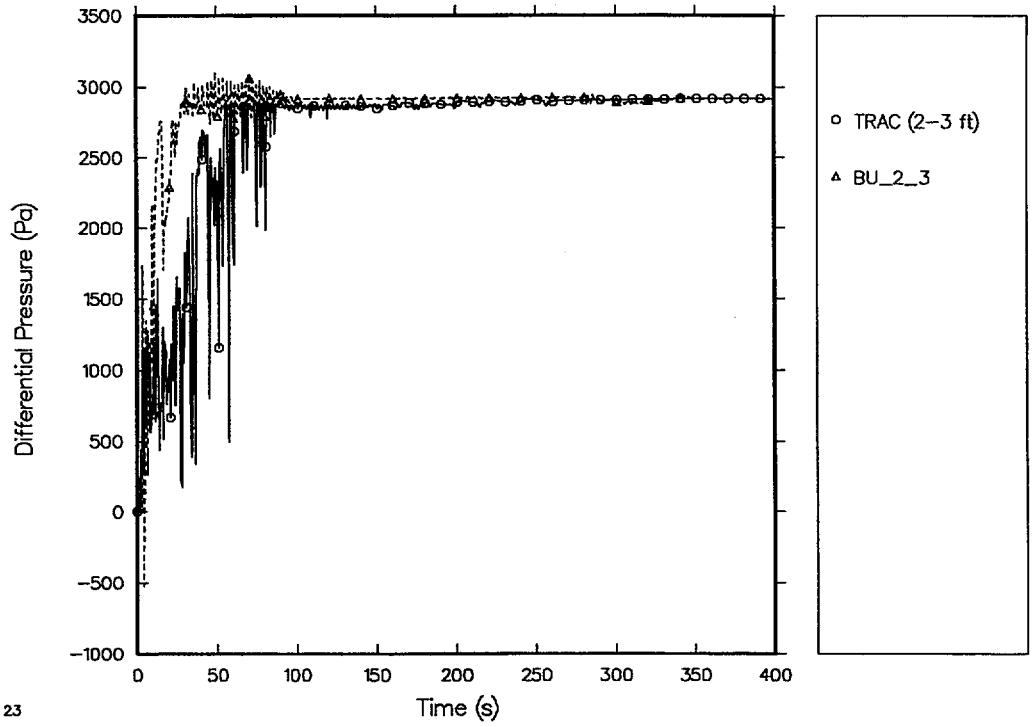


Fig. N-38. Comparison of predicted and measured differential pressures (2–3 ft, with grid-spacer model).

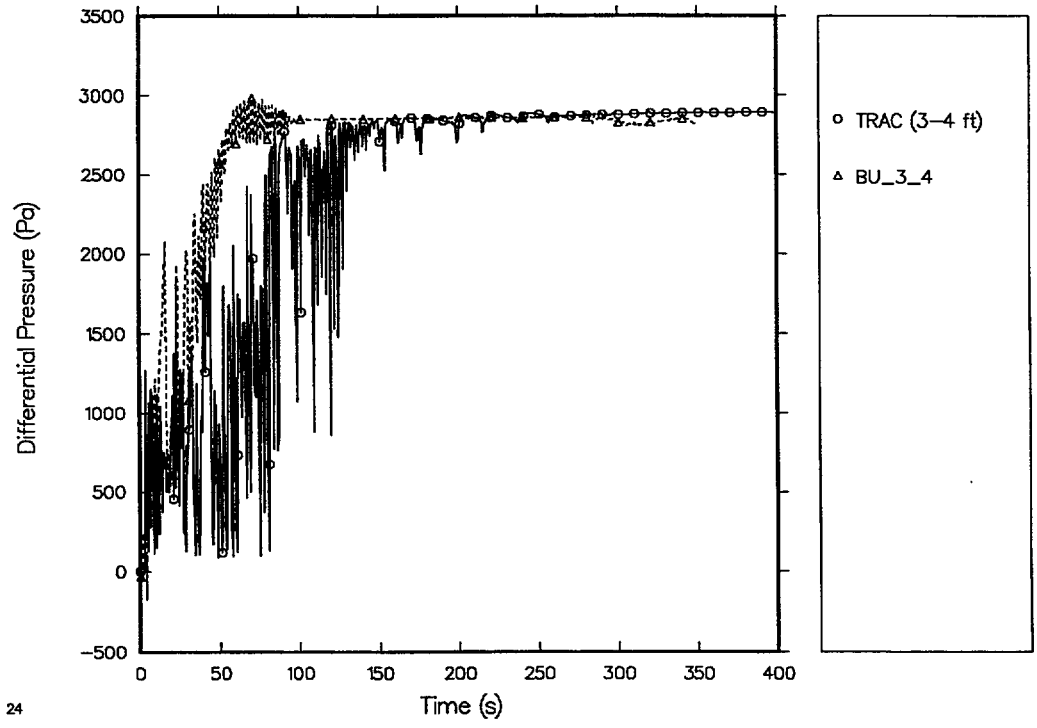


Fig. N-39. Comparison of predicted and measured differential pressures (3–4 ft, with grid-spacer model).

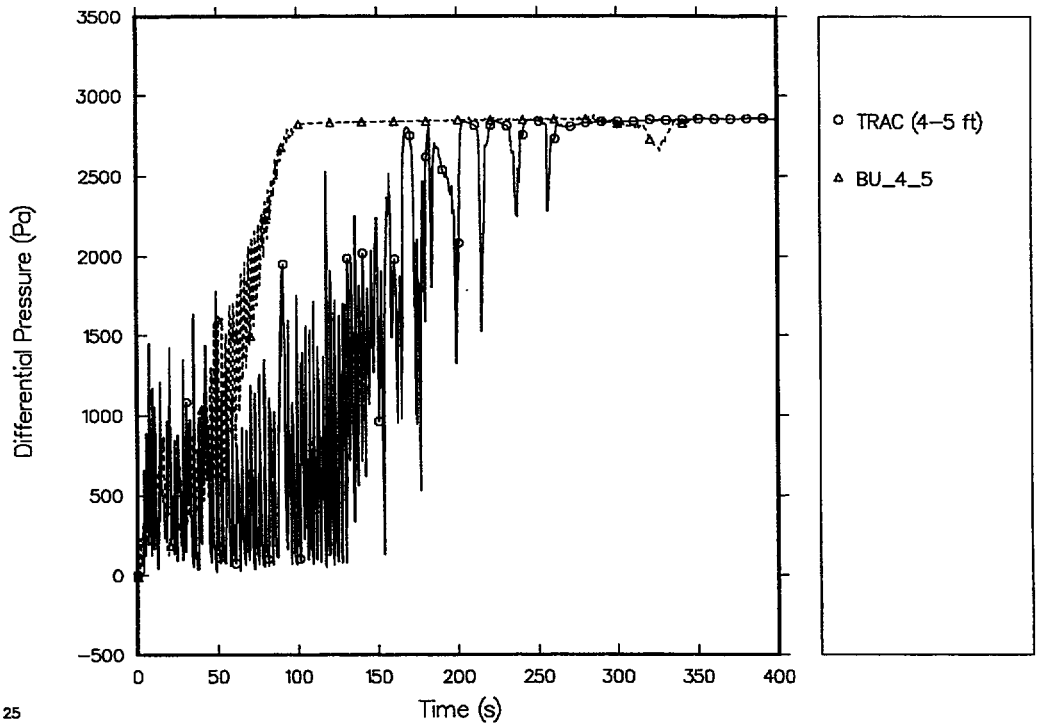


Fig. N-40. Comparison of predicted and measured differential pressures (4-5 ft, with grid-spacer model).

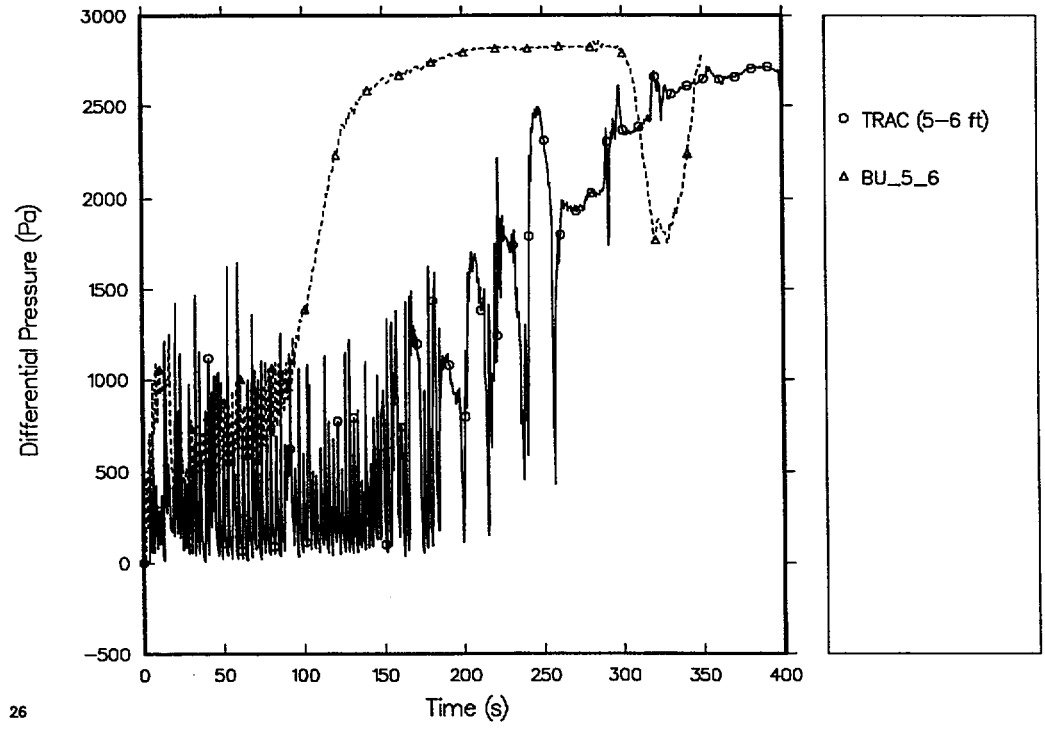


Fig. N-41. Comparison of predicted and measured differential pressures (5–6 ft, with grid-spacer model).

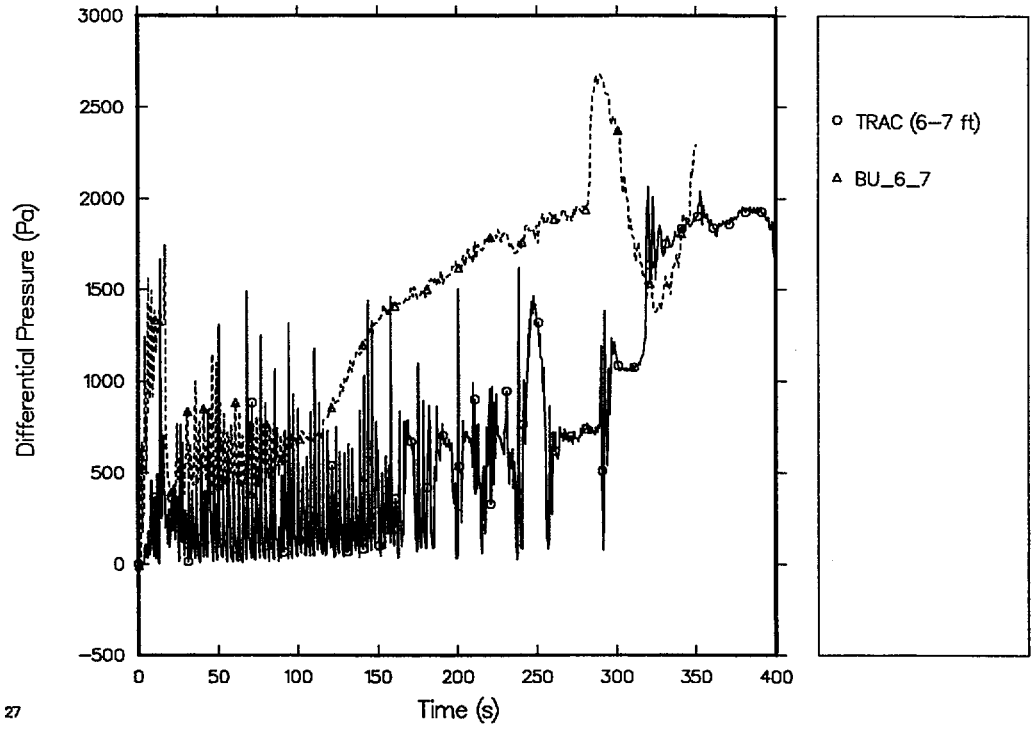


Fig. N-42. Comparison of predicted and measured differential pressures (6–7 ft, with grid-spacer model).

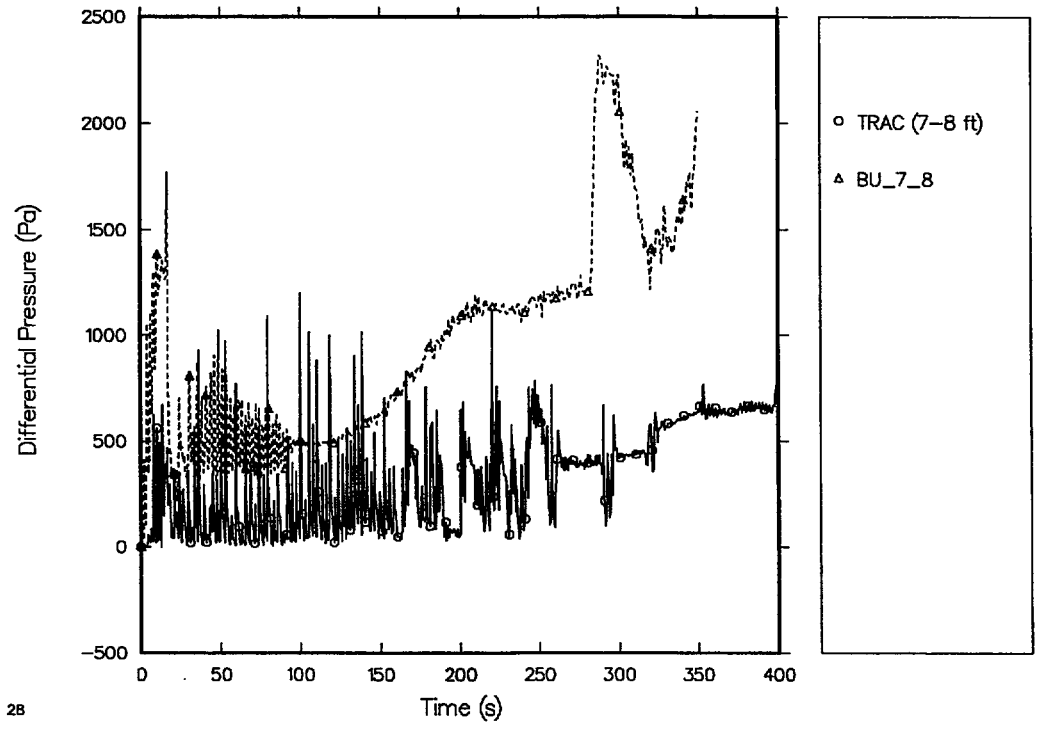


Fig. N-43. Comparison of predicted and measured differential pressures (7–8 ft, with grid-spacer model).

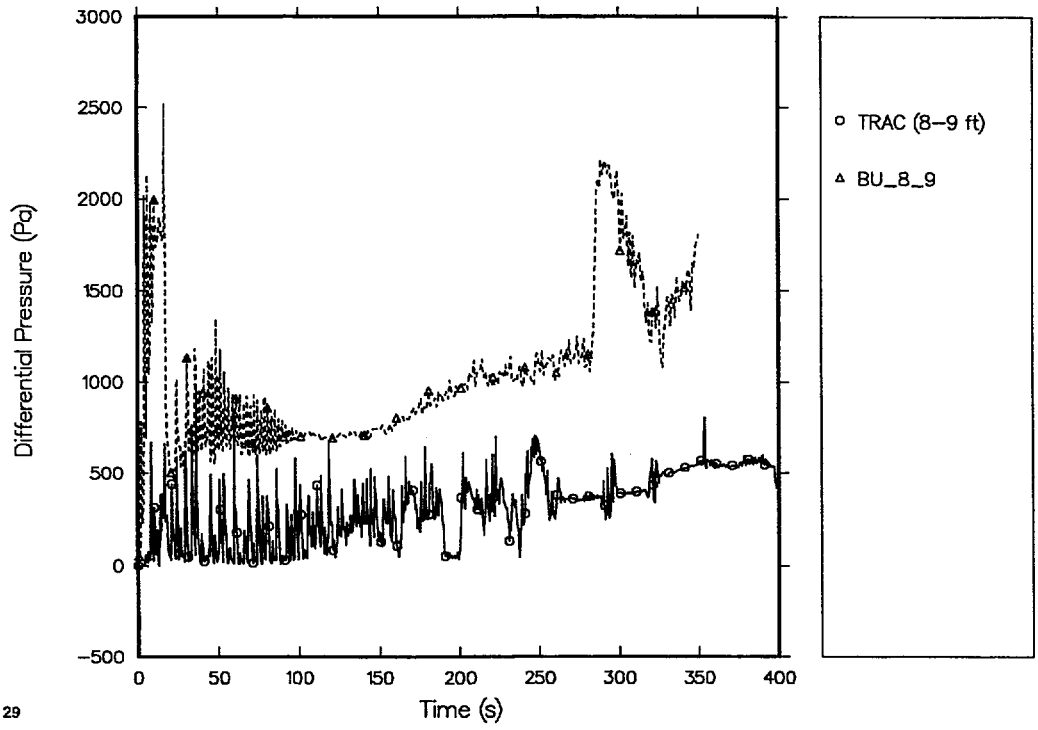


Fig. N-44. Comparison of predicted and measured differential pressures (8–9 ft, with grid-spacer model).

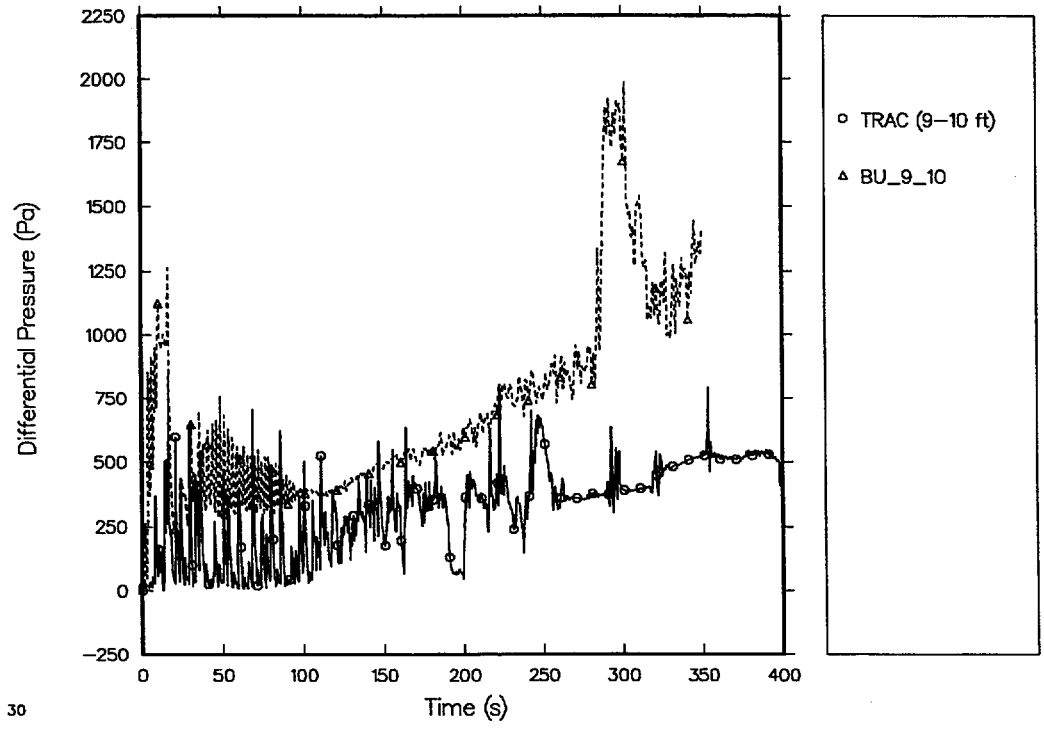


Fig. N-45. Comparison of predicted and measured differential pressures (9–10 ft, with grid-spacer model).

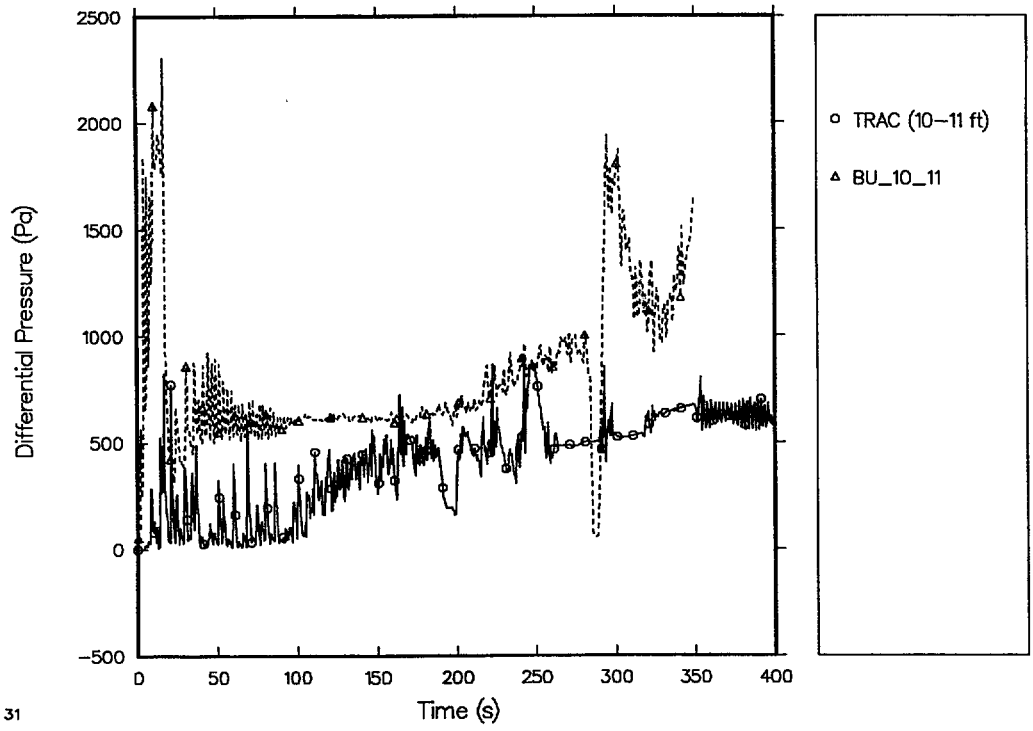


Fig. N-46. Comparison of predicted and measured differential pressures (10–11 ft, with grid-spacer model).

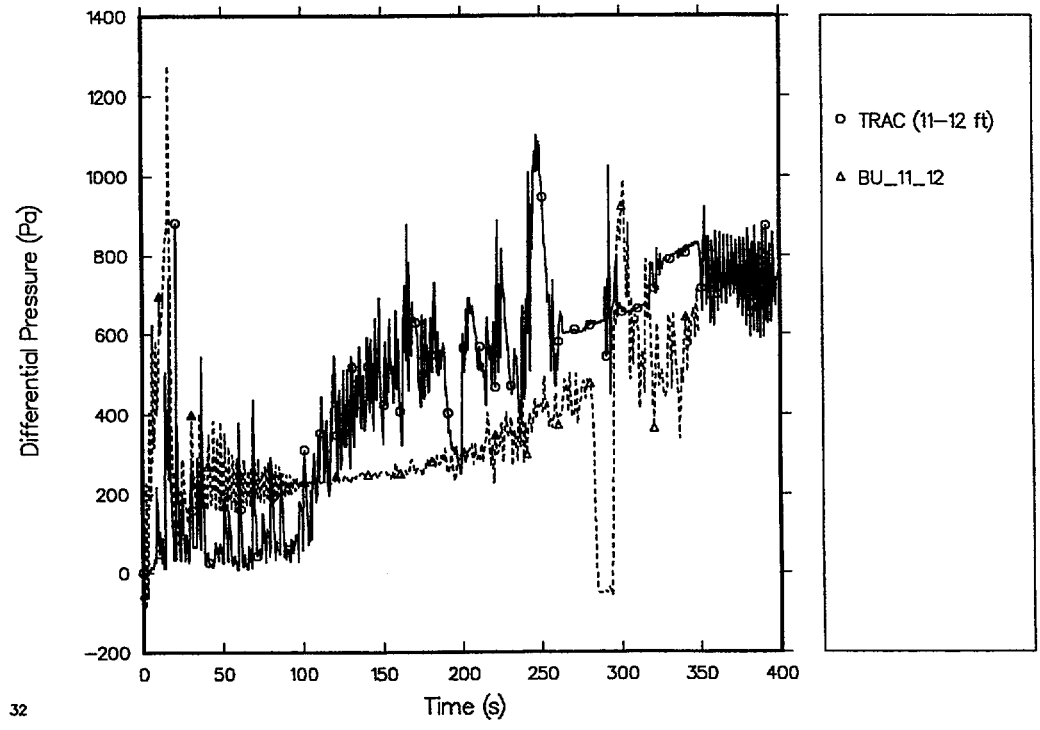
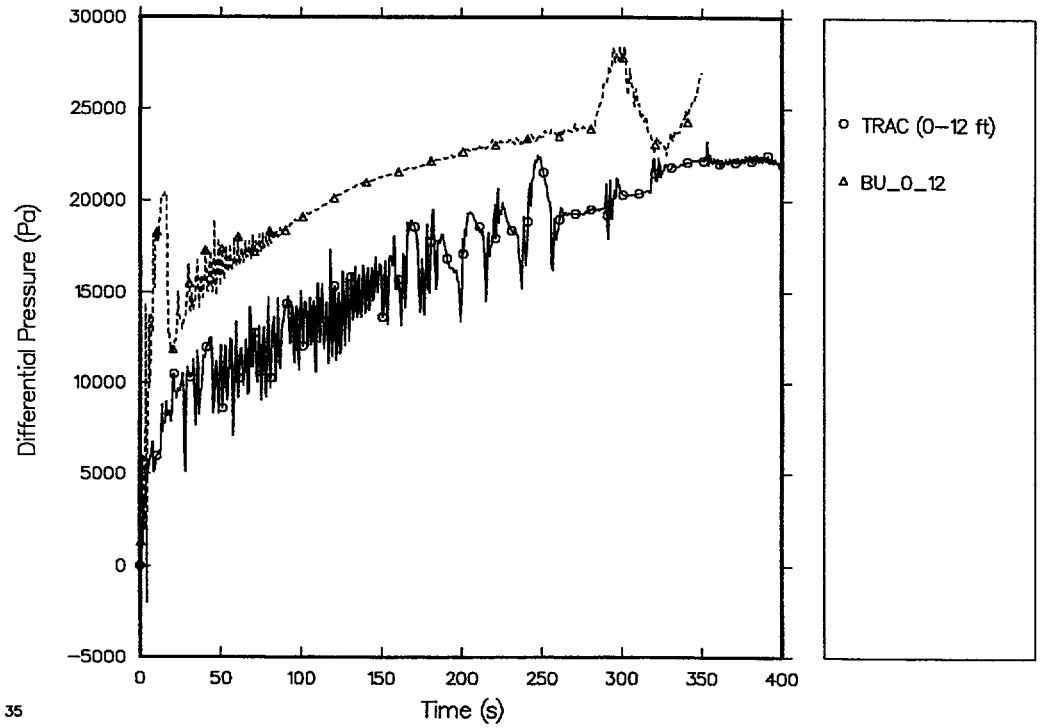


Fig. N-47. Comparison of predicted and measured differential pressures (11–12 ft, with grid-spacer model).



35

Fig. N-48. Comparison of predicted and measured total core differential pressures (0–12 ft, with grid-spacer model).

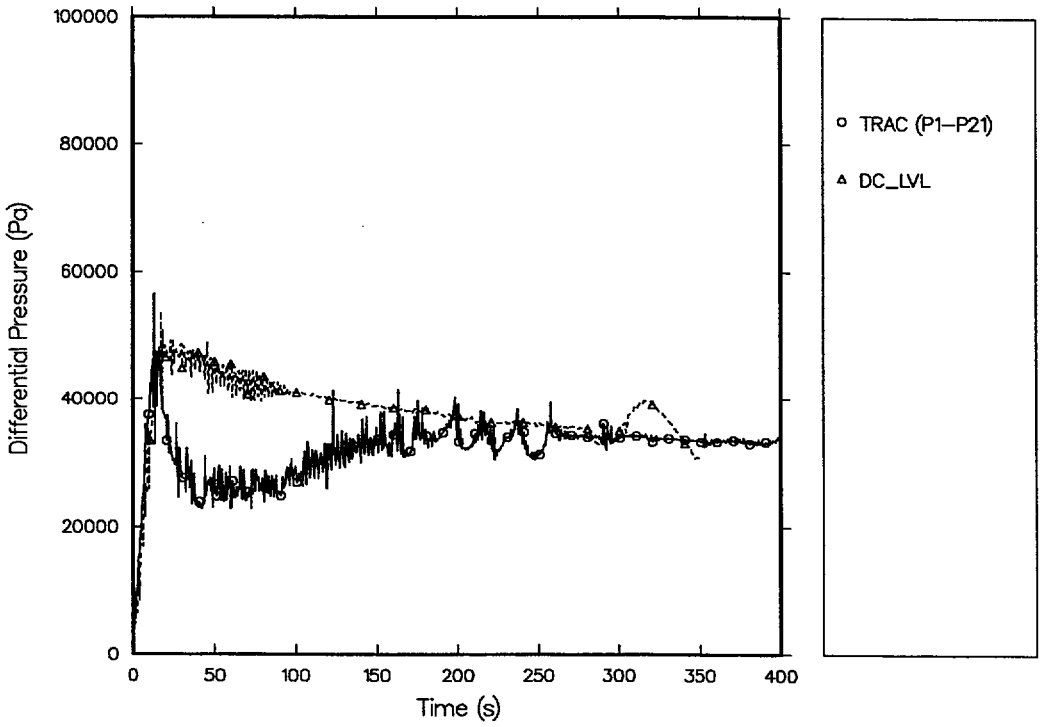


Fig. N-49. Comparison of predicted and measured downcomer differential pressures (with grid-spacer model).

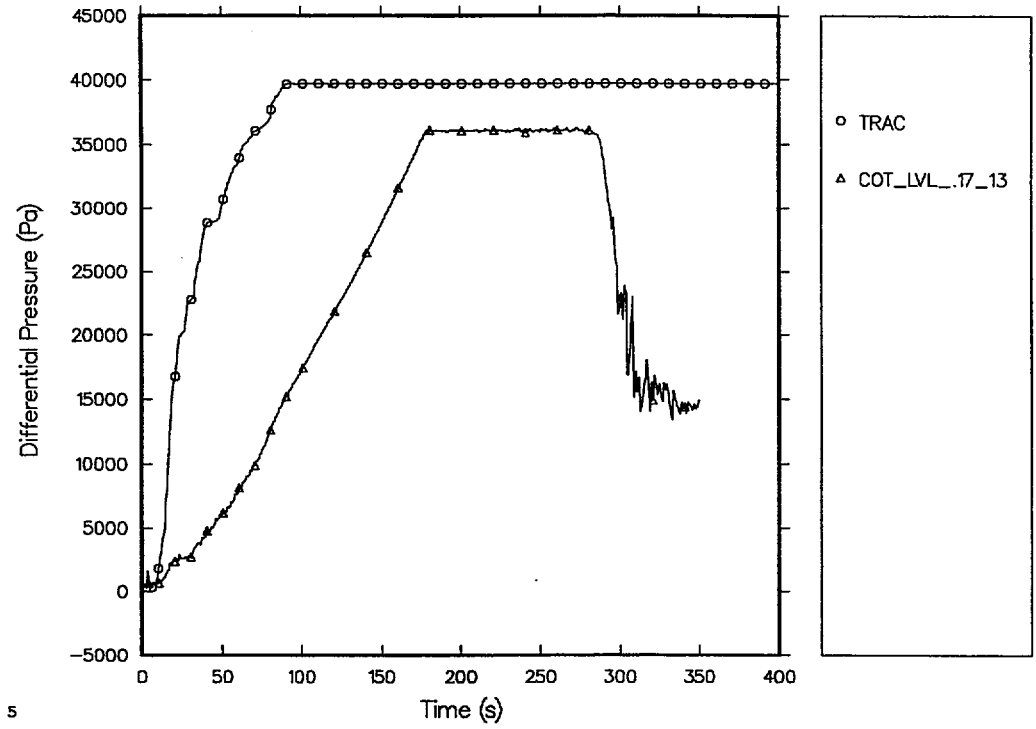


Fig. N-50. Comparison of predicted and measured carryover tank differential pressures (with grid-spacer model).

APPENDIX O

LOFT L2-6 STEADY-STATE AND TRANSIENT INPUT LISTINGS

This appendix contains the steady-state and transient-restart input listings for the LOFT L2-6 assessment problem as follows:

LOFT L2-6 STEADY-STATE INPUT LISTING

```
1  free format
2  *
3  *************
4  * main data *
5  *************
6  *
7  *       numtcr          ieos         inopt          nmat
8               86             0             1             0
9  loft test lp-02-6 ss deck for trac-pf1/mod2
10 4/25/95 convert STGEN component (comp. 2) to PIPEs, TEEs, and Heat Structures:
11    new component numbers: 20 (PIPE), 21 (TEE), 22 (TEE), and
12    Heat Structures 831, 833-848.
13 4/21/95 deck from Bob Steinke (/073417/loftl261):
14    this deck was apparently from /n9mod2/unicos/ptraccl.
15    the deck in ptraccl and from /devass/mod2-5.4/loft-l2-6/run06/loftin
16       were essentially identical.
17    Bob updated the TEE components to be consistent with the current
18       TEE modeling in PF1/MOD2 and with user guidelines.  He also reordered
19       the deck and renumbered a few components to produce a more logical order.
20    Thad Knight reviewed the deck in general and Bob's changes for consistency.
21       This review did not include an accuracy check of the overall geometry;
22       the check was to verify that the geometry in the current deck was
23       consistent with the geometry in the previous deck, that options were set
24       correctly, and that control parameters were set correctly.  Some changes
25       were made to signal variables 15, 32, and 33 to correct apparent
26       errors.  Trip 102 was added for the reflood option.  Unused signal
27       variables, control blocks, and trips were removed.
28
29 loft test l2-6  ss deck for trac-pf1(mod1)
30 the data is based on the 12-3 deck from lanl for trac-pf1(mod1)
31  * control system added to facilitate initialization
32  * accumulator model replaced
33  * initial nitrogen volume reduced to allow for t>=273 k restriction
34  * pcs flow resistance reduced, resistance added for lp-core, rods, core-up
35  * changes to vessel fluid volume and flow area fractions
36  * to reflect data provided in nureg-cr/0247 (tree-1208)
37  * directional friction factors used, fric<0 needs special code version
38  * core 131 mm lower
39  * bypass lower plenum to upper plenum - paths 1,2,6+guide tubes
40  * upper plenum to downcomer - paths   4,5
41  * environmental heat losses - pcs  6.0 w/m**2 k, prizer 2.0 w/m**2 k
42  *                             scs 1.6 w/m**2 k
43  * hot rods in cells 1 2 4 5 9
44  * variable pump inertia data used
45  * changes in vessel heat slabs to represent large break heat transfer
46  *
47 deck needs changing for other lb transients
48    - accumulator volume
49    - lpis, hpis flows
50    - pump characteristics
51    - pcs flow rate, pcs pressure, ecc liquid temp(?)
52    - initial power and decay heat levels
53 other changes might be made for future l2-6 calculations
54    - scs valve closure rate and incomplete closure
55    - set pump speed, pumped ecc flow as functions of time
56    - nff reset to 1
57    - disabling of interphase sharpener in core (namelist isharp)
58  *
59  ************************************************************************
60  * base deck l26input.data(l26ss)
61  * 23/09/86
62  *   this is a revised data set obtained using 'extract' on
63  *   the input data set 'zeszji.pf1loft.dump.l26ss2.one'
64  *
65  * 23/09/86 reduce fuel-clad gap to zero (0.0)
66  *
67  ************************************************************************
68  *
69  * p. coddington
70  * 12/may/1988
71  * l2-6 input deck modified to run on trac-pf1/mod2
72  * (version 4.0) so far
73  *
74  * mods required
75  *             1. replace nff=2 with nff=1
76  *             2. remove -ve frics replace with zeros
77  *             3. adjust wall roughness (initially zero)
78  *             4. move vessel junctions for bypass
79  *             to correct location
80  *
81  * errors cvrt does not include idrod array
82  * 27/may/88..... move bypass vessel up. junctions to improve code convergence
83  * 27/may/88..... reset fuel clad gap to 95 microns to be consistent
84  *          ..... with temperature distribution
85  * 01/jun/88..... redefine time step seclection
86  * 01/jun/88..... reduce vessel no fluid call volumes to less than 1.0e-12
87  *
```

```
 88  *15/08/89 mods to run with code version 4.4/4.5
 89  *    re-node the accumulator to stop flow of n2
 90  *  9/12/90  added CSS controllers
 91  *           made all necessary fa's and nff adjustments to pass MOD2 input
 92  *           checker
 93
 94  * End of Title Cards
 95  *
 96  *****************
 97  * namelist data *
 98  *****************
 99  *
100   &inopts chm12=1.0, chm22=0.84, iadded=10, icflow=2, idiag=1,
101           igeom3=1, inlab=0, iolab=1, ipowr=-1, newrfd=3,
102           nfrc1=2, nhtstr=39, noair=0, nrslv=1, tpowr=0.50,
103   iblaus=1,
104   &
105  *
106  *        dstep          timet
107               0     0.0000e+00
108  *       stdyst         transi          ncomp           njun           ipak
109                2              0             67             30              1
110  *         epso           epss
111      1.0000e-04     1.0000e-04
112  *       oitmax         sitmax         isolut         ncontr          nccfl
113                10             25              0              4              0
114  *          ntsv           ntcb           ntcf           ntrp           ntcp
115                28             22            114              8              2
116  *
117  *************************
118  * component-number data *
119  *************************
120  *
121  * iorder*               1              2              3              4              5
122  * iorder*               6              7              8             11             12
123  * iorder*              13             14             15             16             17
124  * iorder*              18             19             20             21             22
125  * iorder*              23             24             25             31             32
126  * iorder*              41             42             50            831            833
127  * iorder*             834            835            836            837            838
128  * iorder*             839            840            841            842            843
129  * iorder*             844            845            846            847            848
130  * iorder*             851            852            853            854            855
131  * iorder*             856            857            858            859            860
132  * iorder*             861            862            863            864            865
133  * iorder*             866            867            868            869            870
134  * iorder*            871s
135  * iorder*            991e
136  *
137  ****************************
138  ******* CSS INPUT **********
139  ****************************
140  *       numcss         amncss         amxcss         nmpcss         napcss
141  * the following controller type 14 requires RGS's update to be valid.
142  * when RGS's update for the constrained steady-state controllers goes in,
143  * uncomment the following controller that looks at component 831.
144  * intact-loop steam-generator type-14 controller adjusts
145  *    the heat-transfer across the tubes (equivalent to old type 4)
146  *          831            0.5            1.5           7005             14
147  * intact-loop pump 1 type-1 controller adjusts impeller rotational speed
148                4    0.0000e+00    2.0000e+02              0              0
149  * intact-loop pump 2 type-1 controller adjusts impeller rotational speed
150                5    0.0000e+00    2.0000e+02              0              0
151  * steam-flow control valve type-2 controller adjusts upsteam pressure
152               23    0.0000e+00    1.0000e+00              1              0
153  * aux-feedwater type 3 controller adjusts mass flow out of a fill
154               24    0.0000e+00    5.0000e+01          23005              1
155  *
156  *************************
157  * control-parameter data *
158  *************************
159  *
160  * multi-pass control-parameter input
161  *
162  * cntr-p*               1             17             -1            -15s
163  * cntr-p*               1            102             19             61s
164  * cntr-p*             -16            -26              1              0e
165  *
166  * signal variables
167  *
168  * SV   Parameter    Component/Trip   Location        Referenced by
169  *  1   t                                            lots
170  * 10   reactor power      991                       CB -10
171  * 11   void fraction       20        ave/cells 1-5   CB -9
172  * 12   void fraction       22        ave/cells 1-6   CB -6
173  * 14   vapor mass flow     23        interface 6     CB -4
174  * 15   void fraction       22        cell 7          CB -6
175  * 16   void fraction       21        ave/cells 1-4   CB -7
176  * 17   void fraction       21        cell 5          CB -7
177  * 19   trip set status    100                       CB -16
178  * 32   pressure            12        cell 1          FILL 16
179  * 33   pressure            13        cell 1          FILL 17
```

```
* 34   pressure          14        cell 3         trip 6
*
* 4/21/95:  deleted signal variables 4, 6, 13, 21, and 22 -- tk
*          idsv          isvn          ilcn          icn1          icn2
               1             0             0             0             0
              10            18           991             0             0
              11            27            20             1            -5
              12            27            22             1            -6
              14            29            23             6             0
              15            27            22             7             0
              16            27            21             1            -4
              17            27            21             5             0
              19            56           100             0             0
              32            21            12             1             0
              33            21            13             1             0
              34            21            14             3             0
* signal variables added by jfl for graphics purposes
  40     20     8      3      1 * pressurizer water level height
  41     21     8      1      0 * pressurizer pressure
  42     20     15     3      1 * accumulator water level height
  43     76     41     3      0 * broken cold leg mixture density
  50     27     50     1001   -16002 * lower-plenum vap. vol. fr., levels 1 and 2
  51     27     50     1003   -12003 * lower-plenum vap. vol. fr., level 3
  52     27     50     1004   -12008 * core vap. vol. fr.
  53     27     50     1009   -12011 * upper-plenum vap. vol. fr.
  54     27     50     1012   -12012 * upper-head vap. vol. fr.
  55     27     50     9002   -16012 * downcomer vap. vol. fr.
  56     69     50     1003   -12003 * core inlet total mass flow
  57     29     50     1003   -12003 * core inlet vapor mass flow
  58     32     50     1003   -12003 * core inlet liquid mass flow
  59     69     50     1008   -12008 * core outlet total mass flow
  60     29     50     1008   -12008 * core outlet vapor mass flow
  61     32     50     1008   -12008 * core outlet liquid mass flow
*
*
* control blocks
*
* CB   Refers to   Referenced by   Function
* -4   SV 14          CB -5        table lookup based on secondary steam flow
* -5   CB -4          CB -13       table lookup based on CB -5
* -6   SV 12, 15      CB -8        calc steam volume of comp. 22
* -7   SV 16, 17      CB -8        calc steam volume of comp. 21
* -8   CB -6, -7      CB -9        calc steam volume of comp. 21 and 22
* -9   SV 11/CB -8    CB -11       calc steam volume in comp 20, 21, and 22
* -10  SV 10          CB -12       table lookup based on reactor power
* -11  CB -9          CB -12       table lookup based on secondary steam volume
* -12  CB -10, -11    CB -13       sums and applies gain
* -13  CB -12, -5     CB -14       sums
* -14  CB -13, -15    CB -15       subtracts, gain, and limits
* -15  CB -14         CB -14, -17  integrator
* -16  SV 19          CB -17       integrates trip set status with gain/limits
* -17  CB -15, -16    CB -18       sums
* -18  CB -17         FILL 24      table lookup (provides the independent
*                                  variable for the FILL table)
*
* 4/21/95:  deleted CB -42 through -65 -- tk
*          idcb          icbn          icb1          icb2          icb3
               -4           101            14             7             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      lunounit      lunounit      lunounit      lunounit
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
*        luytab        luxtab
       lunounit      lumassfw
*
* cbftb * r02 0.0000e+00    6.8700e+00    2.0000e-01    1.3720e+01    3.9170e-01
* cbftb *     2.0580e+01    5.7700e-01    2.7440e+01    7.5600e-01    3.7130e+01
* cbftb *     1.0000e+00    9.9900e+02    1.0000e+00e
*
*          idcb          icbn          icb1          icb2          icb3
               -5           101            -4            19             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      lunounit      lunounit      lunounit      lunounit
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
*        luytab        luxtab
       lunounit      lunounit
*
* cbftb * r02 0.0000e+00    1.8940e-01    2.5000e-02    2.4600e-01    5.0000e-02
* cbftb *     3.3710e-01    1.0000e-01    3.9170e-01    1.3600e-01    4.1290e-01
* cbftb *     1.5000e-01    4.7350e-01    2.0000e-01    5.2650e-01    2.5000e-01
* cbftb *     5.6820e-01    3.0000e-01    6.1360e-01    3.5000e-01    6.5150e-01
* cbftb *     4.0000e-01    6.8940e-01    4.5000e-01    7.1970e-01    5.0000e-01
* cbftb *     7.5000e-01    5.5000e-01    7.8410e-01    6.0000e-01    8.4850e-01
* cbftb *     7.0000e-01    8.9770e-01    8.0000e-01    9.5450e-01    9.0000e-01
* cbftb * r02 1.0000e+00e
*
*          idcb          icbn          icb1          icb2          icb3
               -6            59            12            15             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      luvolume      luvolume      luvolume      luvolume
*        cbgain        cbxmin        cbxmax        cbcon1        cbcon2
```

```
    1.0000e+00    0.0000e+00    1.2803e+00    1.2641e+00    1.6215e-02
*
*         idcb          icbn          icb1          icb2          icb3
             -7            59            16            17             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit     luvolume      luvolume      luvolume      luvolume
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    2.6178e+00    2.2348e+00    3.8297e-01
*
*         idcb          icbn          icb1          icb2          icb3
             -8             3            -6            -7             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit     luvolume      luvolume      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    3.8981e+00    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
             -9            59            11            -8             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit     luvolume      luvolume      luvolume      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    6.6702e+00    2.7721e+00    1.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
            -10           101            10             2             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    2.9464e+00    3.2004e+00    0.0000e+00    0.0000e+00
*       luytab        luxtab
      lunounit       lupower
*
* cbftb *     0.0000e+00    2.9464e+00    5.0000e+07    3.2004e+00e
*
*         idcb          icbn          icb1          icb2          icb3
            -11           101            -9            10             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    5.6103e+00    0.0000e+00    0.0000e+00
*       luytab        luxtab
      lunounit      luvolume
*
* cbftb *     0.0000e+00    5.6103e+00    2.2660e+00    5.6103e+00    2.5943e+00
* cbftb *     4.6810e+00    4.1502e+00    3.2004e+00    4.4173e+00    2.9464e+00
* cbftb *     4.8360e+00    2.5440e+00    5.0294e+00    2.3500e+00    5.4051e+00
* cbftb *     1.8860e+00    5.8402e+00    1.2460e+00    6.6702e+00    0.0000e+00
* cbtfb * e
*
*         idcb          icbn          icb1          icb2          icb3
            -12            54           -10           -11             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    3.1496e+00   -8.3902e+00    1.0080e+01    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
            -13             3           -12            -5             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
            -14            54           -13           -15             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    7.0000e+00   -5.0000e-02    5.0000e-02    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
            -15            23           -14             0             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lurtime      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    1.0000e-20
*
*         idcb          icbn          icb1          icb2          icb3
            -16            23            19             0             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lurtime      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
   -5.0000e-01   -1.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
            -17             3           -15           -16             0
*       lugain        luxmin        luxmax        lucon1        lucon2
      lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
    1.0000e+00    0.0000e+00    6.3486e-01    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
```

```
          -18          101          -17           19            0
*       lugain       luxmin       luxmax      lucon1       lucon2
      lunounit     lunounit     lunounit     lunounit     lunounit
*       cbgain       cbxmin       cbxmax      cbcon1       cbcon2
   1.0000e+00   0.0000e+00   8.0655e-01   0.0000e+00   0.0000e+00
*       luytab       luxtab
      lunounit     lunounit
*
* cbftb * r02 0.0000e+00    2.5000e-02    1.8940e-01    5.0000e-02    2.4620e-01
* cbftb *     1.0000e-01    3.3710e-01    1.3600e-01    3.9170e-01    1.5000e-01
* cbftb *     4.1290e-01    2.0000e-01    4.7350e-01    2.5000e-01    5.2650e-01
* cbftb *     3.0000e-01    5.6820e-01    3.5000e-01    6.1360e-01    4.0000e-01
* cbftb *     6.5150e-01    4.5000e-01    6.8940e-01    5.0000e-01    7.1970e-01
* cbftb *     5.5000e-01    7.5000e-01    6.0000e-01    7.8410e-01    7.0000e-01
* cbftb *     8.4850e-01    8.0000e-01    8.9770e-01    9.0000e-01    9.5450e-01
* cbftb * r02 1.0000e+00e
*
* control blocks added by jfl for graphics
*
*  idcb      icbn      icb1      icb2      icb3
*            lugain    luxmin    luxmax    lucon1    lucon2
*            cbgain    cbxmin    cbxmax    cbcon1    cbcon2
*
*            constant 1.0
   -20       9         *const*
             lunounit  lunounit  lunounit  lunounit  lunounit
             1.0       1.0       1.0       1.0       0.0
*
*            weighted lower-plenum vapor volume fraction
   -21       59        *wsum*    50        51
             lunounit  lunounit  lunounit  lunounit  lunounit
             1.0       0.0       1.0       0.70722   0.29278
*
*            lower-plenum liquid volume fraction
   -22       54        *subtr*   -20       -21
             lunounit  lunounit  lunounit  lunounit  lunounit
             0.0       0.0       0.0       0.0       0.0
*
*            core liquid volume fraction
   -23       54        *subtr*   -20       52
             lunounit  lunounit  lunounit  lunounit  lunounit
             0.0       0.0       0.0       0.0       0.0
*
*            upper-plenum liquid volume fraction
   -24       54        *subtr*   -20       53
             lunounit  lunounit  lunounit  lunounit  lunounit
             0.0       0.0       0.0       0.0       0.0
*
*            upper-head liquid volume fraction
   -25       54        *subtr*   -20       54
             lunounit  lunounit  lunounit  lunounit  lunounit
             0.0       0.0       0.0       0.0       0.0
*
*            downcomer liquid volume fraction
   -26       54        *subtr*   -20       55
             lunounit  lunounit  lunounit  lunounit  lunounit
             0.0       0.0       0.0       0.0       0.0
*
* trips
*
* Trip   References   Referenced by   Function
*    2   SV 1 (time)  FILL 16         Controls the time at which HPIS starts
*    3   SV 1 (time)  FILL 17         Controls the time at which LPIS starts
*    6   SV 34 (p)    VALVE 14        Controls pressure at which accumulator
*                                        injection starts
*    8   SV 1 (time)  VALVE 23        Set status is always on forward so that
*                     FILL 24            the steam valve and feedwater operate
*                                        during the steady state and transient
*   10   SV 1 (time)  PUMP 4, 5       Controls time of pump trip
*  100   SV 1 (time)  ROD 991         Core power trip
*  101   SV 1 (time)  ROD 991         Fine mesh trip
*  102   SV 1 (time)  ROD 991         New reflood heat transfer trip
*
* 4/21/95:  deleted Trips -21 and 22; added trip 102 -- tk
*
*          ntse          ntct          ntsf          ntdp          ntsd
             0             0             0             0             0
*
*          idtp          isrt          iset          itst          idsg
             2             2             0             1             1
*       setp(1)       setp(2)
    0.0000e+00    2.1800e+01
*       dtsp(1)       dtsp(2)
    0.0000e+00    0.0000e+00
*       ifsp(1)       ifsp(2)
             0             0
*
*          idtp          isrt          iset          itst          idsg
             3             2             0             1             1
*       setp(1)       setp(2)
    0.0000e+00    3.4800e+01
*       dtsp(1)       dtsp(2)
```

```
456      0.0000e+00    0.0000e+00
457  *      ifsp(1)       ifsp(2)
458               0             0
459  *
460  *          idtp          isrt          iset          itst          idsg
461                6             1             0             1            34
462  *      setp(1)       setp(2)
463     4.1100e+06    4.1300e+06
464  *      dtsp(1)       dtsp(2)
465     0.0000e+00    0.0000e+00
466  *      ifsp(1)       ifsp(2)
467               0             0
468  *
469  *          idtp          isrt          iset          itst          idsg
470                8             2             1             1             1
471  *      setp(1)       setp(2)
472    -2.0000e-05   -1.0000e-05
473  *      dtsp(1)       dtsp(2)
474     0.0000e+00    0.0000e+00
475  *      ifsp(1)       ifsp(2)
476               0             0
477  *
478  *          idtp          isrt          iset          itst          idsg
479               10             2             0             1             1
480  *      setp(1)       setp(2)
481     0.0000e+00    8.0000e-01
482  *      dtsp(1)       dtsp(2)
483     0.0000e+00    0.0000e+00
484  *      ifsp(1)       ifsp(2)
485               0             0
486  *
487  *          idtp          isrt          iset          itst          idsg
488              100             2             0             1             1
489  *      setp(1)       setp(2)
490     0.0000e+00    1.0000e-01
491  *      dtsp(1)       dtsp(2)
492     0.0000e+00    0.0000e+00
493  *      ifsp(1)       ifsp(2)
494               0             0
495  *
496  *          idtp          isrt          iset          itst          idsg
497              101             2             0             1             1
498  *      setp(1)       setp(2)
499     0.0000e+00    1.0000e-05
500  *      dtsp(1)       dtsp(2)
501     0.0000e+00    0.0000e+00
502  *      ifsp(1)       ifsp(2)
503               0             0
504  *
505  *          idtp          isrt          iset          itst          idsg
506              102             2             0             1             1
507  *      setp(1)       setp(2)
508           0.0          20.0
509  *      dtsp(1)       dtsp(2)
510           0.0           0.0
511  *      ifsp(1)       ifsp(2)
512               0             0
513  *
514  ******************
515  * component data *
516  ******************
517  *
518  *******   type          num           id       ctitle
519  tee             1       1 $1$ intact-loop hot leg
520  *         jcell        nodes         ichf          cost          epsw
521                5            4            1    0.0000e+00    0.0000e+00
522  *       iconc1        ncell1         jun1          jun2          ipow1
523                0           10            1             2             0
524  *       iqptr1        iqpsv1       nqptb1        nqpsv1        nqprf1
525                0             0            0             0             0
526  *        radin1          th1       houtl1        houtv1        toutl1
527     1.4209e-01    3.5710e-02          0.0    6.0000e+00    3.0000e+02
528  *        toutv1
529     3.0000e+02
530  *         qpin1        qpoff1        rqpmx1        qpscl1
531     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
532  *       iconc2        ncell2         jun3          ipow2
533                0             3           10             0
534  *       iqptr2        iqpsv2       nqptb2        nqpsv2        nqprf2
535                0             0            0             0             0
536  *        radin2          th2       hout12        houtv2        tout12
537     2.3300e-02    8.6968e-03          0.0    2.0000e+00    3.0000e+02
538  *        toutv2
539     3.0000e+02
540  *         qpin2        qpoff2        rqpmx2        qpscl2
541     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
542  *
543  * dx    * r02 7.8365e-01    4.9258e-01r03 2.5861e-01    1.1941e+00    8.6575e-01
544  * dx    *     4.1795e-01    6.2692e-01e
545  * vol   * r02 5.0993e-02    3.2063e-02r03 1.6827e-02    5.9691e-02    5.6280e-02
546  * vol   *     3.1381e-02    5.2188e-02e
547  * fa    * r04 6.3425e-02r02 6.5067e-02r04 6.3425e-02    5.1600e-02e
```

```
548  * fric   * r08 0.0000e+00    7.5250e-02    0.0000e+00    1.7040e-01e
549  * rv fri*     3.1000e-02r07 0.0000e+00    7.5250e-02    0.0000e+00    1.7040e-01
550  * rv fri* e
551  * grav   * r10 0.0000e+00    6.8974e-01e
552  * hd     * r10 2.8400e-01    2.5630e-01e
553  * icflg  * f           0e
554  * nff    * f           1e
555  * alp    * f   0.0000e+00e
556  * vl     * r06 5.7267e+00r04 5.7276e+00    7.0402e+00e
557  * vv     *     5.8408e+00    5.8513e+00r04 5.8519e+00    5.8536e+00    5.8531e+00
558  * vv     *     5.9747e+00    5.8615e+00    7.4169e+00e
559  * tl     * f   5.9129e+02e
560  * tv     * r08 6.1557e+02r02 6.1555e+02e
561  * p      * r06 1.5056e+07r02 1.5055e+07r02 1.5050e+07e
562  * pa     * f   0.0000e+00e
563  * qppp   * f   0.0000e+00e
564  * matid  * f           7e
565  * tw     *     5.9119e+02    5.8986e+02    5.8862e+02    5.8747e+02s
566  * tw     *     5.9119e+02    5.8986e+02    5.8862e+02    5.8747e+02s
567  * tw     *     5.9118e+02    5.8985e+02    5.8862e+02    5.8747e+02s
568  * tw     *     5.9118e+02    5.8985e+02    5.8862e+02    5.8747e+02s
569  * tw     *     5.9118e+02    5.8985e+02    5.8862e+02    5.8747e+02s
570  * tw     *     5.9118e+02    5.8985e+02    5.8862e+02    5.8747e+02s
571  * tw     *     5.9118e+02    5.8985e+02    5.8862e+02    5.8747e+02s
572  * tw     *     5.9118e+02    5.8985e+02    5.8862e+02    5.8747e+02s
573  * tw     *     5.9118e+02    5.8985e+02    5.8861e+02    5.8747e+02s
574  * tw     *     5.9119e+02    5.8986e+02    5.8862e+02    5.8747e+02e
575  *
576  * dx     *     2.1499e+00    2.6428e+00    2.2217e+00e
577  * vol    *     3.1149e-03    3.6954e-03    5.7059e-03e
578  * fa     * r03 1.4493e-03    5.7321e-03e
579  * fric   *     1.6530e-01    5.5032e-03r02 4.6688e-03e
580  * rv fri*     1.6530e-01    5.5032e-03r02 4.6688e-03e
581  * grav   *     5.4510e-01r02 0.0000e+00    6.0410e-01e
582  * hd     * r03 4.2957e-02    8.5430e-02e
583  * icflg  * f           0e
584  * nff    * r03         1           -1e
585  * alp    * f   0.0000e+00e
586  * vl     *    -4.2355e-02   -4.2640e-02   -4.3011e-02   -1.1017e-02e
587  * vv     *     1.6335e-01   -1.3936e-01   -1.4049e-01    2.0502e-01e
588  * tl     *     5.9474e+02    5.9977e+02    6.0682e+02e
589  * tv     * f   6.1555e+02e
590  * p      *     1.5051e+07r02 1.5052e+07e
591  * pa     * f   0.0000e+00e
592  * qppp   * f   0.0000e+00e
593  * matid  * f           7e
594  * tw     *     5.9346e+02    5.9328e+02    5.9310e+02    5.9292e+02    5.9847e+02
595  * tw     *     5.9829e+02    5.9811e+02    5.9792e+02    6.0514e+02    6.0492e+02
596  * tw     *     6.0472e+02    6.0453e+02e
597  *
598  *******   type          num           id        ctitle
599  pipe            2       2 $2$ stgen primary
600  *       ncells         nodes         jun1         jun2         epsw
601                10             0            2            3          0.0
602  *         ichf         iconc         iacc         ipow
603                1             0            0            0
604  *        radin            th        houtl        houtv        toutl
605      5.1055e-03    1.2446e-03          0.0          0.0        300.0
606  *        toutv         powin       powoff       rpowmx       powscl
607            300.0           0.0          0.0          0.0          0.0
608  *
609  * dx     *     9.6360e-01r08 5.6895e-01    9.6360e-01e
610  * vol    *     3.7950e-01r08 8.5950e-02    3.7950e-01e
611  * fa     *     5.1600e-02r09 1.5110e-01    5.1600e-02e
612  * fric   *     1.7040e-01r09 0.0000e+00    1.8610e-01e
613  * rv fri*     1.7040e-01r09 0.0000e+00    1.8610e-01e
614  * grav   *     6.8974e-01r04 1.0000e+00    0.0000e+00r04-1.0000e+00   -7.1160e-01
615  * grav   * e
616  * hd     *     2.5630e-01r09 1.0211e-02    2.5600e-01e
617  * icflg  * f           0e
618  * nff    *     1           -1r07         1           -1            1
619  * nff    * e
620  * alp    * f   0.0000e+00e
621  * vl     *     7.0402e+00    2.4040e+00    2.3432e+00    2.2986e+00    2.2638e+00
622  * vl     *     2.2356e+00    2.2125e+00    2.1936e+00    2.1781e+00    2.1655e+00
623  * vl     *     6.3408e+00e
624  * vv     *     7.4169e+00    2.5343e+00    2.6082e+00    2.5625e+00    2.5266e+00
625  * vv     *     2.4320e+00    2.0099e+00    1.9888e+00    1.9731e+00    1.9604e+00
626  * vv     *     6.7131e+00e
627  * tl     *     5.9123e+02    5.8412e+02    5.7796e+02    5.7279e+02    5.6847e+02
628  * tl     *     5.6482e+02    5.6172e+02    5.5911e+02    5.5693e+02    5.5685e+02
629  * tl     * e
630  * tv     * r02 6.1540e+02    6.1537e+02    6.1534e+02r02 6.1530e+02    6.1531e+02
631  * tv     *     6.1532e+02    6.1534e+02    6.1536e+02e
632  * p      * r02 1.5022e+07    1.5016e+07    1.5011e+07    1.5005e+07    1.5003e+07
633  * p      *     1.5006e+07    1.5009e+07    1.5011e+07    1.5015e+07e
634  * pa     * f   0.0000e+00e
635  *
636  *******   type          num           id        ctitle
637  tee             3       3 $3$ pump suction
638  *       jcell         nodes          ichf         cost         epsw
639                3             4            1    0.0000e+00    0.0000e+00
```

```
640  *       iconc1          ncell1           jun1           jun2          ipow1
641                0               5              4              5              0
642  *       iqptr1          iqpsv1         nqptb1         nqpsv1         nqprf1
643                0               0              0              0              0
644  *       radin1             th1         houtl1         houtv1         toutl1
645     1.4209e-01    3.5710e-02           0.0    6.0000e+00    3.0000e+02
646  *       toutv1
647     3.0000e+02
648  *        qpin1          qpoff1         rqpmx1         qpscl1
649     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
650  *       iconc2          ncell2           jun3          ipow2
651                0               3              3              0
652  *       iqptr2          iqpsv2         nqptb2         nqpsv2         nqprf2
653                0               0              0              0              0
654  *       radin2             th2         houtl2         houtv2         toutl2
655     1.4209e-01    3.5710e-02           0.0    6.0000e+00    3.0000e+02
656  *       toutv2
657     3.0000e+02
658  *        qpin2          qpoff2         rqpmx2         qpscl2
659     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
660  *
661  * dx     *     6.3500e-01r03 6.0113e-01    6.3500e-01e
662  * vol    *     2.7467e-02r03 3.8127e-02    2.7467e-02e
663  * fa     *     3.6613e-02r04 6.3425e-02    3.6613e-02e
664  * fric   * f   0.0000e+00e
665  * rv fri* f    0.0000e+00e
666  * grav   *    -6.2659e-01          -1.0   -9.1789e-02    9.1789e-02           1.0
667  * grav   *     6.2659e-01e
668  * hd     *     2.1591e-01r04 2.8417e-01    2.1591e-01e
669  * icflg  * f            0e
670  * nff    * r05          1            -1e
671  * alp    * f   0.0000e+00e
672  * vl     *    -4.4722e+00r02-2.5816e+00r02 2.5770e+00    4.4642e+00e
673  * vv     *    -4.7363e+00r02-2.8498e+00r02 2.8452e+00    4.7282e+00e
674  * tl     *     5.5674e+02r03 5.5676e+02    5.5674e+02e
675  * tv     *     6.1516e+02r03 6.1524e+02    6.1516e+02e
676  * p      *     1.4978e+07r03 1.4994e+07    1.4978e+07e
677  * pa     * f   0.0000e+00e
678  * qppp   * f   0.0000e+00e
679  * matid  * f            7e
680  * tw     *     5.5661e+02    5.5541e+02    5.5430e+02    5.5326e+02s
681  * tw     *     5.5453e+02    5.5333e+02    5.5223e+02    5.5119e+02s
682  * tw     *     5.5453e+02    5.5333e+02    5.5223e+02    5.5119e+02s
683  * tw     *     5.5453e+02    5.5333e+02    5.5223e+02    5.5119e+02s
684  * tw     *     5.5661e+02    5.5541e+02    5.5430e+02    5.5326e+02e
685  *
686  * dx     *     1.3141e+00r02 6.2230e-01e
687  * vol    *     7.7371e-02    4.0000e-02    5.0048e-02e
688  * fa     * r02 6.3425e-02    6.8714e-02    5.1600e-02e
689  * fric   *     1.0000e-10r02 0.0000e+00    1.8610e-01e
690  * rv fri*      1.0000e-10r02 0.0000e+00    1.8610e-01e
691  * grav   *     0.0000e+00    6.7940e-01    1.0000e+00    7.1160e-01e
692  * hd     * r02 2.8417e-01    2.9579e-01    2.5600e-01e
693  * icflg  * f            0e
694  * nff    * f            1e
695  * alp    * f   0.0000e+00e
696  * vl     * r02-5.1587e+00   -4.7617e+00   -6.3408e+00e
697  * vv     *    -5.2548e+00   -4.9689e+00   -4.4757e+00   -6.7131e+00e
698  * tl     *     5.5679e+02r02 5.5682e+02e
699  * tv     *     6.1525e+02    6.1523e+02    6.1518e+02e
700  * p      *     1.4994e+07    1.4991e+07    1.4981e+07e
701  * pa     * f   0.0000e+00e
702  * qppp   * f   0.0000e+00e
703  * matid  * f            7e
704  * tw     *     5.5660e+02    5.5419e+02    5.5197e+02    5.4991e+02s
705  * tw     *     5.5661e+02    5.5419e+02    5.5197e+02    5.4990e+02s
706  * tw     *     5.5664e+02    5.5421e+02    5.5199e+02    5.4992e+02e
707  *
708  *******   type            num             id        ctitle
709  pump             4       4 $4$ pump no. 2
710  *       ncells          nodes           jun1           jun2          epsw
711                2              4              4              6    0.0000e+00
712  *         ichf          iconc         ipmpty            irp           ipm
713                1              0              2              1             1
714  *       ipmptr         ipmpsv         npmptb         npmpsv         npmprf
715               10              0              0              0             0
716  *       iqp3tr         iqp3sv         nqp3tb         nqp3sv         nqp3rf
717                0              0              0              0             0
718  *        radin             th         houtl          houtv          toutl
719     1.0795e-01    2.8580e-02           0.0    6.0000e+00    3.0000e+02
720  *        toutv          effmi
721     3.0000e+02   -1.0000e+00
722  *         tfr0           tfr1           tfr2           tfr3          tfrb
723              0.0            0.0    1.5300e+02            0.0           0.0
724  *        tfrl0          tfrl1          tfrl2          tfrl3
725              0.0            0.0    1.5300e+02            0.0           0.0
726  *       effmi1         aeffmi         beffmi         ceffmi        omtest
727     1.4300e+00   -2.2865e+01    2.7016e+01    5.7459e+00    7.3540e+01
728  *         ipmps
729                0
730  *        rhead          rtork          rflow           rrho        romega
731     9.4154e+02    5.0000e+02    3.1500e-01    6.1400e+02    3.6966e+02
```

```
*       omegan          omgoff          romgmx          omgscl          npmpsd
    1.7668e+02    0.0000e+00    1.0000e+20    1.0000e+00               0
*         qp3in           qp3off          rqp3mx          qp3scl
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        option
               2
*
* dx    * f   1.3521e+00e
* vol   * f   4.9555e-02e
* fa    * f   3.6613e-02e
* fric  * f   0.0000e+00e
* rv fri* f   0.0000e+00e
* grav  *     6.2659e-01r02 0.0000e+00e
* hd    * f   2.1591e-01e
* icflg * f            0e
* nff   *              1              0              1e
* alp   * f   0.0000e+00e
* vl    * r02 4.4721e+00    4.4715e+00e
* vv    *     4.7363e+00    4.4721e+00    4.5844e+00e
* tl    *     5.5672e+02    5.5676e+02e
* tv    *     6.1510e+02    6.1588e+02e
* p     *     1.4967e+07    1.5113e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    *     5.5651e+02    5.5459e+02    5.5281e+02    5.5116e+02    5.5656e+02
* tw    *     5.5464e+02    5.5287e+02    5.5121e+02e
*
*******   type            num             id        ctitle
pump             5       5 $5$ pump no. 1
*       ncells          nodes           jun1           jun2           epsw
                2              4              5              7    0.0000e+00
*         ichf          iconc         ipmpty            irp           ipm
                1              0              2              1             1
*       ipmptr          ipmpsv         npmptb         npmpsv         npmprf
               10              0              0              0             0
*       iqp3tr          iqp3sv         nqp3tb         nqp3sv         nqp3rf
                0              0              0              0             0
*        radin             th          houtl          houtv          toutl
    1.0795e-01    2.8580e-02            0.0    6.0000e+00    3.0000e+02
*        toutv           effmi
    3.0000e+02   -1.0000e+00
*         tfr0           tfr1           tfr2           tfr3           tfrb
             0.0            0.0    1.5300e+02            0.0            0.0
*        tfrl0          tfrl1          tfrl2          tfrl3
             0.0            0.0    1.5300e+02            0.0            0.0
*       effmi1         aeffmi         beffmi         ceffmi         omtest
    1.4300e+00   -2.2865e+01    2.7016e+01    5.7459e+00    7.3540e+01
*         ipmps
                0
*        rhead          rtork          rflow           rrho         romega
    9.4154e+02    5.0000e+02    3.1500e-01    6.1400e+02    3.6966e+02
*       omegan          omgoff          romgmx          omgscl          npmpsd
    1.7668e+02    0.0000e+00    1.0000e+20    1.0000e+00               0
*         qp3in           qp3off          rqp3mx          qp3scl
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        option
               2
*
* dx    * f   1.3521e+00e
* vol   * f   4.9555e-02e
* fa    * f   3.6613e-02e
* fric  * f   0.0000e+00e
* rv fri* f   0.0000e+00e
* grav  *     6.2659e-01r02 0.0000e+00e
* hd    * f   2.1591e-01e
* icflg * f            0e
* nff   *             -1              0              1e
* alp   * f   0.0000e+00e
* vl    * r02 4.4642e+00    4.4635e+00e
* vv    *     4.7282e+00    4.4642e+00    4.5777e+00e
* tl    *     5.5672e+02    5.5676e+02e
* tv    *     6.1510e+02    6.1588e+02e
* p     *     1.4967e+07    1.5114e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    *     5.5651e+02    5.5459e+02    5.5281e+02    5.5116e+02s
* tw    *     5.5656e+02    5.5464e+02    5.5287e+02    5.5121e+02e
*
*******   type            num             id        ctitle
tee              6       6 $6$ pump discharge
*         jcell          nodes          ichf          cost          epsw
                3              4              1    0.0000e+00    0.0000e+00
*       iconc1         ncell1          jun1           jun2          ipow1
                0              4              7              8             0
*       iqptr1         iqpsv1         nqptb1         nqpsv1         nqprf1
                0              0              0              0             0
*       radin1            th1         houtl1         houtv1         toutl1
    1.0795e-01    2.8580e-02            0.0    6.0000e+00    3.0000e+02
*       toutv1
    3.0000e+02
```

```
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        iconc2        ncell2         jun3         ipow2
             0             1            6             0
*        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
             0             0             0             0             0
*        radin2          th2        houtl2        houtv2        toutl2
    1.0795e-01    2.8580e-02           0.0    6.0000e+00    3.0000e+02
*        toutv2
    3.0000e+02
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    *     1.3081e+00r03 3.7253e-01e
* vol   *     4.7856e-02r03 2.2103e-02e
* fa    * r02 3.6613e-02r02 5.9332e-02    6.3423e-02e
* fric  * r04 0.0000e+00    1.9778e-02e
* rv fri* r04 0.0000e+00    1.9778e-02e
* grav  * f   0.0000e+00e
* hd    * r02 2.1591e-01r02 2.7485e-01    2.8417e-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000e+00e
* vl    * r02 4.4635e+00    2.7545e+00    5.5138e+00    5.1578e+00e
* vv    *     4.5777e+00    4.5807e+00    2.8268e+00    5.7649e+00    5.3927e+00
* vv    * e
* tl    * f   5.5675e+02e
* tv    * f   6.1588e+02e
* p     * f   1.5113e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    *     5.5665e+02    5.5570e+02    5.5481e+02    5.5398e+02s
* tw    *     5.5665e+02    5.5570e+02    5.5481e+02    5.5398e+02s
* tw    *     5.5666e+02    5.5570e+02    5.5482e+02    5.5398e+02s
* tw    *     5.5666e+02    5.5570e+02    5.5482e+02    5.5398e+02e
*
* dx    *     5.4292e-01e
* vol   *     2.5439e-02e
* fa    * f   3.6613e-02e
* fric  *     1.0000e-10    0.0000e+00e
* rv fri*     1.0000e-10    0.0000e+00e
* grav  * f   0.0000e+00e
* hd    * f   2.1591e-01e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000e+00e
* vl    * f  -4.4714e+00e
* vv    *    -4.5885e+00   -4.5844e+00e
* tl    *     5.5675e+02e
* tv    *     6.1588e+02e
* p     *     1.5113e+07e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    *     5.5655e+02    5.5464e+02    5.5287e+02    5.5121e+02e
*
******* type          num           id       ctitle
tee           7       7 $7$ intact-loop cold leg
*        jcell        nodes         ichf         cost         epsw
             5            4            1    0.0000e+00    0.0000e+00
*        iconc1       ncell1         jun1         jun2         ipow1
             0            9            8            9             0
*        iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
             0            0            0            0             0
*        radin1          th1       houtl1       houtv1       toutl1
    1.4209e-01    3.5710e-02           0.0    6.0000e+00    0.0000e+00
*        toutv1
    3.0000e+02
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        iconc2       ncell2         jun3         ipow2
             0            2           14             0
*        iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
             0            0            0            0             0
*        radin2          th2       houtl2       houtv2       toutl2
    4.3663e-02    1.3487e-02           0.0    6.0000e+00    3.0000e+02
*        toutv2
    3.0000e+02
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    * r03 3.8947e-01r03 2.3625e-01r03 4.6567e-01e
* vol   * r03 2.4732e-02r03 1.4914e-02r03 2.9534e-02e
* fa    * r03 6.3423e-02r04 6.3128e-02r03 6.3423e-02e
* fric  *     1.9778e-02r03 0.0000e+00    5.0000e-01r04 0.0000e+00    2.0225e-01
* fric  * e
* rv fri*     1.9778e-02r03 0.0000e+00    5.0000e-01r04 0.0000e+00    2.0225e-01
* rv fri* e
* grav  * f   0.0000e+00e
* hd    * f   2.8417e-01e
* icflg * f            0e
```

```
* nff    *              1r08          1              1e
* alp    * f   0.0000e+00e
* vl     * f   5.1578e+00e
* vv     *     5.3927e+00    5.2837e+00    5.2747e+00    5.2738e+00r05 5.2737e+00
* vv     *     5.4470e+00e
* tl     * f   5.5675e+02e
* tv     * f   6.1585e+02e
* p      * f   1.5107e+07e
* pa     * f   0.0000e+00e
* qppp   * f   0.0000e+00e
* matid  * f           7e
* tw     *     5.5666e+02    5.5548e+02    5.5438e+02    5.5334e+02    5.5666e+02
* tw     *     5.5548e+02    5.5438e+02    5.5334e+02    5.5666e+02    5.5548e+02
* tw     *     5.5438e+02    5.5334e+02    5.5666e+02    5.5548e+02    5.5438e+02
* tw     *     5.5334e+02    5.5666e+02    5.5548e+02    5.5438e+02    5.5334e+02
* tw     *     5.5666e+02    5.5549e+02    5.5438e+02    5.5334e+02    5.5667e+02
* tw     *     5.5549e+02    5.5438e+02    5.5334e+02    5.5667e+02    5.5549e+02
* tw     *     5.5438e+02    5.5334e+02    5.5667e+02    5.5549e+02    5.5438e+02
* tw     *     5.5334e+02e
*
* dx     *     3.0000e-01    2.9080e+00e
* vol    *     1.7970e-03    1.7420e-02e
* fa     * f   5.9900e-03e
* fric   *     1.0000e-10    2.0400e-02    9.7500e-02e
* rv fri*     1.0000e-10    2.0400e-02    9.7500e-02e
* grav   * f  -1.0000e+00e
* hd     * f   8.7325e-02e
* icflg  * f           0e
* nff    * f           1e
* alp    * f   0.0000e+00e
* vl     *    -2.6103e-05   -2.7775e-05   -2.6729e-05e
* vv     *    -2.2967e-01   -2.1107e-01   -2.1069e-01e
* tl     *     3.5029e+02    3.0272e+02e
* tv     *     6.1586e+02    6.1594e+02e
* p      *     1.5109e+07    1.5125e+07e
* pa     * f   0.0000e+00e
* qppp   * f   0.0000e+00e
* matid  * f           7e
* tw     *     3.4867e+02    3.4845e+02    3.4825e+02    3.4807e+02    3.0251e+02
* tw     *     3.0250e+02    3.0249e+02    3.0248e+02e
*
*******   type          num           id        ctitle
prizer          8       8 $8$ pressurizer
*       ncells         nodes          jun1          jun2
                3             0            12            10
*         ichf         iconc         qp3in
                1             0    0.0000e+00
*        radin            th         houtl         houtv         toutl
    0.0000e+00    0.0000e+00          0.0    2.0000e+00    3.0000e+02
*        toutv         qheat          pset         dpmax          zhtr
    3.0000e+02    0.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00
*
* dx     *     5.3073e-01    1.1500e+00    2.0000e-01e
* vol    *     3.0000e-01    6.5005e-01    1.2770e-02e
* fa     * r03 5.6526e-01    5.7321e-03e
* fric   * r03 0.0000e+00    4.6688e-03e
* rv fri* r03 0.0000e+00    4.6688e-03e
* grav   * r03-1.0000e+00   -6.0410e-01e
* hd     * r03 8.4836e-01    8.5430e-02e
* icflg  * f           0e
* nff    * r02         1f           -1e
* alp    *     1.0000e+00    8.0267e-02    0.0000e+00e
* vl     *     0.0000e+00    2.2092e-01   -1.2000e-10    1.1017e-02e
* vv     *     0.0000e+00    5.5075e-08   -2.4411e-01   -2.0502e-01e
* tl     *     6.1549e+02r02 6.1537e+02e
* tv     *     6.1573e+02    6.1647e+02    6.1553e+02e
* p      *     1.5041e+07    1.5044e+07    1.5048e+07e
* pa     * f   0.0000e+00e
*
*******   type          num           id        ctitle
fill           11      11 $11$ accumulator cap
*         jun1          ifty          ioff
                11            1             0
*       twtold          rfmx         concin          felv
    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*         dxin          volin         alpin          vlin          tlin
    5.6500e-01    7.0700e-01    0.0000e+00    0.0000e+00    3.0200e+02
*          pin          pain         flowin          vvin          tvin
    4.1100e+06    4.1100e+06    0.0000e+00    0.0000e+00    5.2499e+02
*
*******   type          num           id        ctitle
pipe           12      12 $12$ hpis line
*       ncells         nodes          jun1          jun2          epsw
                1             0            15            18    0.0000e+00
*         ichf         iconc         iacc          ipow
                1             0             0             0
*        radin            th         houtl         houtv         toutl
    1.0000e+00    1.0000e-01    0.0000e+00    0.0000e+00    3.0000e+02
*        toutv
    3.0000e+02
*
* dx     *     5.0000e+00e
```

```
1008  * vol    *      4.5357e-03e
1009  * fa     * f    9.0713e-04e
1010  * fric   * f    0.0000e+00e
1011  * rv fri* f    0.0000e+00e
1012  * grav   * f    0.0000e+00e
1013  * hd     * f    3.3985e-02e
1014  * icflg  * f             0e
1015  * nff    * f             1e
1016  * alp    *      0.0000e+00e
1017  * vl     *     -2.4370e-06     0.0000e+00e
1018  * vv     *      1.2364e-04     0.0000e+00e
1019  * tl     *      3.0200e+02e
1020  * tv     *      6.1605e+02e
1021  * p      *      1.5145e+07e
1022  * pa     *      0.0000e+00e
1023  *
1024  *******   type           num            id        ctitle
1025  pipe            13      13 $13$ lpis line
1026  *       ncells          nodes          jun1          jun2          epsw
1027                 1              0            20            19     0.0000e+00
1028  *         ichf          iconc          iacc          ipow
1029                 1              0             0             0
1030  *        radin             th         houtl         houtv         toutl
1031     1.0000e+00     1.0000e-01     0.0000e+00     0.0000e+00     3.0000e+02
1032  *        toutv
1033     3.0000e+02
1034  *
1035  * dx     *      1.0000e+00
1036  * vol    *      5.9900e-03e
1037  * fa     * f    5.9900e-03e
1038  * fric   * f    0.0000e+00e
1039  * rv fri* f    0.0000e+00e
1040  * grav   * f    0.0000e+00e
1041  * hd     * f    8.7330e-02e
1042  * icflg  * f             0e
1043  * nff    * f             1e
1044  * alp    *      0.0000e+00e
1045  * vl     *     -4.8826e-07     0.0000e+00e
1046  * vv     *      2.0576e-03     0.0000e+00e
1047  * tl     *      3.0200e+02e
1048  * tv     *      6.1605e+02e
1049  * p      *      1.5145e+07e
1050  * pa     *      0.0000e+00e
1051  *
1052  *******   type           num            id        ctitle
1053  valve           14      14 $14$ ecc line - check valve
1054  *       ncells          nodes          jun1          jun2          epsw
1055                13              0            17            16     0.0000e+00
1056  *         ichf          iconc          ivty          ivps          nvtb2
1057                 0              0             3             3              0
1058  *         ivtr           ivsv         nvtbl          nvsv          nvrf
1059                 6              1             2             0              0
1060  *       ivtrov         ivtyov
1061                 0              0
1062  *         rvmx           rvov         fminov        fmaxov
1063     2.0000e+01     0.0000e+00     0.0000e+00     0.0000e+00
1064  *        radin             th         houtl         houtv         toutl
1065     4.3663e-02     1.3487e-02     0.0000e+00     0.0000e+00     3.0000e+02
1066  *        toutv          avlve          hvlve          favlve         xpos
1067     3.0000e+02     8.2100e-03     1.0224e-01     0.0000e+00     0.0000e+00
1068  *
1069  * dx     *      1.4220e+00     2.6820e+00     5.6100e-01r05 2.3580e+00     3.6900e-01
1070  * dx     *      3.0500e-01r02 2.4840e+00     4.5400e-01e
1071  * vol    *      1.1675e-02     2.2019e-02     1.2684e-02r05 4.3953e-02     5.0370e-03
1072  * vol    *      1.8270e-03r02 3.3907e-02     2.7190e-03e
1073  * fa     * r02  8.2100e-03     0.0000e+00r05 1.8640e-02     1.3650e-02r02 5.9900e-03
1074  * fa     *      1.3650e-02r02 5.9900e-03e
1075  * fric   *      6.1000e-02     1.0746e+00     7.0900e-02     1.1084e+00     7.3500e-02
1076  * fric   * r03  0.0000e+00     6.7440e-02     0.0000e+00     6.1000e-02     0.0000e+00
1077  * fric   *      1.1970e-01     4.0050e-02e
1078  * rv fri*       6.1000e-02     1.0746e+00     7.0900e-02     1.1084e+00     7.3500e-02
1079  * rv fri* r03  0.0000e+00     6.7440e-02     0.0000e+00     6.1000e-02     0.0000e+00
1080  * rv fri*      1.1970e-01     4.0050e-02e
1081  * grav   * r02-1.0000e+00r12 0.0000e+00e
1082  * hd     * r02  1.0224e-01     1.0000e-10r05 1.5406e-01     1.3183e-01r02 8.7330e-02
1083  * hd     *      1.3183e-01r02 8.7330e-02e
1084  * icflg  * f             0e
1085  * nff    * r09           1            -1r03           1             -1e
1086  * alp    * f    0.0000e+00e
1087  * vl     * r03  0.0000e+00     3.3433e-07     1.4928e-06     2.6508e-06     3.8079e-06
1088  * vl     *      4.9638e-06     8.3548e-06     1.9450e-05     1.9599e-05     9.8104e-06
1089  * vl     *      2.5106e-05     2.5813e-05e
1090  * vv     * r03  0.0000e+00     1.6367e-05     9.5107e-06     1.8970e-05     2.8049e-05
1091  * vv     *      3.6335e-05     5.9040e-05     1.2123e-04     1.2441e-04     4.4631e-04
1092  * vv     *      3.4637e-03     1.7215e-03e
1093  * tl     * r11  3.0720e+02     3.0713e+02 3.0200e+02e
1094  * tv     *      5.2519e+02     5.2548e+02r11 6.1605e+02e
1095  * p      *      4.1232e+06     4.1432e+06r11 1.5145e+07e
1096  * pa     * f   .0.0000e+00e
1097  * vtb1   *      0.0000e+00     1.0000e+00     1.0000e+04     1.0000e+00e
1098  *
1099  *******   type           num            id        ctitle
```

```
1100 pipe           15      15 $15$ accumulator
1101 *       ncells          nodes           jun1           jun2           epsw
1102              3              5             11             17    0.0000e+00
1103 *         ichf          iconc           iacc           ipow
1104              1              0              1              0
1105 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
1106              0              0             0              0             0
1107 *        radin             th         houtl          houtv         toutl
1108     1.0000e+00    1.0000e-01    0.0000e+00    0.0000e+00    3.0000e+02
1109 *        toutv
1110     3.0000e+02
1111 *         qp3in         qp3off         rqp3mx         qp3scl
1112     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
1113 *
1114 * dx    *     5.1000e-01    1.0000e+00    5.0000e-02e
1115 * vol   *     6.4200e-01    1.2610e+00    6.3050e-02e
1116 * fa    * r03 1.2610e+00    8.2100e-03e
1117 * fric  * r03 0.0000e+00    6.1000e-02e
1118 * rv fri* r03 0.0000e+00    6.1000e-02e
1119 * grav  * f  -1.0000e+00e
1120 * hd    * r03 1.2595e+00    1.0224e-01e
1121 * icflg * f             0e
1122 * nff   * f             1e
1123 * alp   *     1.0000e+00r02 0.0000e+00e
1124 * vl    * f   0.0000e+00e
1125 * vv    * f   0.0000e+00e
1126 * tl    * f   3.0200e+02e
1127 * tv    *     3.0200e+02r02 5.2501e+02e
1128 * p     *     4.1100e+06r02 4.1111e+06e
1129 * pa    *     4.1060e+06r02 0.0000e+00e
1130 * qppp  * f   0.0000e+00e
1131 * matid * f             7e
1132 * tw    * f   3.0200e+02e
1133 *
1134 *******   type            num            id        ctitle
1135 fill            16      16 $16$ hpis injection
1136 *         jun1           ifty           ioff
1137               18              7              0
1138 *         iftr           ifsv           nftb           nfsv           nfrf
1139               2              32             4              0             0
1140 *       twtold           rfmx         concin          felv
1141     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
1142 *         dxin           volin          alpin          vlin          tlin
1143     5.0000e+00    4.5357e-03    0.0000e+00    0.0000e+00    3.0500e+02
1144 *          pin           pain         flowin          vvin          tvin
1145     1.0000e+05    0.0000e+00    0.0000e+00    0.0000e+00    3.7300e+02
1146 *        vmscl          vvscl
1147     1.0000e+00    0.0000e+00
1148 *
1149 * vmtb  *     1.0000e+00    1.7655e+00    8.5013e+04    1.7655e+00    8.3588e+06
1150 * vmtb  *     7.3564e-01    1.0000e+08    7.3564e-01e
1151 *
1152 *******   type            num            id        ctitle
1153 fill            17      17 $17$ lpis injection
1154 *         jun1           ifty           ioff
1155               19              7              0
1156 *         iftr           ifsv           nftb           nfsv           nfrf
1157               3              33             13             0             0
1158 *       twtold           rfmx         concin          felv
1159     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
1160 *         dxin           volin          alpin          vlin          tlin
1161     1.0000e+00    5.9892e-03    0.0000e+00    0.0000e+00    3.0500e+02
1162 *          pin           pain         flowin          vvin          tvin
1163     1.0000e+05    0.0000e+00    0.0000e+00    0.0000e+00    3.7300e+02
1164 *        vmscl          vvscl
1165     1.0000e+00    0.0000e+00
1166 *
1167 * vmtb  *     1.0000e+04    1.1780e+00    8.2090e+04    1.1780e+00    2.9630e+05
1168 * vmtb  *     1.0930e+00    4.6410e+05    1.0120e+00    6.4750e+05    9.2980e-01
1169 * vmtb  *     8.2990e+05    8.2480e-01    1.0110e+06    6.9720e-01    1.1920e+06
1170 * vmtb  *     5.4700e-01    1.3100e+06    3.7910e-01    1.3990e+06    2.5880e-01
1171 * vmtb  *     1.4570e+06    1.4100e-01    1.5140e+06    0.0000e+00    1.9000e+07
1172 * vmtb  *     0.0000e+00e
1173 *
1174 *******   type            num            id        ctitle
1175 plenum          18      18 $18$ ecc line
1176 *         npljn          iconc          juns1          juns2
1177               4              0              1              1
1178 * junj  *              16             14             20             15e
1179 * dx    * f   0.5620e+00e
1180 * vol   *     6.7327e-03e
1181 * elev  *     0.0000e+00e
1182 * alp   *     0.0000e+00e
1183 * tl    *     3.0205e+02e
1184 * tv    *     6.1605e+02e
1185 * p     *     1.5145e+07e
1186 * pa    *     0.0000e+00e
1187 *
1188 *******   type            num            id        ctitle
1189 fill            19      19 $19$ pressurizer cap
1190 *         jun1           ifty           ioff
1191              12              1              0
```

```
*       twtold          rfmx          concin          felv
    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    4.6990e-01    2.4414e-02    0.0000e+00    0.0000e+00    5.5030e+02
*          pin          pain         flowin          vvin          tvin
    1.4840e+07    0.0000e+00    0.0000e+00    0.0000e+00    6.1442e+02
*
*******   type           num            id         ctitle
pipe           20      20 $20$ stgen secondary boiler
*        ncells         nodes          jun1          jun2          epsw
             5             0            24            21           0.0
*          ichf         iconc         iacc         ipow
             1             0             0            0
*         radin            th        houtl        houtv        toutl
    6.4453e-01    1.2700e-02           0.0           0.0        300.0
*         toutv         powin        powoff       rpowmx       powscl
         300.0           0.0           0.0          0.0           0.0
*
* dx     * r04 5.6895e-01    1.1115e+00
* vol    * r04 4.4356e-01    9.9786e-01e
* fa     *     2.1890e-01r03 7.7961e-01r02 8.9776e-01e
* fric   *     2.0000e+00r05 0.0000e+00e
* rv fri*     2.0000e+00r05 0.0000e+00e
* grav   *     0.0000e+00r05 1.0000e+00e
* hd     * r05 6.3500e-03    1.0691e+00e
* icflg  * f            0e
* nff    *            -1r05          1e
* alp    *     3.7301e-01    6.6229e-01    7.1389e-01    7.3316e-01    6.9255e-01
* alp    * e
* vl     *     3.9032e-01    1.8531e-01    3.1060e-01    3.2750e-01    2.6974e-01
* vl     *     2.7100e-01e
* vv     *     1.0204e+00    4.4066e-01    7.6003e-01    1.1473e+00    1.3286e+00
* vv     *     1.4068e+00e
* tl     *     5.4468e+02    5.4465e+02    5.4463e+02    5.4461e+02    5.4458e+02
* tl     * e
* tv     *     5.4466e+02    5.4463e+02    5.4461e+02    5.4460e+02    5.4457e+02
* tv     * e
* p      *     5.6344e+06    5.6322e+06    5.6307e+06    5.6294e+06    5.6273e+06
* p      * e
* pa     * f   0.0000e+00e
*
*******   type           num            id         ctitle
tee            21      21 $21$ stgen secondary separator
*         jcell         nodes         ichf          cost          epsw
             2             0            1           0.0           0.0
*        iconc1        ncell1         jun1          jun2         ipow1
             0             4           21            22             0
*        radin1           th1        houtl1        houtv1        toutl1
    7.1120e-01    5.3975e-02           0.0           0.0        300.0
*        toutv1         pwin1        pwoff1       rpwmx1       pwscl1
         300.0           0.0           0.0          0.0           0.0
*        iconc2        ncell2         jun3         ipow2
             0             1           23             0
*        radin2           th2        houtl2        houtv2        toutl2
    7.1120e-01    5.3975e-02           0.0           0.0        300.0
*        toutv2         pwin2        pwoff2       rpwmx2       pwscl2
         300.0           0.0           0.0          0.0           0.0
*
* dx     * r03 3.7050e-01    1.1115e+00
* vol    * r03 3.3262e-01    1.2370e+00e
* fa     * r03 8.9776e-01    1.0000e+00    4.6329e-02e
* fric   * r02 0.0000e+00    1.0000e+30           0.0    2.4460e-01e
* rv fri* r02 0.0000e+00    1.0000e+30           0.0    2.4460e-01e
* grav   * f   1.0000e+00e
* hd     * r04 1.0691e+00    2.4290e-01e
* icflg  * f            0e
* nff    * f            1e
* alp    * r03 7.5588e-01    9.9999e-01e
* vl     * r03 2.7100e-01   -1.2000e-10    1.6561e+01e
* vv     * r03 1.4068e+00    7.5110e-01    1.9601e+01e
* tl     * f   5.4455e+02e
* tv     * f   5.4454e+02e
* p      * r03 5.6248e+06    5.6245e+06e
* pa     * f   0.0000e+00e
*
* dx     *     7.4100e-01e
* vol    *     3.8297e-01e
* fa     * f   5.1684e-01e
* fric   * f   0.0000e+00e
* rv fri* f   0.0000e+00e
* grav   * f  -3.3763e-01e
* hd     * f   2.5400e-01e
* icflg  * f            0e
* nff    * f            1e
* alp    *     0.0000e+00e
* vl     *     4.5195e-01    1.1034e-01e
* vv     *    -9.3594e-02   -1.0138e-01e
* tl     *     5.4433e+02e
* tv     *     5.4456e+02e
* p      *     5.6258e+06e
* pa     *     0.0000e+00e
*
```

```
*******   type          num           id       ctitle
tee            22      22 $22$ stgen secondary downcomer
*        jcell          nodes          ichf          cost          epsw
                3              0             1           0.0           0.0
*       iconc1         ncell1         jun1          jun2         ipow1
                0              6            23            24             0
*       radin1            th1        houtl1        houtv1        toutl1
    7.1120e-01    5.3975e-02           0.0           0.0         300.0
*       toutv1          pwin1        pwoff1        rpwmx1        pwscl1
             300.0            0.0           0.0           0.0           0.0
*       iconc2         ncell2         jun3         ipow2
                0              1            25             0
*       radin2            th2        houtl2        houtv2        toutl2
    5.0800e-02    6.0000e-03           0.0           0.0         300.0
*       toutv2          pwin2        pwoff2        rpwmx2        pwscl2
             300.0            0.0           0.0           0.0           0.0
*
* dx    *     7.4100e-01r03 2.4700e-01    1.7069e+00    5.6895e-01e
* vol   *     3.8297e-01r03 1.2766e-01    3.7363e-01    1.2454e-01e
* fa    * r04 5.1684e-01r03 2.1890e-01e
* fric  * r06 0.0000e+00    2.0000e+00e
* rv fri* r06 0.0000e+00    2.0000e+00e
* grav  *    -3.3763e-01r05-1.0000e+00    0.0000e+00e
* hd    * r04 2.5400e-01r02 1.0160e-01    6.3500e-03e
* icflg * f            0e
* nff   * r04          1            -1             1            -1e
* alp   *     5.1735e-04r05 0.0000e+00e
* vl    *     1.1034e-01r03 1.1033e-01    3.8999e-01    3.9024e-01    3.9032e-01
* vl    * e
* vv    *    -1.0138e-01r02-1.6483e-01    4.9637e-02    1.1720e-01    1.1683e-01
* vv    *     1.0204e+00e
* tl    *     5.4427e+02r03 5.2306e+02    5.2324e+02    5.2332e+02e
* tv    *     5.4458e+02r03 5.4465e+02    5.4476e+02    5.4486e+02e
* p     *     5.6277e+06r03 5.6335e+06    5.6430e+06    5.6520e+06e
* pa    * f   0.0000e+00e
*
* dx    *     2.0000e+00e
* vol   *     1.6215e-02e
* fa    * f   8.1073e-03e
* fric  *     1.0000e-10    0.0000e+00e
* rv fri*     1.0000e-10    0.0000e+00e
* grav  * f   0.0000e+00e
* hd    * f   1.0160e-01e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000e+00e
* vl    *    -3.5940e+00   -3.5900e+00e
* vv    *    -3.7371e+00   -3.5900e+00e
* tl    *     4.8169e+02e
* tv    *     5.4465e+02e
* p     *     5.6342e+06e
* pa    *     0.0000e+00e
*
*******   type          num           id       ctitle
valve          23      23 $23$ steam line valve
*       ncells          nodes         jun1          jun2          epsw
                6              0            22            26    0.0000e+00
*         ichf          iconc         ivty          ivps         nvtb2
                1              0             3             6             0
*         ivtr           ivsv        nvtbl         nvsv          nvrf
                8              1             3             0             0
*       ivtrov         ivtyov
                0              0
*         rvmx           rvov       fminov       fmaxov
    1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
*        radin             th        houtl        houtv        toutl
    1.2140e-01    1.5100e-02           0.0    1.6000e+00    3.0537e+02
*        toutv          avlve        hvlve        favlve         xpos
    3.0537e+02    4.0945e-02    2.2832e-01    7.2789e-01    6.8317e-01
*
* dx    * f   5.0119e+00e
* vol   * f   2.3220e-01e
* fa    * r05 4.6329e-02    2.9803e-02    4.6329e-02e
* fric  *     2.4460e-01r04 0.0000e+00    6.4900e+00    0.0000e+00e
* rv fri*     2.4460e-01r04 0.0000e+00    6.4900e+00    0.0000e+00e
* grav  *     1.0000e+00r06 0.0000e+00e
* hd    * r05 2.4290e-01    1.8152e-01    2.4290e-01e
* icflg * r05          0             1             0e
* nff   * r06          1            -1e
* alp   * r05 9.9994e-01    9.9896e-01e
* vl    *     1.6561e+01    1.8585e+01    1.8746e+01    1.8783e+01    1.8806e+01
* vl    *     2.1816e+01    4.3756e+01e
* vv    *     1.9601e+01    1.9770e+01    1.9797e+01    1.9824e+01    1.9850e+01
* vv    *     3.0900e+01    4.8548e+01e
* tl    *     5.4402e+02    5.4401e+02    5.4400e+02    5.4398e+02    5.4397e+02
* tl    *     4.8899e+02e
* tv    *     5.4399e+02    5.4400e+02    5.4399e+02    5.4398e+02    5.4397e+02
* tv    *     4.8777e+02e
* p     *     5.5787e+06    5.5777e+06    5.5768e+06    5.5759e+06    5.5750e+06
* p     *     2.1621e+06e
* pa    * f   0.0000e+00e
* vtbl  *     0.0000e+00    6.0000e-01s
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* vtbl  *     1.0000e+01    0.0000e+00s
* vtbl  *     1.0000e+03    0.0000e+00e
*
*******   type          num           id        ctitle
fill           24      24 $24$ steam generator feedwater
*         jun1          ifty          ioff
            25             8             0
*         iftr          ifsv          nftb          nfsv          nfrf
              8           -18             6             0             0
*       twtold          rfmx        concin          felv
    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*          dxin          volin         alpin          vlin          tlin
    2.0000e+00    1.6215e-02    0.0000e+00    3.5900e+00    4.8200e+02
*           pin          pain         flowin          vvin          tvin
    7.2600e+06    0.0000e+00    2.4992e+01    3.5900e+00    5.6149e+02
*        vmscl         vvscl
    1.0000e+00    0.0000e+00
*
* vmtb  * r02 0.0000e+00    2.0000e-01    6.8700e+00    3.9170e-01    1.3720e+01
* vmtb  *     5.7700e-01    2.0580e+01    7.5620e-01    2.7440e+01    1.0000e+00
* vmtb  *     3.7130e+01e
*
*******   type          num           id        ctitle
break          25      25 $25$ stm gen sec brk
*         jun1          ibty          isat          ioff
            26             0             3             0
*          dxin          volin         alpin           tin           pin
    5.0119e+00    2.3220e-01    1.0000e+00    4.8800e+02    2.1500e+06
*         pain         concin          rbmx          poff          belv
    0.0000e+00    0.0000e+00    1.0000e+20    2.1500e+06    0.0000e+00
*
*******   type          num           id        ctitle
tee            31      31 $31$ broken-loop hot leg
*        jcell         nodes          ichf          cost          epsw
             2             4             1    0.0000e+00    0.0000e+00
*       iconc1        ncell1          jun1          jun2          ipow1
             0            26            31            32             0
*       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
             0             0             0             0             0
*       radin1          th1         houtl1        houtv1        toutl1
    1.4209e-01    3.5710e-02           0.0    6.0000e+00    3.0000e+02
*       toutv1
    3.0000e+02
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*       iconc2        ncell2          jun3          ipow2
             0             3            43             0
*       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
             0             0             0             0             0
*       radin2          th2         houtl2        houtv2        toutl2
    1.0795e-01    2.8580e-01           0.0    6.0000e+00    3.0000e+02
*       toutv2
    3.0000e+02
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    * r03 6.6898e-01    5.2578e-01    4.6749e-01    5.5861e-01    1.9875e+00
* dx    * r02 1.0772e+00    1.9875e+00    5.1029e-01    5.4629e-01    4.8628e-01
* dx    *     2.5400e-01    1.7145e-01    3.0000e-01    2.7940e-01r02 2.1184e-01
* dx    * r04 1.8717e-01    2.9922e-01    2.4448e-01    8.1598e-01e
* vol   * r03 4.2460e-02    4.7280e-03    3.7579e-03    4.6603e-03    1.9686e-01
* vol   * r02 1.1383e-01    1.9686e-01    4.2684e-03    4.5696e-03    3.1715e-03
* vol   *     2.7500e-02    1.8500e-02    1.8900e-02    6.8606e-03r02 1.7667e-03
* vol   * r04 1.5674e-03    2.4920e-03    2.0450e-03    4.2395e-02e
* fa    * r03 6.3469e-02    1.3913e-02r03 8.3647e-03r03 1.9141e-02r03 8.3647e-03
* fa    *     6.3425e-02r02 9.4624e-03    6.3425e-02r09 8.3647e-03    5.1956e-02
* fa    * e
* fric  *     0.0000e+00r02 2.2035e-01    2.3956e-01    2.6400e-01    0.0000e+00
* fric  *     7.7200e-03r03 1.4000e-02    1.9300e-02r03 0.0000e+00    1.4000e-01
* fric  *     1.7000e-01    1.1200e-01r02 0.0000e+00    4.3970e-02r04 0.0000e+00
* fric  *     1.8904e-02    3.4793e-01    0.0000e+00e
* rv fri*     3.5000e-02r02 2.2035e-01    2.3956e-01    2.6400e-01    0.0000e+00
* rv fri*     7.7200e-03r03 1.4000e-02    1.9300e-02r03 0.0000e+00    1.4000e-01
* rv fri*     1.7000e-01    1.1200e-01r02 0.0000e+00    4.3970e-02r04 0.0000e+00
* rv fri*     1.8904e-02    3.4793e-01    0.0000e+00e
* grav  * r05 0.0000e+00    6.2137e-01r02 1.0000e+00    0.0000e+00r05-1.0000e+00
* grav  *    -6.6537e-01r02 0.0000e+00    2.9153e-01r05 1.0000e+00    6.9241e-01
* grav  * r03 0.0000e+00e
* hd    * r03 2.8400e-01    1.3300e-01r03 1.0300e-01r03 1.7500e-02r03 1.0300e-01
* hd    *     2.8400e-01r02 1.1900e-02    2.8400e-01r09 1.0320e-01    2.5720e-01
* hd    * e
* icflg * r25          0             2             0e
* nff   * r13          1            -1r03          1            -1r08          1
* nff   *             -1e
* alp   * f   0.0000e+00e
* vl    *    -2.7128e-01   -2.7129e-01    2.1913e-04    9.4392e-04    1.5015e-03
* vl    *     1.4435e-03    1.3750e-03    4.8827e-04    4.2806e-04    3.6837e-04
* vl    *     5.9408e-04    5.3404e-04    4.7244e-04    5.5294e-05    3.4300e-04
* vl    *     3.2446e-04    4.3416e-05    2.9402e-04    2.6964e-04    2.4576e-04
* vl    *     2.2471e-04    2.0370e-04    1.8273e-04    1.6181e-04    1.2845e-04
* vl    *     1.0125e-04    0.0000e+00e
* vv    *    -1.7888e-01   -3.4516e-01   -3.8433e-02    2.1004e-02    1.4251e-02
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1468  * vv    *     2.1154e-01    2.3867e-01    2.3792e-01    1.6864e-03   -2.3678e-01
1469  * vv    *    -2.3630e-01   -2.3557e-01   -2.3547e-01   -2.3614e-01   -2.1332e-01
1470  * vv    *     1.6682e-02    2.2337e-02    1.7371e-01r02 2.3619e-01    2.3615e-01
1471  * vv    *     2.3612e-01    2.3608e-01    2.1535e-01    7.0167e-03   -2.2062e-02
1472  * vv    *     0.0000e+00e
1473  * tl    * r02 5.5628e+02    5.6359e+02    5.5889e+02    5.5715e+02    5.5663e+02
1474  * tl    *     5.6202e+02    5.6135e+02    5.6062e+02    5.5925e+02    5.5256e+02
1475  * tl    *     5.5117e+02    5.4988e+02    5.5802e+02    5.5797e+02    5.5735e+02
1476  * tl    *     5.5560e+02    5.5120e+02    5.5063e+02    5.5050e+02    5.5038e+02
1477  * tl    *     5.5026e+02    5.5013e+02    5.4994e+02    5.4980e+02    5.5547e+02
1478  * tl    * e
1479  * tv    * r05 6.1568e+02    6.1566e+02    6.1562e+02r02 6.1556e+02    6.1562e+02
1480  * tv    *     6.1566e+02    6.1569e+02    6.1571e+02r13 6.1568e+02e
1481  * p     * r05 1.5075e+07    1.5073e+07    1.5063e+07r02 1.5052e+07    1.5063e+07
1482  * p     *     1.5073e+07    1.5077e+07    1.5081e+07    1.5083e+07r04 1.5084e+07
1483  * p     *     1.5082e+07    1.5081e+07    1.5079e+07    1.5078e+07    1.5076e+07
1484  * p     * r03 1.5075e+07e
1485  * pa    * f   0.0000e+00e
1486  * qppp  * r99 0.0000e+00r05 0.0000e+00e
1487  * matid * f           7e
1488  * tw    *     5.5528e+02    5.5408e+02    5.5297e+02    5.5193e+02    5.5455e+02
1489  * tw    *     5.5336e+02    5.5225e+02    5.5121e+02    5.6137e+02    5.6016e+02
1490  * tw    *     5.5903e+02    5.5798e+02    5.5675e+02    5.5560e+02    5.5452e+02
1491  * tw    *     5.5349e+02    5.5506e+02    5.5393e+02    5.5287e+02    5.5184e+02
1492  * tw    *     5.5454e+02    5.5343e+02    5.5236e+02    5.5134e+02    5.5992e+02
1493  * tw    *     5.5871e+02    5.5758e+02    5.5653e+02    5.5970e+02    5.5849e+02
1494  * tw    *     5.5737e+02    5.5632e+02    5.5898e+02    5.5778e+02    5.5665e+02
1495  * tw    *     5.5560e+02    5.5717e+02    5.5596e+02    5.5485e+02    5.5380e+02
1496  * tw    *     5.5047e+02    5.4936e+02    5.4830e+02    5.4729e+02    5.4912e+02
1497  * tw    *     5.4803e+02    5.4699e+02    5.4598e+02    5.4784e+02    5.4677e+02
1498  * tw    *     5.4574e+02    5.4474e+02    5.5580e+02    5.5461e+02    5.5350e+02
1499  * tw    *     5.5246e+02    5.5646e+02    5.5526e+02    5.5415e+02    5.5310e+02
1500  * tw    *     5.5514e+02    5.5395e+02    5.5284e+02    5.5181e+02    5.5343e+02
1501  * tw    *     5.5226e+02    5.5117e+02    5.5014e+02    5.4912e+02    5.4801e+02
1502  * tw    *     5.4696e+02    5.4595e+02    5.4856e+02    5.4746e+02    5.4642e+02
1503  * tw    *     5.4542e+02    5.4844e+02    5.4734e+02    5.4630e+02    5.4530e+02
1504  * tw    *     5.4831e+02    5.4722e+02    5.4617e+02    5.4517e+02    5.4819e+02
1505  * tw    *     5.4710e+02    5.4605e+02    5.4505e+02    5.4806e+02    5.4697e+02
1506  * tw    *     5.4593e+02    5.4493e+02    5.4787e+02    5.4678e+02    5.4574e+02
1507  * tw    *     5.4474e+02    5.4773e+02    5.4664e+02    5.4560e+02    5.4460e+02
1508  * tw    *     5.5327e+02    5.5209e+02    5.5099e+02    5.4996e+02e
1509  *
1510  * dx    *     1.3890e+00    8.1400e-01    5.1044e+00e
1511  * vol   *     5.4000e-02    3.1400e-02    1.9860e-01e
1512  * fa    * f   3.1350e-02e
1513  * fric  *     1.0000e-10r03 0.0000e+00e
1514  * rv fri*     1.0000e-10r03 0.0000e+00e
1515  * grav  *     0.0000e+00    2.2420e-01    1.9120e-01    0.0000e+00e
1516  * hd    * r03 2.2230e-01    1.4100e-03e
1517  * icflg * f           0e
1518  * nff   * f           1e
1519  * alp   * f   0.0000e+00e
1520  * vl    *    -5.4932e-01   -5.4937e-01   -5.4940e-01   -5.4958e-01e
1521  * vv    *    -5.3804e-01   -3.8671e-01   -3.9323e-01   -6.8625e-01e
1522  * tl    *     5.5628e+02    5.5631e+02    5.5632e+02e
1523  * tv    *     6.1568e+02    6.1567e+02    6.1565e+02e
1524  * p     *     1.5075e+07    1.5073e+07    1.5069e+07e
1525  * pa    * f   0.0000e+00e
1526  * qppp  * f   0.0000e+00e
1527  * matid * f           7e
1528  * tw    *     5.5553e+02    5.4557e+02    5.3565e+02    5.2278e+02    5.5555e+02
1529  * tw    *     5.4558e+02    5.3565e+02    5.2278e+02    5.5566e+02    5.4560e+02
1530  * tw    *     5.3565e+02    5.2277e+02e
1531  *
1532  *******   type          num           id       ctitle
1533  fill           32      32 $32$ broken-hot-leg terminal
1534  *         jun1          ifty          ioff
1535                32             1             0
1536  *       twtold          rfmx        concin          felv
1537      0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
1538  *         dxin          volin         alpin          vlin          tlin
1539      8.1598e-01    4.2395e-02    0.0000e+00    0.0000e+00    5.5650e+02
1540  *          pin          pain         flowin          vvin          tvin
1541      1.5060e+07    0.0000e+00    0.0000e+00    0.0000e+00    6.1560e+02
1542  *
1543  *******   type          num           id       ctitle
1544  tee            41      41 $41$ broken-loop cold leg
1545  *        jcell         nodes         ichf          cost          epsw
1546                2             4             1    0.0000e+00    0.0000e+00
1547  *       iconc1        ncell1         jun1          jun2         ipow1
1548                0             6            41            42             0
1549  *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
1550                0             0             0             0             0
1551  *       radin1           th1        houtl1        houtv1        toutl1
1552      1.4209e-01    3.5710e-02           0.0    6.0000e+00    3.0000e+02
1553  *       toutv1
1554      3.0000e+02
1555  *         qpin1         qpoff1        rqpmx1         qpscl1
1556      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1557  *       iconc2        ncell2         jun3         ipow2
1558                0             2            43             0
1559  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
```

```
1560                0             0             0             0             0
1561  *         radin2           th2         houtl2         houtv2         toutl2
1562      1.0795e-01    2.8580e-01           0.0    6.0000e+00    3.0000e+02
1563  *         toutv2
1564      3.0000e+02
1565  *          qpin2         qpoff2         rqpmx2         qpscl2
1566      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1567  *
1568  * dx     * r03 8.0774e-01    5.1308e-01    1.1450e+00    1.0224e+00e
1569  * vol    * r03 5.1268e-02    5.0514e-03    2.6238e-02    4.7249e-02e
1570  * fa     * r03 6.3471e-02    1.3876e-02    8.3647e-03    2.3520e-02    5.1956e-02
1571  * fa     * e
1572  * fric   *     0.0000e+00    1.8470e+00    3.0679e-02    0.0000e+00    1.6150e-01
1573  * fric   *     4.6010e-02    1.7170e-01e
1574  * rv fri*     1.2910e-01    1.8470e+00    3.0679e-02    0.0000e+00    1.6150e-01
1575  * rv fri*     4.6010e-02    1.7170e-01e
1576  * grav   * f   0.0000e+00e
1577  * hd     * r03 2.8400e-01    1.3292e-01    1.0320e-01    1.7305e-01    2.5720e-01
1578  * hd     * e
1579  * icflg  * r04          0           2r02          0e
1580  * nff    * r03          1          -1r03          1e
1581  * alp    * f   0.0000e+00e
1582  * vl     *     2.7196e-01    2.7195e-01    5.3126e-05    1.8460e-04    2.4966e-04
1583  * vl     *     4.1690e-05    0.0000e+00e
1584  * vv     *     3.0123e-01    3.8705e-01    2.4718e-02    2.0026e-02   -9.7115e-03
1585  * vv     *     2.6967e-03    0.0000e+00e
1586  * tl     *     5.5677e+02    5.5675e+02    5.5330e+02    5.4796e+02    5.4970e+02
1587  * tl     *     5.4960e+02e
1588  * tv     * f   6.1579e+02e
1589  * p      * f   1.5096e+07e
1590  * pa     * f   0.0000e+00e
1591  * qppp   * f   0.0000e+00e
1592  * matid  * f          7e
1593  * tw     *     5.5577e+02    5.5456e+02    5.5345e+02    5.5241e+02    5.5501e+02
1594  * tw     *     5.5381e+02    5.5269e+02    5.5166e+02    5.5110e+02    5.4993e+02
1595  * tw     *     5.4883e+02    5.4781e+02    5.4587e+02    5.4477e+02    5.4373e+02
1596  * tw     *     5.4273e+02    5.4755e+02    5.4641e+02    5.4534e+02    5.4433e+02
1597  * tw     *     5.4742e+02    5.4627e+02    5.4519e+02    5.4418e+02e
1598  *
1599  * dx     *     8.8500e-01    7.2834e+00e
1600  * vol    *     3.0330e-02    2.7680e-01e
1601  * fa     * f   3.1350e-02e
1602  * fric   *     1.0000e-10r02 0.0000e+00e
1603  * rv fri*     1.0000e-10r02 0.0000e+00e
1604  * grav   *     0.0000e+00    1.9900e-01    0.0000e+00e
1605  * hd     * r02 2.2230e-01    1.4100e-03e
1606  * icflg  * f          0e
1607  * nff    * f          1e
1608  * alp    * f   0.0000e+00e
1609  * vl     *     5.5005e-01    5.5000e-01    5.4958e-01e
1610  * vv     *     6.6218e-01    7.0827e-01    6.8625e-01e
1611  * tl     *     5.5671e+02    5.5643e+02e
1612  * tv     *     6.1579e+02    6.1575e+02e
1613  * p      *     1.5096e+07    1.5090e+07e
1614  * pa     * f   0.0000e+00e
1615  * qppp   * f   0.0000e+00e
1616  * matid  * f          7e
1617  * tw     *     5.5553e+02    5.4022e+02    5.2786e+02    5.1460e+02    5.5541e+02
1618  * tw     *     5.4013e+02    5.2779e+02    5.1453e+02e
1619  *
1620  *******   type          num           id       ctitle
1621  fill            42      42 $42$ broken-cold-leg terminal
1622  *          junl          ifty          ioff
1623                42             1             0
1624  *        twtold          rfmx        concin          felv
1625      0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
1626  *          dxin          volin          alpin          vlin          tlin
1627      1.0224e+00    4.7249e-02    0.0000e+00    0.0000e+00    5.5030e+02
1628  *           pin          pain         flowin          vvin          tvin
1629      1.5060e+07    0.0000e+00    0.0000e+00    0.0000e+00    6.1560e+02
1630  *
1631  *******   type          num           id        ctitle
1632  vessel          50      50 $50$ vessel
1633  *          nasx          nrsx          ntsx          ncsr         ivssbf
1634                12             4             4             4              0
1635  *          idcu          idcl          idcr          icru          icrl
1636                12             2             3             8              3
1637  *          icrr         ilcsp         iucsp          iuhp         iconc
1638                 3             3             8            12              0
1639  *         igeom         nvent         nvvtb         nsgrid
1640                 0             0             0              0 * 5 *
1641  *         shelv          epsw
1642      0.0000e+00    0.0000e+00
1643  *
1644  * z      *     6.2700e-01    7.2700e-01    1.2480e+00    1.5530e+00    1.7810e+00
1645  * z      *     2.0100e+00    2.4670e+00    2.9240e+00    3.4000e+00    4.8460e+00
1646  * z      *     5.1300e+00    5.9000e+00e
1647  * rad    *     1.0500e-01    2.3100e-01    3.2900e-01    4.7000e-01e
1648  * th     *    1.570796327   3.141592654   4.712388981   6.283185308e
1649  *
1650  * funh   * f   1.0000e-01e
1651  * nhsca  * f          991e
```

```
* zgrid      1.5520e+00    1.7800e+00    2.0000e+00    2.4650e+00    2.9200e+00
* zgrid  e
*
*        lisrl         lisrc         lisrf         ljuns
             11            10             3             1
             11            15             3             9
             11            12             3            31
             11            13             3            41
*
* level   1
*
* cfzl-t* f   0.0000e+00e
* cfzl-z* r12 0.0000e+00r04 2.0000e-01e
* cfzl-r* r08 0.0000e+00r04 3.0000e-01r04 0.0000e+00e
* cfzv-t* f   0.0000e+00e
* cfzv-z* r12 0.0000e+00r04 2.0000e-01e
* cfzv-r* r08 0.0000e+00r04 3.0000e-01r04 0.0000e+00e
* vol   * r12 1.0000e+00r04 5.8200e-02e
* fa-t  * r12 1.0000e+00r04 5.8200e-02e
* fa-z  * r12 1.0000e+00r04 5.8200e-02e
* fa-r  * r08 1.0000e+00r04 5.8200e-01r04 0.0000e+00e
* hd-t  * f   1.0000e-01e
* hd-z  * f   1.0000e-01e
* hd-r  * f   1.0000e-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 *    -2.0502e-01   -2.7073e-01    2.7057e-01    2.0562e-01   -2.0118e-01
* vln-t *    -2.1208e-01    2.1207e-01    2.0302e-01   -1.4392e-01   -1.3538e-01
* vln-t *     1.3605e-01    1.4689e-01   -1.0533e-02   -2.7136e-02    2.8463e-02
* vln-t *     1.3162e-02e
* vln-z *     9.6331e-01    9.4341e-01    8.5300e-01    9.4345e-01    8.7748e-01
* vln-z *     8.1439e-01    5.6696e-01    8.1406e-01    6.5182e-01    3.5550e-01
* vln-z *    -1.7955e-01    3.5362e-01    1.5052e-01   -5.0226e-01   -1.2346e+00
* vln-z *    -5.0633e-01e
* vln-r *     1.8076e-01   -3.7161e-02   -4.1603e-01   -3.7642e-02    9.4277e-02
* vln-r *    -1.3213e-01   -4.1925e-01   -1.3294e-01    3.4636e-02   -1.4168e-01
* vln-r *    -3.2196e-01   -1.4244e-01r04 0.0000e+00e
* tvn   * f   6.1598e+02e
* tln   * r06 5.5680e+02    5.5681e+02r03 5.5680e+02    5.5681e+02r03 5.5680e+02
* tln   *     5.5682e+02    5.5680e+02e
* pn    * f   1.5131e+07e
* pan   * f   0.0000e+00e
*
* level   2
*
* cfzl-t* f   0.0000e+00e
* cfzl-z* f   0.0000e+00e
* cfzl-r* r08 0.0000e+00r04 5.0000e-01r04 0.0000e+00e
* cfzv-t* f   0.0000e+00e
* cfzv-z* f   0.0000e+00e
* cfzv-r* r08 0.0000e+00r04 5.0000e-01r04 0.0000e+00e
* vol   * r12 1.0000e+00r04 5.8200e-01e
* fa-t  * r12 1.0000e+00r04 5.8200e-01e
* fa-z  * r12 4.0900e-01r04 5.8200e-01e
* fa-r  * r08 1.0000e+00r04 5.8200e-01r04 0.0000e+00e
* hd-t  * f   1.0000e-01e
* hd-z  * f   1.0000e-01e
* hd-r  * f   1.0000e-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 *    -1.1236e-01   -1.0166e-01    1.0246e-01    1.1290e-01   -3.7110e-02
* vln-t *     1.1255e-01   -1.1084e-01    3.8445e-02    1.4918e-01    3.4101e-01
* vln-t *    -3.3798e-01   -1.4858e-01    2.2499e-01    2.0615e-01   -2.0335e-01
* vln-t *    -2.2515e-01e
* vln-z *     2.8789e+00    2.8338e+00    2.7162e+00    2.8337e+00    2.8824e+00
* vln-z *     2.7516e+00    2.4209e+00    2.7507e+00    2.3272e+00    1.6864e+00
* vln-z *     8.6191e-01    1.6829e+00   -3.3861e-01   -1.4500e+00   -2.6289e+00
* vln-z *    -1.4559e+00e
* vln-r *     3.0974e-02   -1.2001e-01   -2.6537e-01   -1.1980e-01   -2.3589e-01
* vln-r *    -3.9153e-01   -4.3085e-01   -3.9127e-01   -4.7230e-01   -5.9005e-01
* vln-r *    -6.1752e-01   -5.8977e-01r04 0.0000e+00e
* tvn   * f   6.1596e+02e
* tln   * r06 5.5679e+02    5.5681e+02r03 5.5680e+02    5.5682e+02r03 5.5680e+02
* tln   *     5.5683e+02    5.5680e+02e
* pn    * r12 1.5128e+07r04 1.5129e+07e
* pan   * f   0.0000e+00e
*
* level   3
*
* cfzl-t* f   0.0000e+00e
* cfzl-z* r12 6.7100e-02r04 0.0000e+00e
* cfzl-r* f   0.0000e+00e
* cfzv-t* f   0.0000e+00e
* cfzv-z* r12 6.7100e-02r04 0.0000e+00e
* cfzv-r* f   0.0000e+00e
* vol   * r12 6.5600e-01r04 5.8200e-01e
* fa-t  * r12 6.5600e-01r04 5.8200e-01e
* fa-z  * r12 4.4800e-01r04 5.8200e-01e
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1744  * fa-r   * r08 7.0000e-01r08 0.0000e+00e
1745  * hd-t   * r12 1.2200e-02r04 1.0000e-01e
1746  * hd-z   * r12 1.2200e-02r04 1.0000e-01e
1747  * hd-r   * r12 1.2200e-02r04 1.0000e-01e
1748  * alpn   * f   0.0000e+00e
1749  * vvn-t  * f   0.0000e+00e
1750  * vvn-z  * f   0.0000e+00e
1751  * vvn-r  * f   0.0000e+00e
1752  * vln-t  *    -4.8498e-03   -3.6438e-02    3.6851e-02    5.2974e-03    4.2077e-02
1753  * vln-t  *     7.9656e-02   -7.8665e-02   -4.1194e-02    1.3145e-01    1.5873e-01
1754  * vln-t  *    -1.5744e-01   -1.3097e-01    2.3811e-01    2.1417e-01   -2.1136e-01
1755  * vln-t  *    -2.3801e-01e
1756  * vln-z  *     2.0258e+00    2.0173e+00    2.0017e+00    2.0172e+00    2.0173e+00
1757  * vln-z  *     1.9926e+00    1.9545e+00    1.9924e+00    1.9454e+00    1.8672e+00
1758  * vln-z  *     1.7875e+00    1.8669e+00   -7.3389e-01   -1.4301e+00   -2.2756e+00
1759  * vln-z  *    -1.4337e+00e
1760  * vln-r  *     4.5319e-02    5.6863e-02   -1.5825e-02    5.6834e-02    6.0825e-02
1761  * vln-r  *     7.1279e-02    7.6565e-02    7.1225e-02r08 0.0000e+00e
1762  * tvn    * r12 6.1594e+02r04 6.1595e+02e
1763  * tln    * r14 5.5680e+02    5.5683e+02    5.5680e+02e
1764  * pn     * r12 1.5124e+07r04 1.5126e+07e
1765  * pan    * f   0.0000e+00e
1766  *
1767  * level   4
1768  *
1769  * cfzl-t* f   0.0000e+00e
1770  * cfzl-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1771  * cfzl-r* f   0.0000e+00e
1772  * cfzv-t* f   0.0000e+00e
1773  * cfzv-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1774  * cfzv-r* f   0.0000e+00e
1775  * vol    * r12 4.7800e-01r04 5.8200e-01e
1776  * fa-t   * r12 2.5100e-01r04 5.8200e-01e
1777  * fa-z   * r12 4.4800e-01r04 5.8200e-01e
1778  * fa-r   * r08 2.5100e-01r08 0.0000e+00e
1779  * hd-t   * r12 1.2200e-02r04 1.0000e-01e
1780  * hd-z   * r12 1.2200e-02r04 1.0000e-01e
1781  * hd-r   * r12 1.2200e-02r04 1.0000e-01e
1782  * alpn   * f   0.0000e+00e
1783  * vvn-t  * f   0.0000e+00e
1784  * vvn-z  * f   0.0000e+00e
1785  * vvn-r  * f   0.0000e+00e
1786  * vln-t  *    -2.6806e-02   -5.5915e-02    5.6002e-02    2.7487e-02    1.5874e-02
1787  * vln-t  *     3.3260e-02   -3.2690e-02   -1.4924e-02    8.5211e-02    1.0218e-01
1788  * vln-t  *    -1.0132e-01   -8.4683e-02    7.9028e-02    4.9232e-02   -4.7024e-02
1789  * vln-t  *    -7.7899e-02e
1790  * vln-z  *     2.2544e+00    2.2478e+00    2.2294e+00    2.2476e+00    1.9986e+00
1791  * vln-z  *     1.9905e+00    1.9775e+00    1.9903e+00    1.9339e+00    1.8982e+00
1792  * vln-z  *     1.8682e+00    1.8977e+00   -8.1017e-01   -1.4156e+00   -2.2288e+00
1793  * vln-z  *    -1.4187e+00e
1794  * vln-r  *    -1.2890e-02   -2.9512e-02   -1.1846e-01   -2.9839e-02    2.2231e-02
1795  * vln-r  *     1.0418e-02   -1.4522e-02    1.0231e-02r08 0.0000e+00e
1796  * tvn    * r12 6.1588e+02r04 6.1593e+02e
1797  * tln    *     5.6978e+02    5.6974e+02    5.6947e+02    5.6974e+02    5.6645e+02
1798  * tln    *     5.6657e+02    5.6668e+02    5.6657e+02    5.6121e+02    5.6134e+02
1799  * tln    *     5.6150e+02    5.6134e+02    5.5679e+02    5.5681e+02    5.5683e+02
1800  * tln    *     5.5681e+02e
1801  * pn     * r12 1.5114e+07r04 1.5123e+07e
1802  * pan    * f   0.0000e+00e
1803  *
1804  * level   5
1805  *
1806  * cfzl-t* f   0.0000e+00e
1807  * cfzl-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1808  * cfzl-r* f   0.0000e+00e
1809  * cfzv-t* f   0.0000e+00e
1810  * cfzv-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1811  * cfzv-r* f   0.0000e+00e
1812  * vol    * r12 4.7800e-01r04 5.8200e-01e
1813  * fa-t   * r12 2.5100e-01r04 5.8200e-01e
1814  * fa-z   * r12 4.4800e-01r04 5.8200e-01e
1815  * fa-r   * r08 2.5100e-01r08 0.0000e+00e
1816  * hd-t   * r12 1.2200e-02r04 1.0000e-01e
1817  * hd-z   * r12 1.2200e-02r04 1.0000e-01e
1818  * hd-r   * r12 1.2200e-02r04 1.0000e-01e
1819  * alpn   * f   0.0000e+00e
1820  * vvn-t  * f   0.0000e+00e
1821  * vvn-z  * f   0.0000e+00e
1822  * vvn-r  * f   0.0000e+00e
1823  * vln-t  *    -3.1480e-02   -5.6137e-02    5.5701e-02    3.2615e-02    6.0283e-03
1824  * vln-t  *     1.5968e-02   -1.5928e-02   -4.7640e-03    6.4924e-02    7.7596e-02
1825  * vln-t  *    -7.7184e-02   -6.4171e-02    2.5781e-02    1.1251e-02   -9.1636e-03
1826  * vln-t  *    -2.4435e-02e
1827  * vln-z  *     2.4632e+00    2.4540e+00    2.4275e+00    2.4534e+00    2.0270e+00
1828  * vln-z  *     2.0249e+00    2.0189e+00    2.0240e+00    1.9355e+00    1.9176e+00
1829  * vln-z  *     1.9057e+00    1.9166e+00   -8.2841e-01   -1.4104e+00   -2.2214e+00
1830  * vln-z  *    -1.4132e+00e
1831  * vln-r  *    -1.1121e-02   -3.5199e-02   -1.1882e-01   -3.5999e-02    1.3267e-02
1832  * vln-r  *    -1.6434e-03   -3.0172e-02   -2.0546e-03r08 0.0000e+00e
1833  * tvn    * r12 6.1587e+02r04 6.1592e+02e
1834  * tln    *     5.8185e+02    5.8170e+02    5.8117e+02    5.8170e+02    5.7654e+02
1835  * tln    *     5.7667e+02    5.7664e+02    5.7667e+02    5.6592e+02    5.6606e+02
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1836  * tln   *     5.6628e+02    5.6606e+02    5.5679e+02    5.5681e+02    5.5683e+02
1837  * tln   *     5.5681e+02e
1838  * pn    * r12 1.5111e+07r04 1.5121e+07e
1839  * pan   * f   0.0000e+00e
1840  *
1841  * level   6
1842  *
1843  * cfzl-t* f   0.0000e+00e
1844  * cfzl-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1845  * cfzl-r* f   0.0000e+00e
1846  * cfzv-t* f   0.0000e+00e
1847  * cfzv-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1848  * cfzv-r* f   0.0000e+00e
1849  * vol   * r12 4.7800e-01r04 5.8200e-01e
1850  * fa-t  * r12 2.5100e-01r04 5.8200e-01e
1851  * fa-z  * r12 4.4800e-01r04 5.8200e-01e
1852  * fa-r  * r08 2.5100e-01r08 0.0000e+00e
1853  * hd-t  * r12 1.2200e-02r04 1.0000e-01e
1854  * hd-z  * r12 1.2200e-02r04 1.0000e-01e
1855  * hd-r  * r12 1.2200e-02r04 1.0000e-01e
1856  * alpn  * f   0.0000e+00e
1857  * vvn-t * f   0.0000e+00e
1858  * vvn-z * f   0.0000e+00e
1859  * vvn-r * f   0.0000e+00e
1860  * vln-t *    -3.1128e-02   -5.2830e-02    5.1046e-02    3.3555e-02    1.1336e-03
1861  * vln-t *     5.9665e-03   -7.0632e-03    1.0620e-03    5.1336e-02    6.0335e-02
1862  * vln-t *    -6.0780e-02   -4.9901e-02    8.9383e-06   -6.4053e-03    8.4642e-03
1863  * vln-t *     1.4018e-03e
1864  * vln-z *     2.7114e+00    2.6987e+00    2.6577e+00    2.6959e+00    2.0869e+00
1865  * vln-z *     2.0865e+00    2.0791e+00    2.0842e+00    1.9327e+00    1.9258e+00
1866  * vln-z *     1.9228e+00    1.9233e+00   -8.2790e-01   -1.4080e+00   -2.2268e+00
1867  * vln-z *    -1.4106e+00e
1868  * vln-r *    -1.7302e-02   -4.3322e-02   -1.1782e-01   -4.5137e-02   -8.4701e-04
1869  * vln-r *    -1.5483e-02   -4.2411e-02   -1.6417e-02r08 0.0000e+00e
1870  * tvn   * r12 6.1586e+02r04 6.1591e+02e
1871  * tln   *     5.9337e+02    5.9312e+02    5.9237e+02    5.9310e+02    5.8719e+02
1872  * tln   *     5.8718e+02    5.8688e+02    5.8717e+02    5.7088e+02    5.7105e+02
1873  * tln   *     5.7130e+02    5.7105e+02    5.5679e+02    5.5681e+02    5.5682e+02
1874  * tln   *     5.5681e+02e
1875  * pn    * r12 1.5109e+07r04 1.5120e+07e
1876  * pan   * f   0.0000e+00e
1877  *
1878  * level   7
1879  *
1880  * cfzl-t* f   0.0000e+00e
1881  * cfzl-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1882  * cfzl-r* f   0.0000e+00e
1883  * cfzv-t* f   0.0000e+00e
1884  * cfzv-z* r04 0.0000e+00r08 7.3200e-03r04 0.0000e+00e
1885  * cfzv-r* f   0.0000e+00e
1886  * vol   * r12 4.7800e-01r04 5.8200e-01e
1887  * fa-t  * r12 2.5100e-01r04 5.8200e-01e
1888  * fa-z  * r12 4.4800e-01r04 5.8200e-01e
1889  * fa-r  * r08 2.5100e-01r08 0.0000e+00e
1890  * hd-t  * r12 1.2200e-02r04 1.0000e-01e
1891  * hd-z  * r12 1.2200e-02r04 1.0000e-01e
1892  * hd-r  * r12 1.2200e-02r04 1.0000e-01e
1893  * alpn  * f   0.0000e+00e
1894  * vvn-t * f   0.0000e+00e
1895  * vvn-z * f   0.0000e+00e
1896  * vvn-r * f   0.0000e+00e
1897  * vln-t *    -2.3456e-02   -4.3402e-02    3.7117e-02    3.0121e-02   -1.6681e-04
1898  * vln-t *    -5.7100e-03   -5.3034e-04    7.0916e-03    3.6513e-02    3.7569e-02
1899  * vln-t *    -4.1732e-02   -3.1684e-02   -1.9675e-02   -2.1180e-02    2.3255e-02
1900  * vln-t *     2.1087e-02e
1901  * vln-z *     2.9732e+00    2.9647e+00    2.9288e+00    2.9603e+00    2.2018e+00
1902  * vln-z *     2.2043e+00    2.1734e+00    2.1897e+00    1.9622e+00    1.9696e+00
1903  * vln-z *     1.9581e+00    1.9532e+00   -7.9822e-01   -1.4069e+00   -2.2592e+00
1904  * vln-z *    -1.4090e+00e
1905  * vln-r *     1.7810e-02   -4.5657e-03   -6.9814e-02   -1.2480e-02    1.3560e-02
1906  * vln-r *     1.7434e-03   -2.3706e-02   -2.0846e-03r08 0.0000e+00e
1907  * tvn   * r12 6.1584e+02r04 6.1590e+02e
1908  * tln   *     6.0710e+02    6.0685e+02    6.0582e+02    6.0679e+02    6.0094e+02
1909  * tln   *     6.0086e+02    6.0002e+02    6.0081e+02    5.7830e+02    5.7823e+02
1910  * tln   *     5.7837e+02    5.7814e+02    5.5679e+02r03 5.5681e+02e
1911  * pn    * r12 1.5105e+07r04 1.5117e+07e
1912  * pan   * f   0.0000e+00e
1913  *
1914  * level   8
1915  *
1916  * cfzl-t* f   0.0000e+00e
1917  * cfzl-z* r12 2.0740e-02r04 0.0000e+00e
1918  * cfzl-r* f   0.0000e+00e
1919  * cfzv-t* f   0.0000e+00e
1920  * cfzv-z* r12 2.0740e-02r04 0.0000e+00e
1921  * cfzv-r* f   0.0000e+00e
1922  * vol   * r12 4.7800e-01r04 5.8200e-01e
1923  * fa-t  * r12 2.5100e-01r04 5.8200e-01e
1924  * fa-z  * r12 4.4800e-01r04 5.8200e-01e
1925  * fa-r  * r08 2.5100e-01r08 0.0000e+00e
1926  * hd-t  * r12 1.2200e-02r04 1.0000e-01e
1927  * hd-z  * r12 1.2200e-02r04 1.0000e-01e
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1928  * hd-r   * r12 1.2200e-02r04 1.0000e-01e
1929  * alpn   * f   0.0000e+00e
1930  * vvn-t * f   0.0000e+00e
1931  * vvn-z * f   0.0000e+00e
1932  * vvn-r * f   0.0000e+00e
1933  * vln-t *    -1.3631e-03   -4.0561e-02    1.4807e-02    2.8705e-02    1.6295e-02
1934  * vln-t *    -1.6231e-02   -9.7312e-03    9.6220e-03    4.0035e-02    1.5762e-02
1935  * vln-t *    -3.7754e-02   -1.8586e-02   -5.7963e-02   -5.7641e-02    5.9738e-02
1936  * vln-t *     5.9441e-02e
1937  * vln-z *     2.5676e+00    2.5693e+00    2.5436e+00    2.5594e+00    2.2206e+00
1938  * vln-z *     2.2345e+00    2.2089e+00    2.2142e+00    2.0799e+00    2.1384e+00
1939  * vln-z *     2.0835e+00    2.0710e+00   -7.1272e-01   -1.4072e+00   -2.3447e+00
1940  * vln-z *    -1.4088e+00e
1941  * vln-r *     1.1702e-01    1.2068e-01    5.8034e-02    8.7964e-02    6.0791e-02
1942  * vln-r *     7.2005e-02    2.8084e-02    4.1201e-02r08 0.0000e+00e
1943  * tvn    * r12 6.1581e+02r04 6.1588e+02e
1944  * tln    *     6.1122e+02    6.1097e+02    6.1006e+02    6.1094e+02    6.0557e+02
1945  * tln    *     6.0549e+02    6.0456e+02    6.0538e+02    5.8209e+02    5.8237e+02
1946  * tln    *     5.8124e+02    5.8128e+02    5.5680e+02r03 5.5681e+02e
1947  * pn     * r12 1.5101e+07r04 1.5114e+07e
1948  * pan    * f   0.0000e+00e
1949  *
1950  * level   9
1951  *
1952  * cfzl-t* f   0.0000e+00e
1953  * cfzl-z* r04 0.0000e+00r04 1.4640e-02r04 6.1000e-03r04 0.0000e+00e
1954  * cfzl-r* f   0.0000e+00e
1955  * cfzv-t* f   0.0000e+00e
1956  * cfzv-z* r04 0.0000e+00r04 1.4640e-02r04 6.1000e-03r04 0.0000e+00e
1957  * cfzv-r* f   0.0000e+00e
1958  * vol    * r12 8.8500e-01r04 5.8200e-01e
1959  * fa-t   * r12 3.6600e-01r04 5.8200e-01e
1960  * fa-z   * r04 8.5000e-01r08 3.6600e-01r04 5.8200e-01e
1961  * fa-r   * r08 3.6600e-01r08 0.0000e+00e
1962  * hd-t   * r12 1.2200e-02r04 1.0000e-01e
1963  * hd-z   * r12 1.2200e-02r04 1.0000e-01e
1964  * hd-r   * r12 1.2200e-02r04 1.0000e-01e
1965  * alpn   * f   0.0000e+00e
1966  * vvn-t * f   0.0000e+00e
1967  * vvn-z * f   0.0000e+00e
1968  * vvn-r * f   0.0000e+00e
1969  * vln-t *     6.3277e-02   -5.8776e-02   -3.9144e-02    2.8707e-02    1.0788e-01
1970  * vln-t *    -8.4504e-02   -5.2355e-02    2.3847e-02    1.2406e-01   -8.0710e-02
1971  * vln-t *    -5.1219e-02    9.5716e-04   -1.1101e-01   -1.3477e-01    1.3676e-01
1972  * vln-t *     1.1285e-01e
1973  * vln-z *     2.8877e+00    2.9212e+00    2.8734e+00    2.8751e+00   -4.8695e-06
1974  * vln-z * r02-4.8693e-06   -4.8695e-06    3.6209e+00    4.6080e+00    3.8052e+00
1975  * vln-z *     3.6562e+00   -5.4293e-01   -1.3891e+00   -2.5507e+00   -1.3907e+00
1976  * vln-z * e
1977  * vln-r *    -4.1539e-01   -3.2400e-01   -4.0542e-01   -4.3446e-01    3.0529e-01
1978  * vln-r *     4.4608e-01    3.2508e-01    2.9783e-01r08 0.0000e+00e
1979  * tvn    * r12 6.1578e+02r04 6.1586e+02e
1980  * tln    *     6.0815e+02    6.0825e+02    6.0713e+02    6.0786e+02    6.0557e+02
1981  * tln    *     6.0545e+02    6.0459e+02    6.0538e+02    5.8981e+02    5.9175e+02
1982  * tln    *     5.8922e+02    5.8909e+02    5.5680e+02    5.5681e+02    5.5680e+02
1983  * tln    *     5.5681e+02e
1984  * pn     * r12 1.5095e+07r04 1.5110e+07e
1985  * pan    * f   0.0000e+00e
1986  *
1987  * level  10
1988  *
1989  * cfzl-t* f   0.0000e+00e
1990  * cfzl-z* f   0.0000e+00e
1991  * cfzl-r* f   0.0000e+00e
1992  * cfzv-t* f   0.0000e+00e
1993  * cfzv-z* f   0.0000e+00e
1994  * cfzv-r* f   0.0000e+00e
1995  * vol    * r12 8.8500e-01r04 5.8200e-01e
1996  * fa-t   * r04 8.8500e-01r08 0.0000e+00r04 5.8200e-01e
1997  * fa-z   * r04 8.5000e-01r04 0.0000e+00r04 2.5000e-01r04 5.8200e-01e
1998  * fa-r   * f   0.0000e+00e
1999  * hd-t   * r12 1.2200e-02r04 1.0000e-01e
2000  * hd-z   * r12 1.2200e-02r04 1.0000e-01e
2001  * hd-r   * r12 1.2200e-02r04 1.0000e-01e
2002  * alpn   * f   0.0000e+00e
2003  * vvn-t * f   0.0000e+00e
2004  * vvn-z * f   0.0000e+00e
2005  * vvn-r * f   0.0000e+00e
2006  * vln-t *     3.2279e-03   -2.0280e-02   -8.6477e-03    2.2352e-02r08 0.0000e+00
2007  * vln-t *    -1.7790e-01   -3.6375e-01    3.6531e-01    1.8093e-01e
2008  * vln-z *     3.2822e+00    3.4062e+00    2.6335e+00    2.2357e+00r04 0.0000e+00
2009  * vln-z *     5.3011e+00    6.7463e+00    5.5709e+00    5.3528e+00    2.8054e-01
2010  * vln-z *    -1.1187e+00   -2.7377e+00   -1.1261e+00e
2011  * vln-r * f   0.0000e+00e
2012  * tvn    * r04 6.1572e+02r04 6.1575e+02    6.1571e+02    6.1569e+02r02 6.1571e+02
2013  * tvn    * r04 6.1583e+02e
2014  * tln    * r02 6.0811e+02    6.0717e+02    6.0785e+02r04 5.8306e+02    5.8980e+02
2015  * tln    *     5.9174e+02    5.8921e+02    5.8909e+02    5.5680e+02    5.5681e+02
2016  * tln    *     5.5679e+02    5.5681e+02e
2017  * pn     * r04 1.5083e+07r04 1.5089e+07    1.5082e+07    1.5077e+07    1.5081e+07
2018  * pn     *     1.5082e+07r02 1.5103e+07    1.5102e+07    1.5103e+07e
2019  * pan    * f   0.0000e+00e
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*
* level  11
*
* cfzl-t* f   0.0000e+00e
* cfzl-z* f   0.0000e+00e
* cfzl-r* r08 0.0000e+00r04 2.1396e-03r04 0.0000e+00e
* cfzv-t* f   0.0000e+00e
* cfzv-z* f   0.0000e+00e
* cfzv-r* r08 0.0000e+00r04 2.1396e-03r04 0.0000e+00e
* vol   * r12 8.8500e-01r04 5.8200e-01e
* fa-t  * r12 3.6600e-01r04 5.8200e-01e
* fa-z  * r12 3.6500e-01r04 0.0000e+00e
* fa-r  * r08 3.6600e-01r04 3.3080e-03r04 0.0000e+00e
* hd-t  * r12 1.2200e-02r04 1.0000e-01e
* hd-z  * r12 1.2200e-02r04 1.0000e-01e
* hd-r  * r08 1.2200e-02r04 4.0600e-04r04 1.0000e-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 *     7.7840e-01   -1.8402e+00   -3.6685e-01    1.7351e+00    2.1920e+00
* vln-t *    -3.0550e+00   -6.0309e-02    2.2998e+00    2.4886e+00   -2.7119e+00
* vln-t *    -2.1339e-01    1.0712e+00    1.4053e-01   -1.9377e+00    1.9357e+00
* vln-t *    -1.1112e-01e
* vln-z *    -6.1485e-01    2.0736e-02    3.0618e+00    2.8782e+00   -2.3308e+00
* vln-z *    -2.5757e+00    1.1342e+00    2.4720e+00    7.1120e+00   -5.0676e+00
* vln-z *    -1.3359e+00   -7.7181e-01r04 0.0000e+00e
* vln-r *     2.1288e+00    3.1245e+00   -3.7479e-01   -9.1966e-01    1.7481e+00
* vln-r *     4.1244e+00   -1.5752e+00   -1.9919e+00   -2.9427e+00   -4.9617e+00
* vln-r *    -4.4877e+00   -2.8966e+00r04 0.0000e+00e
* tvn   * r02 6.1566e+02r02 6.1568e+02    6.1565e+02    6.1563e+02r02 6.1568e+02
* tvn   *     6.1566e+02    6.1559e+02r02 6.1568e+02r02 6.1579e+02    6.1582e+02
* tvn   *     6.1579e+02e
* tln   *     6.0176e+02    6.0456e+02    6.0126e+02    5.9479e+02    5.9137e+02
* tln   *     5.9396e+02    5.8696e+02    5.8075e+02    5.8905e+02    5.9129e+02
* tln   *     5.8704e+02    5.8126e+02r02 5.5679e+02    5.5677e+02    5.5679e+02
* tln   * e
* pn    * r02 1.5072e+07    1.5075e+07    1.5076e+07    1.5071e+07    1.5066e+07
* pn    * r02 1.5076e+07    1.5071e+07    1.5058e+07    1.5074e+07    1.5075e+07
* pn    * r02 1.5096e+07    1.5102e+07    1.5096e+07e
* pan   * f   0.0000e+00e
*
* level  12
*
* 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   * r12 8.8500e-01r04 0.0000e+00e
* fa-t  * r12 3.6600e-01r04 0.0000e+00e
* fa-z  * f   0.0000e+00e
* fa-r  * r08 3.6600e-01r08 0.0000e+00e
* hd-t  * r12 1.2200e-02r04 1.0000e-01e
* hd-z  * r12 1.2200e-02r04 1.0000e-01e
* hd-r  * r12 1.2200e-02r04 1.0000e-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 *     5.3248e-01   -2.9955e-01   -5.4123e-01   -1.4318e-02    7.1226e-01
* vln-t *    -4.7252e-01   -3.6279e-01   -9.2121e-02    1.1664e+00   -4.3542e-01
* vln-t *    -2.3238e-01   -1.7027e-01r04 0.0000e+00e
* vln-z * f   0.0000e+00e
* vln-r *    -3.8991e-01    5.3098e-01    3.6142e-01   -1.4026e-01   -7.3318e-01
* vln-r *     3.4704e-01    2.6039e-01    1.3558e-01r08 0.0000e+00e
* tvn   * r12 6.1566e+02r04 6.1560e+02e
* tln   *     5.8905e+02    5.9081e+02    5.9383e+02    5.8929e+02    5.8905e+02
* tln   *     5.8945e+02    5.8803e+02    5.8157e+02    5.8905e+02    5.8894e+02
* tln   *     5.8714e+02    5.8346e+02r04 5.9300e+02e
* pn    * r08 1.5072e+07    1.5073e+07r03 1.5072e+07r04 1.5060e+07e
* pan   * f   0.0000e+00e
*
*******   type          num           id        ctitle
rod           831      831 $831$ stgen tubes
*          ncrx         ncrz         ittc         iext          mld
                1            8            0            0            0
*        nopowr        nridr        modez        liqlev       iaxcnd
                1            0            1            0            0
*         idbci        idbco        hdri         hdro
                2            2    1.0211e-02   6.3500e-03
*         nrods        nodes        irftr        nzmax        irftr2
                1            4            0            9            0
*      dtxht(1)     dtxht(2)     dznht        hgapo        shelv
              3.0         10.0          0.1          0.0          0.0

* nhcomi* f          2e
* nhceli*           -2            2            3            4            5
* nhceli*            6            7            8            9           10
* nhceli* e
* nhcomo* f         20e
```

```
* nhcelo*              -1              1              2              3              4
* nhcelo*              -4             -3             -2             -1             -1
* nhcelo* e
* dz    * r08 5.6895e-01e
* grav  * r04        1.0r04       -1.0e
*     the value of rdx below preserves the total tube area in the original stgen
*     component.  The actual number of tubes appears to be 1845 with varying
*     lengths.
* rdx   *       1857.353e
* radrd *    5.10540e-03   5.52027e-03   5.93513e-03   6.35000e-03e
* matrd * f            12e
* nfax  * f             0e
* rftn  *     5.8005e+02    5.7354e+02    5.6747e+02    5.6178e+02    5.6891e+02
* rftn  *     5.6240e+02    5.5633e+02    5.5064e+02    5.6525e+02    5.5982e+02
* rftn  *     5.5477e+02    5.5004e+02    5.6225e+02    5.5777e+02    5.5360e+02
* rftn  *     5.4970e+02    5.5974e+02    5.5605e+02    5.5261e+02    5.4940e+02
* rftn  *     5.5753e+02    5.5446e+02    5.5160e+02    5.4892e+02    5.5559e+02
* rftn  *     5.5301e+02    5.5061e+02    5.4836e+02    5.5397e+02    5.5181e+02
* rftn  *     5.4980e+02    5.4793e+02    5.5265e+02    5.5086e+02    5.4919e+02
* rftn  *     5.4764e+02e
*
*******   type           num            id        ctitle
rod           833      833 $833$ stgen inlet plenum
*          ncrx           ncrz          ittc          iext           mld
                1              1             0             0             0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1              0             1             0             0
*         idbci         idbco          hdri          hdro
                2              1    2.5630e-01           1.0
*           tlo           tvo           hlo           hvo
            300.0         300.0           0.0           1.6
*         nrods         nodes         irftr         nzmax        irftr2
                1              4             0             2             0
*     dtxht(1)      dtxht(2)          dznht         hgapo         shelv
              3.0          10.0           0.1           0.0           0.0

* nhcomi* r03          2e
* nhceli*             -1             1             2e
* dz    *     9.6360e-01e
* grav  *     8.4487e-01e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 9, 1.3886 m^2)
* rdx   *       0.334428e
* radrd *     6.8580e-01    7.1543e-01    7.4507e-01    7.7470e-01e
* matrd * f             9e
* nfax  *              0e
* rftn  *     5.9118e+02    5.9056e+02    5.8996e+02    5.8939e+02    5.9118e+02
* rftn  *     5.9056e+02    5.8996e+02    5.8939e+02e
*
*******   type           num            id        ctitle
rod           834      834 $834$ stgen outlet plenum
*          ncrx           ncrz          ittc          iext           mld
                1              1             0             0             0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1              0             1             0             0
*         idbci         idbco          hdri          hdro
                2              1    2.5600e-01           1.0
*           tlo           tvo           hlo           hvo
            300.0         300.0           0.0           1.6
*         nrods         nodes         irftr         nzmax        irftr2
                1              4             0             2             0
*     dtxht(1)      dtxht(2)          dznht         hgapo         shelv
              3.0          10.0           0.1           0.0           0.0

* nhcomi* r02          2             3e
* nhceli*            -10            10            -9e
* dz    *     9.6360e-01e
* grav  *    -8.5580e-01e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 12, 1.3886 m^2)
* rdx   *       0.334428e
* radrd *     6.8580e-01    7.1543e-01    7.4507e-01    7.7470e-01e
* matrd * f             9e
* nfax  *              0e
* rftn  *     5.5679e+02    5.5621e+02    5.5569e+02    5.5521e+02    5.5679e+02
* rftn  *     5.5621e+02    5.5569e+02    5.5521e+02e
*
*******   type           num            id        ctitle
rod           835      835 $835$ stgen inlet tubesheet
*          ncrx           ncrz          ittc          iext           mld
                1              1             0             0             0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1              0             1             0             0
*         idbci         idbco          hdri          hdro
                2              1    1.0211e-02           1.0
*           tlo           tvo           hlo           hvo
            300.0         300.0           0.0           1.6
*         nrods         nodes         irftr         nzmax        irftr2
                1              4             0             2             0
*     dtxht(1)      dtxht(2)          dznht         hgapo         shelv
              3.0          10.0           0.1           0.0           0.0
```

```
* nhcomi* r03          2e
* nhceli*             -1             1             2e
* dz    *     9.6360e-01e
* grav  *     8.4487e-01e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 10, 17.288 m^2)
* rdx   *       559.292e
* radrd *     5.1054e-03    7.1669e-03    9.2283e-03    1.1290e-02e
* matrd * f            9e
* nfax  *             0e
* rftn  *     5.9113e+02    5.9106e+02    5.9100e+02    5.9096e+02    5.9113e+02
* rftn  *     5.9106e+02    5.9100e+02    5.9096e+02e
*
*******   type           num            id        ctitle
rod           836      836 $836$ stgen outlet tubesheet
*          ncrx          ncrz          ittc          iext          mld
                1             1             0             0            0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1             0             1             0            0
*         idbci         idbco          hdri          hdro
                2             1    1.0211e-02           1.0
*           tlo           tvo           hlo           hvo
            300.0         300.0           0.0           1.6
*         nrods         nodes         irftr         nzmax        irftr2
                1             4             0             2            0
*      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              3.0          10.0           0.1           0.0          0.0

* nhcomi* r02          2             3e
* nhceli*            -10            10            -9e
* dz    *     9.6360e-01e
* grav  *    -8.5580e-01e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 13, 17.288 m^2)
* rdx   *       559.292e
* radrd *     5.1054e-03    7.1669e-03    9.2283e-03    1.1290e-02e
* matrd * f            9e
* nfax  *             0e
* rftn  *     5.5675e+02    5.5669e+02    5.5664e+02    5.5661e+02    5.5675e+02
* rftn  *     5.5669e+02    5.5664e+02    5.5661e+02e
*
*******   type           num            id        ctitle
slab          837      837 $837$ stgen plenum partition
*          ncrx          ncrz          ittc          iext          mld
                1             1             0             0            0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1             0             1             0            0
*         idbci         idbco          hdri          hdro
                2             2    2.5630e-01    2.5600e-01
*         width        ipatch
     7.6669e-01             0
*         nrods         nodes         irftr         nzmax        irftr2
                1             4             0             9            0
*      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              3.0          10.0           0.1           0.0          0.0

* nhcomi* r03          2e
* nhceli*             -1             1             2e
* nhcomo* r03          2e
* nhcelo*             10           -10            -9e
* dz    *     9.6360e-01e
* grav  *     8.4487e-01e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 11, 0.73878 m^2)
* rdx   *            1.0e
* radrd *            0.0    1.0583e-02    2.1167e-02    3.1750e-02e
* matrd * f            6e
* nfax  *             0e
* rftn  *     5.9035e+02    5.7956e+02    5.6869e+02    5.5774e+02    5.9035e+02
* rftn  *     5.7956e+02    5.6869e+02    5.5774e+02e
*
*******   type           num            id        ctitle
rod           838      838 $838$ stgen downcomer wall 1
*          ncrx          ncrz          ittc          iext          mld
                1             1             0             0            0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1             0             1             0            0
*         idbci         idbco          hdri          hdro
                2             2    6.3500e-03    1.0160e-01
*         nrods         nodes         irftr         nzmax        irftr2
                1             4             0             2            0
*      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              3.0          10.0           0.1           0.0          0.0

* nhcomi* r03         20e
* nhceli*             -1             1             2e
* nhcomo* r03         22e
* nhcelo*              6            -6            -5e
* dz    *     5.6895e-01e
* grav  *           0.5e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 14, 2.3041 m^2)
```

```
* rdx   *            1.0e
* radrd *     6.4453e-01    6.4876e-01    6.5300e-01    6.5723e-01e
* matrd * f            6e
* nfax  *            0e
* rftn  *     5.3971e+02    5.3571e+02    5.3171e+02    5.2772e+02    5.3971e+02
* rftn  *     5.3571e+02    5.3171e+02    5.2772e+02e
*
*******   type          num          id        ctitle
rod           839      839 $839$ stgen downcomer wall 2
*          ncrx          ncrz          ittc          iext          mld
              1             1             0             0            0
*        nopowr          nridr         modez        liqlev        iaxcnd
              1             0             1             0            0
*         idbci          idbco          hdri          hdro
              2             2    6.3500e-03    1.0160e-01
*         nrods          nodes         irftr         nzmax        irftr2
              1             4             0             2            0
*     dtxht(1)       dtxht(2)         dznht         hgapo         shelv
            3.0           10.0           0.1           0.0           0.0

* nhcomi* r03          20e
* nhceli*              -2             2             3e
* nhcomo* r03          22e
* nhcelo*               5            -5            -4e
* dz    *     5.6895e-01e
* grav  *            1.0e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 15, 2.3041 m^2)
* rdx   *            1.0e
* radrd *     6.4453e-01    6.4876e-01    6.5300e-01    6.5723e-01e
* matrd * f            6e
* nfax  *            0e
* rftn  *     5.3901e+02    5.3528e+02    5.3157e+02    5.2786e+02    5.3901e+02
* rftn  *     5.3528e+02    5.3157e+02    5.2786e+02e
*
*******   type          num          id        ctitle
rod           840      840 $840$ stgen downcomer wall 3
*          ncrx          ncrz          ittc          iext          mld
              1             1             0             0            0
*        nopowr          nridr         modez        liqlev        iaxcnd
              1             0             1             0            0
*         idbci          idbco          hdri          hdro
              2             2    6.3500e-03    1.0160e-01
*         nrods          nodes         irftr         nzmax        irftr2
              1             4             0             2            0
*     dtxht(1)       dtxht(2)         dznht         hgapo         shelv
            3.0           10.0           0.1           0.0           0.0

* nhcomi* r03          20e
* nhceli*              -3             3             4e
* nhcomo* r03          22e
* nhcelo*               5            -5            -4e
* dz    *     5.6895e-01e
* grav  *            1.0e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 16, 2.3041 m^2)
* rdx   *            1.0e
* radrd *     6.4453e-01    6.4876e-01    6.5300e-01    6.5723e-01e
* matrd * f            6e
* nfax  *            0e
* rftn  *     5.3970e+02    5.3582e+02    5.3194e+02    5.2807e+02    5.3970e+02
* rftn  *     5.3582e+02    5.3194e+02    5.2807e+02e
*
*******   type          num          id        ctitle
rod           841      841 $841$ stgen downcomer wall 4
*          ncrx          ncrz          ittc          iext          mld
              1             1             0             0            0
*        nopowr          nridr         modez        liqlev        iaxcnd
              1             0             1             0            0
*         idbci          idbco          hdri          hdro
              2             2    6.3500e-03    1.0160e-01
*         nrods          nodes         irftr         nzmax        irftr2
              1             4             0             2            0
*     dtxht(1)       dtxht(2)         dznht         hgapo         shelv
            3.0           10.0           0.1           0.0           0.0

* nhcomi* r03          20e
* nhceli*              -4             4             5e
* nhcomo* r03          22e
* nhcelo*               5            -5            -4e
* dz    *     5.6895e-01e
* grav  *            1.0e
*     the value of rdx below preserves the total area in the original stgen
*     component (slab 17, 2.3041 m^2)
* rdx   *            1.0e
* radrd *     6.4453e-01    6.4876e-01    6.5300e-01    6.5723e-01e
* matrd * f            6e
* nfax  *            0e
* rftn  *     5.3944e+02    5.3561e+02    5.3180e+02    5.2799e+02    5.3944e+02
* rftn  *     5.3561e+02    5.3180e+02    5.2799e+02e
*
*******   type          num          id        ctitle
```

```
2388  rod           842      842 $842$ stgen downcomer wall 5
2389  *         ncrx          ncrz          ittc          iext          mld
2390                1             1             0             0            0
2391  *       nopowr         nridr         modez         liqlev       iaxcnd
2392                1             0             1             0            0
2393  *        idbci         idbco          hdri          hdro
2394                2             2    1.0691e+00    1.0160e-01
2395  *        nrods         nodes         irftr         nzmax        irftr2
2396                1             4             0             2            0
2397  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2398             3.0          10.0           0.1           0.0           0.0
2399
2400  * nhcomi* r02          20            21e
2401  * nhceli*              -5             5             1e
2402  * nhcomo* r03          22e
2403  * nhcelo*               4            -4            -3e
2404  * dz    *     2.4700e-01e
2405  * grav  *           1.0e
2406  *     the value of rdx below preserves the total area in the original stgen
2407  *     component (slab 18, 0.88693 m^2)
2408  * rdx   *           1.0e
2409  * radrd *     5.7150e-01    5.7573e-01    5.7997e-01    5.8420e-01e
2410  * matrd * f           6e
2411  * nfax  *            0e
2412  * rftn  *     5.3640e+02    5.3373e+02    5.3106e+02    5.2839e+02    5.3640e+02
2413  * rftn  *     5.3373e+02    5.3106e+02    5.2839e+02e
2414  *
2415  *******   type          num           id        ctitle
2416  rod           843      843 $843$ stgen downcomer wall 6
2417  *         ncrx          ncrz          ittc          iext          mld
2418                1             1             0             0            0
2419  *       nopowr         nridr         modez         liqlev       iaxcnd
2420                1             0             1             0            0
2421  *        idbci         idbco          hdri          hdro
2422                2             2    1.0691e+00    1.0160e-01
2423  *        nrods         nodes         irftr         nzmax        irftr2
2424                1             4             0             2            0
2425  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2426             3.0          10.0           0.1           0.0           0.0
2427
2428  * nhcomi* r02          20            21e
2429  * nhceli*              -5             5             1e
2430  * nhcomo* r03          22e
2431  * nhcelo*               3            -3            -2e
2432  * dz    *     2.4700e-01e
2433  * grav  *           1.0e
2434  *     the value of rdx below preserves the total area in the original stgen
2435  *     component (slab 19, 0.88693 m^2)
2436  * rdx   *           1.0e
2437  * radrd *     5.7150e-01    5.7573e-01    5.7997e-01    5.8420e-01e
2438  * matrd * f           6e
2439  * nfax  *            0e
2440  * rftn  *     5.3640e+02    5.3373e+02    5.3106e+02    5.2839e+02    5.3640e+02
2441  * rftn  *     5.3373e+02    5.3106e+02    5.2839e+02e
2442  *
2443  *******   type          num           id        ctitle
2444  rod           844      844 $844$ stgen downcomer wall 7
2445  *         ncrx          ncrz          ittc          iext          mld
2446                1             1             0             0            0
2447  *       nopowr         nridr         modez         liqlev       iaxcnd
2448                1             0             1             0            0
2449  *        idbci         idbco          hdri          hdro
2450                2             2    1.0691e+00    1.0160e-01
2451  *        nrods         nodes         irftr         nzmax        irftr2
2452                1             4             0             2            0
2453  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2454             3.0          10.0           0.1           0.0           0.0
2455
2456  * nhcomi* r02          20            21e
2457  * nhceli*              -5             5             1e
2458  * nhcomo* r03          22e
2459  * nhcelo*               2            -2            -1e
2460  * dz    *     2.4700e-01e
2461  * grav  *           1.0e
2462  *     the value of rdx below preserves the total area in the original stgen
2463  *     component (slab 20, 0.88693 m^2)
2464  * rdx   *           1.0e
2465  * radrd *     5.7150e-01    5.7573e-01    5.7997e-01    5.8420e-01e
2466  * matrd * f           6e
2467  * nfax  *            0e
2468  * rftn  *     5.3640e+02    5.3373e+02    5.3106e+02    5.2839e+02    5.3640e+02
2469  * rftn  *     5.3373e+02    5.3106e+02    5.2839e+02e
2470  *
2471  *******   type          num           id        ctitle
2472  rod           845      845 $845$ stgen downcomer wall 8
2473  *         ncrx          ncrz          ittc          iext          mld
2474                1             1             0             0            0
2475  *       nopowr         nridr         modez         liqlev       iaxcnd
2476                1             0             1             0            0
2477  *        idbci         idbco          hdri          hdro
2478                2             2    1.0691e+00    1.0160e-01
2479  *        nrods         nodes         irftr         nzmax        irftr2
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2480              1              4              0              2              0
2481  *     dtxht(1)       dtxht(2)         dznht          hgapo          shelv
2482            3.0           10.0            0.1            0.0            0.0
2483
2484  * nhcomi* r02          20             21e
2485  * nhceli*              -5              5             1e
2486  * nhcomo* r02          22             21e
2487  * nhcelo*               1             -1            -6e
2488  * dz     *     7.4100e-01e
2489  * grav   *           1.0e
2490  *     the value of rdx below preserves the total area in the original stgen
2491  *     component (slab 21, 2.8483 m^2)
2492  * rdx    *           1.0705e
2493  * radrd *     5.7150e-01    5.7573e-01    5.7997e-01    5.8420e-01e
2494  * matrd * f             6e
2495  * nfax  *              0e
2496  * rftn  *     5.4451e+02    5.4449e+02    5.4446e+02    5.4442e+02    5.4451e+02
2497  * rftn  *     5.4449e+02    5.4446e+02    5.4442e+02e
2498  *
2499  *******   type           num            id        ctitle
2500  rod            846      846 $846$ stgen shell 1
2501  *           ncrx          ncrz          ittc          iext          mld
2502                 1             6             0             0            0
2503  *         nopowr         nridr         modez        liqlev        iaxcnd
2504                 1             0             1             0            0
2505  *          idbci         idbco          hdri          hdro
2506                 2             1    2.5400e-01           1.0
2507  *            tlo           tvo           hlo           hvo
2508             300.0         300.0           0.0           1.6
2509  *          nrods         nodes         irftr         nzmax        irftr2
2510                 1             4             0             2            0
2511  *     dtxht(1)       dtxht(2)         dznht          hgapo          shelv
2512            3.0           10.0            0.1            0.0            0.0
2513
2514  * nhcomi* r07          22             20e
2515  * nhceli*              -1              1             2             3             4
2516  * nhceli*               5              6             1e
2517  * dz     *     7.4100e-01r03 2.4700e-01    1.7069e+00    5.6895e-01e
2518  * grav   * f          -1.0e
2519  *     the value of rdx below preserves the total shell area in the original stgen
2520  *     component (slabs 22-29, 25.070 m^2) of heat structure components 846-848.
2521  * rdx    *            1.0e
2522  * radrd *     7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
2523  * matrd * f             9e
2524  * nfax  * f             0e
2525  * rftn  *     5.4339e+02    5.4310e+02    5.4282e+02    5.4254e+02    5.4339e+02
2526  * rftn  *     5.4310e+02    5.4282e+02    5.4254e+02    5.2261e+02    5.2231e+02
2527  * rftn  *     5.2203e+02    5.2177e+02    5.2261e+02    5.2231e+02    5.2203e+02
2528  * rftn  *     5.2177e+02    5.2261e+02    5.2231e+02    5.2203e+02    5.2177e+02
2529  * rftn  *     5.2298e+02    5.2271e+02    5.2245e+02    5.2221e+02    5.2310e+02
2530  * rftn  *     5.2284e+02    5.2259e+02    5.2234e+02e
2531  *
2532  *******   type           num            id        ctitle
2533  rod            847      847 $847$ stgen shell 2
2534  *           ncrx          ncrz          ittc          iext          mld
2535                 1             1             0             0            0
2536  *         nopowr         nridr         modez        liqlev        iaxcnd
2537                 1             0             1             0            0
2538  *          idbci         idbco          hdri          hdro
2539                 2             1    1.0691e+00           1.0
2540  *            tlo           tvo           hlo           hvo
2541             300.0         300.0           0.0           1.6
2542  *          nrods         nodes         irftr         nzmax        irftr2
2543                 1             4             0             2            0
2544  *     dtxht(1)       dtxht(2)         dznht          hgapo          shelv
2545            3.0           10.0            0.1            0.0            0.0
2546
2547  * nhcomi* r02          21             23e
2548  * nhceli*              -4              4             1e
2549  * dz     *     1.1115e+00e
2550  * grav   * f          -1.0e
2551  *     the value of rdx below preserves the total shell area in the original stgen
2552  *     component (slabs 22-29, 25.070 m^2) of heat structure components 846-848.
2553  * rdx    *            1.0e
2554  * radrd *     7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
2555  * matrd * f             9e
2556  * nfax  *              0e
2557  * rftn  *     5.4453e+02    5.4426e+02    5.4396e+02    5.4367e+02    5.4453e+02
2558  * rftn  *     5.4426e+02    5.4396e+02    5.4367e+02e
2559  *
2560  *******   type           num            id        ctitle
2561  rod            848      848 $848$ stgen shell 3
2562  *           ncrx          ncrz          ittc          iext          mld
2563                 1             1             0             0            0
2564  *         nopowr         nridr         modez        liqlev        iaxcnd
2565                 1             0             1             0            0
2566  *          idbci         idbco          hdri          hdro
2567                 2             1    2.5400e-01           1.0
2568  *            tlo           tvo           hlo           hvo
2569             300.0         300.0           0.0           1.6
2570  *          nrods         nodes         irftr         nzmax        irftr2
2571                 1             4             0             2            0
```

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2572  *     dtxht(1)      dtxht(2)         dznht          hgapo          shelv
2573              3.0          10.0           0.1            0.0            0.0
2574
2575  * nhcomi* r02          21             22e
2576  * nhceli*              -6              6             1e
2577  * dz     *     7.4100e-01e
2578  * grav   * f          -1.0e
2579  *     the value of rdx below preserves the total shell area in the original stgen
2580  *     component (slabs 22-29, 25.070 m^2) of heat structure components 846-848.
2581  * rdx    *             1.0e
2582  * radrd  *     7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
2583  * matrd  * f            9e
2584  * nfax   *              0e
2585  * rftn   *     5.4389e+02    5.4358e+02    5.4329e+02    5.4301e+02    5.4389e+02
2586  * rftn   *     5.4358e+02    5.4329e+02    5.4301e+02e
2587  *
2588  *******   type           num            id        ctitle
2589  slab           851      851   $851$ level 1 slabs
2590  *          ncrx           ncrz          ittc          iext           mld
2591                16              1             0             0             0
2592  *        nopowr          nridr         modez        liqlev        iaxcnd
2593                 1              1             0             0             0
2594  *         idbci          idbco          hdri          hdro
2595                 0              2    0.0000e+00    0.0000e+00
2596  *         width         ipatch
2597     1.3876e-02              0
2598  *         nrods          nodes         irftr         nzmax
2599                16              4             0             5
2600  *      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
2601     3.0000e+00     1.0000e+01     1.0000e-03    0.0000e+00    0.0000e+00
2602  *
2603  * nhcomo* f            50e
2604  * nhcelo*              -1              1             2e
2605  * z      *     0.0000e+00    6.2700e-01e
2606  * grav   * f    1.0000e+00e
2607  *          +              +             +             +             +
2608  * idrod  *              1              2             3            4s
2609  * idrod  *              5              6             7            8s
2610  * idrod  *              9             10            11           12s
2611  * idrod  *             13             14            15           16e
2612  * rdx    * r4       1.0000r4       3.8275r4       4.9539r4     125.9729e
2613  * radrd  *     0.0000e+00    7.5000e-02    8.5000e-02    9.2000e-02e
2614  * matrd  * f            6e
2615  * nfax   * f            1e
2616  * rftn   * f    5.5680e+02e
2617  * rftn   * f    5.5680e+02e
2618  * rftn   * f    5.5680e+02e
2619  * rftn   * f    5.5680e+02e
2620  * rftn   * f    5.5680e+02e
2621  * rftn   * f    5.5680e+02e
2622  * rftn   * f    5.5680e+02e
2623  * rftn   * f    5.5680e+02e
2624  * rftn   * f    5.5680e+02e
2625  * rftn   * f    5.5680e+02e
2626  * rftn   * f    5.5680e+02e
2627  * rftn   * f    5.5680e+02e
2628  * rftn   * f    5.5680e+02e
2629  * rftn   * f    5.5680e+02e
2630  * rftn   * f    5.5680e+02e
2631  * rftn   * f    5.5680e+02e
2632  *
2633  *******   type           num            id        ctitle
2634  slab           852      852   $852$ level 2 slabs
2635  *          ncrx           ncrz          ittc          iext           mld
2636                 4              1             0             0             0
2637  *        nopowr          nridr         modez        liqlev        iaxcnd
2638                 1              1             0             0             0
2639  *         idbci          idbco          hdri          hdro
2640                 0              2    0.0000e+00    0.0000e+00
2641  *         width         ipatch
2642     3.0240e+00              0
2643  *         nrods          nodes         irftr         nzmax
2644                 4              4             0             5
2645  *      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
2646     3.0000e+00     1.0000e+01     1.0000e-03    0.0000e+00    0.0000e+00
2647  *
2648  * nhcomo* f            50e
2649  * nhcelo*              -2              2             3e
2650  * z      *            .627           .727e
2651  * grav   * f    1.0000e+00e
2652  *          +              +             +             +             +
2653  * idrod  *             13             14            15           16e
2654  * rdx    * r4       1.0000e
2655  * radrd  *     0.0000e+00    7.5000e-02    8.5000e-02    9.2000e-02e
2656  * matrd  * f            6e
2657  * nfax   * f            1e
2658  * rftn   * f    5.5680e+02e
2659  * rftn   * f    5.5680e+02e
2660  * rftn   * f    5.5680e+02e
2661  * rftn   * f    5.5680e+02e
2662  *
2663  *******   type           num            id        ctitle
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slab           853      853 $853$ level 3 cells 1-12 slabs
*          ncrx           ncrz           ittc           iext           mld
             12              1              0              0             0
*        nopowr          nridr          modez         liqlev         iaxcnd
              1              1              0              0             0
*         idbci          idbco          hdri           hdro
              0              2    0.0000e+00     0.0000e+00
*         width         ipatch
     2.5739e-01              0
*         nrods          nodes         irftr          nzmax
             12              4              0              5
*      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
     3.0000e+00     1.0000e+01     1.0000e-03     0.0000e+00     0.0000e+00
*
* nhcomo* f   ,          50e
* nhcelo*                -3              3              4e
* z      *              .727          1.248e
* grav   * f    1.0000e+00e
*        +               +              +              +              +
* idrod  *               1              2              3             4s
* idrod  *               5              6              7             8s
* idrod  *               9             10             11            12e
* rdx    * r4       1.0000r4       3.8404r4       4.9784e
* radrd  *      0.0000e+00     5.0000e-03     1.0000e-02     1.5300e-02e
* matrd  * f             6e
* nfax   * f             1e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
*
*******    type           num            id         ctitle
slab           854      854 $854$ level 3 cells 13-16 slabs
*          ncrx           ncrz           ittc           iext           mld
             4              1              0              0             0
*        nopowr          nridr          modez         liqlev         iaxcnd
              1              1              0              0             0
*         idbci          idbco          hdri           hdro
              0              2    0.0000e+00     0.0000e+00
*         width         ipatch
     4.0704e+00              0
*         nrods          nodes         irftr          nzmax
              4              4              0              5
*      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
     3.0000e+00     1.0000e+01     1.0000e-03     0.0000e+00     0.0000e+00
*
* nhcomo* f             50e
* nhcelo*               -3              3              4e
* z      *             .727          1.248e
* grav   * f    1.0000e+00e
*        +               +              +              +              +
* idrod  *              13             14             15             16e
* rdx    * r4       1.0000e
* radrd  *      0.0000e+00     2.5000e-02     3.5000e-02     4.0000e-02e
* matrd  * f             6e
* nfax   * f             1e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
* rftn   * f    5.5680e+02e
*
*******    type           num            id         ctitle
slab           855      855 $855$ level 4 cells 9-12 slabs
*          ncrx           ncrz           ittc           iext           mld
             4              1              0              0             0
*        nopowr          nridr          modez         liqlev         iaxcnd
              1              1              0              0             0
*         idbci          idbco          hdri           hdro
              0              2    0.0000e+00     0.0000e+00
*         width         ipatch
     5.5836e-01              0
*         nrods          nodes         irftr          nzmax
              4              4              0              5
*      dtxht(1)       dtxht(2)         dznht          hgapo          shelv
     3.0000e+00     1.0000e+01     1.0000e-03     0.0000e+00     0.0000e+00
*
* nhcomo* f             50e
* nhcelo*               -4              4              5e
* z      *            1.248          1.553e
* grav   * f    1.0000e+00e
*        +               +              +              +              +
* idrod  *               9             10             11            12e
* rdx    * r4   1.0000e+00e
* radrd  *      0.0000e+00     5.0000e-02     6.0000e-02     6.6500e-02e
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2756  * matrd * f            6e
2757  * nfax  * f            1e
2758  * rftn  * f    5.6980e+02e
2759  * rftn  * f    5.6980e+02e
2760  * rftn  * f    5.6980e+02e
2761  * rftn  * f    5.6980e+02e
2762  *
2763  *******   type           num            id        ctitle
2764  slab           856      856 $856$ lev 4 & 5 cell 13-16 slabs
2765  *          ncrx           ncrz          ittc          iext          mld
2766                4              2             0             0            0
2767  *        nopowr          nridr         modez        liqlev        iaxcnd
2768                1              1             0             0            0
2769  *         idbci          idbco          hdri          hdro
2770                0              2    0.0000e+00    0.0000e+00
2771  *         width         ipatch
2772      4.0689e+00              0
2773  *         nrods          nodes         irftr         nzmax
2774                4              4             0             5
2775  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
2776      3.0000e+00     1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
2777  *
2778  * nhcomo* f            50e
2779  * nhcelo*              -4             4             5             6e
2780  * z     *           1.248         1.553         1.781e
2781  * grav  * f    1.0000e+00e
2782  *       +              +             +             +             +
2783  * idrod *             13            14            15            16e
2784  * rdx   * r4   1.0000e+00e
2785  * radrd *      0.0000e+00    2.5000e-02    3.5000e-02    4.0000e-02e
2786  * matrd * f            6e
2787  * nfax  * f            1e
2788  *       +              +             +             +             +
2789  * rftn  * r4        569.8r4       575.8r4       581.8e
2790  * rftn  * r4        569.8r4       575.8r4       581.8e
2791  * rftn  * r4        569.8r4       575.8r4       581.8e
2792  * rftn  * r4        569.8r4       575.8r4       581.8e
2793  *
2794  *******   type           num            id        ctitle
2795  slab           857      857 $857$ level 5 cells 9-12 slabs
2796  *          ncrx           ncrz          ittc          iext          mld
2797                4              1             0             0            0
2798  *        nopowr          nridr         modez        liqlev        iaxcnd
2799                1              1             0             0            0
2800  *         idbci          idbco          hdri          hdro
2801                0              2    0.0000e+00    0.0000e+00
2802  *         width         ipatch
2803      5.5833e-01              0
2804  *         nrods          nodes         irftr         nzmax
2805                4              4             0             5
2806  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
2807      3.0000e+00     1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
2808  *
2809  * nhcomo* f            50e
2810  * nhcelo*              -5             5             6e
2811  * z     *           1.553         1.781e
2812  * grav  * f    1.0000e+00e
2813  *       +              +             +             +             +
2814  * idrod *              9            10            11            12e
2815  * rdx   * r4   1.0000e+00e
2816  * radrd *      0.0000e+00    5.0000e-02    6.0000e-02    6.6500e-02e
2817  * matrd * f            6e
2818  * nfax  * f            1e
2819  * rftn  * f    5.8180e+02e
2820  * rftn  * f    5.8180e+02e
2821  * rftn  * f    5.8180e+02e
2822  * rftn  * f    5.8180e+02e
2823  *
2824  *******   type           num            id        ctitle
2825  slab           858      858 $858$ level 6 cells 9-12 slabs
2826  *          ncrx           ncrz          ittc          iext          mld
2827                4              1             0             0            0
2828  *        nopowr          nridr         modez        liqlev        iaxcnd
2829                1              1             0             0            0
2830  *         idbci          idbco          hdri          hdro
2831                0              2    0.0000e+00    0.0000e+00
2832  *         width         ipatch
2833      5.5852e-01              0
2834  *         nrods          nodes         irftr         nzmax
2835                4              4             0             5
2836  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
2837      3.0000e+00     1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
2838  *
2839  * nhcomo* f            50e
2840  * nhcelo*              -6             6             7e
2841  * z     *           1.781         2.01e
2842  * grav  * f    1.0000e+00e
2843  *       +              +             +             +             +
2844  * idrod *              9            10            11            12e
2845  * rdx   * r4   1.0000e+00e
2846  * radrd *      0.0000e+00    5.0000e-02    6.0000e-02    6.6500e-02e
2847  * matrd * f            6e
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2848  * nfax  * f            1e
2849  * rftn  * f    5.9340e+02e
2850  * rftn  * f    5.9340e+02e
2851  * rftn  * f    5.9340e+02e
2852  * rftn  * f    5.9340e+02e
2853  *
2854  *******   type           num           id        ctitle
2855  slab           859       859 $859$ level 6 cells 13-16 slabs
2856  *          ncrx          ncrz          ittc          iext          mld
2857                4             1             0             0            0
2858  *        nopowr         nridr         modez        liqlev        iaxcnd
2859                1             1             0             0            0
2860  *         idbci         idbco          hdri          hdro
2861                0             2    0.0000e+00    0.0000e+00
2862  *         width        ipatch
2863      4.0528e+00             0
2864  *         nrods         nodes         irftr         nzmax
2865                4             4             0             5
2866  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2867      3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
2868  *
2869  * nhcomo* f            50e
2870  * nhcelo*              -6             6             7e
2871  * z     *           1.781          2.01e
2872  * grav  * f    1.0000e+00e
2873  *       +              +             +             +             +
2874  * idrod *             13            14            15            16e
2875  * rdx   * r4   1.0000e+00e
2876  * radrd *      0.0000e+00    2.5000e-02    3.5000e-02    4.0000e-02e
2877  * matrd * f             6e
2878  * nfax  * f             1e
2879  * rftn  * f    5.9340e+02e
2880  * rftn  * f    5.9340e+02e
2881  * rftn  * f    5.9340e+02e
2882  * rftn  * f    5.9340e+02e
2883  *
2884  *******   type           num           id        ctitle
2885  slab           860       860 $860$ levels 7 & 8 cell 9-12 slabs
2886  *          ncrx          ncrz          ittc          iext          mld
2887                4             2             0             0            0
2888  *        nopowr         nridr         modez        liqlev        iaxcnd
2889                1             1             0             0            0
2890  *         idbci         idbco          hdri          hdro
2891                0             2    0.0000e+00    0.0000e+00
2892  *         width        ipatch
2893      5.5842e-01             0
2894  *         nrods         nodes         irftr         nzmax
2895                4             4             0             5
2896  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2897      3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
2898  *
2899  * nhcomo* f            50e
2900  * nhcelo*              -7             7             8             9e
2901  * z     *           2.01         2.467         2.924e
2902  * grav  * f    1.0000e+00e
2903  *       +              +             +             +             +
2904  * idrod *             9            10            11            12e
2905  * rdx   * r4   1.0000e+00e
2906  * radrd *      0.0000e+00    5.0000e-02    6.0000e-02    6.6500e-02e
2907  * matrd * f             6e
2908  * nfax  * f             1e
2909  *       +              +             +             +             +
2910  * rftn  * r4        607.1r4       609.15r4       611.2e
2911  * rftn  * r4        607.1r4       609.15r4       611.2e
2912  * rftn  * r4        607.1r4       609.15r4       611.2e
2913  * rftn  * r4        607.1r4       609.15r4       611.2e
2914  *
2915  *******   type           num           id        ctitle
2916  slab           861       861 $861$ levels 7 & 8 cell 13-16 slabs
2917  *          ncrx          ncrz          ittc          iext          mld
2918                4             2             0             0            0
2919  *        nopowr         nridr         modez        liqlev        iaxcnd
2920                1             1             0             0            0
2921  *         idbci         idbco          hdri          hdro
2922                0             2    0.0000e+00    0.0000e+00
2923  *         width        ipatch
2924      4.0521e+00             0
2925  *         nrods         nodes         irftr         nzmax
2926                4             4             0             5
2927  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2928      3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
2929  *
2930  * nhcomo* f            50e
2931  * nhcelo*              -7             7             8             9e
2932  * z     *           2.01         2.467         2.924e
2933  * grav  * f    1.0000e+00e
2934  *       +              +             +             +             +
2935  * idrod *             13            14            15            16e
2936  * rdx   * r4   1.0000e+00e
2937  * radrd *      0.0000e+00    2.5000e-02    3.5000e-02    4.0000e-02e
2938  * matrd * f             6e
2939  * nfax  * f             1e
```

```
*       +               +               +               +               +
* rftn  * r4        607.1r4         609.15r4        611.2e
* rftn  * r4        607.1r4         609.15r4        611.2e
* rftn  * r4        607.1r4         609.15r4        611.2e
* rftn  * r4        607.1r4         609.15r4        611.2e
*
*******   type            num             id          ctitle
slab            862       862 $862$ level 9 cells 1-8 slabs
*           ncrx            ncrz            ittc            iext            mld
                8               1               0               0              0
*         nopowr           nridr           modez          liqlev         iaxcnd
                1               1               0               0              0
*          idbci           idbco            hdri            hdro
                0               2     0.0000e+00      0.0000e+00
*          width          ipatch
      4.4118e-01               0
*          nrods           nodes           irftr           nzmax
                8               4               0               5
*      dtxht(1)        dtxht(2)          dznht           hgapo           shelv
      3.0000e+00      1.0000e+01      1.0000e-03      0.0000e+00      0.0000e+00
*
* nhcomo* f             50e
* nhcelo*               -9              9              10e
* z     *            2.924           3.4e
* grav  * f    1.0000e+00e
*       +               +               +               +               +
* idrod *               1               2               3              4s
* idrod *               5               6               7              8e
* rdx   * r4        1.0000r4        3.8381e
* radrd *      0.0000e+00      2.5000e-03      5.0000e-03      7.1000e-03e
* matrd * f             6e
* nfax  * f             1e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
*
*******   type            num             id          ctitle
slab            863       863 $863$ level 9 cells 9-12 slabs
*           ncrx            ncrz            ittc            iext            mld
                4               1               0               0              0
*         nopowr           nridr           modez          liqlev         iaxcnd
                1               1               0               0              0
*          idbci           idbco            hdri            hdro
                0               2     0.0000e+00      0.0000e+00
*          width          ipatch
      1.0866e+00               0
*          nrods           nodes           irftr           nzmax
                4               4               0               5
*      dtxht(1)        dtxht(2)          dznht           hgapo           shelv
      3.0000e+00      1.0000e+01      1.0000e-03      0.0000e+00      0.0000e+00
*
* nhcomo* f             50e
* nhcelo*               -9              9              10e
* z     *            2.924           3.4e
* grav  * f    1.0000e+00e
*       +               +               +               +               +
* idrod *               9              10              11             12e
* rdx   * r4        1.0000e
* radrd *      0.0000e+00      2.0000e-02      3.0000e-02      3.4100e-02e
* matrd * f             6e
* nfax  * f             1e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
* rftn  * f    6.0820e+02e
*
*******   type            num             id          ctitle
slab            864       864 $864$ level 9 cells 13-16 slabs
*           ncrx            ncrz            ittc            iext            mld
                4               1               0               0              0
*         nopowr           nridr           modez          liqlev         iaxcnd
                1               1               0               0              0
*          idbci           idbco            hdri            hdro
                0               2     0.0000e+00      0.0000e+00
*          width          ipatch
      4.0693e+00               0
*          nrods           nodes           irftr           nzmax
                4               4               0               5
*      dtxht(1)        dtxht(2)          dznht           hgapo           shelv
      3.0000e+00      1.0000e+01      1.0000e-03      0.0000e+00      0.0000e+00
*
* nhcomo* f             50e
* nhcelo*               -9              9              10e
* z     *            2.924           3.4e
* grav  * f    1.0000e+00e
*       +               +               +               +               +
* idrod *              13              14              15             16e
```

```
3032  * rdx   * r4      1.0000e
3033  * radrd *     0.0000e+00    2.5000e-02    3.5000e-02    4.0000e-02e
3034  * matrd * f             6e
3035  * nfax  * f             1e
3036  * rftn  * f    6.0820e+02e
3037  * rftn  * f    6.0820e+02e
3038  * rftn  * f    6.0820e+02e
3039  * rftn  * f    6.0820e+02e
3040  *
3041  *******   type           num            id        ctitle
3042  slab          865      865 $865$ level 10 cells 1-8 slabs
3043  *          ncrx          ncrz          ittc          iext          mld
3044                8             1             0             0            0
3045  *        nopowr         nridr         modez        liqlev        iaxcnd
3046                1             1             0             0            0
3047  *         idbci         idbco          hdri          hdro
3048                0             2    0.0000e+00    0.0000e+00
3049  *         width        ipatch
3050      7.5657e-01             0
3051  *         nrods         nodes         irftr         nzmax
3052                8             4             0             5
3053  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3054      3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
3055  *
3056  * nhcomo* f           50e
3057  * nhcelo*            -10            10            11e
3058  * z     *            3.4         4.846e
3059  * grav  * f    1.0000e+00e
3060  *       +              +             +             +             +
3061  * idrod *              1             2             3            4s
3062  * idrod *              5             6             7            8e
3063  * rdx   * r4      1.0000r4      3.8408e
3064  * radrd *     0.0000e+00    1.0000e-03    2.0000e-03    3.0400e-03e
3065  * matrd * f             6e
3066  * nfax  * f             1e
3067  * rftn  * f    6.0810e+02e
3068  * rftn  * f    6.0810e+02e
3069  * rftn  * f    6.0810e+02e
3070  * rftn  * f    6.0810e+02e
3071  * rftn  * f    6.0810e+02e
3072  * rftn  * f    6.0810e+02e
3073  * rftn  * f    6.0810e+02e
3074  * rftn  * f    6.0810e+02e
3075  *
3076  *******   type           num            id        ctitle
3077  slab          866      866 $866$ level 10 cells 9-12 slabs
3078  *          ncrx          ncrz          ittc          iext          mld
3079                4             1             0             0            0
3080  *        nopowr         nridr         modez        liqlev        iaxcnd
3081                1             1             0             0            0
3082  *         idbci         idbco          hdri          hdro
3083                0             2    0.0000e+00    0.0000e+00
3084  *         width        ipatch
3085      9.6432e-01             0
3086  *         nrods         nodes         irftr         nzmax
3087                4             4             0             5
3088  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3089      3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
3090  *
3091  * nhcomo* f           50e
3092  * nhcelo*            -10            10            11e
3093  * z     *            3.4         4.846e
3094  * grav  * f    1.0000e+00e
3095  *       +              +             +             +             +
3096  * idrod *              9            10            11            12e
3097  * rdx   * r4      1.0000e
3098  * radrd *     0.0000e+00    2.0000e-02    3.0000e-02    3.4100e-02e
3099  * matrd * f             6e
3100  * nfax  * f             1e
3101  * rftn  * f    6.0810e+02e
3102  * rftn  * f    6.0810e+02e
3103  * rftn  * f    6.0810e+02e
3104  * rftn  * f    6.0810e+02e
3105  *
3106  *******   type           num            id        ctitle
3107  slab          867      867 $867$ level 10 cells 13-16 slabs
3108  *          ncrx          ncrz          ittc          iext          mld
3109                4             1             0             0            0
3110  *        nopowr         nridr         modez        liqlev        iaxcnd
3111                1             1             0             0            0
3112  *         idbci         idbco          hdri          hdro
3113                0             2    0.0000e+00    0.0000e+00
3114  *         width        ipatch
3115      4.0692e+00             0
3116  *         nrods         nodes         irftr         nzmax
3117                4             4             0             5
3118  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3119      3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
3120  *
3121  * nhcomo* f           50e
3122  * nhcelo*            -10            10            11e
3123  * z     *            3.4         4.846e
```

```
3124  * grav  * f   1.0000e+00e
3125  *       +            +             +             +             +
3126  * idrod *            13            14            15            16e
3127  * rdx   * r4      1.0000e
3128  * radrd *     0.0000e+00    2.5000e-02    3.5000e-02    4.0000e-02e
3129  * matrd * f            6e
3130  * nfax  * f            1e
3131  * rftn  * f   6.0810e+02e
3132  * rftn  * f   6.0810e+02e
3133  * rftn  * f   6.0810e+02e
3134  * rftn  * f   6.0810e+02e
3135  *
3136  *******   type           num           id        ctitle
3137  slab           868      868 $868$ level 11 cells 1-12 slabs
3138  *          ncrx          ncrz          ittc          iext          mld
3139                12             1             0             0            0
3140  *        nopowr         nridr        modez        liqlev        iaxcnd
3141                1             1             0             0            0
3142  *         idbci         idbco         hdri          hdro
3143                0             2    0.0000e+00    0.0000e+00
3144  *         width        ipatch
3145     7.5669e-01             0
3146  *         nrods         nodes        irftr         nzmax
3147                12             4             0             5
3148  *      dtxht(1)      dtxht(2)        dznht         hgapo         shelv
3149     3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
3150  *
3151  * nhcomo* f           50e
3152  * nhcelo*            -11            11            12e
3153  * z     *          4.846         5.13e
3154  * grav  * f   1.0000e+00e
3155  *       +            +             +             +             +
3156  * idrod *            1             2             3             4s
3157  * idrod *            5             6             7             8s
3158  * idrod *            9            10            11            12e
3159  * rdx   * r4      1.0000r4      3.8395r4      4.9776e
3160  * radrd *     0.0000e+00    1.0000e-03    2.0000e-03    3.0400e-03e
3161  * matrd * f            6e
3162  * nfax  * f            1e
3163  * rftn  * f   6.0180e+02e
3164  * rftn  * f   6.0180e+02e
3165  * rftn  * f   6.0180e+02e
3166  * rftn  * f   6.0180e+02e
3167  * rftn  * f   6.0180e+02e
3168  * rftn  * f   6.0180e+02e
3169  * rftn  * f   6.0180e+02e
3170  * rftn  * f   6.0180e+02e
3171  * rftn  * f   6.0180e+02e
3172  * rftn  * f   6.0180e+02e
3173  * rftn  * f   6.0180e+02e
3174  * rftn  * f   6.0180e+02e
3175  *
3176  *******   type           num           id        ctitle
3177  slab           869      869 $869$ level 11 cells 13-16 slabs
3178  *          ncrx          ncrz          ittc          iext          mld
3179                4             1             0             0            0
3180  *        nopowr         nridr        modez        liqlev        iaxcnd
3181                1             1             0             0            0
3182  *         idbci         idbco         hdri          hdro
3183                0             2    0.0000e+00    0.0000e+00
3184  *         width        ipatch
3185     4.0690e+00             0
3186  *         nrods         nodes        irftr         nzmax
3187                4             4             0             5
3188  *      dtxht(1)      dtxht(2)        dznht         hgapo         shelv
3189     3.0000e+00    1.0000e+01    1.0000e-03    0.0000e+00    0.0000e+00
3190  *
3191  * nhcomo* f           50e
3192  * nhcelo*            -11            11            12e
3193  * z     *          4.846         5.13e
3194  * grav  * f   1.0000e+00e
3195  *       +            +             +             +             +
3196  * idrod *            13            14            15            16e
3197  * rdx   * r4      1.0000e
3198  * radrd *     0.0000e+00    2.5000e-02    3.5000e-02    4.0000e-02e
3199  * matrd * f            6e
3200  * nfax  * f            1e
3201  * rftn  * f   6.0180e+02e
3202  * rftn  * f   6.0180e+02e
3203  * rftn  * f   6.0180e+02e
3204  * rftn  * f   6.0180e+02e
3205  *
3206  *******   type           num           id        ctitle
3207  slab           870      870 $860$ level 12 cells 1-8 slabs
3208  *          ncrx          ncrz          ittc          iext          mld
3209                8             1             0             0            0
3210  *        nopowr         nridr        modez        liqlev        iaxcnd
3211                1             1             0             0            0
3212  *         idbci         idbco         hdri          hdro
3213                0             2    0.0000e+00    0.0000e+00
3214  *         width        ipatch
3215     7.5675e-01             0
```

```
*        nrods          nodes          irftr          nzmax
               8              4              0              5
*     dtxht(1)       dtxht(2)       dznht          hgapo          shelv
    3.0000e+00     1.0000e+01     1.0000e-03     0.0000e+00     0.0000e+00
*
* nhcomo* f            50e
* nhcelo*             -12             12             13e
* z     *            5.13           5.9e
* grav  * f    1.0000e+00e
*       +              +              +              +              +
* idrod *              1              2              3             4s
* idrod *              5              6              7             8e
* rdx   * r4       1.0000r4       3.8392e
* radrd *     0.0000e+00     1.0000e-03     2.0000e-03     3.0400e-03e
* matrd * f            6e
* nfax  * f            1e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
*
*******    type           num            id        ctitle
slab           871       871 $871$ level 12 cells 9-12 slabs
*         ncrx           ncrz           ittc           iext           mld
                4              1              0              0             0
*        nopowr          nridr          modez         liqlev         iaxcnd
                1              1              0              0             0
*         idbci          idbco          hdri           hdro
                0              2     0.0000e+00     0.0000e+00
*         width         ipatch
     9.6442e-01              0
*        nrods          nodes          irftr          nzmax
                4              4              0              5
*     dtxht(1)       dtxht(2)       dznht          hgapo          shelv
    3.0000e+00     1.0000e+01     1.0000e-03     0.0000e+00     0.0000e+00
*
* nhcomo* f            50e
* nhcelo*             -12             12             13e
* z     *            5.13           5.9e
* grav  * f    1.0000e+00e
*       +              +              +              +              +
* idrod *              9             10             11            12e
* rdx   * r4       1.0000e
* radrd *     0.0000e+00     2.0000e-02     3.0000e-02     3.4100e-02e
* matrd * f            6e
* nfax  * f            1e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
* rftn  * f    5.8900e+02e
*
*******    type           num            id        ctitle
rod            991       991 $991$ fuel rod component
*         ncrx           ncrz           ittc           iext           mld
               12              5              0              0             0
*        nopowr          nridr          modez         liqlev         iaxcnd
                0              0              0              1             1
*         idbci          idbco          hdri           hdro
                0              2     0.0000e+00     0.0000e+00
*        nrods          nodes          irftr          nzmax         irftr2
               17             10            101            250           102
*     dtxht(1)       dtxht(2)       dznht          hgapo          shelv
    5.0000e+00     2.0000e+01     1.0000e-03     2.0000e+03     0.0000e+00
*        irpwty          ndgx           ndhx           nrts          nhist
                7              0              0             10             0
*        irpwtr         irpwsv         nrpwtb         nrpwsv         nrpwrf
              100              1             21              0             0
*        izpwtr         izpwsv         nzpwtb         nzpwsv         nzpwrf
                0              1              1              0             0
*         nmwrx           nfci           nfcil          ipwrad         ipwdep
                1              1              1              0             0
*         nzpwz          nzpwi          nfbpwt          nrpwr          nrpwi
                0              0              0              0             0
*         react          tneut          rpwoff         rrpwmx         rpwscl
     0.0000e+00     0.0000e+00    -1.0000e+20     1.0000e+30     1.0000e+00
*        rpowri          zpwin          zpwoff         rzpwmx
     4.7000e+07     0.0000e+00     0.0000e+00     0.0000e+00
*        extsou          pldr           pdrat          fucrac
     0.0000e+00     0.0000e+00     1.3360e+00     7.0000e-01
*
* nhcomo* f            50e
* nhcelo*              -4              4              5              6             7
* nhcelo*               8             9e
* z     *     1.2480e+00     1.5530e+00     1.7810e+00     2.0100e+00     2.4670e+00
* z     *     2.9240e+00e
* grav  * f    1.0000e+00e
* idrod *              1              2              4              5             9
* idrod * e
```

```
3308  * rdx   * r04 4.0500e+01r04 1.5250e+02r04 1.3200e+02e
3309  * radrd *     0.0000e+00    7.7449e-04    1.5489e-03    2.3235e-03    3.0979e-03
3310  * radrd *     3.8725e-03    4.6470e-03    4.7250e-03    5.0508e-03    5.3590e-03
3311  * radrd * e
3312  * matrd * r06          1             3r02          2e
3313  * nfax  * f           3e
3314  * rftn  *     1.2745e+03    1.2598e+03    1.2160e+03    1.1455e+03    1.0518e+03
3315  * rftn  *     9.3930e+02    8.1349e+02    6.2453e+02    6.1308e+02    6.0224e+02
3316  * rftn  *     2.2274e+03    2.1873e+03    2.0631e+03    1.8485e+03    1.5576e+03
3317  * rftn  *     1.2285e+03    8.9897e+02    6.7605e+02    6.5072e+02    6.2653e+02
3318  * rftn  *     2.4107e+03    2.3685e+03    2.2364e+03    2.0002e+03    1.6631e+03
3319  * rftn  *     1.2759e+03    8.9700e+02    6.8708e+02    6.5847e+02    6.3109e+02
3320  * rftn  *     2.3509e+03    2.3094e+03    2.1802e+03    1.9506e+03    1.6285e+03
3321  * rftn  *     1.2623e+03    9.0076e+02    6.8692e+02    6.5959e+02    6.3345e+02
3322  * rftn  *     1.5480e+03    1.5255e+03    1.4589e+03    1.3523e+03    1.2122e+03
3323  * rftn  *     1.0477e+03    8.6902e+02    6.5722e+02    6.4235e+02    6.2824e+02
3324  * rftn  *     6.4319e+02    6.4275e+02    6.4143e+02    6.3924e+02    6.3615e+02
3325  * rftn  *     6.3217e+02    6.2727e+02    6.1389e+02    6.1331e+02    6.1277e+02
3326  * rftn  * e
3327  * rftn  *     1.2746e+03    1.2598e+03    1.2161e+03    1.1456e+03    1.0518e+03
3328  * rftn  *     9.3936e+02    8.1354e+02    6.2460e+02    6.1314e+02    6.0230e+02
3329  * rftn  *     2.2274e+03    2.1873e+03    2.0631e+03    1.8485e+03    1.5576e+03
3330  * rftn  *     1.2285e+03    8.9896e+02    6.7605e+02    6.5072e+02    6.2652e+02
3331  * rftn  *     2.4106e+03    2.3684e+03    2.2363e+03    2.0002e+03    1.6631e+03
3332  * rftn  *     1.2759e+03    8.9698e+02    6.8704e+02    6.5844e+02    6.3106e+02
3333  * rftn  *     2.3508e+03    2.3094e+03    2.1801e+03    1.9505e+03    1.6285e+03
3334  * rftn  *     1.2622e+03    9.0072e+02    6.8687e+02    6.5954e+02    6.3340e+02
3335  * rftn  *     1.5479e+03    1.5254e+03    1.4589e+03    1.3522e+03    1.2121e+03
3336  * rftn  *     1.0476e+03    8.6897e+02    6.5716e+02    6.4228e+02    6.2818e+02
3337  * rftn  *     6.4293e+02    6.4250e+02    6.4118e+02    6.3898e+02    6.3590e+02
3338  * rftn  *     6.3192e+02    6.2702e+02    6.1363e+02    6.1306e+02    6.1252e+02
3339  * rftn  * e
3340  * rftn  *     1.2745e+03    1.2597e+03    1.2160e+03    1.1455e+03    1.0518e+03
3341  * rftn  *     9.3929e+02    8.1347e+02    6.2451e+02    6.1306e+02    6.0222e+02
3342  * rftn  *     2.2274e+03    2.1873e+03    2.0630e+03    1.8484e+03    1.5575e+03
3343  * rftn  *     1.2285e+03    8.9893e+02    6.7600e+02    6.5067e+02    6.2647e+02
3344  * rftn  *     2.4105e+03    2.3683e+03    2.2362e+03    2.0000e+03    1.6629e+03
3345  * rftn  *     1.2758e+03    8.9690e+02    6.8693e+02    6.5832e+02    6.3094e+02
3346  * rftn  *     2.3506e+03    2.3092e+03    2.1799e+03    1.9503e+03    1.6283e+03
3347  * rftn  *     1.2621e+03    9.0060e+02    6.8669e+02    6.5935e+02    6.3321e+02
3348  * rftn  *     1.5476e+03    1.5251e+03    1.4586e+03    1.3519e+03    1.2119e+03
3349  * rftn  *     1.0474e+03    8.6878e+02    6.5690e+02    6.4202e+02    6.2791e+02
3350  * rftn  *     6.4202e+02    6.4158e+02    6.4027e+02    6.3807e+02    6.3499e+02
3351  * rftn  *     6.3102e+02    6.2612e+02    6.1272e+02    6.1214e+02    6.1160e+02
3352  * rftn  * e
3353  * rftn  *     1.2746e+03    1.2598e+03    1.2161e+03    1.1456e+03    1.0518e+03
3354  * rftn  *     9.3936e+02    8.1354e+02    6.2459e+02    6.1314e+02    6.0230e+02
3355  * rftn  *     2.2274e+03    2.1873e+03    2.0631e+03    1.8485e+03    1.5576e+03
3356  * rftn  *     1.2285e+03    8.9896e+02    6.7605e+02    6.5072e+02    6.2652e+02
3357  * rftn  *     2.4106e+03    2.3684e+03    2.2363e+03    2.0002e+03    1.6631e+03
3358  * rftn  *     1.2759e+03    8.9698e+02    6.8704e+02    6.5843e+02    6.3105e+02
3359  * rftn  *     2.3508e+03    2.3094e+03    2.1801e+03    1.9505e+03    1.6285e+03
3360  * rftn  *     1.2622e+03    9.0072e+02    6.8686e+02    6.5953e+02    6.3339e+02
3361  * rftn  *     1.5479e+03    1.5254e+03    1.4588e+03    1.3522e+03    1.2121e+03
3362  * rftn  *     1.0476e+03    8.6896e+02    6.5714e+02    6.4227e+02    6.2816e+02
3363  * rftn  *     6.4291e+02    6.4247e+02    6.4115e+02    6.3896e+02    6.3587e+02
3364  * rftn  *     6.3189e+02    6.2699e+02    6.1361e+02    6.1303e+02    6.1249e+02
3365  * rftn  * e
3366  * rftn  *     1.0787e+03    1.0690e+03    1.0403e+03    9.9351e+02    9.3048e+02
3367  * rftn  *     8.5349e+02    7.6520e+02    6.0742e+02    5.9879e+02    5.9063e+02
3368  * rftn  *     1.8225e+03    1.7907e+03    1.6968e+03    1.5463e+03    1.3502e+03
3369  * rftn  *     1.1245e+03    8.8756e+02    6.5854e+02    6.3947e+02    6.2133e+02
3370  * rftn  *     1.9983e+03    1.9618e+03    1.8515e+03    1.6723e+03    1.4386e+03
3371  * rftn  *     1.1719e+03    8.9735e+02    6.6840e+02    6.4685e+02    6.2632e+02
3372  * rftn  *     1.9398e+03    1.9045e+03    1.7995e+03    1.6306e+03    1.4105e+03
3373  * rftn  *     1.1586e+03    8.9723e+02    6.6892e+02    6.4833e+02    6.2874e+02
3374  * rftn  *     1.2909e+03    1.2762e+03    1.2325e+03    1.1620e+03    1.0681e+03
3375  * rftn  *     9.5543e+02    8.2918e+02    6.4600e+02    6.3484e+02    6.2428e+02
3376  * rftn  *     6.2947e+02    6.2915e+02    6.2818e+02    6.2657e+02    6.2430e+02
3377  * rftn  *     6.2137e+02    6.1776e+02    6.0766e+02    6.0723e+02    6.0682e+02
3378  * rftn  * e
3379  * rftn  *     1.0791e+03    1.0694e+03    1.0406e+03    9.9386e+02    9.3082e+02
3380  * rftn  *     8.5381e+02    7.6549e+02    6.0778e+02    5.9914e+02    5.9099e+02
3381  * rftn  *     1.8226e+03    1.7908e+03    1.6969e+03    1.5464e+03    1.3503e+03
3382  * rftn  *     1.1246e+03    8.8762e+02    6.5863e+02    6.3956e+02    6.2142e+02
3383  * rftn  *     1.9983e+03    1.9618e+03    1.8515e+03    1.6723e+03    1.4386e+03
3384  * rftn  *     1.1719e+03    8.9737e+02    6.6842e+02    6.4686e+02    6.2633e+02
3385  * rftn  *     1.9397e+03    1.9045e+03    1.7995e+03    1.6306e+03    1.4105e+03
3386  * rftn  *     1.1585e+03    8.9722e+02    6.6891e+02    6.4833e+02    6.2873e+02
3387  * rftn  *     1.2909e+03    1.2761e+03    1.2325e+03    1.1620e+03    1.0681e+03
3388  * rftn  *     9.5541e+02    8.2916e+02    6.4598e+02    6.3481e+02    6.2425e+02
3389  * rftn  *     6.2938e+02    6.2906e+02    6.2809e+02    6.2648e+02    6.2421e+02
3390  * rftn  *     6.2128e+02    6.1767e+02    6.0757e+02    6.0714e+02    6.0674e+02
3391  * rftn  * e
3392  * rftn  *     1.0796e+03    1.0699e+03    1.0412e+03    9.9435e+02    9.3129e+02
3393  * rftn  *     8.5424e+02    7.6589e+02    6.0826e+02    5.9963e+02    5.9148e+02
3394  * rftn  *     1.8227e+03    1.7909e+03    1.6970e+03    1.5465e+03    1.3504e+03
3395  * rftn  *     1.1247e+03    8.8768e+02    6.5872e+02    6.3965e+02    6.2151e+02
3396  * rftn  *     1.9983e+03    1.9617e+03    1.8515e+03    1.6723e+03    1.4385e+03
3397  * rftn  *     1.1719e+03    8.9735e+02    6.6839e+02    6.4684e+02    6.2631e+02
3398  * rftn  *     1.9396e+03    1.9044e+03    1.7994e+03    1.6305e+03    1.4104e+03
3399  * rftn  *     1.1584e+03    8.9714e+02    6.6879e+02    6.4820e+02    6.2861e+02
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3400	* rftn	*	1.2907e+03	1.2759e+03	1.2322e+03	1.1617e+03	1.0679e+03
3401	* rftn	*	9.5522e+02	8.2898e+02	6.4576e+02	6.3459e+02	6.2403e+02
3402	* rftn	*	6.2845e+02	6.2813e+02	6.2717e+02	6.2556e+02	6.2329e+02
3403	* rftn	*	6.2037e+02	6.1676e+02	6.0665e+02	6.0621e+02	6.0581e+02
3404	* rftn	* e					
3405	* rftn	*	1.0791e+03	1.0694e+03	1.0406e+03	9.9386e+02	9.3082e+02
3406	* rftn	*	8.5381e+02	7.6549e+02	6.0778e+02	5.9914e+02	5.9099e+02
3407	* rftn	*	1.8226e+03	1.7908e+03	1.6969e+03	1.5464e+03	1.3503e+03
3408	* rftn	*	1.1246e+03	8.8762e+02	6.5863e+02	6.3956e+02	6.2142e+02
3409	* rftn	*	1.9983e+03	1.9618e+03	1.8515e+03	1.6723e+03	1.4386e+03
3410	* rftn	*	1.1719e+03	8.9737e+02	6.6842e+02	6.4687e+02	6.2633e+02
3411	* rftn	*	1.9397e+03	1.9045e+03	1.7995e+03	1.6306e+03	1.4105e+03
3412	* rftn	*	1.1585e+03	8.9722e+02	6.6890e+02	6.4832e+02	6.2872e+02
3413	* rftn	*	1.2909e+03	1.2761e+03	1.2325e+03	1.1620e+03	1.0681e+03
3414	* rftn	*	9.5540e+02	8.2915e+02	6.4597e+02	6.3480e+02	6.2424e+02
3415	* rftn	*	6.2928e+02	6.2896e+02	6.2799e+02	6.2638e+02	6.2411e+02
3416	* rftn	*	6.2118e+02	6.1757e+02	6.0747e+02	6.0704e+02	6.0663e+02
3417	* rftn	* e					
3418	* rftn	*	8.8717e+02	8.8174e+02	8.6553e+02	8.3893e+02	8.0256e+02
3419	* rftn	*	7.5722e+02	7.0387e+02	5.8848e+02	5.8277e+02	5.7738e+02
3420	* rftn	*	1.3545e+03	1.3373e+03	1.2866e+03	1.2050e+03	1.0970e+03
3421	* rftn	*	9.6842e+02	8.2613e+02	6.2513e+02	6.1240e+02	6.0035e+02
3422	* rftn	*	1.4798e+03	1.4590e+03	1.3976e+03	1.2992e+03	1.1697e+03
3423	* rftn	*	1.0170e+03	8.5034e+02	6.3876e+02	6.2442e+02	6.1083e+02
3424	* rftn	*	1.4443e+03	1.4248e+03	1.3671e+03	1.2744e+03	1.1523e+03
3425	* rftn	*	1.0077e+03	8.4908e+02	6.4329e+02	6.2964e+02	6.1670e+02
3426	* rftn	*	1.0214e+03	1.0133e+03	9.8936e+02	9.5030e+02	8.9738e+02
3427	* rftn	*	8.3221e+02	7.5673e+02	6.1650e+02	6.0907e+02	6.0205e+02
3428	* rftn	*	5.9765e+02	5.9745e+02	5.9684e+02	5.9582e+02	5.9440e+02
3429	* rftn	*	5.9255e+02	5.9027e+02	5.8343e+02	5.8315e+02	5.8288e+02
3430	* rftn	* e					
3431	* rftn	*	8.8786e+02	8.8242e+02	8.6620e+02	8.3958e+02	8.0319e+02
3432	* rftn	*	7.5783e+02	7.0445e+02	5.8914e+02	5.8343e+02	5.7805e+02
3433	* rftn	*	1.3553e+03	1.3381e+03	1.2873e+03	1.2057e+03	1.0976e+03
3434	* rftn	*	9.6901e+02	8.2666e+02	6.2581e+02	6.1309e+02	6.0105e+02
3435	* rftn	*	1.4804e+03	1.4596e+03	1.3981e+03	1.2997e+03	1.1701e+03
3436	* rftn	*	1.0174e+03	8.5070e+02	6.3923e+02	6.2490e+02	6.1131e+02
3437	* rftn	*	1.4444e+03	1.4249e+03	1.3672e+03	1.2745e+03	1.1523e+03
3438	* rftn	*	1.0078e+03	8.4915e+02	6.4339e+02	6.2973e+02	6.1680e+02
3439	* rftn	*	1.0214e+03	1.0134e+03	9.8941e+02	9.5035e+02	8.9742e+02
3440	* rftn	*	8.3225e+02	7.5677e+02	6.1655e+02	6.0911e+02	6.0210e+02
3441	* rftn	*	5.9791e+02	5.9771e+02	5.9710e+02	5.9609e+02	5.9466e+02
3442	* rftn	*	5.9281e+02	5.9053e+02	5.8370e+02	5.8341e+02	5.8314e+02
3443	* rftn	* e					
3444	* rftn	*	8.8863e+02	8.8320e+02	8.6696e+02	8.4033e+02	8.0391e+02
3445	* rftn	*	7.5852e+02	7.0510e+02	5.8989e+02	5.8419e+02	5.7881e+02
3446	* rftn	*	1.3560e+03	1.3388e+03	1.2880e+03	1.2064e+03	1.0983e+03
3447	* rftn	*	9.6959e+02	8.2717e+02	6.2648e+02	6.1377e+02	6.0173e+02
3448	* rftn	*	1.4809e+03	1.4601e+03	1.3986e+03	1.3002e+03	1.1705e+03
3449	* rftn	*	1.0178e+03	8.5104e+02	6.3968e+02	6.2536e+02	6.1178e+02
3450	* rftn	*	1.4446e+03	1.4251e+03	1.3674e+03	1.2747e+03	1.1525e+03
3451	* rftn	*	1.0079e+03	8.4928e+02	6.4355e+02	6.2990e+02	6.1697e+02
3452	* rftn	*	1.0210e+03	1.0129e+03	9.8899e+02	9.4994e+02	8.9703e+02
3453	* rftn	*	8.3188e+02	7.5643e+02	6.1614e+02	6.0870e+02	6.0169e+02
3454	* rftn	*	5.9679e+02	5.9659e+02	5.9599e+02	5.9497e+02	5.9355e+02
3455	* rftn	*	5.9170e+02	5.8942e+02	5.8258e+02	5.8229e+02	5.8202e+02
3456	* rftn	* e					
3457	* rftn	*	8.8786e+02	8.8242e+02	8.6620e+02	8.3959e+02	8.0319e+02
3458	* rftn	*	7.5783e+02	7.0445e+02	5.8914e+02	5.8343e+02	5.7805e+02
3459	* rftn	*	1.3553e+03	1.3381e+03	1.2873e+03	1.2057e+03	1.0976e+03
3460	* rftn	*	9.6902e+02	8.2667e+02	6.2582e+02	6.1310e+02	6.0105e+02
3461	* rftn	*	1.4804e+03	1.4596e+03	1.3982e+03	1.2997e+03	1.1701e+03
3462	* rftn	*	1.0174e+03	8.5071e+02	6.3925e+02	6.2492e+02	6.1133e+02
3463	* rftn	*	1.4444e+03	1.4249e+03	1.3672e+03	1.2745e+03	1.1523e+03
3464	* rftn	*	1.0078e+03	8.4914e+02	6.4337e+02	6.2972e+02	6.1678e+02
3465	* rftn	*	1.0209e+03	1.0129e+03	9.8894e+02	9.4989e+02	8.9698e+02
3466	* rftn	*	8.3184e+02	7.5639e+02	6.1609e+02	6.0865e+02	6.0163e+02
3467	* rftn	*	5.9684e+02	5.9664e+02	5.9604e+02	5.9502e+02	5.9360e+02
3468	* rftn	*	5.9175e+02	5.8947e+02	5.8263e+02	5.8234e+02	5.8207e+02
3469	* rftn	* e					
3470	* rftn	*	1.3331e+03	1.3166e+03	1.2681e+03	1.1899e+03	1.0862e+03
3471	* rftn	*	9.6251e+02	8.2513e+02	6.2862e+02	6.1633e+02	6.0470e+02
3472	* rftn	*	2.3324e+03	2.2910e+03	2.1621e+03	1.9335e+03	1.6148e+03
3473	* rftn	*	1.2539e+03	8.9730e+02	6.8086e+02	6.5368e+02	6.2770e+02
3474	* rftn	*	2.5122e+03	2.4691e+03	2.3333e+03	2.0875e+03	1.7256e+03
3475	* rftn	*	1.3016e+03	8.9232e+02	6.9224e+02	6.6155e+02	6.3214e+02
3476	* rftn	*	2.4516e+03	2.4091e+03	2.2757e+03	2.0360e+03	1.6895e+03
3477	* rftn	*	1.2882e+03	8.9739e+02	6.9177e+02	6.6244e+02	6.3437e+02
3478	* rftn	*	1.6249e+03	1.5999e+03	1.5260e+03	1.4078e+03	1.2529e+03
3479	* rftn	*	1.0721e+03	8.7752e+02	6.6007e+02	6.4410e+02	6.2893e+02
3480	* rftn	*	6.4562e+02	6.4515e+02	6.4373e+02	6.4136e+02	6.3804e+02
3481	* rftn	*	6.3374e+02	6.2846e+02	6.1409e+02	6.1347e+02	6.1289e+02
3482	* rftn	* e					
3483	* rftn	*	1.3332e+03	1.3167e+03	1.2681e+03	1.1899e+03	1.0863e+03
3484	* rftn	*	9.6257e+02	8.2519e+02	6.2869e+02	6.1640e+02	6.0477e+02
3485	* rftn	*	2.3324e+03	2.2910e+03	2.1621e+03	1.9335e+03	1.6148e+03
3486	* rftn	*	1.2539e+03	8.9730e+02	6.8085e+02	6.5368e+02	6.2769e+02
3487	* rftn	*	2.5122e+03	2.4691e+03	2.3333e+03	2.0875e+03	1.7255e+03
3488	* rftn	*	1.3016e+03	8.9229e+02	6.9220e+02	6.6151e+02	6.3210e+02
3489	* rftn	*	2.4516e+03	2.4090e+03	2.2756e+03	2.0360e+03	1.6895e+03
3490	* rftn	*	1.2882e+03	8.9735e+02	6.9172e+02	6.6239e+02	6.3432e+02
3491	* rftn	*	1.6248e+03	1.5998e+03	1.5260e+03	1.4077e+03	1.2529e+03

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3492  * rftn  *      1.0720e+03  8.7747e+02  6.6001e+02  6.4403e+02  6.2887e+02
3493  * rftn  *      6.4537e+02  6.4489e+02  6.4348e+02  6.4111e+02  6.3778e+02
3494  * rftn  *      6.3349e+02  6.2821e+02  6.1384e+02  6.1322e+02  6.1263e+02
3495  * rftn  * e
3496  * rftn  *      1.3332e+03  1.3167e+03  1.2681e+03  1.1899e+03  1.0863e+03
3497  * rftn  *      9.6257e+02  8.2519e+02  6.2869e+02  6.1640e+02  6.0477e+02
3498  * rftn  *      2.3324e+03  2.2910e+03  2.1621e+03  1.9335e+03  1.6148e+03
3499  * rftn  *      1.2539e+03  8.9730e+02  6.8085e+02  6.5368e+02  6.2769e+02
3500  * rftn  *      2.5122e+03  2.4691e+03  2.3333e+03  2.0875e+03  1.7255e+03
3501  * rftn  *      1.3016e+03  8.9229e+02  6.9220e+02  6.6151e+02  6.3210e+02
3502  * rftn  *      2.4516e+03  2.4090e+03  2.2756e+03  2.0359e+03  1.6895e+03
3503  * rftn  *      1.2882e+03  8.9735e+02  6.9171e+02  6.6238e+02  6.3431e+02
3504  * rftn  *      1.6248e+03  1.5998e+03  1.5260e+03  1.4077e+03  1.2529e+03
3505  * rftn  *      1.0720e+03  8.7746e+02  6.6000e+02  6.4402e+02  6.2886e+02
3506  * rftn  *      6.4534e+02  6.4487e+02  6.4345e+02  6.4108e+02  6.3776e+02
3507  * rftn  *      6.3346e+02  6.2818e+02  6.1381e+02  6.1319e+02  6.1261e+02
3508  * rftn  * e
3509  * rftn  *      1.2146e+03  1.2014e+03  1.1623e+03  1.0991e+03  1.0148e+03
3510  * rftn  *      9.1321e+02  7.9872e+02  6.1724e+02  6.0658e+02  5.9649e+02
3511  * rftn  *      2.1196e+03  2.0810e+03  1.9622e+03  1.7628e+03  1.4997e+03
3512  * rftn  *      1.2012e+03  8.9831e+02  6.7102e+02  6.4748e+02  6.2503e+02
3513  * rftn  *      2.3038e+03  2.2629e+03  2.1353e+03  1.9106e+03  1.5996e+03
3514  * rftn  *      1.2480e+03  8.9913e+02  6.8121e+02  6.5462e+02  6.2920e+02
3515  * rftn  *      2.2411e+03  2.2010e+03  2.0765e+03  1.8607e+03  1.5670e+03
3516  * rftn  *      1.2345e+03  9.0187e+02  6.8083e+02  6.5542e+02  6.3115e+02
3517  * rftn  *      1.4720e+03  1.4518e+03  1.3922e+03  1.2966e+03  1.1705e+03
3518  * rftn  *      1.0216e+03  8.5844e+02  6.5308e+02  6.3926e+02  6.2617e+02
3519  * rftn  *      6.3529e+02  6.3489e+02  6.3368e+02  6.3166e+02  6.2883e+02
3520  * rftn  *      6.2517e+02  6.2066e+02  6.0816e+02  6.0763e+02  6.0713e+02
3521  * rftn  * e
3522  * rftn  *      7.5242e+02  7.4956e+02  7.4098e+02  7.2679e+02  7.0717e+02
3523  * rftn  *      6.8233e+02  6.5250e+02  5.7758e+02  5.7414e+02  5.7089e+02
3524  * rftn  *      1.0170e+03  1.0087e+03  9.8419e+02  9.4418e+02  8.9002e+02
3525  * rftn  *      8.2345e+02  7.4650e+02  6.0050e+02  5.9276e+02  5.8545e+02
3526  * rftn  *      1.0895e+03  1.0796e+03  1.0502e+03  1.0024e+03  9.3807e+02
3527  * rftn  *      8.5954e+02  7.6957e+02  6.1079e+02  6.0205e+02  5.9380e+02
3528  * rftn  *      1.0728e+03  1.0635e+03  1.0357e+03  9.9050e+02  9.2953e+02
3529  * rftn  *      8.5490e+02  7.6911e+02  6.1653e+02  6.0822e+02  6.0037e+02
3530  * rftn  *      8.3703e+02  8.3290e+02  8.2057e+02  8.0025e+02  7.7230e+02
3531  * rftn  *      7.3718e+02  6.9542e+02  6.0200e+02  5.9751e+02  5.9328e+02
3532  * rftn  *      5.9140e+02  5.9128e+02  5.9091e+02  5.9031e+02  5.8946e+02
3533  * rftn  *      5.8836e+02  5.8700e+02  5.8289e+02  5.8272e+02  5.8256e+02
3534  * rftn  * e
3535  * rdpwr *      9.5500e-01  9.6000e-01  9.6500e-01  9.7500e-01  9.9000e-01
3536  * rdpwr *      1.0160e+00  1.0600e+00r03 0.0000e+00e
3537  * cpowr * r04 1.4874e+00r04 1.1090e+00r04 7.2450e-01e
3538  * rpkf  * r03 1.0757e+00  1.2426e+00  5.9870e-01e
3539  * zpwtb *      1.0000e+00  5.9415e-01  1.3555e+00  1.5406e+00  1.4723e+00
3540  * zpwtb *      7.8850e-01  2.9708e-02e
3541  * rpwtb *      0.0000e+00  4.7000e+07  1.0000e-01  4.2934e+07  2.0000e-01
3542  * rpwtb *      1.3075e+07  3.0000e-01  7.3013e+06  4.0000e-01  5.2826e+06
3543  * rpwtb *      5.0000e-01  4.3676e+06  6.0000e-01  3.9665e+06  8.0000e-01
3544  * rpwtb *      3.5062e+06  1.0000e+00  3.1164e+06  1.5000e+00  3.0359e+06
3545  * rpwtb *      2.0000e+00  2.8812e+06  3.0000e+00  2.7583e+06  5.0000e+00
3546  * rpwtb *      2.3870e+06  8.0000e+00  2.2150e+06  1.0000e+01  2.1451e+06
3547  * rpwtb *      1.5000e+01  2.0010e+06  2.0000e+01  1.9003e+06  3.0000e+01
3548  * rpwtb *      1.7615e+06  4.0000e+01  1.6645e+06  6.0000e+01  1.5293e+06
3549  * rpwtb *      2.0000e+02  1.1675e+06e
3550  * fpuo2 * f    0.0000e+00e
3551  * ftd   * f    9.3000e-01e
3552  * gmix  *      9.8101e-01  0.0000e+00  1.0103e-02  1.7830e-03  0.0000e+00
3553  * gmix  *      7.0991e-03  0.0000e+00  9.8101e-01  0.0000e+00  1.0103e-02
3554  * gmix  *      1.7830e-03  0.0000e+00  7.0991e-03  0.0000e+00  9.8101e-01
3555  * gmix  *      0.0000e+00  1.0103e-02  1.7830e-03  0.0000e+00  7.0991e-03
3556  * gmix  *      0.0000e+00  9.8101e-01  0.0000e+00  1.0103e-02  1.7830e-03
3557  * gmix  *      0.0000e+00  7.0991e-03  0.0000e+00  9.8101e-01  0.0000e+00
3558  * gmix  *      1.0103e-02  1.7830e-03  0.0000e+00  7.0991e-03  0.0000e+00
3559  * gmix  *      9.8101e-01  0.0000e+00  1.0103e-02  1.7830e-03  0.0000e+00
3560  * gmix  *      7.0991e-03  0.0000e+00  9.8101e-01  0.0000e+00  1.0103e-02
3561  * gmix  *      1.7830e-03  0.0000e+00  7.0991e-03  0.0000e+00  9.8101e-01
3562  * gmix  *      0.0000e+00  1.0103e-02  1.7830e-03  0.0000e+00  7.0991e-03
3563  * gmix  *      0.0000e+00  9.8101e-01  0.0000e+00  1.0103e-02  1.7830e-03
3564  * gmix  *      0.0000e+00  7.0991e-03  0.0000e+00  9.8101e-01  0.0000e+00
3565  * gmix  *      1.0103e-02  1.7830e-03  0.0000e+00  7.0991e-03  0.0000e+00
3566  * gmix  *      9.8101e-01  0.0000e+00  1.0103e-02  1.7830e-03  0.0000e+00
3567  * gmix  *      7.0991e-03  0.0000e+00  9.8101e-01  0.0000e+00  1.0103e-02
3568  * gmix  *      1.7830e-03  0.0000e+00  7.0991e-03  0.0000e+00e
3569  * gmles * f    1.0000e+00e
3570  * pgapt * f    2.4000e+06e
3571  * plvol * f    0.0000e+00e
3572  * pslen * f    0.0000e+00e
3573  * clenn * f    0.0000e+00e
3574  * burn  * f    0.0000e+00e
3575  * burn  * f    0.0000e+00e
3576  * burn  * f    0.0000e+00e
3577  * burn  * f    0.0000e+00e
3578  * burn  * f    0.0000e+00e
3579  * burn  * f    0.0000e+00e
3580  * burn  * f    0.0000e+00e
3581  * burn  * f    0.0000e+00e
3582  * burn  * f    0.0000e+00e
3583  * burn  * f    0.0000e+00e
```

```
3584  * burn  * f   0.0000e+00e
3585  * burn  * f   0.0000e+00e
3586  * burn  * f   0.0000e+00e
3587  * burn  * f   0.0000e+00e
3588  * burn  * f   0.0000e+00e
3589  * burn  * f   0.0000e+00e
3590  * burn  * f   0.0000e+00e
3591  *
3592  end
3593  *
3594  ******************
3595  * time-step data *
3596  ******************
3597  *
3598  *        dtmin          dtmax          tend          rtwfp
3599       1.0000e-05     1.0000e-02     1.0000e+00     1.0000e+01
3600  *        edint          gfint         dmpint         sedint
3601       1.0000e+00     2.0000e+00     5.0000e+00     2.0000e+00
3602  *
3603  ******************
3604  * time-step data *
3605  ******************
3606  *
3607  *        dtmin          dtmax          tend          rtwfp
3608       1.0000e-05     2.5000e-02     5.0000e+00     1.0000e+01
3609  *        edint          gfint         dmpint         sedint
3610       4.0000e+00     2.0000e+00     5.0000e+00     2.0000e+00
3611  *
3612  ******************
3613  * time-step data *
3614  ******************
3615  *
3616  *        dtmin          dtmax          tend          rtwfp
3617       1.0000e-05     1.0000e-01     2.0000e+01     5.0000e+01
3618  *        edint          gfint         dmpint         sedint
3619       2.0000e+01     2.0000e+00     2.0000e+01     5.0000e+00
3620  *
3621  ******************
3622  * time-step data *
3623  ******************
3624  *
3625  *        dtmin          dtmax          tend          rtwfp
3626       1.0000e-05     1.0000e-01     1.0000e+02     2.0000e+02
3627  *        edint          gfint         dmpint         sedint
3628       2.0000e+01     2.0000e+00     3.0000e+01     1.0000e+01
3629  *
3630  ******************
3631  * time-step data *
3632  ******************
3633  *
3634  *        dtmin          dtmax          tend          rtwfp
3635       1.0000e-05     1.5000e-01     2.0000e+02     2.0000e+02
3636  *        edint          gfint         dmpint         sedint
3637       5.0000e+01     2.0000e+00     4.0000e+01     2.0000e+01
3638  *
3639  ******************
3640  * time-step data *
3641  ******************
3642  *
3643  *      endflag
3644      -1.0000e+00
```

LOFT L2-6 TRANSIENT RESTART INPUT LISTING, REFLOOD TRIP AT 1 S

```
free format
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
                3             0             1             0
loft test lp-02-6 transient restart deck for trac-pf1/mod2
(for input without old stgen component)

*
*****************
* namelist data *
*****************
*
 &inopts chm12=1.0, chm22=0.84, iadded=10, icflow=2, idiag=1,
         igeom3=1, inlab=0, iolab=1, ipowr=-1, newrfd=3,
         nfrc1=2, nhtstr=39, noair=0, nrslv=1, tpowr=0.50,
    iblaus=1,
 &end
*
*        dstep         timet
                -1           0.0
*       stdyst        transi         ncomp          njun          ipak
                 0             1            67            30             1
*         epso          epss
    1.0000e-04    1.0000e-04
*       oitmax        sitmax        isolut        ncontr         nccfl
                10            25             0             0             0
*         ntsv          ntcb          ntcf          ntrp          ntcp
                28            22           114             8             2
*
*************************
* component-number data *
*************************
*
* iorder*               1             2             3             4             5
* iorder*               6             7             8            11            12
* iorder*              13            14            15            16            17
* iorder*              18            19            20            21            22
* iorder*              23            24            25            31            32
* iorder*              41            42            50           831           833
* iorder*             834           835           836           837           838
* iorder*             839           840           841           842           843
* iorder*             844           845           846           847           848
* iorder*             851           852           853           854           855
* iorder*             856           857           858           859           860
* iorder*             861           862           863           864           865
* iorder*             866           867           868           869           870
* iorder*            871s
* iorder*            991e
**
*************************
* control-parameter data *
*************************
*
* multi-pass control-parameter input
*
* cntr-p*               1            17            -1          -15s
* cntr-p*               1           102            19           61s
* cntr-p*             -16           -26             1            0e
*
* signal variables
*
* SV   Parameter    Component/Trip   Location       Referenced by
*  1   t                                            lots
* 10   reactor power      991                       CB -10
* 11   void fraction       20        ave/cells 1-5  CB -9
* 12   void fraction       22        ave/cells 1-6  CB -6
* 14   vapor mass flow     23        interface 6    CB -4
* 15   void fraction       22        cell 7         CB -6
* 16   void fraction       21        ave/cells 1-4  CB -7
* 17   void fraction       21        cell 5         CB -7
* 19   trip set status    100                       CB -16
* 32   pressure            12        cell 1         FILL 16
* 33   pressure            13        cell 1         FILL 17
* 34   pressure            14        cell 3         trip 6
*
*          idsv          isvn          ilcn          icn1          icn2
                1             0             0             0             0
                0
*
* control blocks
*
* CB   Refers to   Referenced by   Function
```

```
 87  * -4   SV 14          CB -5        table lookup based on secondary steam flow
 88  * -5   CB -4          CB -13       table lookup based on CB -5
 89  * -6   SV 12, 15      CB -8        calc steam volume of comp. 22
 90  * -7   SV 16, 17      CB -8        calc steam volume of comp. 21
 91  * -8   CB -6, -7      CB -9        calc steam volume of comp. 21 and 22
 92  * -9   SV 11/CB -8    CB -11       calc steam volume in comp 20, 21, and 22
 93  * -10  SV 10          CB -12       table lookup based on reactor power
 94  * -11  CB -9          CB -12       table lookup based on secondary steam volume
 95  * -12  CB -10, -11    CB -13       sums and applies gain
 96  * -13  CB -12, -5     CB -14       sums
 97  * -14  CB -13, -15    CB -15       subtracts, gain, and limits
 98  * -15  CB -14         CB -14, -17  integrator
 99  * -16  SV 19          CB -17       integrates trip set status with gain/limits
100  * -17  CB -15, -16    CB -18       sums
101  * -18  CB -17         FILL 24      table lookup (provides the independent
102  *                                  variable for the FILL table)
103  *
104  *         idcb          icbn          icb1          icb2          icb3
105                0
106  *
107  * trips
108  *
109  * Trip   References   Referenced by   Function
110  *    2   SV 1 (time)  FILL 16         Controls the time at which HPIS starts
111  *    3   SV 1 (time)  FILL 17         Controls the time at which LPIS starts
112  *    6   SV 34 (p)    VALVE 14        Controls pressure at which accumulator
113  *                                        injection starts
114  *    8   SV 1 (time)  VALVE 23        Set status is always on forward so that
115  *                     FILL 24           the steam valve and feedwater operate
116  *                                       during the steady state and transient
117  *   10   SV 1 (time)  PUMP 4, 5       Controls time of pump trip
118  *  100   SV 1 (time)  ROD 991         Core power trip
119  *  101   SV 1 (time)  ROD 991         Fine mesh trip
120  *  102   SV 1 (time)  ROD 991         New reflood heat transfer trip
121  *
122  *         ntse          ntct          ntsf          ntdp          ntsd
123                0             0             0             0             0
124  *
125  *         idtp          isrt          iset          itst          idsg
126               102             2             0             1             1
127  *       setp(1)       setp(2)
128               0.0           1.0
129  *       dtsp(1)       dtsp(2)
130               0.0           0.0
131  *       ifsp(1)       ifsp(2)
132                 0             0
133  *
134  *         idtp          isrt          iset          itst          idsg
135                0
136  *
137  ******************
138  * component data *
139  ******************
140  *
141  *******   type          num           id        ctitle
142  break                    32            32 $32$ broken-hot-leg terminal
143  *         junl          ibty          isat          ioff
144                32             1             3             1
145  *         ibtr          ibsv          nbtb          nbsv          nbrf
146                0             1            10             0             0
147  *         dxin          volin         alpin          tin           pin
148       0.815976     0.0423948           0.0         615.3     150.1e+05
149  *         pain          concin        rbmx          poff          belv
150               0.0           0.0       1.0e+20          0.0           0.0
151  *         pscl          tlscl         tvscl         pascl         consol
152               1.0           1.0           1.0           1.0           1.0
153  * ptb   *             0.0       150.1e+05s
154  * ptb   *           0.0191        1.0e+05s
155  * ptb   *             1.0        2.5e+05s
156  * ptb   *             5.0        3.0e+05s
157  * ptb   *            32.0        3.6e+05s
158  * ptb   *            52.0       3.34e+05s
159  * ptb   *            70.0       3.17e+05s
160  * ptb   *           100.0        3.0e+05s
161  * ptb   *           310.0        2.7e+05s
162  * ptb   *           500.0        2.7e+05e
163  *
164  *******   type          num           id        ctitle
165  break                    42            42 $42$ broken-cold-leg terminal
166  *         junl          ibty          isat          ioff
167                42             1             3             1
168  *         ibtr          ibsv          nbtb          nbsv          nbrf
169                0             1            10             0             0
170  *         dxin          volin         alpin          tin           pin
171       1.0224006     0.0531200           0.0         615.5     150.4e+05
172  *         pain          concin        rbmx          poff          belv
173               0.0           0.0       1.0e+20          0.0           0.0
174  *         pscl          tlscl         tvscl         pascl         consol
175               1.0           1.0           1.0           1.0           1.0
176  * ptb   *             0.0       150.4e+05s
177  * ptb   *           0.0191        1.0e+05s
178  * ptb   *             1.0        2.5e+05s
```

```
* ptb   *          5.0       3.0e+05s
* ptb   *         32.0       3.6e+05s
* ptb   *         52.0      3.34e+05s
* ptb   *         70.0      3.17e+05s
* ptb   *        100.0       3.0e+05s
* ptb   *        310.0       2.7e+05s
* ptb   *        500.0       2.7e+05e
*
*
end
*
******************
* time-step data *
******************
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06    5.0000e-03           0.1            1.0
*       edint          gfint         dmpint         sedint
            0.5           0.05            2.0            0.5
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06    1.0000e-02            2.0            1.0
*       edint          gfint         dmpint         sedint
            0.5           0.05            2.0            0.5
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06    0.01                6.0              1.0
*       edint          gfint         dmpint         sedint
            2.0            0.2            3.0            2.0
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06          0.01           20.0            1.0
*       edint          gfint         dmpint         sedint
            5.0            0.5            5.0            5.0
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06          0.01           70.0            1.0
*       edint          gfint         dmpint         sedint
           10.0            0.5           10.0           10.0
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06          0.02           90.0            1.0
*       edint          gfint         dmpint         sedint
           10.0            0.5           10.0           10.0
*
*       dtmin          dtmax          tend          rtwfp
    1.0000e-06          0.04          120.0            1.0
*       edint          gfint         dmpint         sedint
           10.0            0.5           10.0           10.0
*
*     endflag
   -1.0000e+00
```

LOFT L2-6 TRANSIENT RESTART INPUT LISTING, REFLOOD TRIP AT 20 S

```
free format
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
                3             0             1             0
loft test lp-02-6 transient restart deck for trac-pf1/mod2
(for input without old stgen component)

*
*****************
* namelist data *
*****************
*
 &inopts chm12=1.0, chm22=0.84, iadded=10, icflow=2, idiag=1,
         igeom3=1, inlab=0, iolab=1, ipowr=-1, newrfd=3,
         nfrc1=2, nhtstr=39, noair=0, nrslv=1, tpowr=0.50,
    iblaus=1,
 &end
*
*        dstep         timet
              -1           0.0
*       stdyst        transi         ncomp          njun          ipak
                0             1            67            30             1
*         epso          epss
    1.0000e-04    1.0000e-04
*       oitmax        sitmax        isolut        ncontr         nccfl
               10            25             0             0             0
*         ntsv          ntcb          ntcf          ntrp          ntcp
               28            22           114             8             2
*
*************************
* component-number data *
*************************
*
* iorder*               1             2             3             4             5
* iorder*               6             7             8            11            12
* iorder*              13            14            15            16            17
* iorder*              18            19            20            21            22
* iorder*              23            24            25            31            32
* iorder*              41            42            50           831           833
* iorder*             834           835           836           837           838
* iorder*             839           840           841           842           843
* iorder*             844           845           846           847           848
* iorder*             851           852           853           854           855
* iorder*             856           857           858           859           860
* iorder*             861           862           863           864           865
* iorder*             866           867           868           869           870
* iorder*            871s
* iorder*            991e
**
*************************
* control-parameter data *
*************************
*
* multi-pass control-parameter input
*
* cntr-p*               1            17            -1          -15s
* cntr-p*               1           102            19           61s
* cntr-p*             -16           -26             1            0e
*
* signal variables
*
* SV   Parameter    Component/Trip   Location       Referenced by
*  1   t                                            lots
* 10   reactor power      991                       CB -10
* 11   void fraction       20        ave/cells 1-5  CB -9
* 12   void fraction       22        ave/cells 1-6  CB -6
* 14   vapor mass flow     23        interface 6    CB -4
* 15   void fraction       22        cell 7         CB -6
* 16   void fraction       21        ave/cells 1-4  CB -7
* 17   void fraction       21        cell 5         CB -7
* 19   trip set status    100                       CB -16
* 32   pressure            12        cell 1         FILL 16
* 33   pressure            13        cell 1         FILL 17
* 34   pressure            14        cell 3         trip 6
*
*         idsv          isvn          ilcn          icn1          icn2
                1             0             0             0             0
                0
*
* control blocks
*
```

```
 86  * CB   Refers to   Referenced by   Function
 87  * -4   SV 14          CB -5        table lookup based on secondary steam flow
 88  * -5   CB -4          CB -13       table lookup based on CB -5
 89  * -6   SV 12, 15      CB -8        calc steam volume of comp. 22
 90  * -7   SV 16, 17      CB -8        calc steam volume of comp. 21
 91  * -8   CB -6, -7      CB -9        calc steam volume of comp. 21 and 22
 92  * -9   SV 11/CB -8    CB -11       calc steam volume in comp 20, 21, and 22
 93  * -10  SV 10          CB -12       table lookup based on reactor power
 94  * -11  CB -9          CB -12       table lookup based on secondary steam volume
 95  * -12  CB -10, -11    CB -13       sums and applies gain
 96  * -13  CB -12, -5     CB -14       sums
 97  * -14  CB -13, -15    CB -15       subtracts, gain, and limits
 98  * -15  CB -14         CB -14, -17  integrator
 99  * -16  SV 19          CB -17       integrates trip set status with gain/limits
100  * -17  CB -15, -16    CB -18       sums
101  * -18  CB -17         FILL 24      table lookup (provides the independent
102  *                                  variable for the FILL table)
103  *
104  *         idcb          icbn          icb1          icb2          icb3
105                0
106  *
107  * trips
108  *
109  * Trip   References   Referenced by   Function
110  *    2   SV 1 (time)  FILL 16         Controls the time at which HPIS starts
111  *    3   SV 1 (time)  FILL 17         Controls the time at which LPIS starts
112  *    6   SV 34 (p)    VALVE 14        Controls pressure at which accumulator
113  *                                        injection starts
114  *    8   SV 1 (time)  VALVE 23        Set status is always on forward so that
115  *                     FILL 24            the steam valve and feedwater operate
116  *                                        during the steady state and transient
117  *   10   SV 1 (time)  PUMP 4, 5        Controls time of pump trip
118  *  100   SV 1 (time)  ROD 991          Core power trip
119  *  101   SV 1 (time)  ROD 991          Fine mesh trip
120  *  102   SV 1 (time)  ROD 991          New reflood heat transfer trip
121  *
122  *         ntse          ntct          ntsf          ntdp          ntsd
123                0             0             0             0             0
124  *
125  *         idtp          isrt          iset          itst          idsg
126               102             2             0             1             1
127  *      setp(1)       setp(2)
128               0.0          20.0
129  *      dtsp(1)       dtsp(2)
130               0.0           0.0
131  *      ifsp(1)       ifsp(2)
132                 0             0
133  *
134  *         idtp          isrt          iset          itst          idsg
135                 0
136  *
137  ******************
138  * component data *
139  ******************
140  *
141  *******   type           num            id        ctitle
142  break                     32            32 $32$ broken-hot-leg terminal
143  *         junl          ibty          isat          ioff
144                32             1             3             1
145  *         ibtr          ibsv          nbtb          nbsv          nbrf
146                 0             1            10             0             0
147  *         dxin          volin         alpin          tin           pin
148         0.815976     0.0423948           0.0         615.3     150.1e+05
149  *         pain          concin        rbmx          poff          belv
150              0.0           0.0       1.0e+20           0.0           0.0
151  *         pscl          tlscl         tvscl         pascl         consol
152               1.0             1.0           1.0           1.0           1.0
153  * ptb    *              0.0      150.1e+05s
154  * ptb    *            0.0191       1.0e+05s
155  * ptb    *              1.0        2.5e+05s
156  * ptb    *              5.0        3.0e+05s
157  * ptb    *             32.0        3.6e+05s
158  * ptb    *             52.0       3.34e+05s
159  * ptb    *             70.0       3.17e+05s
160  * ptb    *            100.0        3.0e+05s
161  * ptb    *            310.0        2.7e+05s
162  * ptb    *            500.0        2.7e+05e
163  *
164  *******   type           num            id        ctitle
165  break                     42            42 $42$ broken-cold-leg terminal
166  *         junl          ibty          isat          ioff
167                42             1             3             1
168  *         ibtr          ibsv          nbtb          nbsv          nbrf
169                 0             1            10             0             0
170  *         dxin          volin         alpin          tin           pin
171       1.0224006     0.0531200           0.0         615.5     150.4e+05
172  *         pain          concin        rbmx          poff          belv
173              0.0           0.0       1.0e+20           0.0           0.0
174  *         pscl          tlscl         tvscl         pascl         consol
175               1.0             1.0           1.0           1.0           1.0
176  * ptb    *              0.0      150.4e+05s
177  * ptb    *            0.0191       1.0e+05s
```

```
178  * ptb   *            1.0       2.5e+05s
179  * ptb   *            5.0       3.0e+05s
180  * ptb   *           32.0       3.6e+05s
181  * ptb   *           52.0      3.34e+05s
182  * ptb   *           70.0      3.17e+05s
183  * ptb   *          100.0       3.0e+05s
184  * ptb   *          310.0       2.7e+05s
185  * ptb   *          500.0       2.7e+05e
186  *
187  *
188  end
189  *
190  ******************
191  * time-step data *
192  ******************
193  *
194  *        dtmin          dtmax          tend          rtwfp
195       1.0000e-06     5.0000e-03           0.1            1.0
196  *        edint          gfint         dmpint         sedint
197             0.5           0.05            2.0            0.5
198  *
199  *        dtmin          dtmax          tend          rtwfp
200       1.0000e-06     1.0000e-02           2.0            1.0
201  *        edint          gfint         dmpint         sedint
202             0.5           0.05            2.0            0.5
203  *
204  *        dtmin          dtmax          tend          rtwfp
205       1.0000e-06     2.5000e-02           6.0            1.0
206  *        edint          gfint         dmpint         sedint
207             2.0            0.2            3.0            2.0
208  *
209  *        dtmin          dtmax          tend          rtwfp
210       1.0000e-06           0.05          20.0            1.0
211  *        edint          gfint         dmpint         sedint
212             5.0            0.5            5.0            5.0
213  *
214  *        dtmin          dtmax          tend          rtwfp
215       1.0000e-06           0.01          70.0            1.0
216  *        edint          gfint         dmpint         sedint
217            10.0            0.5           10.0           10.0
218  *
219  *        dtmin          dtmax          tend          rtwfp
220       1.0000e-06           0.02          90.0            1.0
221  *        edint          gfint         dmpint         sedint
222            10.0            0.5           10.0           10.0
223  *
224  *        dtmin          dtmax          tend          rtwfp
225       1.0000e-06           0.04         120.0            1.0
226  *        edint          gfint         dmpint         sedint
227            10.0            0.5           10.0           10.0
228  *
229  *     endflag
230     -1.0000e+00
```

APPENDIX P

CODE-DATA COMPARISON FOR LOFT L2-6 WITH NEWRFD=1

The calculation results for the reflood option newrfd=1 are presented in this appendix. The set of plots presented is the same as that presented in the main body of the report for the reflood option newrfd=3. The TRAC-PF1/MOD2 developmental assessment calculations used the TRAC grid-spacer model. We have run LOFT L2-6 calculations both with and without the grid-spacer model. We have determined that the grid-spacer model should not be used because it results in excessive and nonphysical heat-transfer processes in the upper portions of the core. Therefore, the base-case assessment results for LOFT L2-6 do not use the TRAC grid-spacer model (see Section 4.4.5 for details). For reference purposes, the figure numbers for the two reflood options are listed below.

20-s Trip Figures		**1-s Trip Figures**	
newrfd=1	newrfd=3	newrfd=1	newrfd=3
P-1	5.1-10	P-18	5.1-27
P-2	5.1-11	P-19	5.1-28
P-3	5.1-12	P-20	5.1-29
P-4	5.1-13	P-21	5.1-30
P-5	5.1-14	P-22	5.1-31
P-6	5.1-15	P-23	5.1-32
P-7	5.1-16	P-24	5.1-33
P-8	5.1-17	P-25	5.1-34
P-9	5.1-18	P-26	5.1-35
P-10	5.1-19	P-27	5.1-36
P-11	5.1-20	P-28	5.1-37
P-12	5.1-21	P-29	5.1-38
P-13	5.1-22	P-30	5.1-39
P-14	5.1-23	P-31	5.1-40
P-15	5.1-24	P-32	5.1-41
P-16	5.1-25	P-33	5.1-42
P-17	5.1-26	P-34	5.1-43

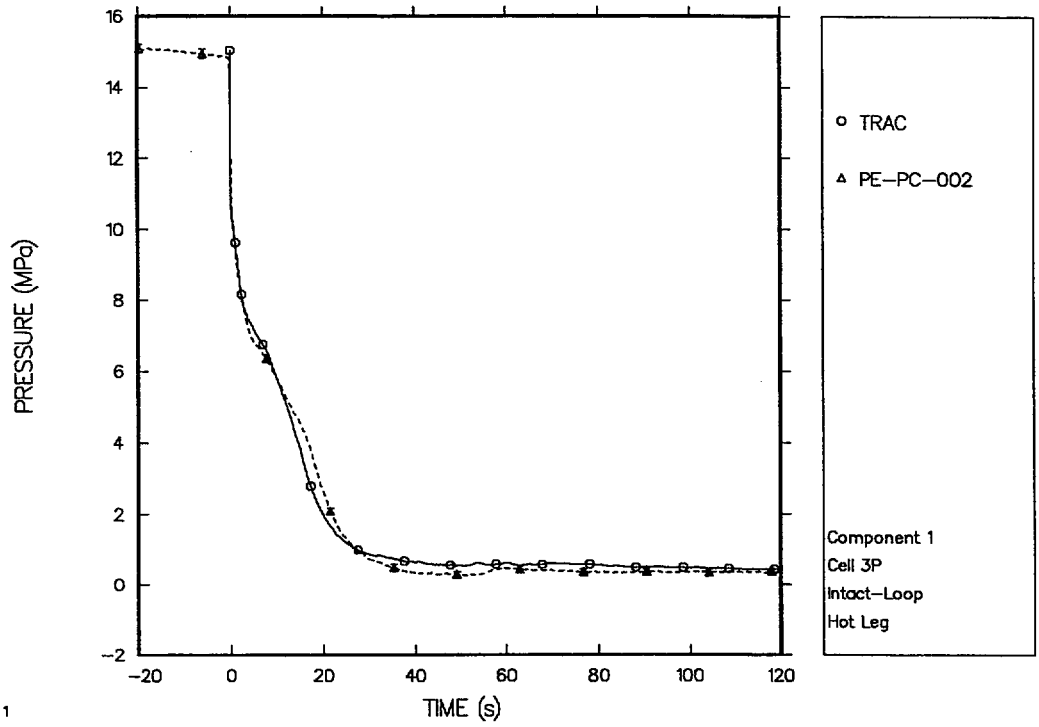


Fig. P-1. Intact-loop hot-leg pressure.

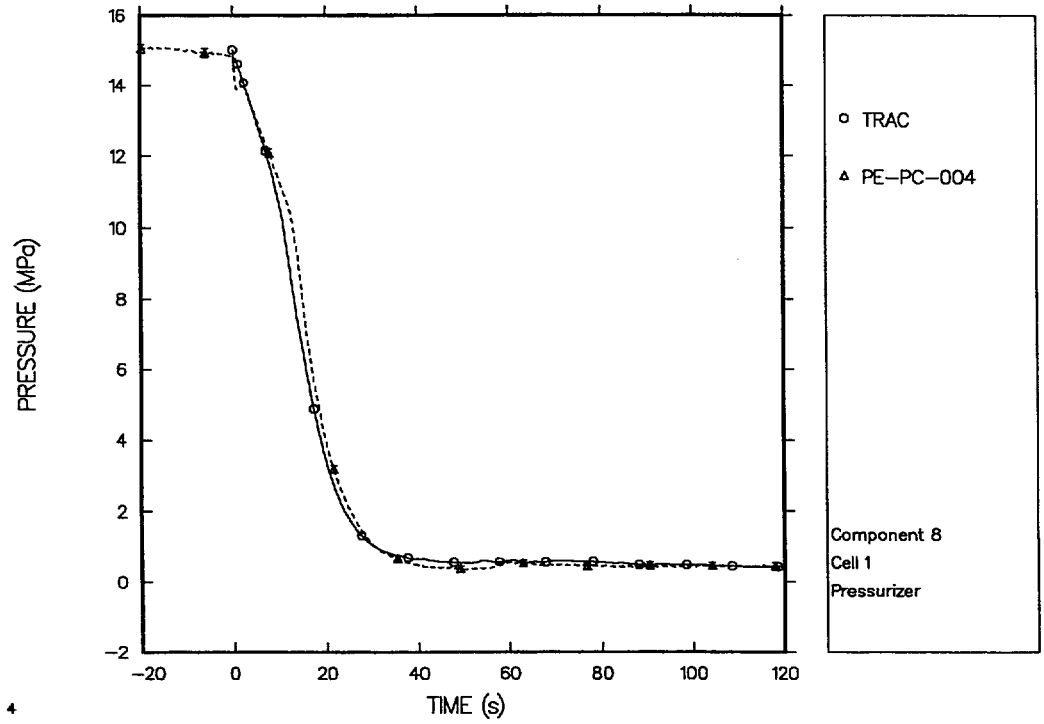


Fig. P-2. Pressurizer pressure.

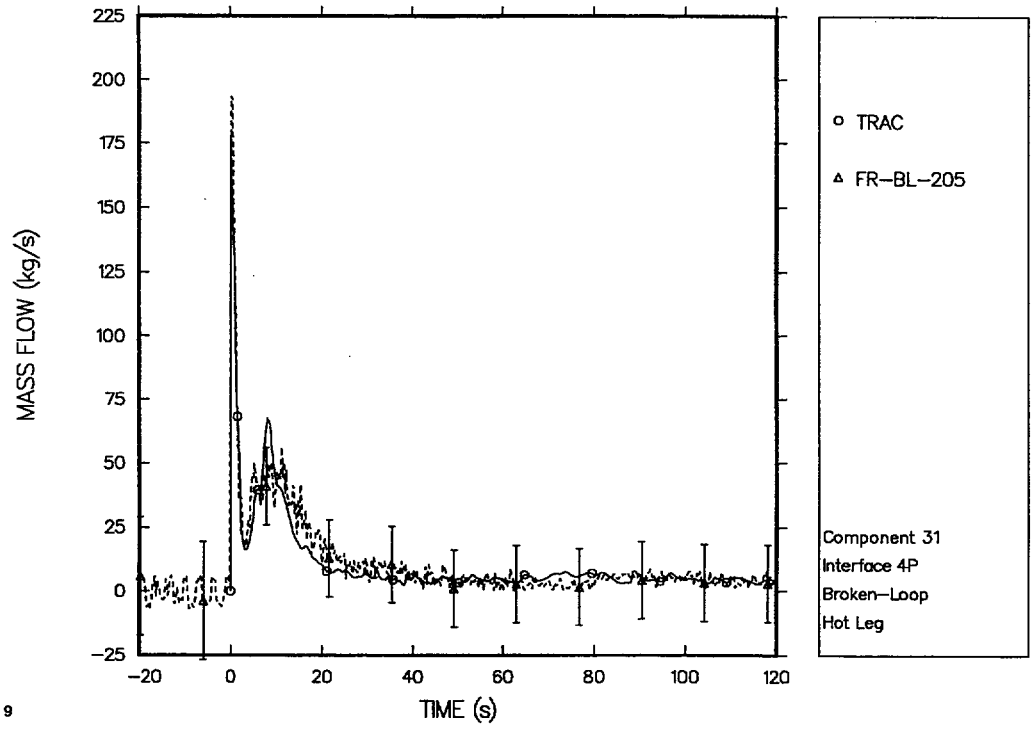


Fig. P-3. Broken-loop hot-leg mass flow.

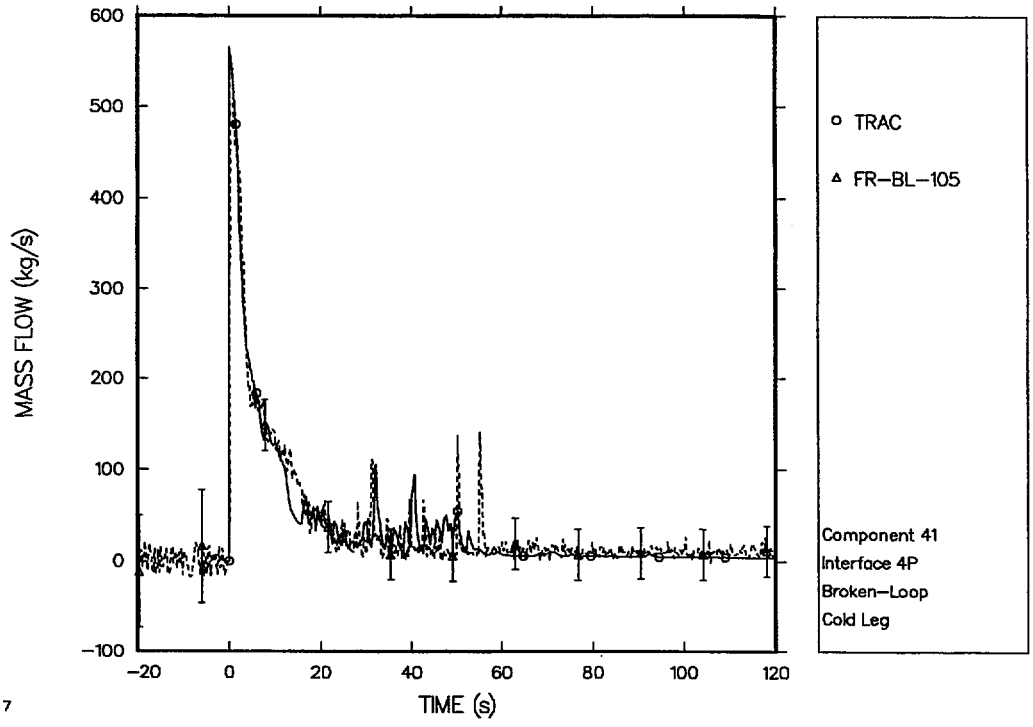


Fig. P-4. Broken-loop cold-leg mass flow.

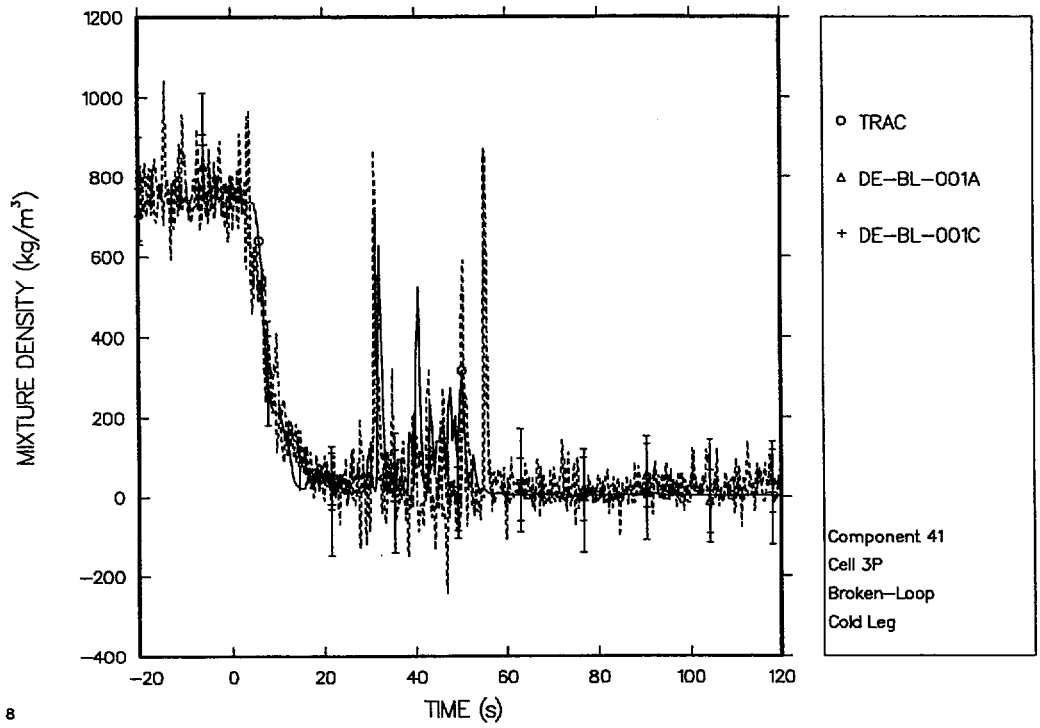


Fig. P-5. Broken-loop cold-leg mixture density.

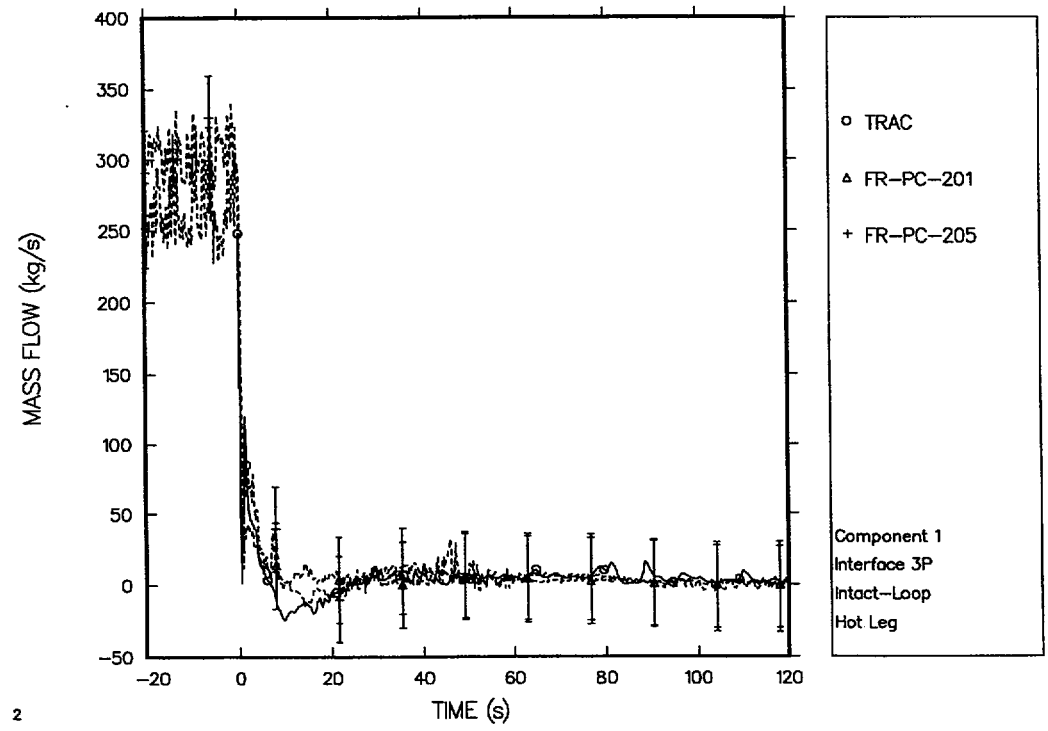


Fig. P-6. Intact-loop hot-leg mass flow.

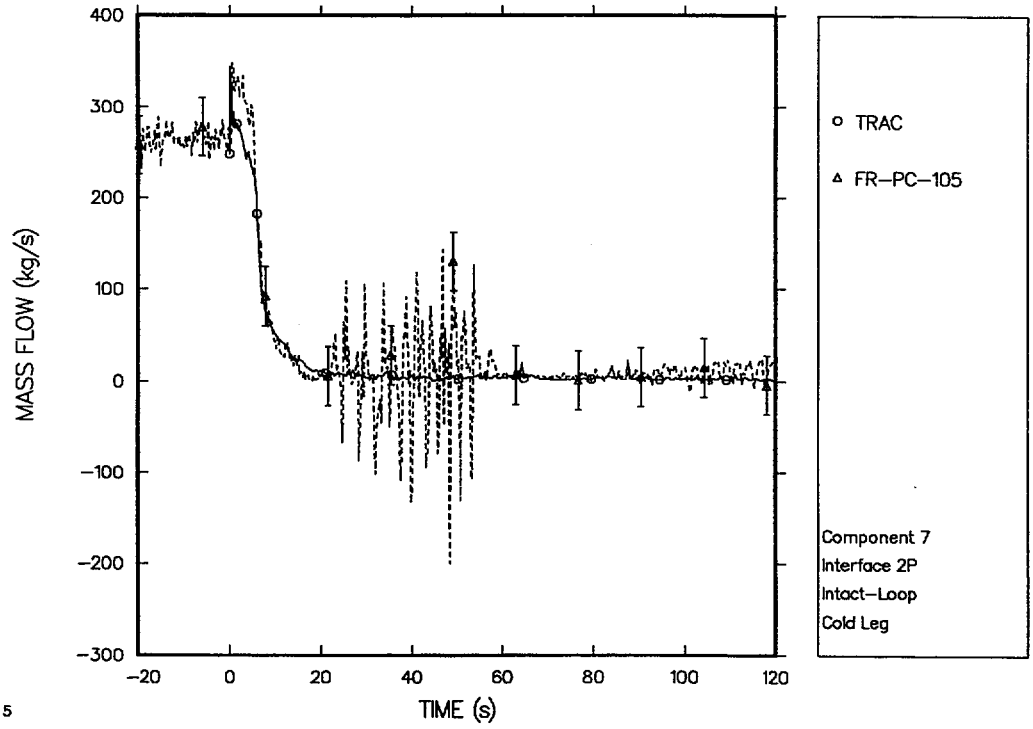


Fig. P-7. Intact-loop cold-leg mass flow.

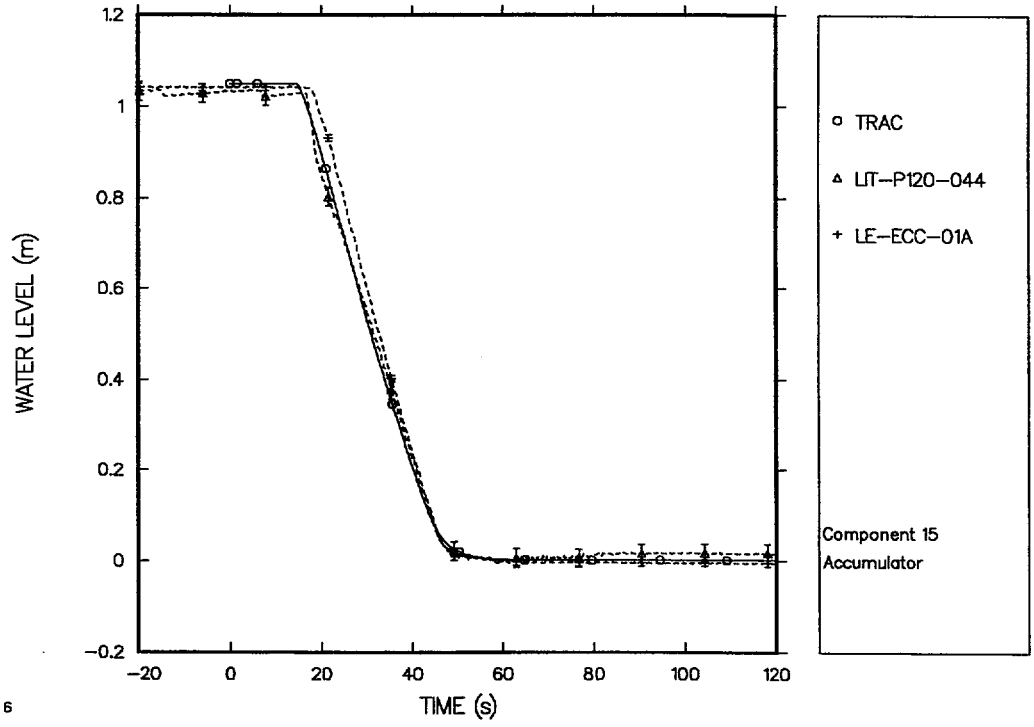
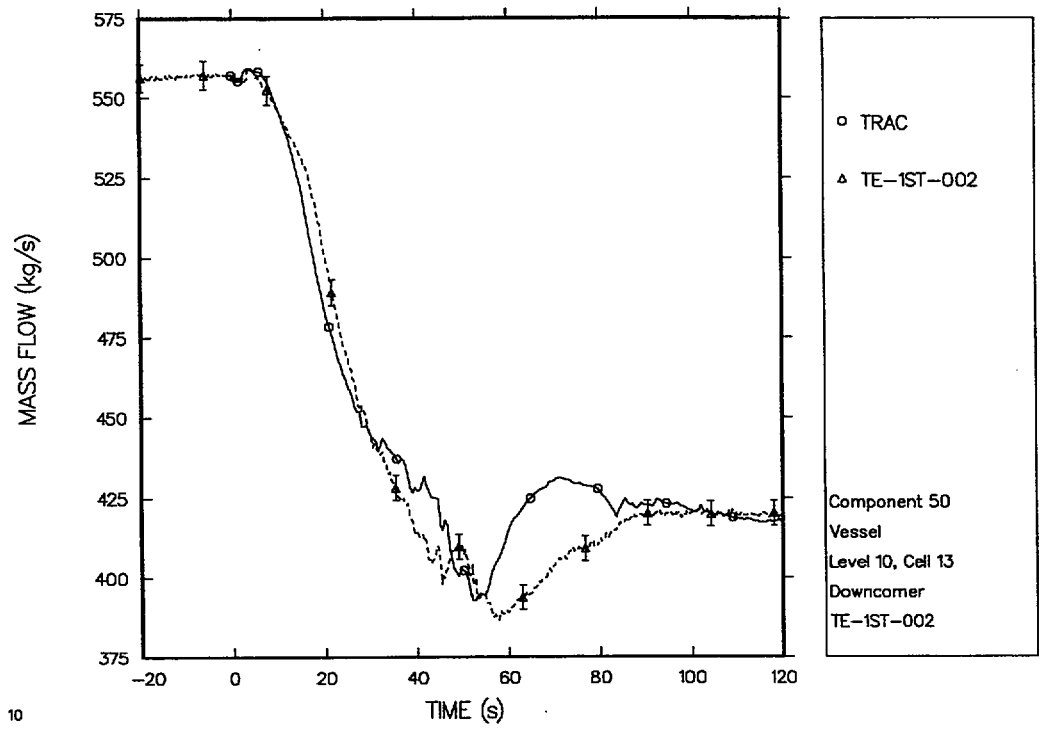
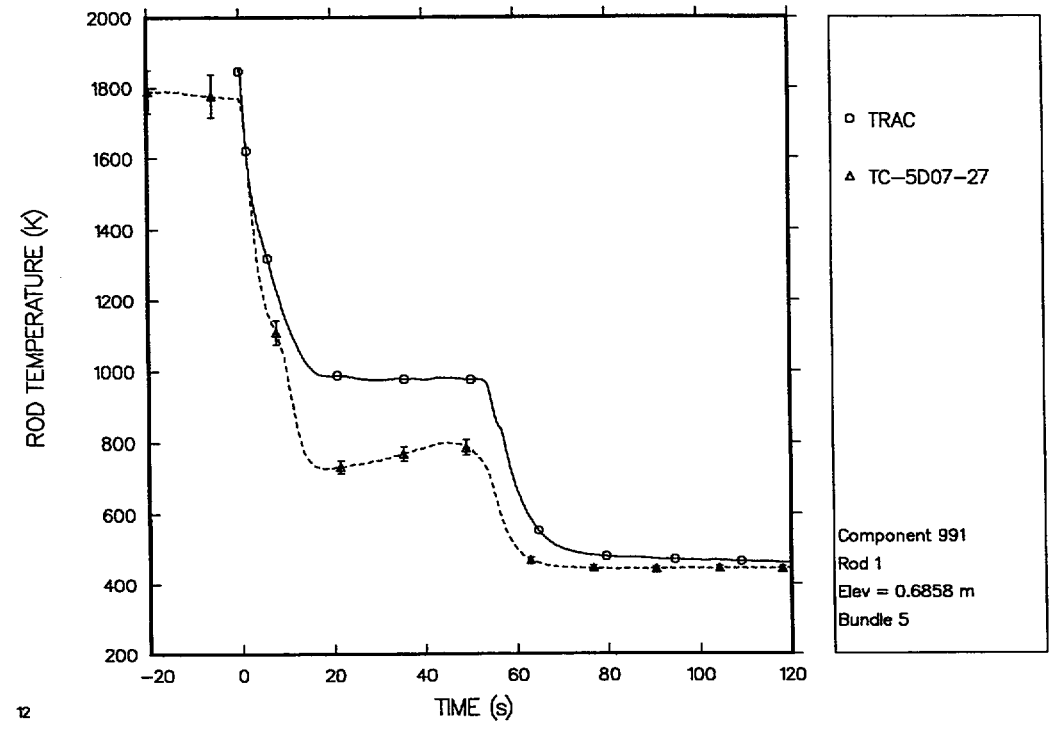


Fig. P-8. Accumulator level comparison.



10

Fig. P-9. Downcomer liquid-temperature comparison



12

Fig. P-10. Centerline fuel, temperature; Rod 1 elevation = 0.6858 m.

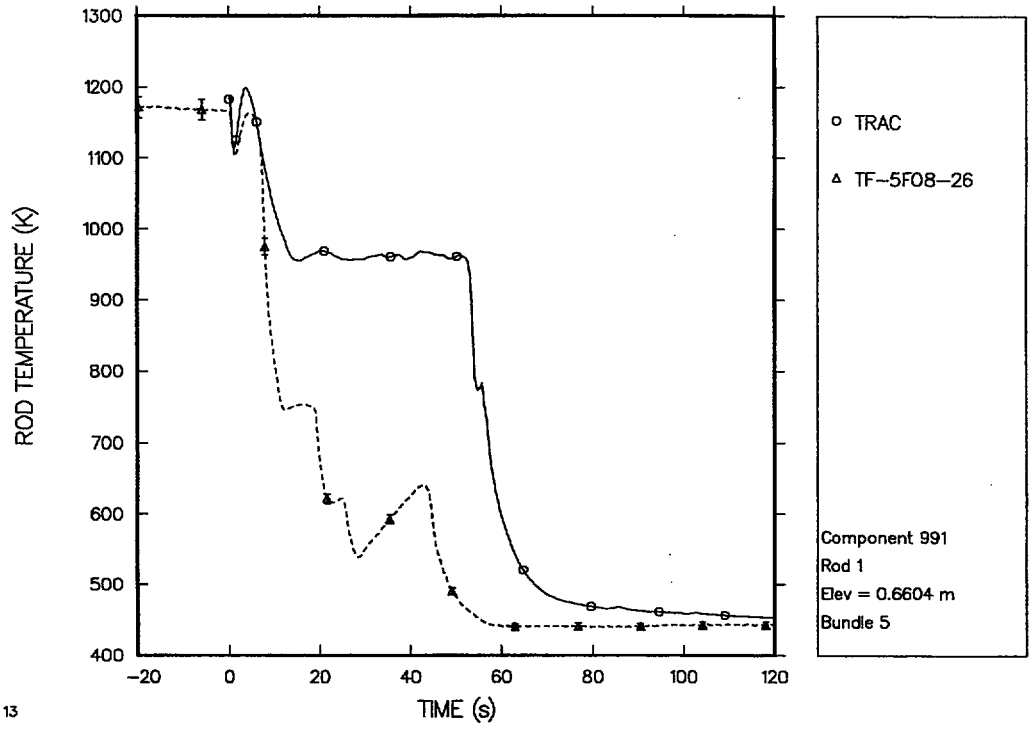


Fig. P-11. Pellet surface temperature; Rod 1 elevation = 0.6604 m.

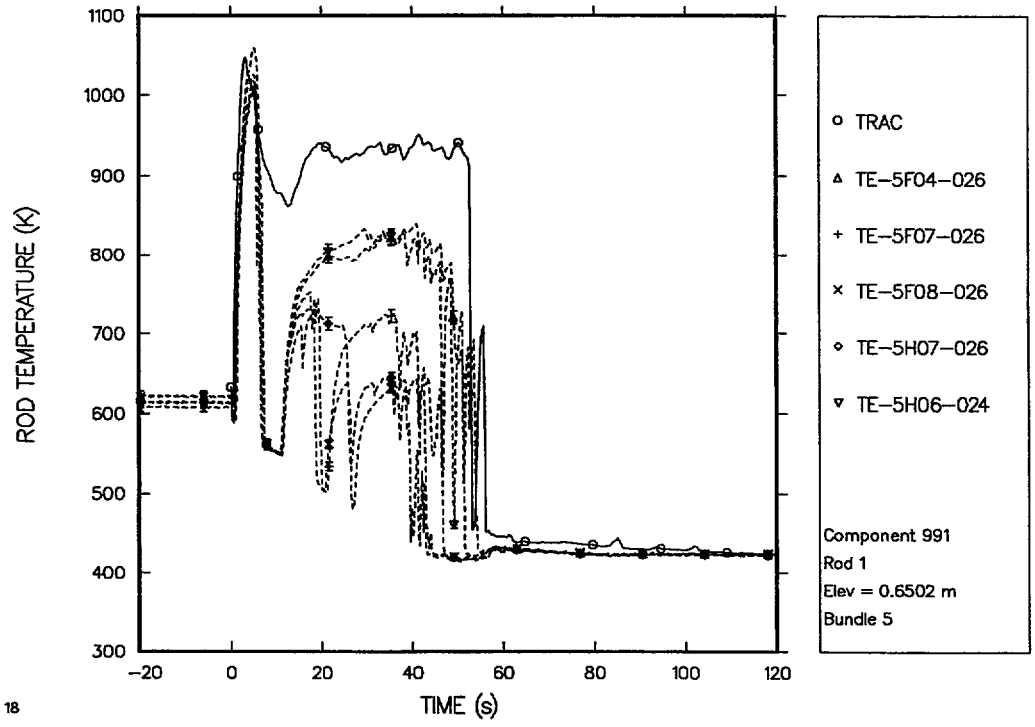
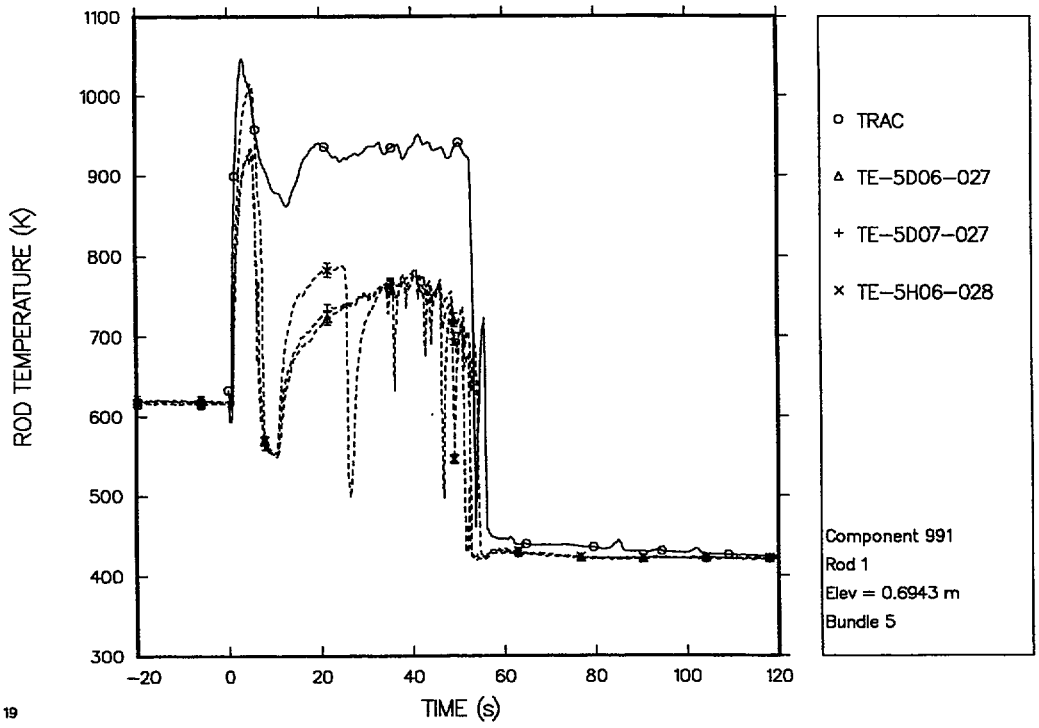
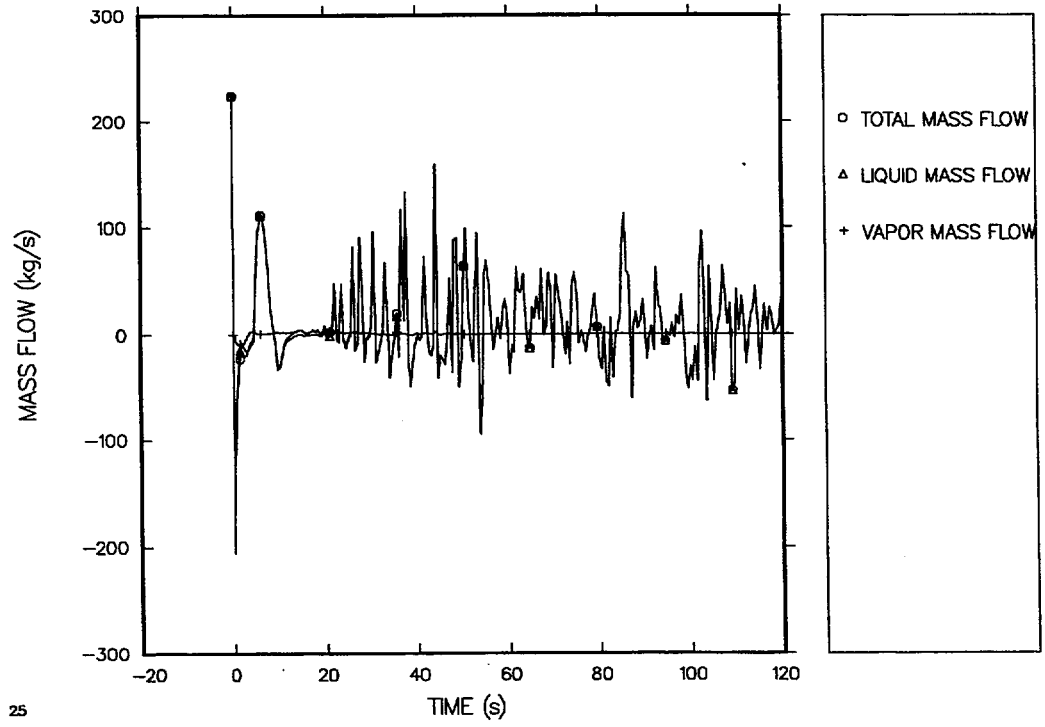


Fig. P-12. Cladding surface temperature; Rod 1 elevation = 0.6502 m.



19

Fig. P-13. Cladding surface temperature; Rod 1 elevation = 0.6943 m.



25

Fig. P-14. Calculated core-inlet mass flow.

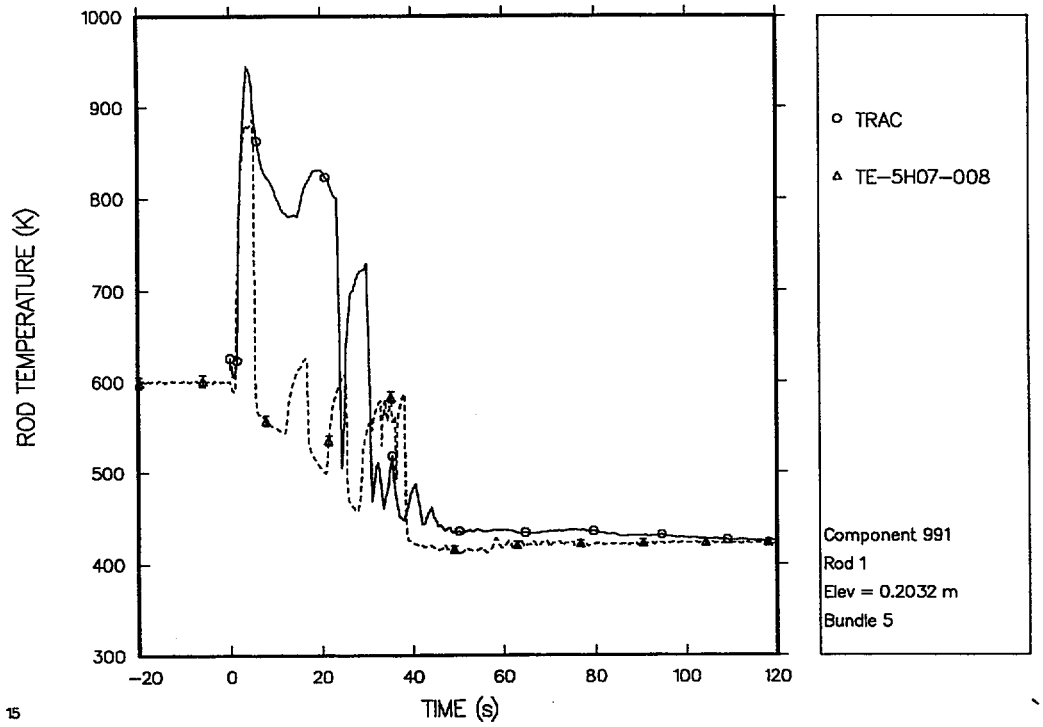


Fig. P-15. Cladding surface temperature; Rod 1 elevation = 0.2032 m.

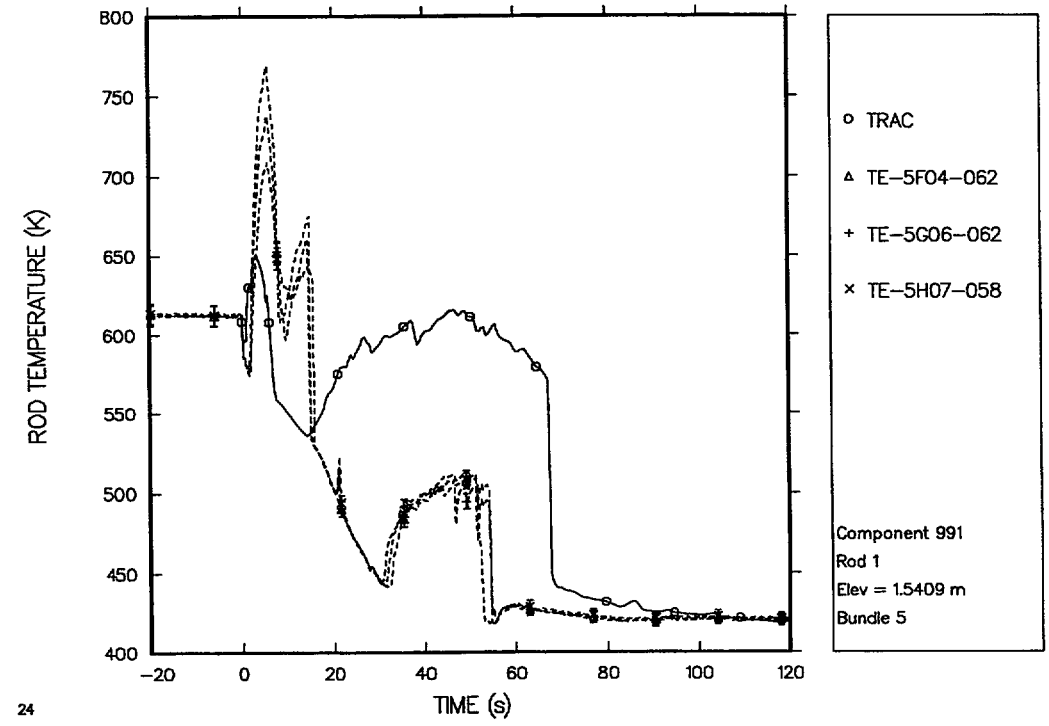


Fig. P-16. Cladding surface temperature; Rod 1 elevation = 1.5409 m.

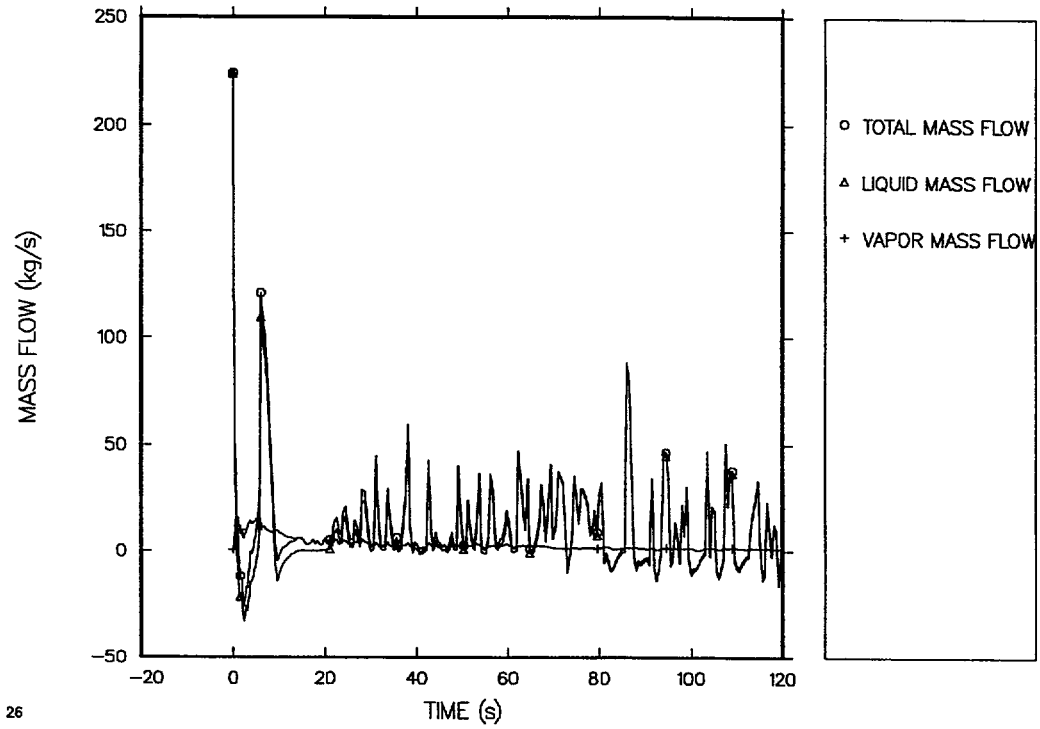


Fig. P-17. Calculated core-outlet mass flow.

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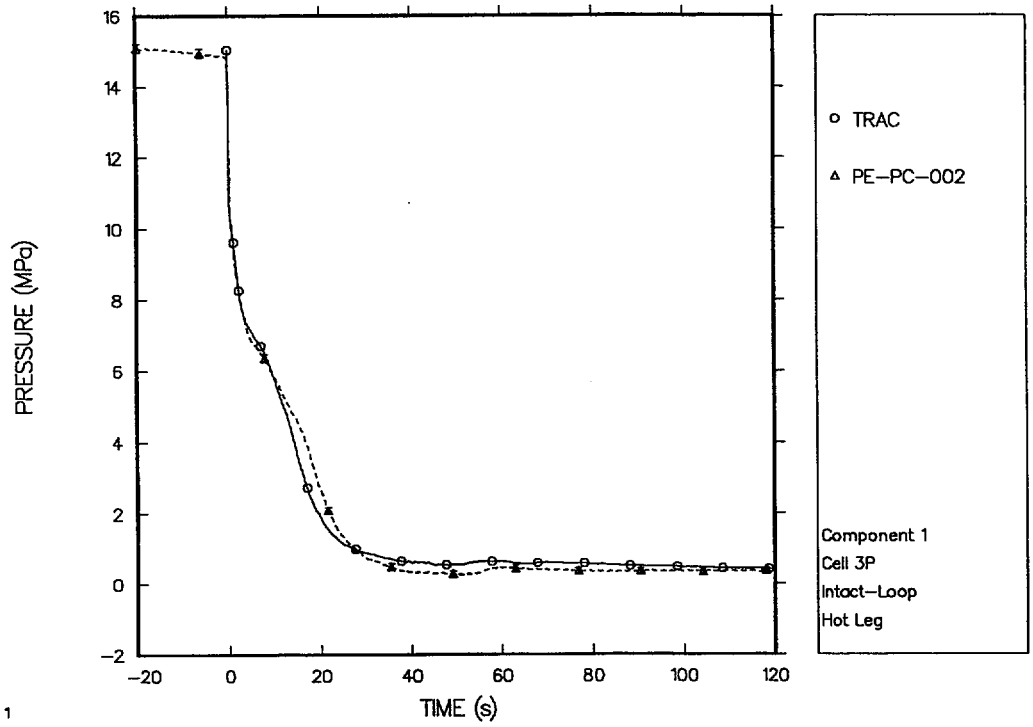


Fig. P-18. Intact-loop hot-leg pressure, reflood trip at 1 s.

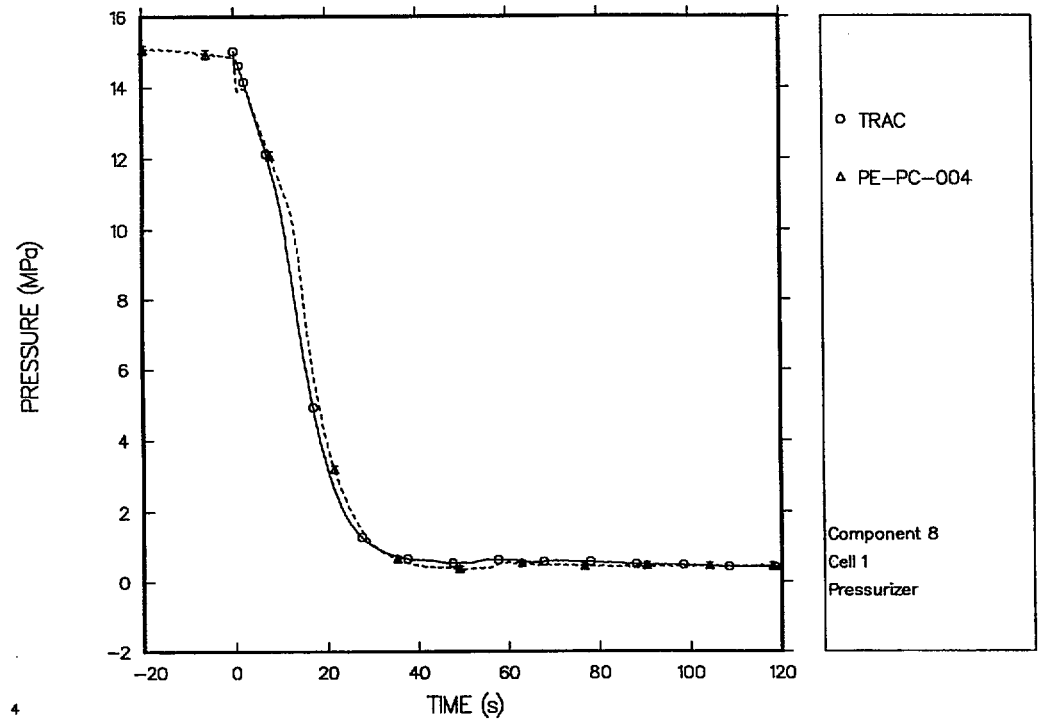


Fig. P-19. Pressurizer pressure, reflood trip at 1 s.

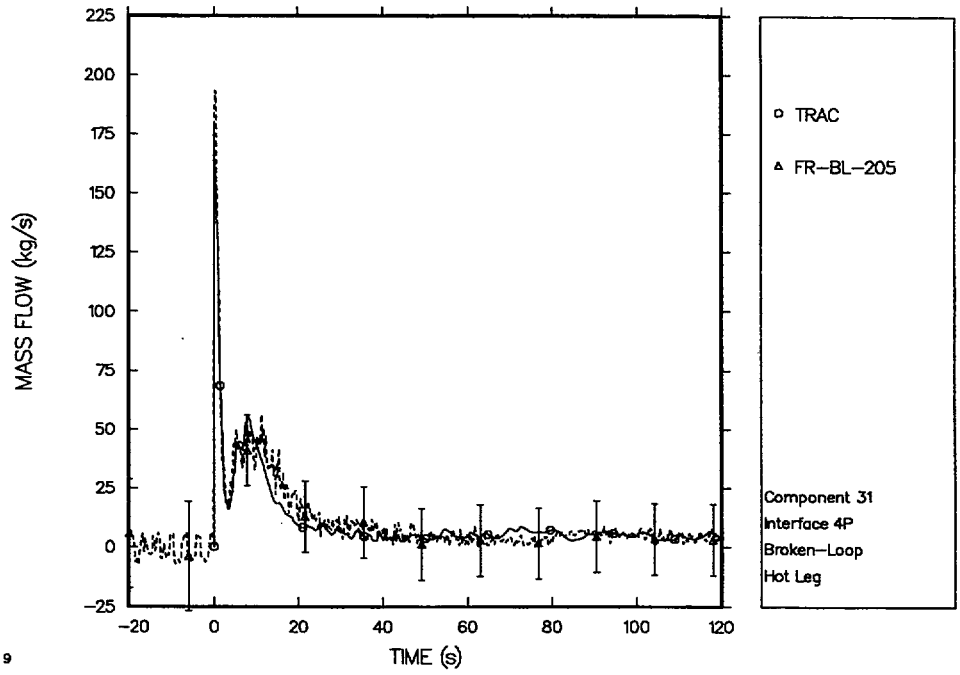


Fig. P-20. Broken-loop hot-leg mass flow, reflood trip at 1 s.

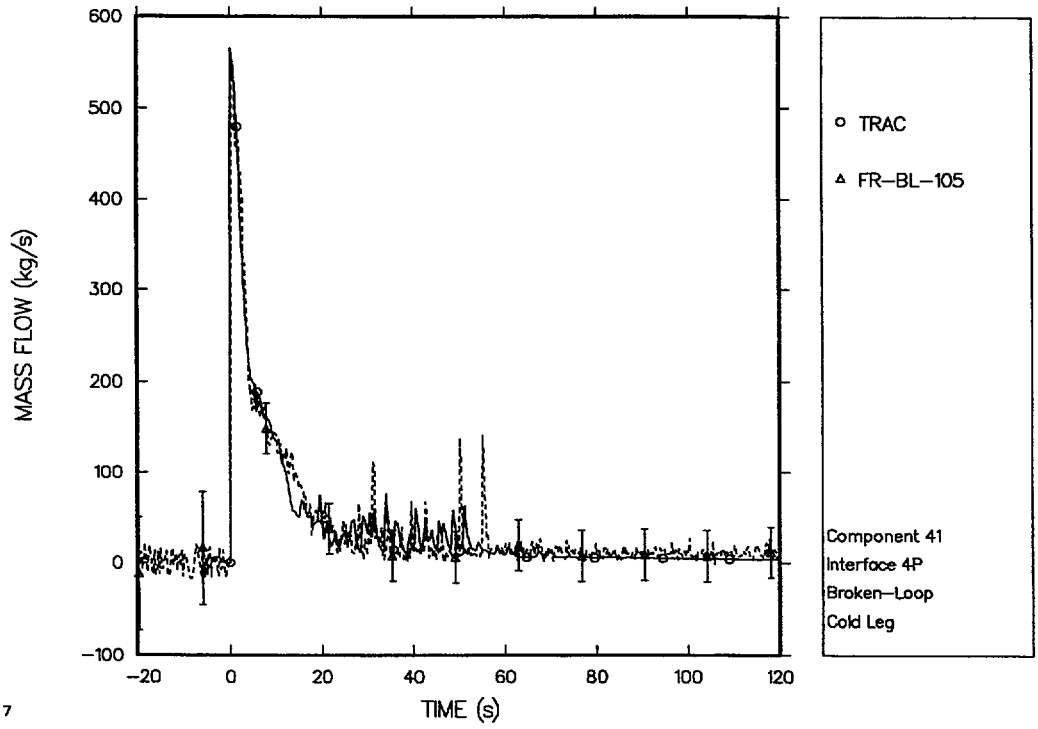


Fig. P-21. Broken-loop cold-leg mass flow, reflood trip at 1 s.

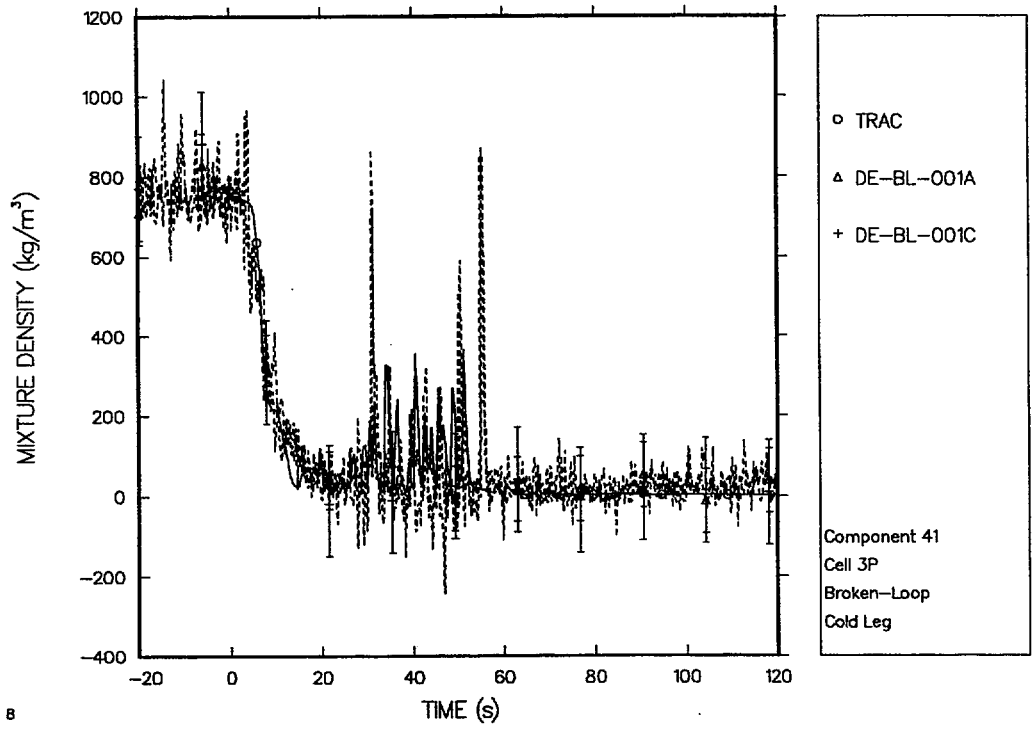


Fig. P-22. Broken-loop cold-leg mixture density, reflood trip at 1 s.

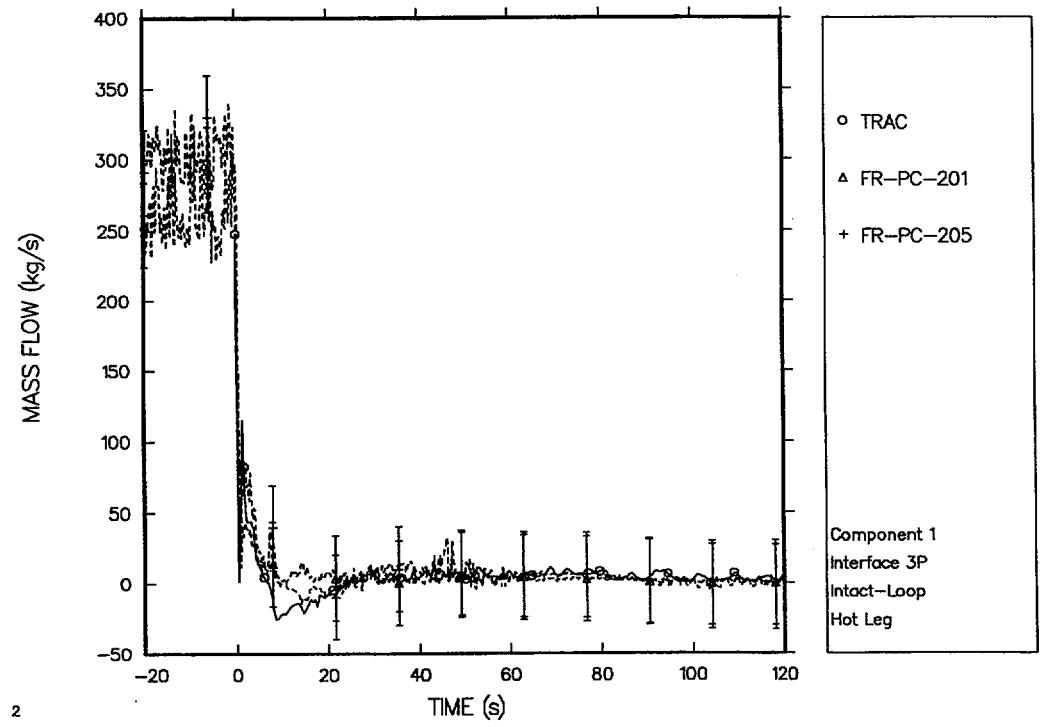


Fig. P-23. Intact-loop hot-leg mass flow, reflood trip at 1 s.

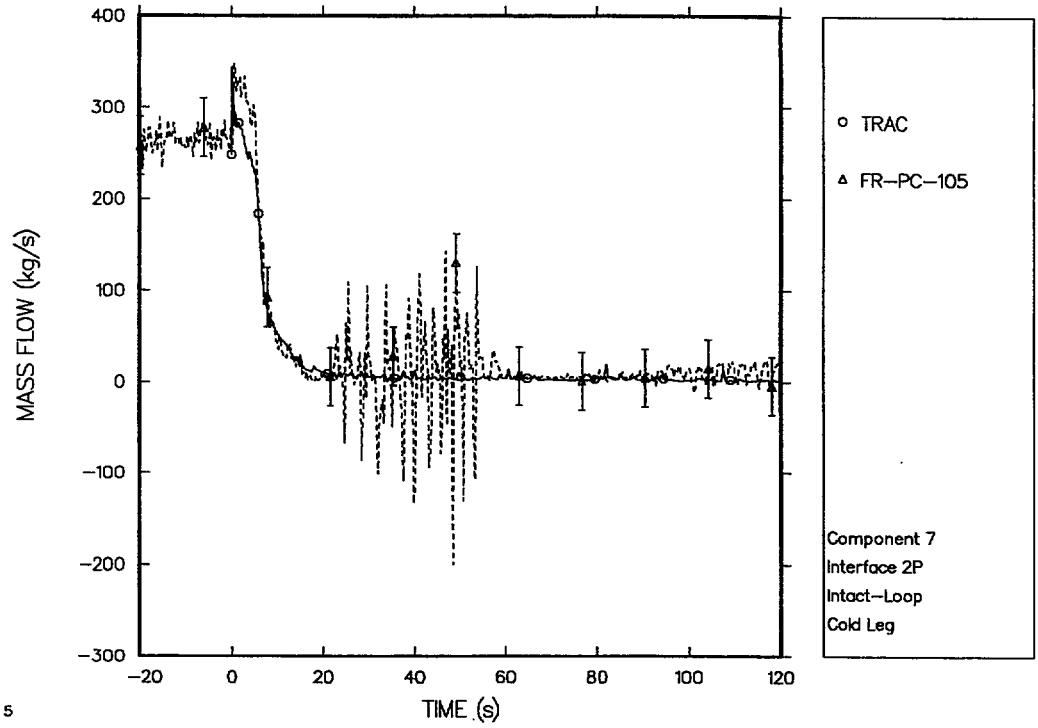


Fig. P-24. Intact-loop cold-leg mass flow, reflood trip at 1 s.

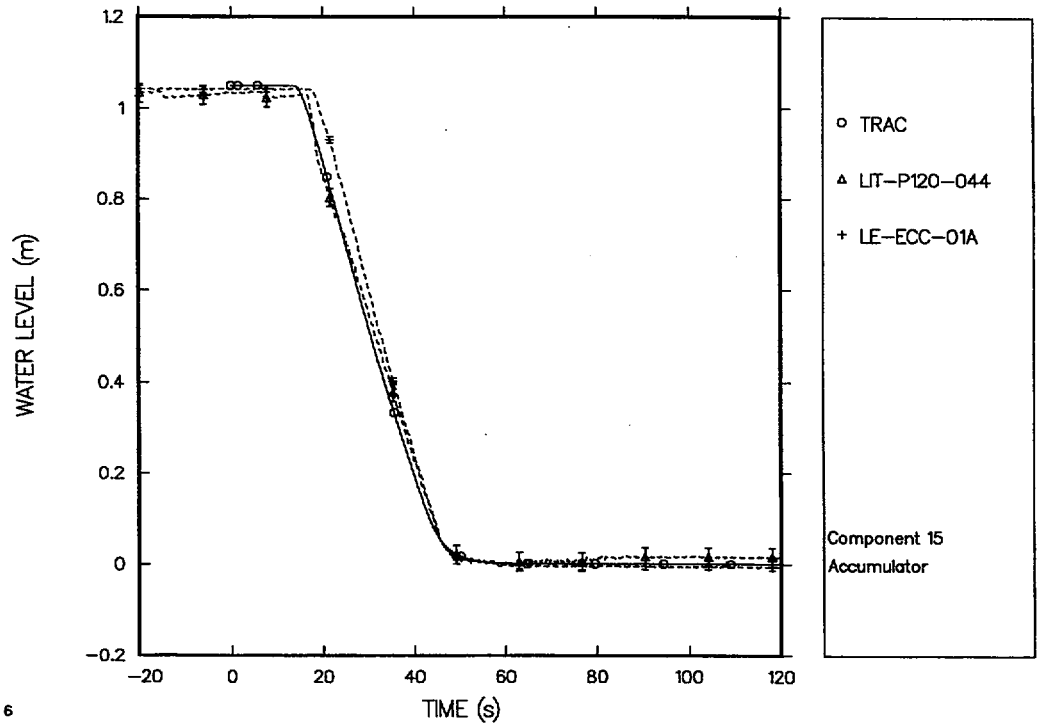


Fig. P-25. Accumulator level comparison, reflood trip at 1 s.

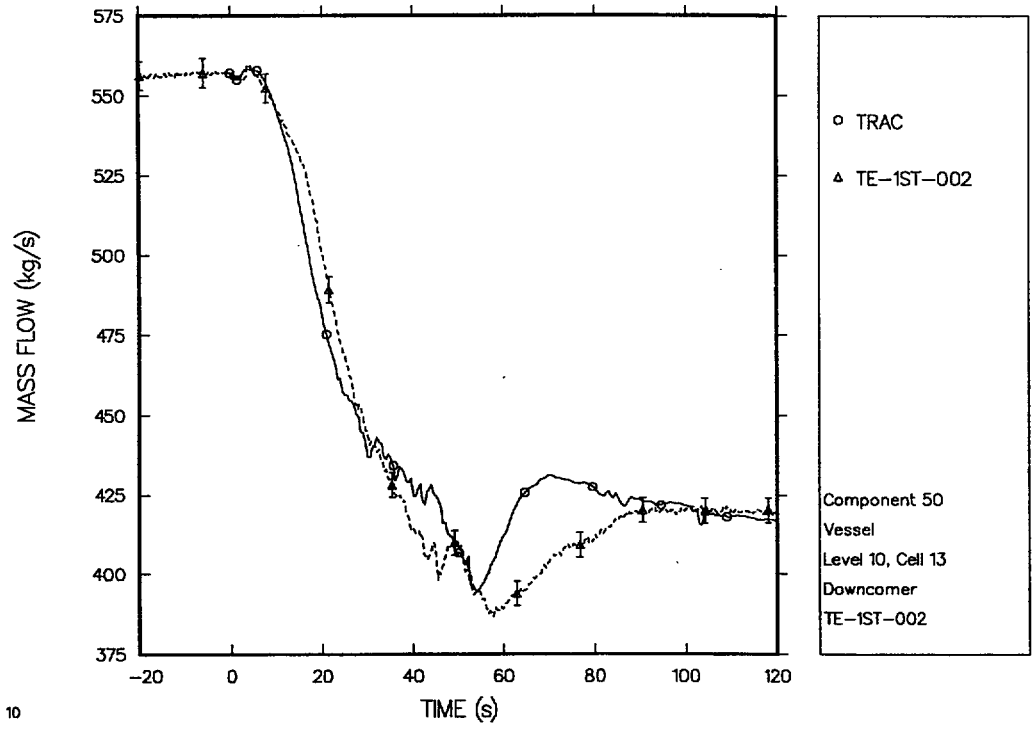


Fig. P-26. Downcomer liquid-temperature comparison, reflood trip at 1 s.

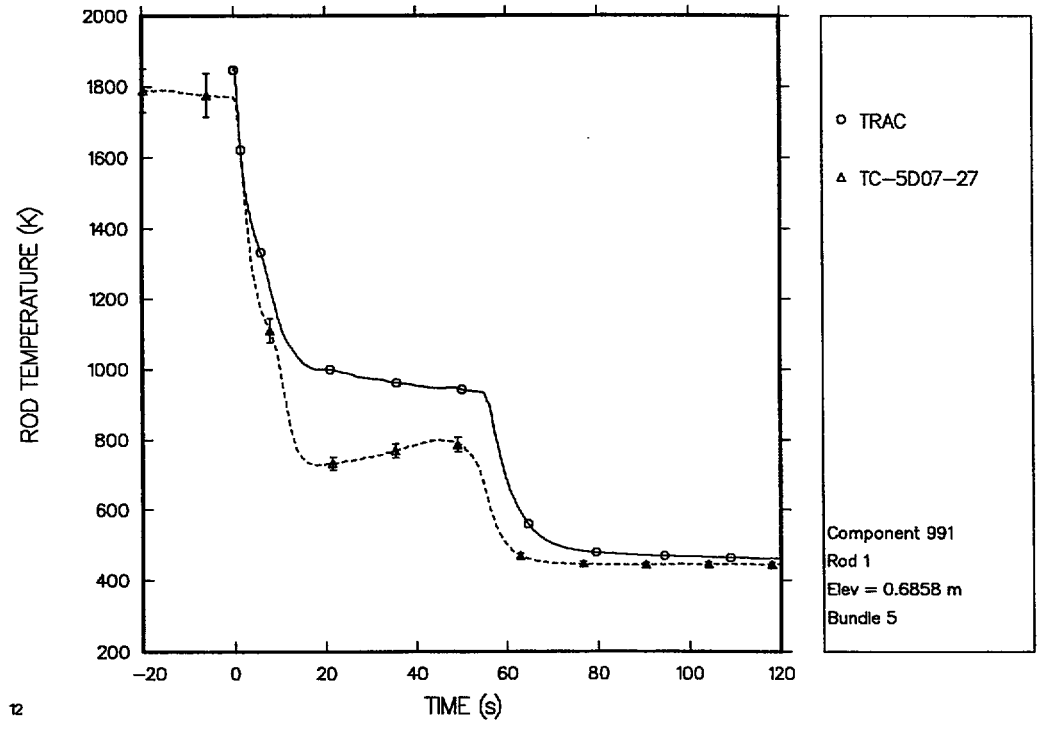


Fig. P-27. Centerline fuel, temperature; Rod 1 elevation = 0.6858 m, reflood trip at 1 s.

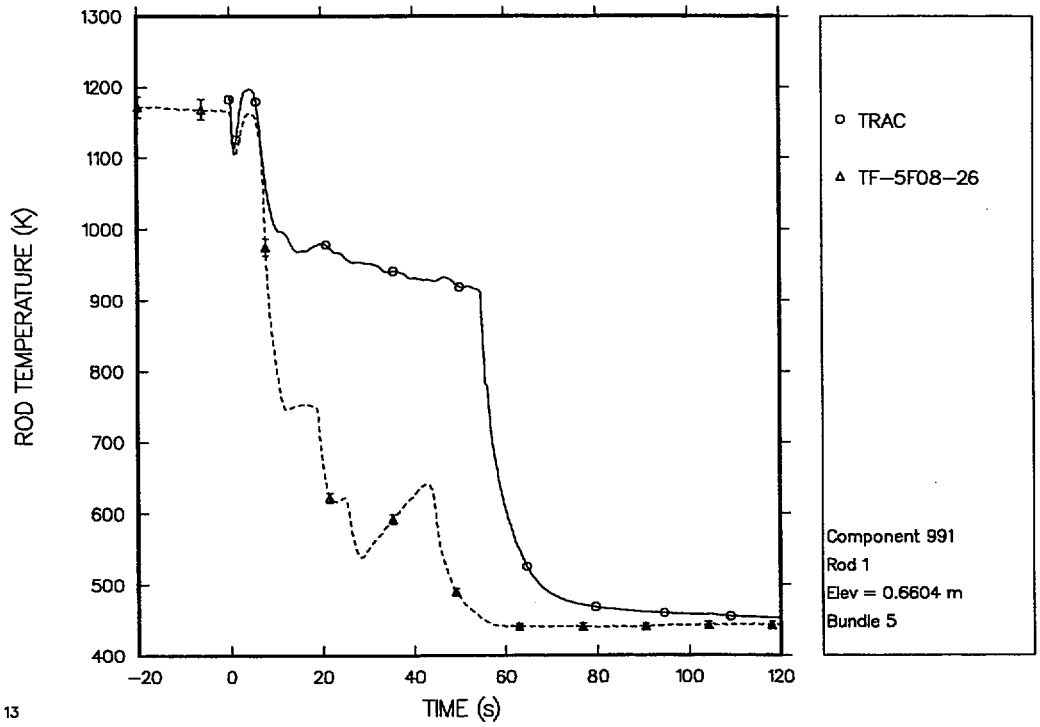


Fig. P-28. Pellet surface temperature; Rod 1 elevation = 0.6604 m, reflood trip at 1 s.

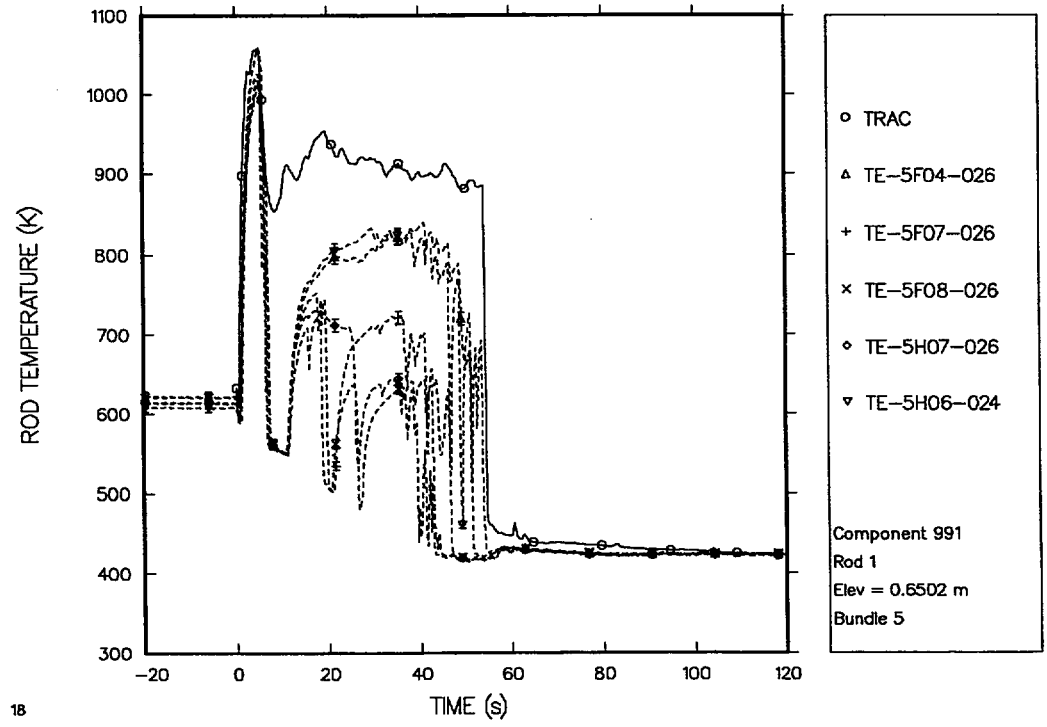


Fig. P-29. Cladding surface temperature; Rod 1 elevation = 0.6502 m, reflood trip at 1 s.

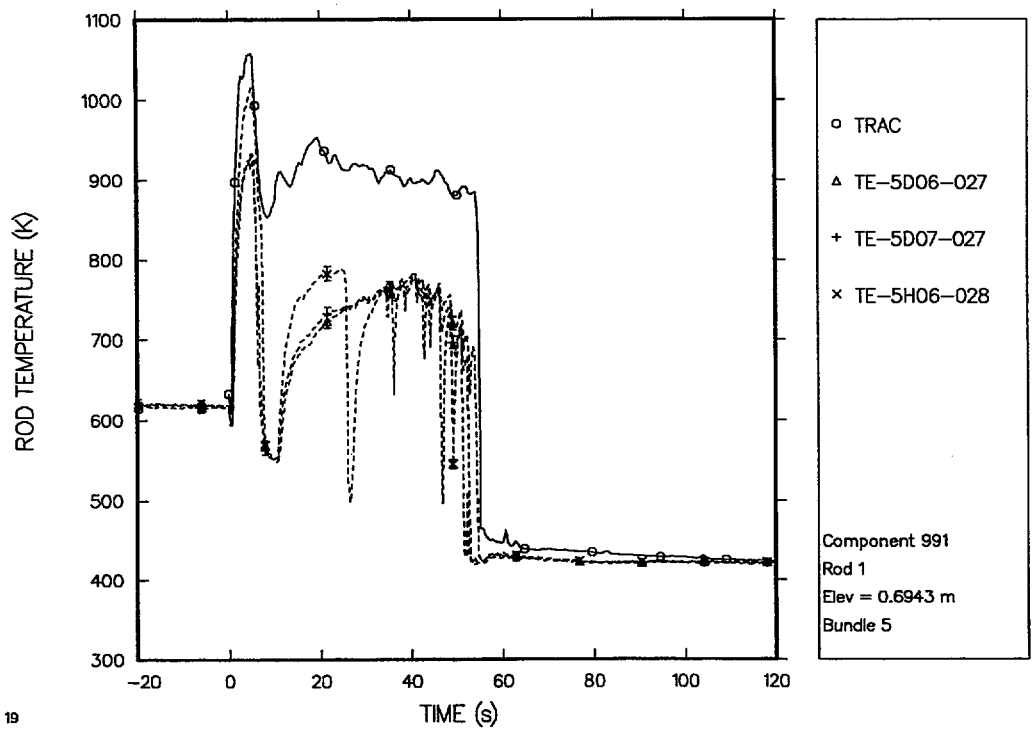


Fig. P-30. Cladding surface temperature; Rod 1 elevation = 0.6943 m, reflood trip at 1 s.

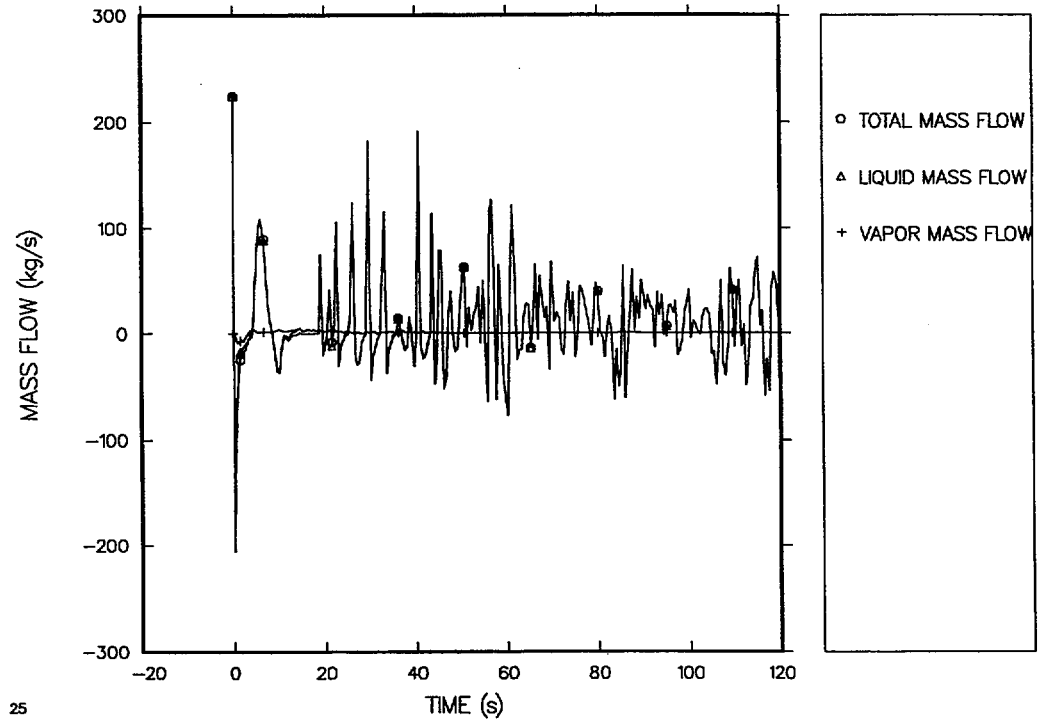
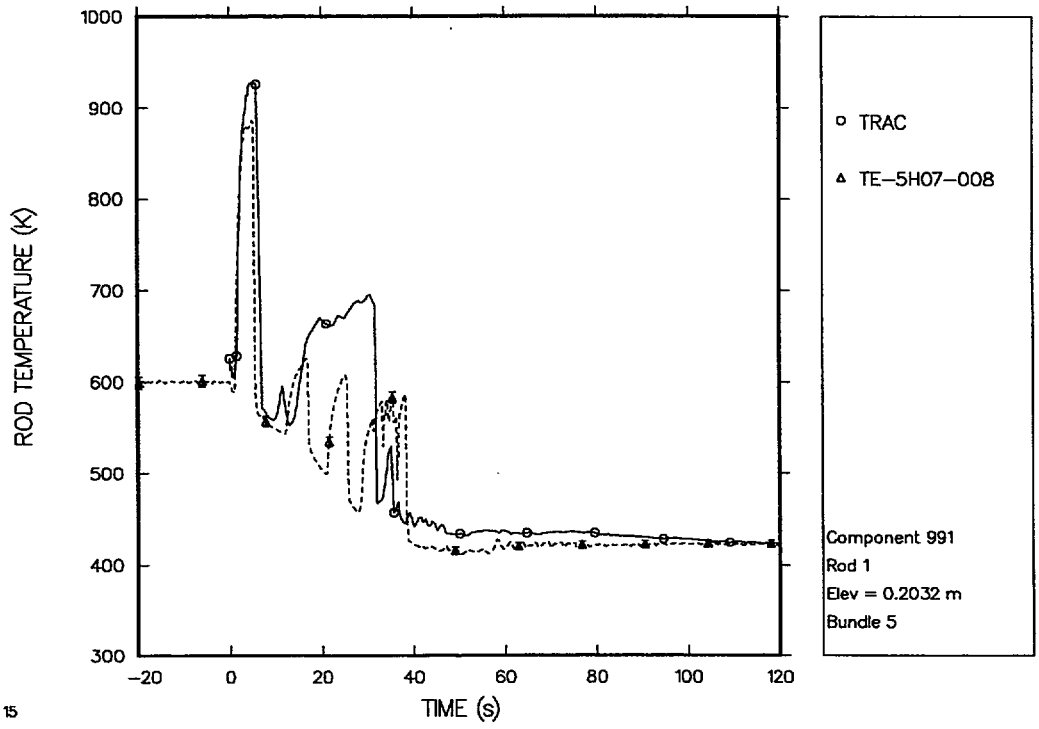
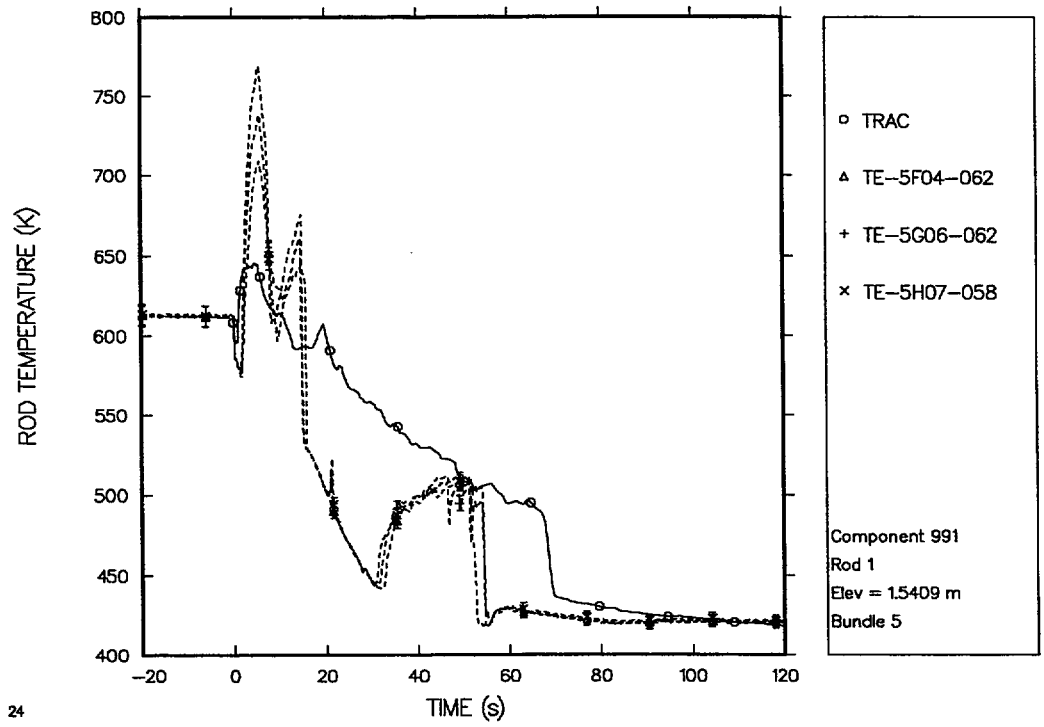


Fig. P-31. Calculated core-inlet mass flow, reflood trip at 1 s.



15

Fig. P-32. Cladding surface temperature; Rod 1 elevation = 0.2032 m, reflood trip at 1 s.



24

Fig. P-33. Cladding surface temperature; Rod 1 elevation = 1.5409 m, reflood trip at 1 s.

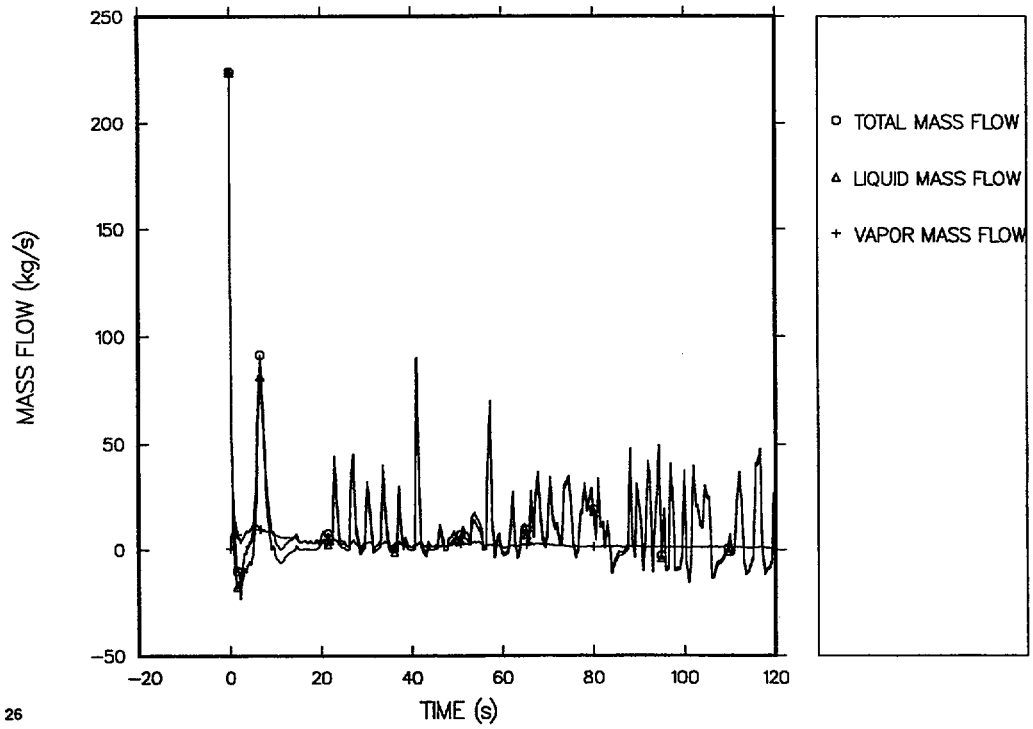


Fig. P-34. Calculated core-outlet mass flow, reflood trip at 1 s.

APPENDIX Q

LOFT L6-1 STEADY-STATE AND TRANSIENT INPUT LISTINGS FOR 1D VESSEL MODEL

This appendix contains the steady-state and transient-restart input listings for the LOFT L6-1 1D vessel model assessment problem as follows:

LOFT L6-1 STEADY-STATE INPUT LISTING FOR 1D VESSEL MODEL

```
1  free format
2  *       1         2         3         4         5         6         7         8
3  *2345678901234567890123456789012345678901234567890123456789012345678901234567890
4  *
5  *************
6  * main data *
7  *************
8  *
9  *       numtcr          ieos          inopt          nmat
10                2             0             1             0
11 loft experiment 16-1 : posttest specifications modeled with a 1-d vessel
12 constrained steady-state calculation with nature of transient defined
13 *
14 * Test description problem:  Pump 1 (component 5) is set for a CSS controlled
15 *     flow of 250 kg/s and Pump 2 (component 4) is set for 240 kg/s.  This
16 *     difference needs to be confirmed from the data or otherwise resolved.
17 *
18 * modified by Thad Knight, 2/13/96
19 * deck from /devass/mod2-5.3.05/loft-16-1/1-dvess.s
20 *   Initial changes amount to converting STGEN component to 2 PIPEs, 2 TEEs, and
21 *     2 heat structures.  I have maintained the component numbering scheme.  The
22 *     structural mass of the steam generator needs to be added later.
23 *   Renumbered the first array values for NHCOMO and NHCELLO in rod 99 to avoid
24 *     warning messages at the start of the run.
25 *   Added input [INOPTS, user-defined units-name data, and additional
26 *     control-block data cards (cards 2 and 4 as required)] to turn on
27 *     units labeling and conversion.
28 *   Changed heat structure component for the core to number 900.
29 *   Corrected some CTITLE information and modified others to be more
30 *     descriptive.
31 *   Renoded JCELLs in components 1, 3, 6, 7, 11, 21, 22, 29, 30, 31, 33, 34,
32 *     36, 40, 43, 73, 74, 83, 95, and 96 to resolve warning messages from
33 *     FEMOM about area changes in the vicinity of JCELL.  In general, I changed
34 *     arrays DX, VOL, FA, FRIC, and GRAV for these components.  I changed
35 *     other arrays as necessary to fill them.  Also, I factored the changes
36 *     across junctions 1, 9, 29, 34, 37, 45, and 74 to maintain consistency
37 *     across junctions.  I maintained the HDs on each interface of the JCELLs
38 *     because changing them would change the nonzero GRAVs at the first
39 *     interface of the side leg; I did this by duplicating HD(old JCELL) and
40 *     HD(old JCELL+1).
41 *   Changed NFF=-1 to +1 at the JCELL+1 interfaces in components 22, 30, and 33.
42 *     The changes avoid warning messages, and there are no longer area changes
43 *     at those interfaces).  I set NFF to a -1 at the JCELL+2 interfaces
44 *     in those components to calculate the loss coefficient associated with the
45 *     area change.
46 *   I ran a null transient in which I replaced the two PRIZER components with
47 *     PIPEs and FILL 35 at the top of the vessel with a BREAK.  I manually set
48 *     all void fractions to 0.0, pressures to 1.5 MPa, air partial pressures to
49 *     0.0, liquid and wall temperatures to 500.0 K, and velocities to 0.0.  I
50 *     also set all powers to zero and pump speeds to zero and disabled the
51 *     constrained steady state controllers.  The initial run revealed many
52 *     velocities > 0.1 m/s.  I reevaluated all of the GRAVs and made the
53 *     following changes to resolve elevation errors:
54 *          Component 31:  I changed the sign of all GRAVs in the main run of the
55 *               component to better represent the actual LOFT geometry.  Then to
56 *               correct a -0.1567 m elevation difference down the pipe, I
57 *               changed GRAV(7) from +1.0 to +0.72818405 (forced JUN1 and JUN2
58 *               to the same elevation).
59 *          Component 73:  I changed GRAV(2) in the main leg from +1.0 to
60 *               +0.98972962 to force the implied elevation difference between
61 *               hot and cold legs through the pump suction to 0.0 (error had the
62 *               Junction 66 0.0055 m lower than Junction 74).
63 *          Component 73:  I changed GRAV(2) in the side leg from +0.25395 to
64 *               +0.06427634 to force the elevation difference between Junctions
65 *               45 and 74 to 0.0 as implied by the recirculation line from the
66 *               broken hot leg to the pump suction (error had Junction 74
67 *               0.9479 m lower than Junction 45).
68 *          Component 10:  I increased the length of cells 1 and 2 from 0.56600 m
69 *               to 0.70537663 m to force the elevation difference between the
70 *               JCELLs of components 1 and 11 to 0.0 as implied by the
71 *               pressurizer spray line (the error had component 11 0.2788 m
72 *               higher than component 1).  I changed the volumes of the two
73 *               cells from 8.2030e-4 m^3 to 1.0223e-03 m^3to preserve the
74 *               VOL/DX.
75 *          Component 41:  I changed GRAV(2) in the side leg from 0.1990 to
76 *               0.19899989 to force the JCELLs of components 41 and 31 to the
77 *               same elevation as implied by the reflood assist bypass line
78 *               (through Junction 43) (the error had component 41 4.6e-07 m
79 *               lower than component 31).  This error appears to have been the
80 *               result of extracting the input from a TRCDMP file at some time
81 *               in the past.
82 *          Components 21 and 22:  I changed GRAV(1) and GRAV(2) on the side leg
83 *               of component 21 and GRAV(1) in the main leg of component 22 from
84 *               -0.33763 to -0.33759606 to correct an elevation error of
85 *               -5.586e-05 m in the secondary loop defined by Junctions 24, 21,
86 *               23, and 24.  This error appears to have been the result of
87 *               extracting the input from a TRCDMP file at some time in the past
```

```
*             and of renoding JCELL of component 21 (described above).
*          Components 29 and 96:  I changed GRAV(1) and GRAV(2) in the side leg
*             of component 29 and GRAV(1) in the main leg of component 96 to
*             -1.0 from the original values of -9.9985e-01, -0.99963215, and
*             -0.99963215 and DX(1) in the side leg of component 29 from 0.1 m
*             to 0.1006805 m to correct a 0.7765 mm elevation error between
*             the cold and hot legs implied by the path defined by Junctions
*             40, 83, 38, 37, 95, 35, 96, and 34 (cold leg was low relative to
*             the hot leg).  I also changed VOL(1) on the side leg of
*             component 29 from 1.4192e-02 m^3 to 0.01428858 m^3 to preserve
*             VOL/DX.
*          Component 96:  I changed DX(1) in the side leg of component 96 from
*             0.7955 m to 0.79549 m to correct a 5.0e-06 m elevation error
*             around the loop defined by Junctions 96, 35, 97, and 96.  This
*             error was the result of renoding JCELL in component 96
*             (described above).  To the accuracy that the volumes are input
*             and the original ratio VOL/DX, the change in DX(1) has no impact
*             on VOL(1).
*          Component 83:  I changed GRAV(1) in the side leg of component 83 from
*             0.0 to -0.0017408 to correct a 0.79 mm elevation error around
*             the loop defined by Junctions 37, 38, 84, 86, and 37.
*     With these changes the null transient run to 1000 s yielded maximum
*     velocities of 2.012e-03 m/s in components 95 and 96.  All other velocities
*     were less than 1.0e-03.
*   Renoded components 20 and 22 so that there is a one-to-one correspondence in
*     cells to improve the connections of the heat structure between the
*     boiler/riser and the secondary downcomer.  This change involved renoding
*     cell 5 of component 20 and cells 1 and 5 of component 22.  I reset GRAV(1)
*     and GRAV(2) of the component 21 side leg and GRAV(1) and new GRAV(2) of
*     component 22 main leg to preserve the elevation closure of the secondary
*     loop defined by Junctions 24, 21, 23, and 24.  I reran the null transient,
*     and maximum velocity in this loop is 4.861e-04 m/s.
*   Added an additional 9 heat structures (903-911) to represent the structural
*     mass of the steam generator--secondary downcomer wall, secondary shell,
*     primary-side plenum baffle, inlet plenum wall, outlet plenum wall, inlet
*     side tube sheet, and outlet side tube sheet.  The structures for the
*     secondary downcomer and secondary shell assume that the inside radii from
*     the old stgen component were correct and that a single complete (RDX=1.0)
*     structure is defined for each; the old areas were not checked and may not
*     be preserved.  The structures associated with the primary-side plenums,
*     represented as SLABs, preserve the area and thickness from the stgen
*     component.
*   Modified as necessary the signal variables to assure that they pointed
*     correctly at the appropriate components.
*
*                                  ++++++++  ++++++++
*                                  + valve+  + pipe +
*                                67+  10  +68+   9  +
*                                  ++++++++  ++++++++
*                                              60
* ++++++++                                    ++++++++
* + break+                                    +prizer+
* +  25  +                                    +  13  +
* ++++++++                                    ++++++++
*    26                                44        61
* ++++++++  ++++++++                  ++++++++  ++++++++
* + valve+  + fill +                  + pipe +  + pipe +
* +  23  +  +  24  +                  +  75  +  +  12  +
* ++++++++  ++++++++                  ++++++++  ++++++++
*    22        25                     42        64
* ++++++++  ++++++++                  ++++++++  ++++++++
* +  tee +  +  tee +                  + valve+  +prizer+
* +  21  +23+  22  + rods             +  78  +  +   8  +
* ++++++++  ++++++++ |901             ++++++++  ++++++++
*    21        24    |902                78        10
*           ++++++++ |++++++++  ++++++++  ++++++++  ++++++++  ++++++++  ++++++++
*  stgen    + pipe +==+ pipe +  +  tee +  +  tee +  +vessel+  +  tee +
*   sec   21+  20  +==+   2  + 2+  74  +74+   1  + 9+region+45+  31  +32
*           ++++++++  ++++++++  ++++++++  ++++++++  +define+  ++++++++
*                        3                         + with +     36
*           ++++++++  ++++++++                      + a 1-d+  ++++++++
*           + valve+  +  tee +                      + model+  +  tee +
*         32+  77  +77+  73  +                      +      + 1+  41  +44
*           ++++++++  ++++++++                      +      +  ++++++++
*                        73                         +      +
*                     ++++++++                      +      +  (isolated)
*                     +  tee +            intact    +      +    broken
*                   5+   3  +             loop      +      +     loop
*                     ++++++++                      +      +
*              5         4                          +      +
*           ++++++++  ++++++++                      +      +
*           + pump +  + pump +                      +      +
*           +   5  +  +   4  +                      +      +
*           ++++++++  ++++++++                      +      +
*              7         6                          +      +
*                     ++++++++  ++++++++  ++++++++  +      +
*                     +  tee +  +  tee +  +  tee +  +      +
*                   7+   6  +66+  11  + 8+   7  +29+      +
*                     ++++++++  ++++++++  ++++++++  +      +
*                                  67        14     +      +
*                                         ++++++++  +      +
*                                         + fill +  +      +
```

```
*                                        + 17  +  +      +
*                                        ++++++++  ++++++++
*
* The vessel is modeled with 13 1-d hydro & 1 heat-structure components.
*
*            ++++++++++++++++++++++++++++++++++++++++++++
*            + vessel region defined with a 1-d model +
*            +                                        +
*            +                              40        +
*            +                    ++++++++  ++++++++    +
*            +                    +  tee +  +  tee +    +
*          9+-------------------+  43  +48+  34  +----+45
*            +                    ++++++++  ++++++++    +
*            +                      47                  +
*            +                    ++++++++  ++++++++    +
*            +                    +  tee +  +  tee +    +
*          29+-------------------+  40  +46+  29  +----+ 1
*            +                    ++++++++  ++++++++    +
*            +                              34          +
*            +   ++++++++         ++++++++  ++++++++    +
*            +   +  rod +         +  tee +  +  tee +    +
*            +   +  900 +         +  95  +97+  96  +    +
*            +   ++++++++         ++++++++  ++++++++    +
*            +    ||  ||           95  35    96         +
*            +   ++++++++  ++++++++  ++++++++           +
*            +   + pipe +  +  tee +  +  tee +           +
*            +   +  37  +37+  36  +  +  30  +           +
*            +   ++++++++  ++++++++  ++++++++           +
*            +        38         86    36               +
*            +        ++++++++  ++++++++               +
*            +        +  tee +  +  tee +               +
*            +        +  83  +84+  86  +               +
*            +        ++++++++  ++++++++               +
*            +           83                            +
*            +        ++++++++  ++++++++               +
*            +        +  tee +  + fill +               +
*            +        +  33  +39+  35  +               +
*            +        ++++++++  ++++++++               +
*            +           40                            +
*            +                                         +
*            +++++++++++++++++++++++++++++++++++++++++++
*
* Experiment 16-1 simulated a loss of steam load in the steam generators
* of a four-loop commercial PWR in the Loss-Of-Fluid Test (LOFT) facility.
* The steady-state initial conditions of the experiment were:
* Primary Intact Loop:    hot-leg mass flow     478.5     +-6.3      kg/s
*                         hot-leg pressure      1.478e+07+-1.1e+05 Pa
*                         hot-leg temperature   567.5     +-1.8      K
*                         cold-leg temperature  552.8     +-1.2      K
* Steam Gen. Sec. Side:   steam & fw mass flow  20.1      +-0.6      kg/s
*                         steam-dome pressure   5.37e+05 +-6.0e+04 Pa
*                         liq/vap temperature   541.7     +-0.8      K
*                         dwncmr liquid level   3.183     +-0.034    m
* Pressurizer:            pressure              1.487e+07+-2.0e+05 Pa
*                         liq/vap temperature   614.3     +-0.8      K
*                         liquid level          1.18      +-0.07     m
* The experiment's transient was initiated by closing the main steam flow
* control valve (MSFCV); the actual start of closing was observed to
* occur at 2.0 s (rather than at 0.0 s) based on parameter measurements.
* The pressurizer cycling heater (on initially) was shut off at 6.1+-0.1 s
* as the pressurizer pressure increased.  The pressurizer sprayer was in-
* itiated at 9.1+-0.1 s to reduce primary-side (PS) pressure and remained
* on until 30.4+-0.1 s.  The PS pressure continued to rise and caused the
* reactor to scram at 21.8+-0.2 s.  Thereafter, the PS pressure reached a
* maximum value at 22.0+-0.2 s.  To reduce steam-generator (SG) secondary-
* side (SS) pressure, the MSFCV began opening at 22.2+-0.2 s and began
* closing at 31.4+-0.2 s.  The pressurizer cycling heater came on at
* 31.4+-0.1 s and the pressurizer backup heater came on at 32.5+-0.1 s
* to prevent the PS to pressure from falling further.  The MSFCV opened
* and closed automatically at 91.2+-0.2 s and 97.8+-0.2 s, respectively,
* based on pressure setpoints and was manually opened and closed at
* 312.6+-0.2 s and 326.0+-0.4 s, respectively, to control SGSS pressure.
* The pressurizer backup heater was shut off at 415.4+-0.1 s and the
* experiment was ended at 700.0+-10.0 s.
*
* Experiment Events                                          Experiment Time
* ---------------------------------------------------------- ---------------
* Main Steam Flow Control Valve (MSFCV) starts to close          2.0+-0.2 s
* Pressurizer cycling heater is set off                          6.1+-0.1 s
* Pressurizer sprayer is set on                                  9.1+-0.1 s
* MSFCV reaches its closed position                             11.6+-0.2 s
* Reactor core power is scrammed based on high pressure         21.8+-0.2 s
* Primary-side pressure reaches maximum                         22.0+-0.2 s
* MSFCV starts to open based on high-pressure setpoint          22.2+-0.2 s
* Pressurizer level reaches maximum                             26.5+-0.5 s
* Pressurizer sprayer is set off                                30.4+-0.1 s
* MSFCV starts to close based on low-pressure setpoint          31.4+-0.2 s
* Pressurizer cycling heater is set on                          31.4+-0.1 s
* Pressurizer backup heater is set on                           32.5+-0.1 s
* MSFCV reaches its closed position                             40.6+-0.2 s
* MSFCV starts to open based on high-pressure setpoint          91.2+-0.2 s
* MSFCV starts to close based on low-pressure setpoint          97.8+-0.2 s
```

```
* MSFCV reaches its closed position                              104.4+-0.2 s
* MSFCV starts to open based on manual adjustment               312.6+-0.2 s
* MSFCV starts to close based on manual adjustment              326.0+-0.4 s
* MSFCV reaches its closed position                             339.4+-0.4 s
* Pressurizer backup heater is set off                         415.4+-0.1 s
* Experiment is ended                                          700.0+-10. s
*
*****************
* namelist data *
*****************
*
*     SI/English units flags:  0--SI units/1--English units
*     iogrf:  units flag for writing TRCGRF
*     ioinp:  units flag for reading TRACIN
*     iolab:  units flag for writing input to INLAB
*     ioout:  units flag for writing TRCOUT and TRCMSG
*
*     iunlab:  input user-defined units labels (0-no/>0-yes; default is 0)
*     iunout:  write units to file TRCOUT (0-no/1-yes; default is 1)
*
 $inopts iadded=10, icflow=2, nhtstr=12,
         iogrf=0, ioinp=0, iolab=1, ioout=0, iunlab=1, iunout=1 $
*
*        dstep         timet
                0           0.0
*       stdyst        transi         ncomp          njun          ipak
                2             0            52            49             1
*         epso          epss
     1.0000e-04    1.0000e-04
*       oitmax        sitmax        isolut        ncontr         nccfl
               10            25             0             5             0
*         ntsv          ntcb          ntcf          ntrp          ntcp
               21            13            46            20             2
*
************************
* component-number data *
************************
*
* iorder*          1         2         3         4         5
* iorder*          6         7         8         9        10
* iorder*         11        12        13        17        20
* iorder*         21        22       23s
* iorder*         24        25        29        30        31
* iorder*         33        34        35        36        37
* iorder*         40        41        43        73        74
* iorder*         75        77        78        83        86
* iorder*         95        96       900       901       902
* iorder*        903       904       905       906       907
* iorder*        908       909       910      911e
*
*************************
* control-parameter data *
*************************
*
* constrained steady-state controllers
*
*       numcss        amncss        amxcss        nmpcss        napcss
*            2    9.0000e-01    1.1000e+00          7002             2
* intact-loop steam-generator type-14 controller adjusts
*    the heat-transfer across the tubes (equivalent to old type 4)
           901           0.5           1.5          7002            14
           902           0.5           1.5          7002            14
* intact-loop pump 2 type-1 controller adjusts impeller rotational speed
             4    2.0000e+02    5.0000e+02            -1             0
* intact-loop pump 1 type-1 controller adjusts impeller rotational speed
             5    2.0000e+02    5.0000e+02            -1             0
* steam-flow control valve type-2 controller adjusts upsteam pressure
            23    0.0000e+00    1.0000e+00             1             0
*
* multipass control-parameter evaluations
*
* cp1sv *             1           16s
* cp1cb *            -1           -7s
* cp1tp *             1          -24s
* cp2sv *            17           21s
* cp2cb *            -8          -13s
* cp2tp *             1            0e
*
* signal variables
*
*           problem time
*         idsv          isvn          ilcn          icn1          icn2
              1             0             0             0             0
*
*           hot-leg pressure
*         idsv          isvn          ilcn          icn1          icn2
              2            21             1             1             0
*
*           hot-leg liquid temperature
*         idsv          isvn          ilcn          icn1          icn2
              3            23             1             1             0
*
```

```
*            hot-leg liquid mass flow
*         idsv          isvn          ilcn          icn1          icn2
*            4            32             1             3             0
             4            32             1             5             0
*
*            pressurizer-dome pressure
*         idsv          isvn          ilcn          icn1          icn2
*            5            21             9             1             0
             5            21            13             1             0
*
*            pressurizer top-section liquid level
*         idsv          isvn          ilcn          icn1          icn2
             6            20            13             7             1
*
*            pressurizer middle-section liquid level
*         idsv          isvn          ilcn          icn1          icn2
             7            20            12             1             1
*
*            pressurizer bottom-section liquid level
*         idsv          isvn          ilcn          icn1          icn2
             8            20             8             1             1
*
*            cold-leg pressure at hpis connection
*         idsv          isvn          ilcn          icn1          icn2
*            9            21             7             4             0
             9            21             7             5             0
*
*            reactor-core power
*         idsv          isvn          ilcn          icn1          icn2
*           10            18            90             0             0
            10            18           900             0             0
*
*            stgen-sec pipe 20 volume-averaged alpha
*         idsv          isvn          ilcn          icn1          icn2
*           11            27            20             1            -5
            11            27            20             1            -8
*
*            stgen-sec tee 21 main volume-averaged alpha
*         idsv          isvn          ilcn          icn1          icn2
*           12            27            21             1            -2
            12            27            21             1            -4
*
*            stgen-sec tee 21 side alpha
*         idsv          isvn          ilcn          icn1          icn2
*           13            27            21             3             0
            13            27            21             5             0
*
*            stgen-sec tee 22 main volume-averaged alpha
*         idsv          isvn          ilcn          icn1          icn2
*           14            27            22             1            -4
            14            27            22             1            -9
*
*            stgen-sec tee 22 side alpha
*         idsv          isvn          ilcn          icn1          icn2
*           15            27            22             5             0
            15            27            22            10             0
*
*            stgen-sec tee 21 pressure
*         idsv          isvn          ilcn          icn1          icn2
*           16            21            21             2             0
            16            21            21             4             0
*
*            trip 8 iset
*         idsv          isvn          ilcn          icn1          icn2
            17            56             8             0             0
*
*            trip 20 iset
*         idsv          isvn          ilcn          icn1          icn2
            18            56            20             0             0
*
*            trip 22 iset
*         idsv          isvn          ilcn          icn1          icn2
            19            56            22             0             0
*
*            trip 23 iset
*         idsv          isvn          ilcn          icn1          icn2
            20            56            23             0             0
*
*            trip -24 signal
*         idsv          isvn          ilcn          icn1          icn2
            21            55           -24             0             0
*
*
* user-defined units-name data
*
*      lulabel       lunitsi      luniteng       ufactor        ushift
     lumdot/m    lu(kg/s)/m  lu(lbm/s)/ft   0.671968931           0.0
*
*
* control blocks
*
*            pressurizer liquid-level for plot
```

```
*         idcb          icbn          icb1          icb2          icb3
             -1            57             6             7             8
*       lugain        luxmin        luxmax       lucon1        lucon2
      lunounit      lulength      lulength      lunounit      lunounit
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   1.0000e+00    0.0000e+00    1.7500e+00    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
             -2            56            -1             0             0
*       lugain        luxmin        luxmax       lucon1        lucon2
      lunounit      lulength      lulength      lulength      lunounit
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   1.0000e+00    0.0000e+00    1.6400e+00   -1.1000e-01    0.0000e+00
*
*              stgen-sec downcomer liq-level for plot, cb -8, & trip 6
*         idcb          icbn          icb1          icb2          icb3
             -3            56            11             0             0
*       lugain        luxmin        luxmax       lucon1        lucon2
      luvolume      luvolume      luvolume      lunounit      lunounit
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   2.7721e+00    0.0000e+00    2.7721e+00    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
             -4            59            12            13             0
*       lugain        luxmin        luxmax       lucon1        lucon2
      lunounit      luvolume      luvolume      luvolume      luvolume
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   1.0000e+00    0.0000e+00    2.6178e+00    2.2348e+00    3.8297e-01
*
*         idcb          icbn          icb1          icb2          icb3
             -5            59            14            15             0
*       lugain        luxmin        luxmax       lucon1        lucon2
      lunounit      luvolume      luvolume      luvolume      luvolume
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   1.0000e+00    0.0000e+00    1.2803e+00    1.2641e+00    1.6215e-02
*
*         idcb          icbn          icb1          icb2          icb3
             -6            57            -3            -4            -5
*       lugain        luxmin        luxmax       lucon1        lucon2
      lunounit      luvolume      luvolume      lunounit      lunounit
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   1.0000e+00    0.0000e+00    6.6702e+00    0.0000e+00    0.0000e+00
*
*         idcb          icbn          icb1          icb2          icb3
             -7           101            -6             9             0
*       lugain        luxmin        luxmax       lucon1        lucon2
      lunounit      lulength      lulength      lunounit      lunounit
*       cbgain        cbxmin        cbxmax       cbcon1        cbcon2
   1.0000e+00    0.0000e+00    5.6103e+00    0.0000e+00    0.0000e+00
*       luytab     luxtab(1)
      lulength      luvolume
*
*                 vapor vol     dc liq lev
*                   (m3)           (m)
* cbftb *      2.2660e+00    5.6103e+00s
* cbftb *      2.5943e+00    4.6810e+00s
* cbftb *      4.1502e+00    3.2004e+00s
* cbftb *      4.4173e+00    2.9464e+00s
* cbftb *      4.8360e+00    2.5440e+00s
* cbftb *      5.0294e+00    2.3500e+00s
* cbftb *      5.4051e+00    1.8860e+00s
* cbftb *      5.8402e+00    1.2460e+00s
* cbftb *      6.6702e+00    0.0000e+00e
*
*              stgen-sec feedwater-control controller for fill 24
*           idcb          icbn          icb1          icb2          icb3
               -8           200            -7             0             0
*         lugain        luxmin        luxmax       lucon1        lucon2
        lumdot/m      lumassfw      lumassfw      lulength      lumassfw
*         cbgain        cbxmin        cbxmax       cbcon1        cbcon2
     7.0000e+00    1.0000e+01    3.0000e+01    3.1830e+00    2.0100e+01
*          cbdt          cbtau          cbwt
     1.0000e+01    1.0000e+00    0.0000e+00
*
*           idcb          icbn          icb1          icb2          icb3
               -9           101             1             2             0
*         lugain        luxmin        luxmax       lucon1        lucon2
        lunounit      lumassfw      lumassfw      lunounit      lunounit
*         cbgain        cbxmin        cbxmax       cbcon1        cbcon2
     1.0000e+00    0.0000e+00    2.0100e+01    0.0000e+00    0.0000e+00
*         luytab     luxtab(1)
        lumassfw        lutime
*
*                   time          mass flow
*                    (s)           (kg/s)
* cbftb *      1.0000e+00    2.0100e+01s
* cbftb *      1.2000e+01    0.0000e+00e
*
*           idcb          icbn          icb1          icb2          icb3
              -10            22            -9            -8            17
*         lugain        luxmin        luxmax       lucon1        lucon2
        lunounit      lumassfw      lumassfw      lunounit      lunounit
```

```
*       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
    1.0000e+00      0.0000e+00      1.0000e+02      0.0000e+00      0.0000e+00
*
*               stgen-sec steam-flow-control controller for valve 23
*         idcb            icbn            icb1            icb2            icb3
              -11              22              19              18              20
*       lugain          luxmin          luxmax          lucon1          lucon2
      lurtime         lurtime         lurtime       lunounit        lunounit
*       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
    5.0000e-02     -5.0000e-02      5.0000e-02      0.0000e+00      0.0000e+00
*
*         idcb            icbn            icb1            icb2            icb3
              -12              23             -11               0               0
*       lugain          luxmin          luxmax          lucon1          lucon2
      lunounit        lunounit        lunounit        lunounit        lunounit
*       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
    1.0000e+00      0.0000e+00      1.0000e+00      0.0000e+00      6.3800e-01
*
*         idcb            icbn            icb1            icb2            icb3
              -13             101             -12              12               0
*       lugain          luxmin          luxmax          lucon1          lucon2
      lunounit        lunounit        lunounit        lunounit        lunounit
*       cbgain          cbxmin          cbxmax          cbcon1          cbcon2
    1.0000e+00      0.0000e+00      1.0000e+00      0.0000e+00      0.0000e+00
*       luytab      luxtab(1)
      lunounit        lunounit
*
*                  xpos          favlve
*                   (-)             (-)
* cbftb *      0.0000e+00      0.0000e+00s
* cbftb *      1.0000e-01      7.3360e-02s
* cbftb *      2.0000e-01      1.5334e-01s
* cbftb *      3.0000e-01      2.4500e-01s
* cbftb *      4.0000e-01      3.4000e-01s
* cbftb *      5.0000e-01      4.4000e-01s
* cbftb *      5.7500e-01      5.1733e-01s
* cbftb *      6.0000e-01      5.4666e-01s
* cbftb *      7.0000e-01      6.6000e-01s
* cbftb *      8.0000e-01      7.7248e-01s
* cbftb *      9.0000e-01      8.8665e-01s
* cbftb *      1.0000e+00      1.0000e+00e
*
* trips
*
*         ntse            ntct            ntsf            ntdp            ntsd
              0               2               2               0               1
*
*                 system low-pressure scram trip
*         idtp            isrt            iset            itst            idsg
              1               1               0               1               2
*      setp(1)         setp(2)
    1.4360e+07      1.4361e+07
*      dtsp(1)         dtsp(2)
    0.0000e+00      0.0000e+00
*      ifsp(1)         ifsp(2)
              0               0
*
*                 system high-pressure scram trip
*         idtp            isrt            iset            itst            idsg
              2               2               0               1               2
*      setp(1)         setp(2)
    1.5769e+07      1.5770e+07
*      dtsp(1)         dtsp(2)
    0.0000e+00      0.0000e+00
*      ifsp(1)         ifsp(2)
              0               0
*
*                 intact-loop hot-leg high-temperature scram trip
*         idtp            isrt            iset            itst            idsg
              3               2               0               1               3
*      setp(1)         setp(2)
    5.8320e+02      5.8330e+02
*      dtsp(1)         dtsp(2)
    0.0000e+00      0.0000e+00
*      ifsp(1)         ifsp(2)
              0               0
*
*                 intact-loop low-mass-flow scram trip
*         idtp            isrt            iset            itst            idsg
              4               1               0               1               4
*      setp(1)         setp(2)
    4.3350e+02      4.3400e+02
*      dtsp(1)         dtsp(2)
    2.0000e+00      0.0000e+00
*      ifsp(1)         ifsp(2)
              0               0
*
*                 high core-averaged-power scram trip
*         idtp            isrt            iset            itst            idsg
              5               2               0               1              10
*      setp(1)         setp(2)
    5.1000e+07      5.1500e+07
```

```
*      dtsp(1)        dtsp(2)
    0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              stgen-sec downcomer low-liquid-level scram trip
*         idtp           isrt           iset           itst           idsg
             6              1              0              1             -7
*      setp(1)        setp(2)
     2.0000e+00     2.0100e+00
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              steady-state or transient flag trip
*         idtp           isrt           iset           itst           idsg
             7             -1             -1              1              1
*      setp(1)        setp(2)
    -2.0000e-05    -1.0000e-05
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              stgen-sec feedwater fill & steam-flow-control valve trip
*         idtp           isrt           iset           itst           idsg
             8              2              0              1              1
*      setp(1)        setp(2)
    -2.0000e-05    -1.0000e-05
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              warm-up-lines trip
*         idtp           isrt           iset           itst           idsg
             9              2              0              1              1
*      setp(1)        setp(2)
    -2.0000e-05     1.0000e+20
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              intact-loop pump-shutdown trip
*         idtp           isrt           iset           itst           idsg
            10              2              0              1              1
*      setp(1)        setp(2)
    -2.0000e-05     1.0000e+20
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              pressurizer power-operated-relief-valve trip
*         idtp           isrt           iset           itst           idsg
            11             -3              0              1              5
*      setp(1)        setp(2)        setp(3)        setp(4)
     1.6560e+07     1.6570e+07     1.6690e+07     1.6700e+07
*      dtsp(1)        dtsp(2)        dtsp(3)        dtsp(4)
     0.0000e+00     0.0000e+00     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)        ifsp(3)        ifsp(4)
             0              0              0              0
*
*              pressurizer spray-valve trip
*         idtp           isrt           iset           itst           idsg
            12             -3              0              1              5
*      setp(1)        setp(2)        setp(3)        setp(4)
     1.4900e+07     1.5000e+07     1.5140e+07     1.5240e+07
*      dtsp(1)        dtsp(2)        dtsp(3)        dtsp(4)
     0.0000e+00     1.0000e+04     1.0000e+04     0.0000e+00
*      ifsp(1)        ifsp(2)        ifsp(3)        ifsp(4)
             0              0              0              0
*
*              pressurizer cycling-heaters trip flag
*         idtp           isrt           iset           itst           idsg
            13              1              1              1              5
*      setp(1)        setp(2)
     1.4750e+07     1.4930e+07
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
*      ifsp(1)        ifsp(2)
             0              0
*
*              pressurizer backup-heaters trip flag
*         idtp           isrt           iset           itst           idsg
            14              1              0              1              5
*      setp(1)        setp(2)
     1.4620e+07     1.4800e+07
*      dtsp(1)        dtsp(2)
     0.0000e+00     0.0000e+00
```

```
*      ifsp(1)       ifsp(2)
             0             0
*
*                steady state and transient ON trip
*          idtp          isrt          iset          itst          idsg
             15             2             1             1             1
*       setp(1)       setp(2)
   -2.0000e-05   -1.0000e-05
*       dtsp(1)       dtsp(2)
    0.0000e+00    0.0000e+00
*       ifsp(1)       ifsp(2)
             0             0
*
*                emergency-core-coolant low-pressure hpis trip
*          idtp          isrt          iset          itst          idsg
             17             1             0             1             2
*       setp(1)       setp(2)
    1.3297e+07    1.5500e+07
*       dtsp(1)       dtsp(2)
    0.0000e+00    0.0000e+00
*       ifsp(1)       ifsp(2)
             0             0
*
*                stgen-sec steam-flow-control valve closure trip
*                forced closure at 2 s into the 16-1 transient
*          idtp          isrt          iset          itst          idsg
             20            -2             0             1             1
*       setp(1)       setp(2)
   -2.0000e-05   -1.0000e-05
*       dtsp(1)       dtsp(2)
    0.0000e+00    2.0000e+00
*       ifsp(1)       ifsp(2)
             0             0
*
*                stgen-sec pressure-regulator trip after reactor scram
*          idtp          isrt          iset          itst          idsg
             22            -3             0             1            16
*       setp(1)       setp(2)       setp(3)       setp(4)
    6.7500e+06    6.8800e+06    6.8900e+06    6.9900e+06
*       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
    3.5000e-01    1.0000e+04    1.0000e+04    2.0000e+00
*       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             1             1             2             2
*
*                coincidence scram trip
*          idtp          isrt          iset          itst          idsg
             23             2             0             3             1
*       setp(1)       setp(2)
    4.0000e-01    6.0000e-01
*       dtsp(1)       dtsp(2)
    1.0000e+04    0.0000e+00
*       ifsp(1)       ifsp(2)
             0             0
*
*                trip-controlled trip for pressurizer heaters
*          idtp          isrt          iset          itst          idsg
            -24            -3            -1             3             2
*       setp(1)       setp(2)       setp(3)       setp(4)
   -6.0000e-01   -4.0000e-01    4.0000e-01    6.0000e-01
*       dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*       ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0
*
*                trip-controlled trip 23 signal (coincidence trip)
*          idtn          intn
             1             6
*       itn(1)        itn(2)        itn(3)        itn(4)        itn(5)
             1             2             3             4             5
*       itn(6)
             6
*
*                trip-controlled trip 24 signal (pressurizer heaters)
*          idtn          intn
             2             4
*       itn(1)        itn(2)        itn(3)        itn(4)
            13            14             7             7
*
*                trip set-point-factor table for trip 22
*          idft          idsg          inft
             1             1             6
*        ftx()         fty()
    0.0000e+00    1.0000e+00    7.5000e+01    1.0000e+00    7.5100e+01
    9.8519e-01    2.0000e+02    9.8519e-01    2.0010e+02    9.7778e-01
    7.0000e+02    9.7778e-01
*
*                trip set-point-factor table for trip 22
*          idft          idsg          inft
             2             1             6
*        ftx()         fty()
    0.0000e+00    1.0000e+00    7.5000e+01    1.0000e+00    7.5100e+01
    9.9805e-01    2.0000e+02    9.9805e-01    2.0010e+02    9.9376e-01
```

```
    7.0000e+02    9.9376e-01
*
*            trip 22 initiated time-step data
*         ndid          ntid
              1             1
*       itid(1)
             22
*         dtmin         dtmax         dtend         dtsof
    1.0000e-03    1.0000e+00    3.0000e+00    1.0000e+00
*         edint         gfint         dmpit         sedint
    4.0000e+00    5.0000e-01    4.0000e+00    4.0000e+00
*
******************
* component data *
******************
*
*******   type           num            id        ctitle
tee                        1             1 $1$ intact-loop hot leg
*         jcell         nodes          ichf          cost          epsw
              3             4             1    0.0000e+00    1.0000e-05
*        iconc1        ncell1         jun1          jun2         ipow1
              0             4             9            74             0
*        iqptr1        iqpsv1       nqptb1        nqpsv1       nqprf1
              0             0             0             0             0
*        radin1          th1        houtl1        houtv1       toutl1
    1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
*        toutv1
    3.0537e+02
*         qpin1         qpoff1        rqpmx1        qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        iconc2        ncell2         jun3          ipow2
              0             3            10             0
*        iqptr2        iqpsv2       nqptb2        nqpsv2       nqprf2
              0             0             0             0             0
*        radin2          th2        houtl2        houtv2       toutl2
    2.3300e-02    8.6968e-03    0.0000e+00    1.2270e+01    3.0537e+02
*        toutv2
    3.0537e+02
*         qpin2         qpoff2        rqpmx2        qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    +     1.8415e+00    1.0795e+00e
* dx    *     1.8415e+00    3.5983E-01    3.5983E-01    3.5983E-01e
* vol   +     1.1667e-01    6.8527e-02e
* vol   *     1.1667e-01    2.2842E-02    2.2842E-02    2.2842E-02e
* fa    + f   6.3425e-02e
* fa    * r 2 6.3425e-02    6.3480E-02    6.3480E-02    6.3425E-02e
* fric  +     3.7203e-02    1.1170e-02    2.0282e-02e
* fric  *     3.8186E-02    1.4822E-02          0.0           0.0    3.0891E-02
* fric  * e
* grav  * f   0.0000e+00e
* hd    * f   2.8417e-01e
* icflg * f           0e
* nff   * f           1e
* alp   * f   0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   5.6750e+02e
* tv    * f   5.6750e+02e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f           7e
* tw    * f   5.6750e+02e
*
* dx    *     2.1499e+00    2.1213e+00    2.2217e+00e
* vol   *     3.1149e-03    3.0744e-03    5.7059e-03e
* fa    * r03 1.4493e-03    5.7321e-03e
* fric  *     1.0000e-04    5.5032e-03r02 0.0000e+00e
* grav  *     5.4510e-01r02 0.0000e+00    6.0410e-01e
* hd    * r03 4.2957e-02    8.5430e-02e
* icflg * f           0e
* nff   * r02         1r02         -1e
* alp   * f   0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   6.1411e+02e
* tv    * f   6.1411e+02e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f           7e
* tw    * f   6.1411e+02e
*
* the old STGEN component 2 has been converted into the following:
*     PIPE component 2
*     PIPE component 20
*     TEE  component 21
*     TEE  component 22
*     ROD  component 901 (placed before time-step data)
*     ROD  component 902 (placed before time-step data)
*******   type           num            id        ctitle
```

```
pipe                    2           2 $2$ steam generator primary
*       ncells        nodes         jun1          jun2          epsw
             10            0            2             3       1.0e-5
*         ichf        iconc         iacc          ipow
              1            0            0             0
*        radin          th        houtl         houtv         toutl
   5.1069e-03   1.2431e-03          0.0           0.0        305.67
*        toutv        powin       powoff        rpowmx        powscl
          305.67          0.0          0.0           0.0           1.0
*
* dx    *     3.7061e-01r03 5.6895e-01r02 5.6899e-01r03 5.6895e-01    3.7061e-01
* dx    * e
* vol   *     3.3541e-01r03 8.6009e-02r02 8.6015e-02r03 8.6009e-02    3.3541e-01
* vol   * e
* fa    *     8.8959e-02r09 1.5117e-01    8.8959e-02e
* fric  *     2.0941e-01    3.5994e-03r07 0.0000e+00    5.9416e-03    1.5112e-01
* fric  * e
* grav  *     6.1566e-01r04 1.0000e+00    0.0000e+00r04-1.0000e+00   -6.1566e-01
* grav  * e
* hd    *     3.3655e-01r09 1.0214e-02    3.3655e-01e
* icflg * f           0e
* nff   * f           1e
* alp   * f   0.0000e+00
* vl    * f   0.0000e+00
* vv    * f   0.0000e+00
* tl    *     5.6750e+02    5.6587e+02    5.6423e+02    5.6260e+02    5.6097e+02
* tl    *     5.5933e+02    5.5770e+02    5.5607e+02    5.5443e+02    5.5280e+02
* tl    * e
* tv    *     5.6750e+02    5.6587e+02    5.6423e+02    5.6260e+02    5.6097e+02
* tv    *     5.5933e+02    5.5770e+02    5.5607e+02    5.5443e+02    5.5280e+02
* tv    * e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
*
*******   type          num           id        ctitle
pipe                   20           20 $20$ steam generator boiler
*       ncells        nodes         jun1          jun2          epsw
              8            0           24            21       1.0e-5
*         ichf        iconc         iacc          ipow
              1            0            0             0
*        radin          th        houtl         houtv         toutl
   5.1069e-03   1.2431e-03          0.0           0.0        305.67
*        toutv        powin       powoff        rpowmx        powscl
          305.67          0.0          0.0           0.0           1.0
*
* dx    + r04 5.6895e-01    1.1115e+00e
* dx    * r04 5.6895e-01r03 2.4700E-01    3.7050E-01e
* vol   + r04 4.4356e-01    9.9786e-01e
* vol   * r04 4.4356e-01r03 0.22174667      0.33262e
* fa    +     2.1890e-01r03 7.7961e-01r02 8.9776e-01e
* fa    *     2.1890e-01r03 7.7961e-01r05 8.9776e-01e
* fric  +     2.0000e-02r05 0.0000e+00e
* fric  *     2.0000e-02r08 0.0000e+00e
* grav  +     0.0000e+00r05 1.0000e+00e
* grav  *     0.0000e+00r08 1.0000e+00e
* hd    + r05 6.3500e-03    1.0691e+00e
* hd    * r05 6.3500e-03r04 1.0691e+00e
* icflg * f           0e
* nff   * f           1e
* alp   + r03 0.0000e+00    3.5000e-01    1.0000e+00e
* alp   * r03 0.0000e+00    3.5000e-01r04 1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   5.4157e+02e
* tv    * f   5.4157e+02e
* p     * f   5.3700e+06e
* pa    * f   0.0000e+00e
*
*******   type          num           id        ctitle
tee                    21           21 $21$ steam generator steam dome
*        jcell        nodes         ichf          cost          epsw
              2            0            1           0.0       1.0e-5
*       iconc1       ncell1         jun1          jun2         ipow1
              0            4           21            22             0
*       radin1          th1       houtl1        houtv1        toutl1
         0.53455         0.05          0.0           0.0        305.67
*       toutv1        pwin1       pwoff1        rpwmx1        pwscl1
          305.67          0.0          0.0           0.0           1.0
*       iconc2       ncell2         jun3         ipow2
              0            1           23             0
*       radin2          th2       houtl2        houtv2        toutl2
         0.53455         0.05          0.0           0.0        305.67
*       toutv2        pwin2       pwoff2        rpwmx2        pwscl2
          305.67          0.0          0.0           0.0           1.0
*
* dx    + f   1.1115e+00e
* dx    *     3.7050E-01    3.7050E-01    3.7050E-01    1.1115e+00e
* vol   +     9.9786e-01    1.2370e+00e
* vol   *     3.3262E-01    3.3262E-01    3.3262E-01    1.2370e+00e
* fa    +     8.9776e-01    1.1129e+00    4.6329e-02e
* fa    *     8.9776e-01    8.9776E-01    8.9776E-01    1.1129e+00    4.6329e-02
* fa    * e
```

```
* fric  +     0.0000e+00    1.0000e+30    2.4460e-01
* fric  *     0.0000e+00           0.0    1.0000e+30           0.0    2.4460e-01
* fric  * e
* grav  * f   1.0000e+00e
* hd    + r02 1.0691e+00    2.4290e-01e
* hd    * r04 1.0691e+00    2.4290e-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   5.4157e+02e
* tv    * f   5.4157e+02e
* p     * f   5.3700e+06e
* pa    * f   0.0000e+00e
*
* dx    *     7.4100e-01e
* vol   *     3.8297e-01e
* fa    * f   5.1683e-01e
* fric  *     1.0000e-04    0.0000e+00e
* grav  + f  -3.3763e-01e
* grav  + f  -0.33759606e
* grav  * f  -0.40463059e
* hd    * f   2.5400e-01e
* icflg * f            0e
* nff   * f            1e
* alp   *     1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    *     5.4157e+02e
* tv    *     5.4157e+02e
* p     *     5.3700e+06e
* pa    *     0.0000e+00e
*
*******   type           num            id        ctitle
tee                       22            22 $22$ steam generator downcomer
*         jcell         nodes          ichf          cost          epsw
                4             0             1           0.0        1.0e-5
*        iconc1        ncell1          jun1          jun2          ipow1
                0             9            23            24              0
*        radin1           th1        houtl1        houtv1        toutl1
         0.53455          0.05           0.0           0.0        305.67
*        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
         305.67           0.0           0.0           0.0           1.0
*        iconc2        ncell2          jun3         ipow2
                0             1            25             0
*        radin2           th2        houtl2        houtv2        toutl2
         0.0508          0.02           0.0           0.0        305.67
*        toutv2         pwin2        pwoff2        rpwmx2        pwscl2
         305.67           0.0           0.0           0.0           1.0
*
* dx    + r02 7.4100e-01    1.7069e+00    5.6895e-01e
* dx    +     7.4100e-01r03 2.4700E-01    1.7069e+00    5.6895e-01e
* dx    * r02 3.7050E-01r03 2.4700E-01r03 5.6895E-01    5.6895e-01e
* vol   + r02 3.8297e-01    3.7363e-01    1.2454e-01e
* vol   +     3.8297e-01r03 1.2766E-01    3.7363e-01    1.2454e-01e
* vol   * r02 1.9149E-01r03 1.2766E-01r03 1.2454E-01    1.2454e-01e
* fa    + r02 5.1683e-01r03 2.1890e-01e
* fa    + r02 5.1683e-01    5.1683E-01    5.1683E-01r03 2.1890e-01e
* fa    * r05 5.1683e-01r05 2.1890e-01e
* fric  + r04 0.0000e+00    2.0000e-02e
* fric  + r06 0.0000e+00    2.0000e-02e
* fric  * r09 0.0000e+00    2.0000e-02e
* grav  +    -3.3763e-01r03-1.0000e+00    0.0000e+00e
* grav  +    -0.33759606r05-1.0000e+00    0.0000e+00e
* grav  * r02-0.40463059r07-1.0000e+00    0.0000e+00e
* hd    + r02 2.5400e-01r02 1.0160e-01    6.3500e-03e
* hd    + r03 2.5400e-01r03 1.0160e-01    6.3500e-03e
* hd    * r04 2.5400e-01r05 1.0160e-01    6.3500e-03e
* icflg * f            0e
* nff   + r02          1           -1r02         1e
* nff   + r04          1           -1r02         1e
* nff   * r05          1           -1r04         1e
* alp   +     1.0000e+00r03 0.0000e+00e
* alp   +     1.0000e+00r05 0.0000e+00e
* alp   * r02 1.0000e+00r07 0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    +     5.4157e+02r03 5.2500e+02e
* tl    +     5.4157e+02r05 5.2500e+02e
* tl    * r02 5.4157e+02r07 5.2500e+02e
* tv    * f   5.4157e+02e
* p     * f   5.3700e+06e
* pa    * f   0.0000e+00e
*
* dx    *     2.0000e+00e
* vol   *     1.6215e-02e
* fa    * f   8.1073e-03e
* fric  *     1.0000e-04    0.0000e+00e
* grav  * f   0.0000e+00e
* hd    * f   1.0160e-01e
* icflg * f            0e
```

```
* nff    * f            1e
* alp    *     0.0000e+00e
* vl     * f   0.0000e+00e
* vv     * f   0.0000e+00e
* tl     *     5.0000e+02e
* tv     *     5.0000e+02e
* p      *     5.3700e+06e
* pa     *     0.0000e+00e
*
*******   type           num            id        ctitle
tee                        3             3 $3$ pump suction
*         jcell         nodes          ichf          cost          epsw
                           5             4             1    0.0000e+00    1.0000e-05
*        iconc1        ncell1          jun1          jun2          ipow1
                           0             9             4             5             0
*        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
                           0             0             0             0             0
*        radin1           th1        houtl1        houtv1        toutl1
     1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
*        toutv1
     3.0537e+02
*         qpin1        qpoff1        rqpmx1        qpscl1
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        iconc2        ncell2          jun3          ipow2
                           0             1            73             0
*        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
                           0             0             0             0             0
*        radin2           th2        houtl2        houtv2        toutl2
     1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
*        toutv2
     3.0537e+02
*         qpin2        qpoff2        rqpmx2        qpscl2
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx     +     3.0480e-01    3.3020e-01    5.5880e-01    6.8580e-01    5.5880e-01
* dx     *     3.0480e-01    3.3020e-01    5.5880e-01    2.0081E-01    2.8417E-01
* dx     *     2.0081E-01    5.5880e-01s
* dx     *     3.3020e-01    3.0480e-01e
* vol    +     1.1044e-02    1.6424e-02    3.5396e-02    4.3497e-02    3.5396e-02
* vol    *     1.1044e-02    1.6424e-02    3.5396e-02    1.2737E-02    1.8024E-02
* vol    *     1.2737E-02    3.5396e-02s
* vol    *     1.6424e-02    1.1044e-02e
* fa     + r02 3.6613e-02r04 6.3425e-02r02 3.6613e-02e
* fa     * r02 3.6613e-02r02 6.3425e-02    6.3425E-02    6.3425E-02r02 6.3425E-02
* fa     * r02 3.6613e-02e
* fric   +     2.8678e-02    3.6439e-02    2.1983e-03    1.1068e-01    1.1068e-01
* fric   *     2.8678e-02    3.6439e-02    2.1983e-03    1.8135E-01           0.0
* fric   *           0.0     1.8135E-01s
* fric   *     2.1983e-03    3.6439e-02    2.8678e-02e
* grav   +    -6.2659e-01r02-1.0000e+00r02 0.0000e+00r02 1.0000e+00    6.2659e-01
* grav   *    -6.2659e-01r02-1.0000e+00r04 0.0000e+00r02 1.0000e+00    6.2659e-01
* grav   * e
* hd     + r02 2.1591e-01r04 2.8417e-01r02 2.1591e-01e
* hd     * r02 2.1591e-01r06 2.8417e-01r02 2.1591e-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   1.4780e+07e
* pa     * f   0.0000e+00e
* qppp   * f   0.0000e+00e
* matid  * f            7e
* tw     * f   5.5280e+02e
*
* dx     *     7.3120e-01e
* vol    *     4.6268e-02e
* fa     * f   6.3425e-02e
* fric   *     1.6244e-01    0.0000e+00e
* grav   * f   0.0000e+00e
* hd     * f   2.8417e-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      *     1.4780e+07e
* pa     *     0.0000e+00e
* qppp   * f   0.0000e+00e
* matid  * f            7e
* tw     * f   5.5280e+02e
*
*******   type           num            id        ctitle
pump                       4             4 $4$ pump 2
*        ncells        nodes          jun1          jun2          epsw
                           2             4             4             6    1.0000e-05
*          ichf        iconc        ipmpty           irp           ipm
                           1             0             1             1             1
```

```
1192  *       ipmptr        ipmpsv        npmptb        npmpsv        npmprf
1193              10             1           -10             0             0
1194  *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
1195               0             0             0             0             0
1196  *        radin            th         houtl         houtv         toutl
1197     1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
1198  *        toutv         effmi
1199     3.0537e+02    3.1744e+02
1200  *         tfr0          tfr1          tfr2          tfr3          tfrb
1201     3.6813e+00    0.0000e+00    2.3119e+02    0.0000e+00    0.0000e+00
1202  *        tfrl0         tfrl1         tfrl2         tfrl3
1203     3.6813e+00    0.0000e+00    2.3119e+02    0.0000e+00
1204  *        rhead         rtork         rflow         rrho          romega
1205     9.4154e+02    5.0000e+02    3.1500e-01    6.1400e+02    3.6966e+02
1206  *       omegan        omgoff        romgmx        omgscl        npmpsd
1207     3.6966e+02   -1.0000e+00    1.0000e+20    3.6966e+02             0
1208  *         qp3in         qp3off        rqp3mx        qp3scl
1209     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1210  *        option
1211               2
1212  *
1213  * dx     * f    1.3521e+00e
1214  * vol    * f    4.9555e-02e
1215  * fa     * f    3.6613e-02e
1216  * fric   *      2.8678e-02r02 0.0000e+00e
1217  * grav   *      6.2659e-01r02 0.0000e+00e
1218  * hd     * f    2.1591e-01e
1219  * icflg  * f             0e
1220  * nff    * f             1e
1221  * alp    * f    0.0000e+00e
1222  * ml     *      0.0000e+00    2.4000e+02    0.0000e+00e
1223  * mv     * f    0.0000e+00e
1224  * tl     * f    5.5280e+02e
1225  * tv     * f    5.5280e+02e
1226  * p      * f    1.4780e+07e
1227  * pa     * f    0.0000e+00e
1228  * qppp   * f    0.0000e+00e
1229  * matid  * f             7e
1230  * tw     * f    5.5280e+02e
1231  *
1232  * pmptb  *      0.0000e+00    1.0000e+00    5.0000e+00    6.4516e-01    1.0000e+01
1233  * pmptb  *      4.3548e-01    1.8000e+01    2.2581e-01    2.0000e+01    1.2903e-01
1234  * pmptb  *      2.5000e+01    6.4516e-02    3.0000e+01    4.4355e-02    4.0000e+01
1235  * pmptb  *      2.4806e-02    4.4000e+01    1.9355e-02    4.6500e+01    0.0000e+00
1236  * pmptb  * e
1237  *
1238  *******   type           num            id        ctitle
1239  pump                      5             5 $5$ pump 1
1240  *        ncells         nodes          jun1          jun2          epsw
1241               2             4             5             7    1.0000e-05
1242  *          ichf         iconc        ipmpty           irp          ipm
1243               1             0             1             1            1
1244  *       ipmptr        ipmpsv        npmptb        npmpsv        npmprf
1245              10             1           -10             0             0
1246  *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
1247               0             0             0             0             0
1248  *        radin            th         houtl         houtv         toutl
1249     1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
1250  *        toutv         effmi
1251     3.0537e+02    3.1744e+02
1252  *         tfr0          tfr1          tfr2          tfr3          tfrb
1253     3.6813e+00    0.0000e+00    2.3119e+02    0.0000e+00    0.0000e+00
1254  *        tfrl0         tfrl1         tfrl2         tfrl3
1255     3.6813e+00    0.0000e+00    2.3119e+02    0.0000e+00
1256  *        rhead         rtork         rflow         rrho          romega
1257     9.4154e+02    5.0000e+02    3.1500e-01    6.1400e+02    3.6966e+02
1258  *       omegan        omgoff        romgmx        omgscl        npmpsd
1259     3.6966e+02   -1.0000e+00    1.0000e+20    3.6966e+02             0
1260  *         qp3in         qp3off        rqp3mx        qp3scl
1261     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1262  *        option
1263               2
1264  *
1265  * dx     * f    1.3521e+00e
1266  * vol    * f    4.9555e-02e
1267  * fa     * f    3.6613e-02e
1268  * fric   *      2.8678e-02r02 0.0000e+00e
1269  * grav   *      6.2659e-01r02 0.0000e+00e
1270  * hd     * f    2.1591e-01e
1271  * icflg  * f             0e
1272  * nff    * f             1e
1273  * alp    * f    0.0000e+00e
1274  * ml     *      0.0000e+00    2.5000e+02    0.0000e+00e
1275  * mv     * f    0.0000e+00e
1276  * tl     * f    5.5280e+02e
1277  * tv     * f    5.5280e+02e
1278  * p      * f    1.4780e+07e
1279  * pa     * f    0.0000e+00e
1280  * qppp   * f    0.0000e+00e
1281  * matid  * f             7e
1282  * tw     * f    5.5280e+02e
1283  *
```

```
* pmptb *     0.0000e+00    1.0000e+00    5.0000e+00    6.4516e-01    1.0000e+01
* pmptb *     4.3548e-01    1.8000e+01    2.2581e-01    2.0000e+01    1.2903e-01
* pmptb *     2.5000e+01    6.4516e-02    3.0000e+01    4.4355e-02    4.0000e+01
* pmptb *     2.4806e-02    4.4000e+01    1.9355e-02    4.6500e+01    0.0000e+00
* pmptb * e
*
*******   type           num            id       ctitle
tee                        6             6 $6$ pump discharge
*        jcell         nodes          ichf          cost          epsw
                           4             4             1    0.0000e+00    1.0000e-05
*       iconc1        ncell1          jun1          jun2          ipow1
                           0             5             7            66             0
*       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
                           0             0             0             0             0
*       radin1           th1        houtl1        houtv1        toutl1
     1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
*       toutv1
     3.0537e+02
*        qpin1        qpoff1        rqpmx1        qpscl1
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*       iconc2        ncell2          jun3          ipow2
                           0             1             6             0
*       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
                           0             0             0             0             0
*       radin2           th2        houtl2        houtv2        toutl2
     1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
*       toutv2
     3.0537e+02
*        qpin2        qpoff2        rqpmx2        qpscl2
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    +     1.3081e+00    3.3020e-01    8.1280e-01e
* dx    *     1.3081e+00    3.3020e-01    2.7093E-01    2.7093E-01    2.7093E-01
* dx    * e
* vol   +     4.7856e-02    1.6424e-02    5.1552e-02e
* vol   *     4.7856e-02    1.6424e-02    1.7184E-02    1.7184E-02    1.7184E-02
* vol   * e
* fa    + r02 3.6613e-02r02 6.3425e-02e
* fa    * r02 3.6613e-02    6.3425e-02    6.3425E-02    6.3425E-02    6.3425E-02
* fa    * e
* fric  +     0.0000e+00    2.3841e-02    6.7127e-02    5.2244e-02e
* fric  *     0.0000e+00    2.3841e-02    1.2764E-01           0.0           0.0
* fric  *     1.5673E-01e
* grav  * f   0.0000e+00e
* hd    + r02 2.1591e-01r02 2.8417e-01e
* hd    * r02 2.1591e-01r04 2.8417e-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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.5280e+02e
*
* dx    *     3.9370e-01e
* vol   *     1.4442e-02e
* fa    * f   3.6613e-02e
* fric  *     3.5099e-01    0.0000e+00e
* grav  * f   0.0000e+00e
* hd    * f   2.1591e-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     *     1.4780e+07e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.5280e+02e
*
*******   type           num            id       ctitle
tee                        7             7 $7$ intact-loop cold leg
*        jcell         nodes          ichf          cost          epsw
                           2             4             1    0.0000e+00    1.0000e-05
*       iconc1        ncell1          jun1          jun2          ipow1
                           0             4             8            29             0
*       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
                           0             0             0             0             0
*       radin1           th1        houtl1        houtv1        toutl1
     1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
*       toutv1
     3.0537e+02
*        qpin1        qpoff1        rqpmx1        qpscl1
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
```

```
1376  *       iconc2          ncell2           jun3          ipow2
1377                 0               1             14              0
1378  *       iqptr2          iqpsv2         nqptb2        nqpsv2          nqprf2
1379                 0               0              0              0               0
1380  *       radin2            th2          houtl2        houtv2          toutl2
1381     4.3663e-02    1.3487e-02    0.0000e+00    0.0000e+00    3.0537e+02
1382  *       toutv2
1383     3.0537e+02
1384  *        qpin2           qpoff2         rqpmx2        qpscl2
1385     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1386  *
1387  * dx    +     7.0874e-01    1.3970e+00e
1388  * dx    *     2.3625E-01    2.3625E-01    2.3625E-01    1.3970e+00e
1389  * vol   +     4.4741e-02    8.8603e-02e
1390  * vol   *     1.4914E-02    1.4914E-02    1.4914E-02    8.8603e-02e
1391  * fa    + f   6.3425e-02e
1392  * fa    *     6.3425E-02    6.3128E-02    6.3128E-02r02 6.3425e-02e
1393  * fric  + r02 0.0000e+00    2.0000e-02e
1394  * fric  * r04 0.0000e+00    1.8719E-02e
1395  * grav  * f   0.0000e+00e
1396  * hd    + f   2.8417e-01e
1397  * hd    * r04 2.8417E-01    2.8418E-01e
1398  * icflg * f            0e
1399  * nff   * f            1e
1400  * alp   * f   0.0000e+00e
1401  * vl    * f   0.0000e+00e
1402  * vv    * f   0.0000e+00e
1403  * tl    * f   5.5280e+02e
1404  * tv    * f   5.5280e+02e
1405  * p     * f   1.4780e+07e
1406  * pa    * f   0.0000e+00e
1407  * qppp  * f   0.0000e+00e
1408  * matid * f            7e
1409  * tw    * f   5.5280e+02e
1410  *
1411  * dx    *     1.5000e+00e
1412  * vol   *     8.9838e-03e
1413  * fa    * f   5.9892e-03e
1414  * fric  *     1.0000e-04    3.3380e-01e
1415  * grav  *    -1.0000e+00    0.0000e+00e
1416  * hd    * f   8.7325e-02e
1417  * icflg * f            0e
1418  * nff   * f            1e
1419  * alp   *     0.0000e+00e
1420  * vl    * f   0.0000e+00e
1421  * vv    * f   0.0000e+00e
1422  * tl    *     5.0000e+02e
1423  * tv    *     5.0000e+02e
1424  * p     *     1.4780e+07e
1425  * pa    *     0.0000e+00e
1426  * qppp  * f   0.0000e+00e
1427  * matid * f            7e
1428  * tw    * f   5.0000e+02e
1429  *
1430  *******   type            num            id        ctitle
1431  prizer                    8             8 $8$ pressurizer bottom
1432  *       ncells          nodes          jun1          jun2
1433                 1              4            64            10
1434  *         ichf          iconc         qp3in
1435                 1              0    0.0000e+00
1436  *        radin             th         houtl         houtv         toutl
1437     4.2418e-01    7.4930e-02    0.0000e+00    2.7411e+00    3.0537e+02
1438  *        toutv          qheat          pset          dpmax          zhtr
1439     3.0537e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
1440  *
1441  * dx    *     2.0000e-01e
1442  * vol   *     1.2770e-02e
1443  * fa    *     5.6526e-01    5.7321e-03e
1444  * fric  * f   0.0000e+00e
1445  * grav  *    -1.0000e+00   -6.0410e-01e
1446  * hd    *     8.4836e-01    8.5430e-02e
1447  * icflg * f            0e
1448  * nff   * f           -1e
1449  * alp   *     0.0000e+00e
1450  * vl    * f   0.0000e+00e
1451  * vv    * f   0.0000e+00e
1452  * tl    *     6.1411e+02e
1453  * tv    *     6.1411e+02e
1454  * p     *     1.4780e+07e
1455  * pa    *     0.0000e+00e
1456  * qppp  * f   0.0000e+00e
1457  * matid * f            9e
1458  * tw    * f   6.1411e+02e
1459  *
1460  *******   type            num            id        ctitle
1461  pipe                      9             9 $9$ prizer top and prizer spray
1462  *       ncells          nodes          jun1          jun2          epsw
1463                 1              4            60            68    1.0000e-05
1464  *         ichf          iconc          iacc          ipow
1465                 1              0             0             1
1466  *       ipowtr         ipowsv        npowtb        npowsv        npowrf
1467                 7              1             2             0             0
```

```
1468  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
1469                 0             0             0             0             0
1470  *       radin2           th2        houtl2        houtv2        toutl2
1471      2.3300e-02    8.7970e-03    0.0000e+00    1.2270e+01    3.0537e+02
1472  *       toutv2         pwin2        pwoff2        rpwmx2        pwscl2
1473      3.0537e+02    0.0000e+00    0.0000e+00    1.0000e+20    5.0000e+03
1474  *        qpin2        qpoff2        rqpmx2        qpscl2
1475      0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+00
1476  *
1477  * dx     *     4.6022e-02
1478  * vol    *     6.6699e-05
1479  * fa     *     1.4493e-04    1.4493e-03e
1480  * fric   * f   0.0000e+00e
1481  * grav   * f  -1.0000e+00e
1482  * hd     * f   4.2957e-02e
1483  * icflg  * f            0e
1484  * nff    *             -1            1e
1485  * alp    *     0.0000e+00e
1486  * vl     * f   0.0000e+00e
1487  * vv     * f   0.0000e+00e
1488  * tl     *     4.5000e+02e
1489  * tv     *     4.5000e+02e
1490  * p      *     1.4780e+07e
1491  * pa     *     0.0000e+00e
1492  * qppp   * f   0.0000e+00e
1493  * matid  * f            6e
1494  * tw     * f   4.5000e+02e
1495  *
1496  * powtb2* r02 0.0000e+00    2.0000e+01    1.0000e+00e
1497  *
1498  *******   type          num           id        ctitle
1499  valve                    10           10 $10$ prizer spray control valve
1500  *       ncells         nodes         junl          jun2          epsw
1501                3             4           67            68    1.0000e-05
1502  *         ichf         iconc         ivty          ivps         nvtb2
1503                1             0            3             2             0
1504  *         ivtr         ivsv        nvtbl         nvsv          nvrf
1505                12            1           -2             0             0
1506  *       iqp3tr       iqp3sv       nqp3tb       nqp3sv       nqp3rf
1507                0             0            0             0             0
1508  *       ivtrov       ivtyov
1509                0             0
1510  *         rvmx          rvov       fminov       fmaxov
1511      1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
1512  *        radin           th        houtl         houtv         toutl
1513      3.3000e-02    8.6970e-03    0.0000e+00    1.2270e+01    3.0537e+02
1514  *        toutv         avlve         hvlve         favlve          xpos
1515      3.0537e+02    1.4490e-03    4.2957e-02    6.8600e-03   -1.0000e+00
1516  *        qp3in        qp3off        rqp3mx        qp3scl
1517      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1518  *
1519  * dx     + r02 5.6600e-01    7.0000e-01e
1520  * dx     * r02 0.70537663    7.0000e-01e
1521  * vol    + r02 8.2030e-04    1.0145e-03e
1522  * vol    * r02 1.0223e-03    1.0145e-03e
1523  * fa     * f   1.4493e-03e
1524  * fric   *     0.0000e+00    1.0500e+01r02 0.0000e+00e
1525  * grav   * f   1.0000e+00e
1526  * hd     * f   4.2957e-02e
1527  * icflg  * f            0e
1528  * nff    * f            1e
1529  * alp    * f   0.0000e+00e
1530  * vl     * f   0.0000e+00e
1531  * vv     * f   0.0000e+00e
1532  * tl     * f   4.5000e+02e
1533  * tv     * f   4.5000e+02e
1534  * p      * f   1.4780e+07e
1535  * pa     * f   0.0000e+00e
1536  * qppp   * f   0.0000e+00e
1537  * matid  * f            7e
1538  * tw     * f   4.5000e+02e
1539  *
1540  * vtbl   *     0.0000e+00    6.8600e-03    1.0000e-01    1.0000e+00e
1541  *
1542  *******   type          num           id        ctitle
1543  tee                      11           11 $11$ prizer spray source
1544  *         jcell         nodes         ichf          cost          epsw
1545                2             4            1    0.0000e+00    1.0000e-05
1546  *       iconc1       ncell1        junl          jun2          ipow1
1547                0             3           66             8             0
1548  *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
1549                0             0            0             0             0
1550  *       radin1           th1        houtl1        houtv1        toutl1
1551      1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1552  *       toutv1
1553      3.0537e+02
1554  *        qpin1        qpoff1        rqpmx1        qpscl1
1555      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1556  *       iconc2       ncell2        jun3          ipow2
1557                0             1           67             0
1558  *       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
1559                0             0            0             0             0
```

```
1560  *       radin2          th2        houtl2        houtv2        toutl2
1561      2.3300e-02    8.6970e-03    0.0000e+00    1.2270e+01    3.0537e+02
1562  *       toutv2
1563      3.0537e+02
1564  *         qpin2         qpoff2         rqpmx2         qpscl2
1565      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1566  *
1567  * dx     +      1.1684e+00
1568  * dx     *      3.8947E-01    3.8947E-01    3.8947E-01e
1569  * vol    +      7.4190e-02e
1570  * vol    *      2.4730E-02    2.4730E-02    2.4730E-02e
1571  * fa     + f    6.3425e-02e
1572  * fa     *      6.3425e-02    6.3497E-02    6.3497E-02    6.3425E-02e
1573  * fric   +      5.2244e-02    0.0000e+00e
1574  * fric   *      1.5673E-01          0.0           0.0    0.0000e+00e
1575  * grav   * f    0.0000e+00e
1576  * hd     * f    2.8417e-01e
1577  * icflg  * f             0e
1578  * nff    * f             1e
1579  * alp    * f    0.0000e+00e
1580  * vl     * f    0.0000e+00e
1581  * vv     * f    0.0000e+00e
1582  * tl     * f    5.5280e+02e
1583  * tv     * f    5.5280e+02e
1584  * p      * f    1.4780e+07e
1585  * pa     * f    0.0000e+00e
1586  * qppp   * f    0.0000e+00e
1587  * matid  * f             7e
1588  * tw     * f    5.5280e+02e
1589  *
1590  * dx     *      7.4602e-01e
1591  * vol    *      1.0812e-03e
1592  * fa     * f    1.4493e-03e
1593  * fric   *      1.0000e-04    0.0000e+00e
1594  * grav   * f    1.0000e+00e
1595  * hd     * f    4.2957e-02e
1596  * icflg  * f             0e
1597  * nff    * f             1e
1598  * alp    * f    0.0000e+00e
1599  * vl     * f    0.0000e+00e
1600  * vv     * f    0.0000e+00e
1601  * tl     * f    4.5000e+02e
1602  * tv     * f    4.5000e+02e
1603  * p      * f    1.4780e+07e
1604  * pa     * f    0.0000e+00e
1605  * qppp   * f    0.0000e+00e
1606  * matid  * f             7e
1607  * tw     * f    4.5000e+02e
1608  *
1609  *******   type           num            id       ctitle
1610  pipe                     12            12 $12$ pressurizer lower middle
1611  *       ncells         nodes          jun1          jun2          epsw
1612                1             4            61            64    1.0000e-05
1613  *         ichf         iconc          iacc          ipow
1614                1             0             0             1
1615  *       ipowtr        ipowsv        npowtb        npowsv        npowrf
1616                -24           21             8             0             0
1617  *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
1618                0             0             0             0             0
1619  *        radin            th         houtl         houtv         toutl
1620      4.2418e-01    7.4930e-02    0.0000e+00    2.7411e+00    3.0537e+02
1621  *        toutv         powin        powoff         rpowmx        powscl
1622      3.0537e+02    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1623  *         qp3in         qp3off         rqp3mx         qp3scl
1624      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1625  *
1626  * dx     *      1.5000e-01e
1627  * vol    *      8.4789e-02e
1628  * fa     * f    5.6526e-01e
1629  * fric   * f    0.0000e+00e
1630  * grav   * f   -1.0000e+00e
1631  * hd     * f    8.4836e-01e
1632  * icflg  * f             0e
1633  * nff    *              1            -1e
1634  * alp    *      0.0000e+00e
1635  * vl     * f    0.0000e+00e
1636  * vv     * f    0.0000e+00e
1637  * tl     *      6.1411e+02e
1638  * tv     *      6.1411e+02e
1639  * p      *      1.4780e+07e
1640  * pa     *      0.0000e+00e
1641  * qppp   * f    0.0000e+00e
1642  * matid  * f             9e
1643  * tw     * f    6.1411e+02e
1644  *
1645  * powtb  *     -1.2500e+00    3.9800e+02   -7.5000e-01    3.9800e+02   -5.0000e-01
1646  * powtb  *      0.0000e+00    5.0000e-01    0.0000e+00    7.5000e-01    3.6000e+04
1647  * powtb  *      1.2500e+00    3.6000e+04    1.7500e+00    4.8000e+04    2.2500e+00
1648  * powtb  *      4.8000e+04e
1649  *
1650  *******   type           num            id       ctitle
1651  prizer                   13            13 $13$ pressurizer upper middle
```

```
*       ncells          nodes           jun1            jun2
              7              4             60              61
*         ichf          iconc          qp3in
                1              0    0.0000e+00
*        radin             th          houtl          houtv          toutl
    4.2418e-01    7.4930e-02    0.0000e+00    2.7411e+00    3.0537e+02
*        toutv          qheat           pset          dpmax           zhtr
    3.0537e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* dx    *     1.3073e-01    4.0000e-01r05 2.0000e-01e
* vol   *     6.7133e-02    2.0259e-01r05 1.1305e-01e
* fa    *     1.4493e-04    5.0647e-01r06 5.6526e-01e
* fric  * f   0.0000e+00e
* grav  *     1.0000e+00r07-1.0000e+00e
* hd    *     4.2957e-02r07 8.4836e-01e
* icflg * f             0e
* nff   *            -1r07          1e
* alp   * r02 1.0000e+00    2.9032e-01r04 0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   6.1411e+02e
* tv    * f   6.1411e+02e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f             9e
* tw    * f   6.1411e+02e
*
*******   type           num            id        ctitle
fill                      17            17 $17$ hpis injection
*         jun1          ifty          ioff
                14             8             1
*         iftr          ifsv          nftb          nfsv          nfrf
                17             1           -12             0             0
*       twtold          rfmx        concin          felv
    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*         dxin          volin         alpin          vlin          tlin
    1.5000e+00    8.9838e-03    0.0000e+00    0.0000e+00    3.7500e+02
*          pin          pain         flowin          vvin          tvin
    1.4780e+07    0.0000e+00    0.0000e+00    0.0000e+00    3.7500e+02
*        vmscl          vvscl
    1.0000e+00    1.0000e+00
*
* vmtb  * r02 0.0000e+00    2.0000e-01    2.4375e-01    1.6000e+00    3.8875e+00
* vmtb  *     2.0600e+01    3.8937e+00    2.1600e+01    1.4750e+00    2.2600e+01
* vmtb  *     3.7500e-01    2.3600e+01    2.5000e-01    2.6600e+01    1.5937e-01
* vmtb  *     3.3600e+01    1.2500e-01    3.9600e+01    1.2500e-01    4.0100e+01
* vmtb  *     0.0000e+00    1.0000e+04    0.0000e+00e
*
*******   type           num            id        ctitle
valve                     23            23 $23$ steam line valve
*       ncells          nodes          jun1          jun2          epsw
              6              0            22            26    1.0000e-05
*         ichf          iconc          ivty          ivps          nvtb2
                1              0             3             6             0
*         ivtr          ivsv         nvtbl          nvsv          nvrf
                8             -13             0             0             0
*       ivtrov         ivtyov
                0              0
*         rvmx          rvov         fminov        fmaxov
    1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
*        radin             th          houtl          houtv          toutl
    1.2140e-01    1.5100e-02    0.0000e+00    0.0000e+00    3.0537e+02
*        toutv          avlve          hvlve          favlve          xpos
    3.0537e+02    3.7580e-02    2.1870e-01    5.8973e-01    6.3800e-01
*
* dx    * f   5.0119e+00e
* vol   * f   2.3220e-01e
* fa    * f   4.6329e-02e
* fric  *     2.4460e-01r04 0.0000e+00    6.4900e+00    0.0000e+00e
* grav  *     1.0000e+00r06 0.0000e+00e
* hd    * f   2.4290e-01e
* icflg * r05           0             1             0e
* nff   * r06           1            -1e
* alp   * f   1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   5.4157e+02e
* tv    * f   5.4157e+02e
* p     *     5.3700e+06    5.3628e+06    5.3556e+06    5.3483e+06    5.3411e+06
* p     *     2.1500e+06e
* pa    * f   0.0000e+00e
*
*******   type           num            id        ctitle
fill                      24            24 $24$ steam generator feedwater
*         jun1          ifty          ioff
                25             8             0
*         iftr          ifsv          nftb          nfsv          nfrf
                15           -10             0             0             0
*       twtold          rfmx        concin          felv
    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*         dxin          volin         alpin          vlin          tlin
```

```
    2.0000e+00    1.6215e-02    0.0000e+00    0.0000e+00    4.7900e+02
*          pin          pain        flowin          vvin          tvin
    5.3700e+06    0.0000e+00    2.0100e+01    0.0000e+00    4.7900e+02
*
******   type          num           id        ctitle
break                   25           25 $25$ stm gen sec brk
*         jun1         ibty         isat         ioff
             26            0            3            0
*         dxin         volin        alpin          tin          pin
    5.0119e+00    2.3220e+01    1.0000e+00    4.8800e+02    2.1500e+06
*         pain         concin         rhmx         poff         helv
    0.0000e+00    0.0000e+00    0.0000e+00    2.1500e+06    0.0000e+00
*
******   type          num           id        ctitle
tee                     29           29 $29$ inlet annulus and downcomer
*        jcell        nodes         ichf         cost         epsw
             1           10            1    0.0000e+00    1.0000e-05
*       iconc1       ncell1         jun1         jun2        ipow1
             0            2           46            1            0
*       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
             0            0            0            0            0
*       radin1         th1       houtl1       houtv1       toutl1
    1.4209e-01    1.5907e-01    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv1
    3.0537e+02
*        qpin1        qpoff1       rqpmx1       qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*       iconc2       ncell2         jun3         ipow2
             0            1           34            0
*       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
             0            0            0            0            0
*       radin2         th2       houtl2       houtv2       toutl2
    9.2000e-01    1.3600e-01    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv2
    3.0537e+02
*        qpin2        qpoff2       rqpmx2       qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* renoding of this component was done in conjunction with component 40
* dx    +     7.0974e-01e
* dx    *     2.0244E-01    2.0244E-01e
* vol   +     1.0073e-01e
* vol   *     2.7252E-02    2.7252E-02e
* fa    +     1.4192e-01    6.3425e-02e
* fa    *     1.3462E-01    1.3462E-01    6.3425e-02e
* fric  +     0.0000e+00    2.0000e-02e
* fric  *           0.0           0.0    2.7309E-02e
* grav  * f   0.0000e+00e
* hd    * f   2.8418e-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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            6e
* tw    * f   5.5280e+02e
*
* dx    +     1.0000e-01e
* dx    *      0.1006805e
* vol   +     1.4192e-02e
* vol   *     0.01428858e
* fa    * f   1.4192e-01e
* fric  *     1.0000e-04    0.0000e+00e
* grav  + f  -9.9985e-01e
* grav  +    -9.9985e-01   -0.99963215e
* grav  * f         -1.0e
* 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     *     1.4780e+07e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            6e
* tw    * f   5.5280e+02e
*
******   type          num           id        ctitle
tee                     30           30 $30$ vessel lower plenum outside
*        jcell        nodes         ichf         cost         epsw
             2           10            1    0.0000e+00    1.0000e-05
*       iconc1       ncell1         jun1         jun2        ipow1
             0            4           96           35            0
*       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
```

```
1836                0               0               0               0               0
1837  *          radin1             th1          houtl1          houtv1          toutl1
1838       9.4000e-01      1.3600e-01      0.0000e+00      0.0000e+00      3.0537e+02
1839  *          toutv1
1840       3.0537e+02
1841  *           qpin1          qpoff1          rqpmx1          qpscl1
1842       0.0000e+00      0.0000e+00      1.0000e+20      1.0000e+00
1843  *          iconc2          ncell2           jun3           ipow2
1844                0               1              36               0
1845  *          iqptr2          iqpsv2          nqptb2          nqpsv2          nqprf2
1846                0               0               0               0               0
1847  *          radin2             th2          houtl2          houtv2          toutl2
1848       5.0000e-02      5.0000e-02      0.0000e+00      0.0000e+00      3.0537e+02
1849  *          toutv2
1850       3.0537e+02
1851  *           qpin2          qpoff2          rqpmx2          qpscl2
1852       0.0000e+00      0.0000e+00      1.0000e+20      1.0000e+00
1853  *
1854  * dx    +     8.4700e-01      4.3200e-01e
1855  * dx    *     2.8233E-01      2.8233E-01      2.8233E-01      4.3200e-01e
1856  * vol   +     1.2021e-01      1.5429e-01e
1857  * vol   *     4.0070E-02      4.0070E-02      4.0070E-02      1.5429e-01e
1858  * fa    + r02 1.4192e-01      3.4005e-01e
1859  * fa    * r04 1.4192e-01      3.4005e-01e
1860  * fric  * f   0.0000e+00e
1861  * grav  + r02-1.0000e+00      0.0000e+00e
1862  * grav  * r04-1.0000e+00      0.0000e+00e
1863  * hd    * f   1.0000e-01e
1864  * icflg * f             0e
1865  * nff   +               1              -1              1e
1866  * nff   * r03           1              -1              1e
1867  * alp   * f   0.0000e+00e
1868  * vl    * f   0.0000e+00e
1869  * vv    * f   0.0000e+00e
1870  * tl    * f   5.5280e+02e
1871  * tv    * f   5.5280e+02e
1872  * p     * f   1.4780e+07e
1873  * pa    * f   0.0000e+00e
1874  * qppp  * f   0.0000e+00e
1875  * matid * f             6e
1876  * tw    * f   5.5280e+02e
1877  *
1878  * dx    *     1.0000e-01e
1879  * vol   *     4.1321e-02e
1880  * fa    * f   4.1321e-01e
1881  * fric  *     1.0000e-04      0.0000e+00e
1882  * grav  * f   0.0000e+00e
1883  * hd    * f   1.0000e-01e
1884  * icflg * f             0e
1885  * nff   * f             1e
1886  * alp   *     0.0000e+00e
1887  * vl    * f   0.0000e+00e
1888  * vv    * f   0.0000e+00e
1889  * tl    *     5.5280e+02e
1890  * tv    *     5.5280e+02e
1891  * p     *     1.4780e+07e
1892  * pa    *     0.0000e+00e
1893  * qppp  * f   0.0000e+00e
1894  * matid * f             6e
1895  * tw    * f   5.5280e+02e
1896  *
1897  *******   type            num             id          ctitle
1898  tee                      31              31 $31$ broken loop hot leg
1899  *          jcell         nodes          ichf          cost          epsw
1900                3               4             1    0.0000e+00    1.0000e-05
1901  *         iconc1         ncell1          jun1          jun2          ipow1
1902                0              20            45            32             0
1903  *         iqptr1         iqpsv1         nqptb1         nqpsv1         nqprf1
1904                0               0              0              0              0
1905  *         radin1            th1         houtl1         houtv1         toutl1
1906       1.4209e-01      3.5710e-02      0.0000e+00      1.2270e+01      3.0537e+02
1907  *         toutv1
1908       3.0537e+02
1909  *          qpin1          qpoff1          rqpmx1          qpscl1
1910       0.0000e+00      0.0000e+00      1.0000e+20      1.0000e+00
1911  *         iconc2         ncell2          jun3           ipow2
1912                0               3              43              0
1913  *         iqptr2         iqpsv2         nqptb2         nqpsv2         nqprf2
1914                0               0              0              0              0
1915  *         radin2            th2         houtl2         houtv2         toutl2
1916       1.0795e-01      2.8580e-02      0.0000e+00      1.2270e+01      3.0537e+02
1917  *         toutv2
1918       3.0537e+02
1919  *          qpin2          qpoff2          rqpmx2          qpscl2
1920       0.0000e+00      0.0000e+00      1.0000e+20      1.0000e+00
1921  *
1922  * dx    +     9.2939e-01      5.5880e-01      1.3890e+00      2.9921e-01      8.5396e-01
1923  * dx    *     9.2939e-01      1.6825E-01      2.2230E-01      1.6825E-01      1.3890e+00
1924  * dx    *     2.9921e-01      8.5396e-01s
1925  * dx    *     1.6921e+00      1.0772e+00      2.6314e-01      1.0772e+00      1.6921e+00
1926  * dx    *     1.5080e+00      3.3020e-01      2.7940e-01      4.9530e-01      2.9921e-01
1927  * dx    *     8.3185e-01      2.9921e-01      5.0000e-01e
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1928  * vol   +      5.8701e-02    3.5442e-02    5.0618e-02    2.4919e-03    3.8990e-02
1929  * vol   *      5.8701e-02    1.0671E-02    1.4099E-02    1.0671E-02    5.0618e-02
1930  * vol   *      2.4919e-03    3.8990e-02s
1931  * vol   *      1.7868e-01    1.1383e-01    2.7779e-02    1.1383e-01    1.7868e-01
1932  * vol   *      4.3550e-02    2.0105e-03    1.7726e-02    1.9441e-02    2.4919e-03
1933  * vol   *      6.9660e-03    2.4919e-03    2.4542e-03e
1934  * fa    + r03 6.3425e-02r02 8.3677e-03r06 1.0562e-01    8.3677e-03r02 6.3425e-02
1935  * fa    * r05 6.3425e-02r02 8.3677e-03r06 1.0562e-01    8.3677e-03r02 6.3425e-02
1936  * fa    * r04 8.3677e-03    2.0694e-02e
1937  * fric  +      7.0547e-02    5.1558e-02    5.9983e-02    3.7870e-02    3.7944e-02
1938  * fric  *      7.4149E-02    6.9903E-02          0.0           0.0    7.5026E-02
1939  * fric  *      3.7870e-02    3.7944e-02s
1940  * fric  *      6.1057e-02    1.9809e-01    0.0000e+00    1.7157e-02    0.0000e+00
1941  * fric  *      2.1500e-01    2.6383e-01    4.8453e-01    5.8143e-02    1.1840e-01
1942  * fric  *      0.0000e+00    2.5031e-02    6.2037e-03    5.0970e-01e
1943  * grav  + r04 0.0000e+00r03-1.0000e+00r02 0.0000e+00r04 1.0000e+00r02 0.0000e+00
1944  * grav  + r02-1.0000e+00r02 0.0000e+00e
1945  * grav  * r06 0.0000e+00    0.72818405r02+1.0000e+00r02 0.0000e+00r04-1.0000e+00
1946  * grav  * r02 0.0000e+00r02+1.0000e+00r02 0.0000e+00e
1947  * hd    + r03 2.8418e-01r02 1.0322e-01r06 3.6671e-01    1.0322e-01r02 2.8418e-01
1948  * hd    * r05 2.8418e-01r02 1.0322e-01r06 3.6671e-01    1.0322e-01r02 2.8418e-01
1949  * hd    * r04 1.0322e-01    2.5720e-01e
1950  * icflg * f            0e
1951  * nff   * f            1e
1952  * alp   * f   0.0000e+00e
1953  * vl    * f   0.0000e+00e
1954  * vv    * f   0.0000e+00e
1955  * tl    * f   5.6750e+02e
1956  * tv    * f   5.6750e+02e
1957  * p     * f   1.4780e+07e
1958  * pa    * f   0.0000e+00e
1959  * qppp  * f   0.0000e+00e
1960  * matid * f            7e
1961  * tw    * f   5.6750e+02e
1962  *
1963  * dx    *      1.3890e+00    8.1400e-01    5.1044e+00e
1964  * vol   *      5.4000e-02    3.1400e-02    1.9860e-01e
1965  * fa    * f   3.8800e-02e
1966  * fric  *      1.1160e-01r03 0.0000e+00e
1967  * grav  *      0.0000e+00    2.2420e-01    1.9120e-01    0.0000e+00e
1968  * hd    * r03 2.2230e-01    1.4100e-03e
1969  * icflg * f            0e
1970  * nff   * f            1e
1971  * alp   * f   0.0000e+00e
1972  * vl    * f   0.0000e+00e
1973  * vv    * f   0.0000e+00e
1974  * tl    * f   5.5280e+02e
1975  * tv    * f   5.5280e+02e
1976  * p     * f   1.4780e+07e
1977  * pa    * f   0.0000e+00e
1978  * qppp  * f   0.0000e+00e
1979  * matid * f            7e
1980  * tw    * f   5.5280e+02e
1981  *
1982  *******   type           num            id       ctitle
1983  tee                      33            33 $33$ vessel upper plenum
1984  *         jcell         nodes          ichf          cost          epsw
1985                2             4             1    0.0000e+00    1.0000e-05
1986  *       iconc1        ncell1          jun1          jun2          ipow1
1987                0             4            83            39              0
1988  *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
1989                0             0             0             0              0
1990  *       radin1           th1        houtl1        houtv1        toutl1
1991     3.3197e-01    4.9029e-02    0.0000e+00    0.0000e+00    3.0537e+02
1992  *       toutv1
1993     3.0537e+02
1994  *        qpin1         qpoff1         rqpmx1         qpscl1
1995     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1996  *       iconc2        ncell2          jun3          ipow2
1997                0             1            40              0
1998  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
1999                0             0             0             0              0
2000  *       radin2           th2        houtl2        houtv2        toutl2
2001     1.4209e-01    4.9029e-02    0.0000e+00    0.0000e+00    3.0537e+02
2002  *       toutv2
2003     3.0537e+02
2004  *        qpin2         qpoff2         rqpmx2         qpscl2
2005     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2006  *
2007  * dx    +      2.8418e-01    7.7000e-01e
2008  * dx    *      9.4727E-02    9.4727E-02    9.4727E-02    7.7000e-01e
2009  * vol   +      3.5298e-02    2.5817e-01e
2010  * vol   *      1.1766E-02    1.1766E-02    1.1766E-02    2.5817e-01e
2011  * fa    +      1.2412e-01r02 1.2446e-01e
2012  * fa    *      1.2412e-01    1.2421E-01    1.2421E-01r02 1.2446e-01e
2013  * fric  +      5.0000e-03r02 0.0000e+00e
2014  * fric  *      1.5000E-02          0.0           0.0r02 0.0000e+00e
2015  * grav  * f   1.0000e+00e
2016  * hd    * f   1.2200e-02e
2017  * icflg * f            0e
2018  * nff   +              1            -1             1e
2019  * nff   * r03          1            -1             1e
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2020  * alp    * f   0.0000e+00e
2021  * vl     * f   0.0000e+00e
2022  * vv     * f   0.0000e+00e
2023  * tl     * f   5.6750e+02e
2024  * tv     * f   5.6750e+02e
2025  * p      * f   1.4780e+07e
2026  * pa     * f   0.0000e+00e
2027  * qppp   * f   0.0000e+00e
2028  * matid  * f            6e
2029  * tw     * f   5.6750e+02e
2030  *
2031  * dx     *     1.0974e-01e
2032  * vol    *     1.3658e-02e
2033  * fa     * f   1.2446e-01e
2034  * fric   *     1.0000e-04    0.0000e+00e
2035  * grav   * f   0.0000e+00e
2036  * hd     * f   2.8418e-01e
2037  * icflg  * f            0e
2038  * nff    * f            1e
2039  * alp    *     0.0000e+00e
2040  * vl     * f   0.0000e+00e
2041  * vv     * f   0.0000e+00e
2042  * tl     *     5.6750e+02e
2043  * tv     *     5.6750e+02e
2044  * p      *     1.4780e+07e
2045  * pa     *     0.0000e+00e
2046  * qppp   * f   0.0000e+00e
2047  * matid  * f            6e
2048  * tw     * f   5.6750e+02e
2049  *
2050  *******   type          num           id       ctitle
2051  tee                      34           34 $34$ upper plenum and hot legs
2052  *         jcell         nodes         ichf         cost         epsw
2053                1             0            1    0.0000e+00    0.0000e+00
2054  *       iconc1        ncell1         jun1         jun2         ipow1
2055                0             2           48           45             0
2056  *       radin1           th1       hout11       houtv1       tout11
2057     1.4209e-01    4.9029e-02    0.0000e+00    0.0000e+00    3.0537e+02
2058  *       toutv1
2059     3.0537e+02
2060  *       iconc2        ncell2         jun3         ipow2
2061                0             1           40             0
2062  *       radin2           th2       hout12       houtv2       tout12
2063     1.4209e-01    4.9029e-02    0.0000e+00    0.0000e+00    3.0537e+02
2064  *       toutv2
2065     3.0537e+02
2066  *
2067  * renoding of this component was done in conjunction with component 43
2068  * dx     +     1.0000e-01e
2069  * dx     *     5.0000E-02    5.0000E-02e
2070  * vol    +     6.5218e-03e
2071  * vol    *     3.2609E-03    3.2609E-03e
2072  * fa     + f   6.3425e-02e
2073  * fa     *     6.5218E-02    6.5218E-02    6.3425E-02e
2074  * fric   +     0.0000e+00    7.0547e-02e
2075  * fric   *           0.0           0.0    7.4149E-02e
2076  * grav   * f   0.0000e+00e
2077  * hd     * f   2.8418e-01e
2078  * icflg  * f            0e
2079  * nff    * f            1e
2080  * alp    * f   0.0000e+00e
2081  * vl     * f   0.0000e+00e
2082  * vv     * f   0.0000e+00e
2083  * tl     * f   5.6750e+02e
2084  * tv     * f   5.6750e+02e
2085  * p      * f   1.4780e+07e
2086  * pa     * f   0.0000e+00e
2087  *
2088  * dx     *     1.0974e-01e
2089  * vol    *     1.3658e-02e
2090  * fa     * f   1.2446e-01e
2091  * fric   *     1.0000e-04    0.0000e+00e
2092  * grav   * f   0.0000e+00e
2093  * hd     * f   2.8418e-01e
2094  * icflg  * f            0e
2095  * nff    * f            1e
2096  * alp    *     0.0000e+00e
2097  * vl     * f   0.0000e+00e
2098  * vv     * f   0.0000e+00e
2099  * tl     *     5.6750e+02e
2100  * tv     *     5.6750e+02e
2101  * p      *     1.4780e+07e
2102  * pa     *     0.0000e+00e
2103  *
2104  *******   type          num           id       ctitle
2105  fill                     35           35 $35$ vessel head
2106  *         jun1         ifty         ioff
2107                39            1            0
2108  *       twtold         rfmx       concin         felv
2109     0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
2110  *         dxin        volin        alpin         vlin         tlin
2111     7.7000e-01    2.5817e-01    0.0000e+00    0.0000e+00    5.6750e+02
```

```
*          pin          pain         flowin          vvin          tvin
    1.4780e+07    0.0000e+00    0.0000e+00    0.0000e+00    5.6750e+02
*
*******   type           num            id        ctitle
tee                       36            36 $36$ vessel lower plenum inside
*        jcell         nodes          ichf          cost          epsw
               3             0             1    0.0000e+00    1.0000e-05
*       iconc1        ncell1          jun1          jun2          ipow1
               0             4            95            37              0
*       radin1           th1        houtl1        houtv1        toutl1
    3.3197e-01    4.9029e-02    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv1
    3.0537e+02
*       iconc2        ncell2          jun3          ipow2
               0             1            86              0
*       radin2           th2        houtl2        houtv2        toutl2
    5.0000e-02    5.0000e-02    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv2
    3.0537e+02
*
* dx    +     4.3200e-01    8.4700e-01e
* dx    *     4.3200e-01    2.8233E-01    2.8233E-01    2.8233E-01e
* vol   +     1.4696e-01    2.3172e-01e
* vol   *     1.4696e-01    7.7240E-02    7.7240E-02    7.7240E-02e
* fa    + r02 3.4005e-01    1.6356e-01e
* fa    * r02 3.4005e-01    2.7358E-01    2.7358E-01    1.6356e-01e
* fric  + r02 0.0000e+00    2.4437e-02e
* fric  * r02 0.0000e+00          0.0           0.0    4.5239E-02e
* grav  +     0.0000e+00r02 1.0000e+00e
* grav  *     0.0000e+00r04 1.0000e+00e
* hd    + r02 1.0000e-01    1.2200e-02e
* hd    * r03 1.0000e-01r02 1.2200e-02e
* 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   1.4780e+07e
* pa    * f   0.0000e+00e
*
* dx    *     5.0000e-02e
* vol   *     2.0660e-02e
* fa    * f   4.1321e-01e
* fric  *     1.0000e-04    0.0000e+00e
* 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     *     1.4780e+07e
* pa    *     0.0000e+00e
*
*******   type           num            id        ctitle
pipe                      37            37 $37$ nuclear reactor core pipe
*       ncells         nodes          jun1          jun2          epsw
               4             4            37            38    1.0000e-05
*         ichf         iconc          iacc          ipow
               1             0             0             0
*       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
               0             0             0             0             0
*        radin            th         houtl         houtv         toutl
    3.3197e-01    1.6343e-02    0.0000e+00    0.0000e+00    3.0537e+02
*        toutv          powin         powoff         rpowmx         powscl
    3.0537e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*         qp3in         qp3off         rqp3mx         qp3scl
    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* dx    *     3.8100e-01    2.9100e-01    4.7100e-01    5.3380e-01e
* vol   *     7.8656e-02    6.0075e-02    9.7236e-02    1.1003e-01e
* fa    * f   1.6356e-01e
* fric  +     2.4437e-02r03 0.0000e+00    1.0000e-02e
* fric  *     4.5239E-02r03 0.0000e+00    1.0000e-02e
* grav  * f   1.0000e+00e
* hd    * f   1.2200e-02e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    *     5.5460e+02    5.5820e+02    5.6210e+02    5.6570e+02e
* tv    *     5.5460e+02    5.5820e+02    5.6210e+02    5.6570e+02e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            6e
* tw    * r04 5.5280e+02r04 5.5770e+02r04 5.6260e+02r04 5.6750e+02e
```

```
*
*******   type            num             id        ctitle
tee                        40             40 $40$ inlet annulus nozzle penetration
*        jcell         nodes           ichf          cost          epsw
               2             4              1    0.0000e+00    1.0000e-05
*       iconc1        ncell1           jun1          jun2          ipow1
               0             2             29            46              0
*       iqptr1        iqpsv1         nqptb1        nqpsv1        nqprf1
               0             0              0             0              0
*       radin1           th1         houtl1        houtv1        toutl1
    1.4209e-01    1.5907e-01    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv1
    3.0537e+02
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*       iconc2        ncell2           jun3          ipow2
               0             1             47             0
*       iqptr2        iqpsv2         nqptb2        nqpsv2        nqprf2
               0             0              0             0              0
*       radin2           th2         houtl2        houtv2        toutl2
    5.0000e-02    5.0000e-02    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv2
    3.0537e+02
*        qpin2        qpoff2        rqpmx2        qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* renoding of this component was done in conjunction with component 29
* dx     +     1.0000e-01e
* dx     *     2.0244E-01    2.0244E-01e
* vol    +     8.2790e-03e
* vol    *     2.7252E-02    2.7252E-02e
* fa     +     6.3425e-02    1.4192e-01e
* fa     *     6.3425e-02    1.3462E-01    1.3462E-01e
* fric   +     2.0000e-02    0.0000e+00e
* fric   *     1.8719E-02           0.0    0.0000E+00e
* grav   * f   0.0000e+00e
* hd     * f   2.8418e-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   1.4780e+07e
* pa     * f   0.0000e+00e
* qppp   * f   0.0000e+00e
* matid  * f            6e
* tw     * f   5.5280e+02e
*
* dx     *     1.0000e-01e
* vol    *     7.8540e-04e
* fa     * f   7.8540e-03e
* fric   *     1.0000e-04    0.0000e+00e
* grav   * f   0.0000e+00e
* hd     *     1.0000e-01    2.5150e-04e
* 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      *     1.4780e+07e
* pa     *     0.0000e+00e
* qppp   * f   0.0000e+00e
* matid  * f            6e
* tw     * f   5.5280e+02e
*
*******   type            num             id        ctitle
tee                        41             41 $41$ broken loop cold leg
*        jcell         nodes           ichf          cost          epsw
               2             4              1    0.0000e+00    1.0000e-05
*       iconc1        ncell1           jun1          jun2          ipow1
               0             2              1            44              0
*       iqptr1        iqpsv1         nqptb1        nqpsv1        nqprf1
               0             0              0             0              0
*       radin1           th1         houtl1        houtv1        toutl1
    1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
*       toutv1
    3.0537e+02
*        qpin1        qpoff1        rqpmx1        qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*       iconc2        ncell2           jun3          ipow2
               0             2             43             0
*       iqptr2        iqpsv2         nqptb2        nqpsv2        nqprf2
               0             0              0             0              0
*       radin2           th2         houtl2        houtv2        toutl2
    1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
*       toutv2
    3.0537e+02
*        qpin2        qpoff2        rqpmx2        qpscl2
```

```
2296      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2297  *
2298  * dx    * f   1.1858e+00e
2299  * vol   * f   7.5209e-02e
2300  * fa    * f   6.3425e-02e
2301  * fric  +     2.0000e-02    1.0990e-01    1.7900e-02e
2302  * fric  *     2.7309E-02    1.0990e-01    1.7900e-02e
2303  * grav  * f   0.0000e+00e
2304  * hd    * f   2.8418e-01e
2305  * icflg * f           0e
2306  * nff   * f           1e
2307  * alp   * f   0.0000e+00e
2308  * vl    * f   0.0000e+00e
2309  * vv    * f   0.0000e+00e
2310  * tl    * f   5.5280e+02e
2311  * tv    * f   5.5280e+02e
2312  * p     * f   1.4780e+07e
2313  * pa    * f   0.0000e+00e
2314  * qppp  * f   0.0000e+00e
2315  * matid * f           7e
2316  * tw    * f   5.5280e+02e
2317  *
2318  * dx    *     8.5000e-01    7.2834e+00e
2319  * vol   *     3.4338e-02    2.8260e-01e
2320  * fa    * f   3.8800e-02e
2321  * fric  *     1.0000e-04r02 0.0000e+00e
2322  * grav  +     0.0000e+00    1.9900e-01    0.0000e+00e
2323  * grav  *     0.0000e+00    0.19899989    0.0000e+00e
2324  * hd    * r02 2.2230e-01    1.4100e-03e
2325  * icflg * f           0e
2326  * nff   * f           1e
2327  * alp   * f   0.0000e+00e
2328  * vl    * f   0.0000e+00e
2329  * vv    * f   0.0000e+00e
2330  * tl    * f   5.5280e+02e
2331  * tv    * f   5.5280e+02e
2332  * p     * f   1.4780e+07e
2333  * pa    * f   0.0000e+00e
2334  * qppp  * f   0.0000e+00e
2335  * matid * f           7e
2336  * tw    * f   5.5280e+02e
2337  *
2338  ******* type          num           id       ctitle
2339  tee                   43           43 $43$ upper plenum nozzle penetration
2340  *        jcell       nodes         ichf       cost       epsw
2341               1           4            1  0.0000e+00  1.0000e-05
2342  *       iconc1      ncell1         jun1       jun2       ipow1
2343               0           2           48          9           0
2344  *       iqptr1      iqpsv1       nqptb1     nqpsv1     nqprf1
2345               0           0            0          0           0
2346  *       radin1         th1       houtl1     houtv1     toutl1
2347     1.4209e-01  4.9029e-02  0.0000e+00  0.0000e+00  3.0537e+02
2348  *       toutv1
2349     3.0537e+02
2350  *        qpin1       qpoff1       rqpmx1     qpscl1
2351     0.0000e+00  0.0000e+00  1.0000e+20  1.0000e+00
2352  *       iconc2      ncell2         jun3       ipow2
2353               0           1           47          0
2354  *       iqptr2      iqpsv2       nqptb2     nqpsv2     nqprf2
2355               0           0            0          0           0
2356  *       radin2         th2       houtl2     houtv2     toutl2
2357     5.0000e-02  5.0000e-02  0.0000e+00  0.0000e+00  3.0537e+02
2358  *       toutv2
2359     3.0537e+02
2360  *        qpin2       qpoff2       rqpmx2     qpscl2
2361     0.0000e+00  0.0000e+00  1.0000e+20  1.0000e+00
2362  *
2363  * renoding of this component was done in conjunction with component 34
2364  * dx    +     1.0000e-01e
2365  * dx    *     5.0000E-02    5.0000E-02e
2366  * vol   +     6.5218e-03e
2367  * vol   *     3.2609E-03    3.2609E-03e
2368  * fa    + f   6.3425e-02e
2369  * fa    *     6.5218E-02    6.5218E-02    6.3425e-02e
2370  * fric  +     0.0000e+00    3.7203e-02e
2371  * fric  *           0.0           0.0    3.8186E-02e
2372  * grav  * f   0.0000e+00e
2373  * hd    * f   2.8418e-01e
2374  * icflg * f           0e
2375  * nff   * f           1e
2376  * alp   * f   0.0000e+00e
2377  * vl    * f   0.0000e+00e
2378  * vv    * f   0.0000e+00e
2379  * tl    * f   5.6750e+02e
2380  * tv    * f   5.6750e+02e
2381  * p     * f   1.4780e+07e
2382  * pa    * f   0.0000e+00e
2383  * qppp  * f   0.0000e+00e
2384  * matid * f           6e
2385  * tw    * f   5.6750e+02e
2386  *
2387  * dx    *     1.0000e-01e
```

```
2388  * vol   *     7.8540e-04e
2389  * fa    * f   7.8540e-03e
2390  * fric  *     1.0000e-04    0.0000e+00e
2391  * grav  * f   0.0000e+00e
2392  * hd    *     1.0000e-01    2.5150e-04e
2393  * icflg * f           0e
2394  * nff   * f           1e
2395  * alp   *     0.0000e+00e
2396  * vl    * f   0.0000e+00e
2397  * vv    * f   0.0000e+00e
2398  * tl    *     5.5280e+02e
2399  * tv    *     5.5280e+02e
2400  * p     *     1.4780e+07e
2401  * pa    *     0.0000e+00e
2402  * qppp  * f   0.0000e+00e
2403  * matid * f           6e
2404  * tw    * f   5.5280e+02e
2405  *
2406  *******   type          num           id       ctitle
2407  tee                     73           73 $73$ recir line from blhl to ilps
2408  *        jcell        nodes         ichf         cost         epsw
2409                4            4            1    0.0000e+00    1.0000e-05
2410  *       iconc1       ncell1         jun1         jun2         ipow1
2411                0            6           73            3             0
2412  *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
2413                0            0            0            0             0
2414  *       radin1         thl        houtl1       houtv1       toutl1
2415      1.4209e-01   3.5710e-02   0.0000e+00   1.2270e+01   3.0537e+02
2416  *       toutv1
2417      3.0537e+02
2418  *        qpin1        qpoff1       rqpmx1       qpscl1
2419      0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
2420  *       iconc2       ncell2         jun3         ipow2
2421                0            2           77            0
2422  *       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
2423                0            0            0            0             0
2424  *       radin2         th2        houtl2       houtv2       toutl2
2425      2.3300e-02   8.6970e-03   0.0000e+00   0.0000e+00   3.0537e+02
2426  *       toutv2
2427      3.0537e+02
2428  *        qpin2        qpoff2       rqpmx2       qpscl2
2429      0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
2430  *
2431  * dx    +     5.5880e-01   5.0800e-01   3.5560e-01   3.8100e-01e
2432  * dx    *     5.5880e-01   5.0800e-01   1.1853E-01   1.1853E-01   1.1853E-01
2433  * dx    *     3.8100e-01e
2434  * vol   +     3.5396e-02   3.2281e-02   2.6052e-02   3.1715e-02e
2435  * vol   *     3.5396e-02   3.2281e-02   8.6840E-03   8.6840E-03   8.6840E-03
2436  * vol   *     3.1715e-02e
2437  * fa    + r03 6.3425e-02   8.3195e-02   8.8959e-02e
2438  * fa    * r03 6.3425e-02   7.3262E-02   7.3262E-02   8.3195e-02   8.8959e-02
2439  * fa    * e
2440  * fric  +     0.0000e+00   6.4676e-02   0.0000e+00   8.4551e-04   1.5112e-01
2441  * fric  *     0.0000e+00   6.4676e-02   0.0000E+00          0.0          0.0
2442  * fric  *     1.2468E-03   1.5112e-01e
2443  * grav  +     0.0000e+00r03 1.0000e+00   6.1566e-01e
2444  * grav  *     0.0000e+00   0.98972962r04 1.0000e+00   6.1566e-01e
2445  * hd    + r03 2.8417e-01   3.2546e-01   3.3655e-01e
2446  * hd    * r04 2.8417e-01r02 3.2546e-01   3.3655e-01e
2447  * icflg * f           0e
2448  * nff   * f           1e
2449  * alp   * f   0.0000e+00e
2450  * vl    * f   0.0000e+00e
2451  * vv    * f   0.0000e+00e
2452  * tl    * f   5.5280e+02e
2453  * tv    * f   5.5280e+02e
2454  * p     * f   1.4780e+07e
2455  * pa    * f   0.0000e+00e
2456  * qppp  * f   0.0000e+00e
2457  * matid * f           7e
2458  * tw    * f   5.5280e+02e
2459  *
2460  * dx    * f   5.0000e+00e
2461  * vol   * f   7.2465e-03e
2462  * fa    * f   1.4493e-03e
2463  * fric  *     1.0000e-04r02 0.0000e+00e
2464  * grav  +     0.0000e+00   2.5395e-01   0.0000e+00e
2465  * grav  *     0.0000e+00   0.06427634   0.0000e+00e
2466  * hd    * f   4.2960e-02e
2467  * icflg * f           0e
2468  * nff   * f           1e
2469  * alp   * f   0.0000e+00e
2470  * vl    * f   0.0000e+00e
2471  * vv    * f   0.0000e+00e
2472  * tl    * f   5.6750e+02e
2473  * tv    * f   5.6750e+02e
2474  * p     * f   1.4780e+07e
2475  * pa    * f   0.0000e+00e
2476  * qppp  * f   0.0000e+00e
2477  * matid * f           7e
2478  * tw    * f   5.6750e+02e
2479  *
```

```
2480  *******   type           num            id        ctitle
2481  tee                       74            74 $74$ recir line from blcl to ilhl
2482  *        jcell         nodes          ichf          cost          epsw
2483                 4             4             1  0.0000e+00  1.0000e-05
2484  *       iconc1        ncell1          jun1          jun2          ipow1
2485                 0             7            74             2             0
2486  *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
2487                 0             0             0             0             0
2488  *       radin1           th1         houtl1         houtv1         toutl1
2489      1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
2490  *       toutv1
2491      3.0537e+02
2492  *        qpin1         qpoff1        rqpmx1         qpscl1
2493      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2494  *       iconc2        ncell2          jun3          ipow2
2495                 0             2            78             0
2496  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
2497                 0             0             0             0             0
2498  *       radin2           th2         houtl2         houtv2         toutl2
2499      2.3300e-02    8.7970e-03    0.0000e+00    0.0000e+00    3.0537e+02
2500  *       toutv2
2501      3.0537e+02
2502  *        qpin2         qpoff2        rqpmx2         qpscl2
2503      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2504  *
2505  * dx    +     1.0160e+00    5.5880e-01    1.7780e-01    3.5560e-01    5.3340e-01
2506  * dx    *     1.0160e+00    5.5880e-01    5.9267E-02    5.9267E-02    5.9267E-02
2507  * dx    *     3.5560e-01    5.3340e-01e
2508  * vol   +     4.9555e-02    3.5396e-02    1.1327e-02    2.6052e-02    4.3325e-02
2509  * vol   *     4.9555e-02    3.5396e-02    3.7757E-03    3.7757E-03    3.7757E-03
2510  * vol   *     2.6052e-02    4.3325e-02e
2511  * fa    + r05 6.3425e-02    8.8959e-02e
2512  * fa    * r03 6.3425e-02    6.3706E-02    6.3706E-02r02 6.3425E-02    8.8959e-02
2513  * fa    * e
2514  * fric  +     2.0282e-02    3.8262e-02    1.0416e-01    4.5334e-03    3.6089e-02
2515  * fric  *     3.0891E-02    3.8262e-02    1.2414E-01           0.0           0.0
2516  * fric  *     5.8287E-03    3.6089e-02s
2517  * fric  *     2.0941e-01e
2518  * grav  + r05 0.0000e+00    6.1566e-01e
2519  * grav  * r07 0.0000e+00    6.1566e-01e
2520  * hd    + r04 2.8417e-01    3.2546e-01    3.3655e-01e
2521  * hd    * r06 2.8417e-01    3.2546e-01    3.3655e-01e
2522  * icflg * f             0e
2523  * nff   * f             1e
2524  * alp   * f   0.0000e+00e
2525  * vl    * f   0.0000e+00e
2526  * vv    * f   0.0000e+00e
2527  * tl    * f   5.6750e+02e
2528  * tv    * f   5.6750e+02e
2529  * p     * f   1.4780e+07e
2530  * pa    * f   0.0000e+00e
2531  * qppp  * f   0.0000e+00e
2532  * matid * f             7e
2533  * tw    * f   5.6750e+02e
2534  *
2535  * dx    *     4.4785e+00    5.0000e+00e
2536  * vol   *     6.4907e-03    7.2465e-03e
2537  * fa    * f   1.4493e-03e
2538  * fric  *     1.0000e-04r02 0.0000e+00e
2539  * grav  * f   0.0000e+00e
2540  * hd    * f   4.2960e-02e
2541  * icflg * f             0e
2542  * nff   * f             1e
2543  * alp   * f   0.0000e+00e
2544  * vl    * f   0.0000e+00e
2545  * vv    * f   0.0000e+00e
2546  * tl    * f   5.5280e+02e
2547  * tv    * f   5.5280e+02e
2548  * p     * f   1.4780e+07e
2549  * pa    * f   0.0000e+00e
2550  * qppp  * f   0.0000e+00e
2551  * matid * f             7e
2552  * tw    * f   5.5280e+02e
2553  *
2554  *******   type           num            id        ctitle
2555  pipe                      75            75 $75$ blcl outlet pipe
2556  *       ncells         nodes          jun1          jun2          epsw
2557                 1             0            44            42  1.0000e-05
2558  *         ichf         iconc          iacc          ipow
2559                 1             0             0             0
2560  *        radin            th         houtl         houtv         toutl
2561      9.5880e-01    1.5992e-01    0.0000e+00    0.0000e+00    3.0537e+02
2562  *        toutv
2563      3.0537e+02
2564  *
2565  * dx    *     5.0000e-01e
2566  * vol   *     3.1714e-02e
2567  * fa    *     6.3427e-02    1.2858e-05e
2568  * fric  *     1.7900e-02    6.5246e-03e
2569  * grav  * f   0.0000e+00e
2570  * hd    *     2.8418e-01    4.0462e-03e
2571  * 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      *     1.4780e+07e
* pa     *     0.0000e+00e
*
*******   type           num            id        ctitle
valve                     77            77 $77$ recirc vlve (blhl to ilps)
*        ncells         nodes          junl          jun2          epsw
               2             0            77            32    1.0000e-05
*          ichf         iconc         ivty          ivps         nvtb2
               1             0             3             2             0
*          ivtr          ivsv        nvtbl          nvsv          nvrf
               9             1            -2             0             0
*        ivtrov        ivtyov
               0             0
*          rvmx          rvov       fminov       fmaxov
     1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
*         radin            th         houtl         houtv         toutl
     3.3000e-02    8.6970e-03    0.0000e+00    0.0000e+00    3.0537e+02
*         toutv         avlve         hvlve         favlve          xpos
     3.0537e+02    1.4490e-03    4.2957e-02    1.0000e+00    1.0000e+00
*
* dx     * f   5.0000e-01e
* vol    *     7.2465e-04    1.0347e-02e
* fa     * r02 1.4493e-03    2.0694e-02e
* fric   * r02 0.0000e+00    5.0970e-01e
* grav   * f   0.0000e+00e
* hd     * r02 4.2960e-02    2.5720e-01e
* icflg  * f            0e
* nff    *              1            -1             1e
* alp    * f   0.0000e+00e
* vl     * f   0.0000e+00e
* vv     * f   0.0000e+00e
* tl     * f   5.6750e+02e
* tv     * f   5.6750e+02e
* p      * f   1.4780e+07e
* pa     * f   0.0000e+00e
*
* vtbl   *     0.0000e+00    1.0000e+00    5.0000e-01    0.0000e+00e
*
*******   type           num            id        ctitle
valve                     78            78 $78$ recirc vlve (blcl to ilhl)
*        ncells         nodes          junl          jun2          epsw
               2             0            78            42    1.0000e-05
*          ichf         iconc         ivty          ivps         nvtb2
               1             0             3             2             0
*          ivtr          ivsv        nvtbl          nvsv          nvrf
               9             1            -2             0             0
*        ivtrov        ivtyov
               0             0
*          rvmx          rvov       fminov       fmaxov
     1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
*         radin            th         houtl         houtv         toutl
     3.3000e-02    8.6970e-03    0.0000e+00    0.0000e+00    3.0537e+02
*         toutv         avlve         hvlve         favlve          xpos
     3.0537e+02    1.4490e-03    4.2957e-02    1.0000e+00    1.0000e+00
*
* dx     * f   5.0000e-01e
* vol    *     7.2465e-04    2.6644e-04e
* fa     * r02 1.4493e-03    1.2858e-05e
* fric   * r02 0.0000e+00    6.5246e-03e
* grav   * f   0.0000e+00e
* hd     * r02 4.2960e-02    4.0462e-03e
* icflg  * f            0e
* nff    *              1            -1             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   1.4780e+07e
* pa     * f   0.0000e+00e
*
* vtbl   *     0.0000e+00    1.0000e+00    5.0000e-01    0.0000e+00e
*
*******   type           num            id        ctitle
tee                       83            83 $83$ upper plenum and core bypass
*         jcell         nodes         ichf          cost          epsw
               3             4            1    0.0000e+00    1.0000e-05
*        iconc1        ncell1         jun1          jun2         ipow1
               0             4           38            83             0
*        iqptr1        iqpsv1       nqptbl        nqpsv1        nqprf1
               0             0            0             0             0
*        radin1           th1       houtl1        houtv1        toutl1
     3.3197e-01    1.6343e-02    0.0000e+00    0.0000e+00    3.0537e+02
*         toutv1
     3.0537e+02
*          qpin1         qpoff1        rqpmx1         qpscl1
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2664      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2665  *       iconc2        ncell2          jun3          ipow2
2666               0             2            84              0
2667  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
2668               0             0             0             0             0
2669  *       radin2           th2        houtl2        houtv2        toutl2
2670      1.5494e+00    1.6343e-02    0.0000e+00    0.0000e+00    3.0537e+02
2671  *       toutv2
2672      3.0537e+02
2673  *        qpin2        qpoff2        rqpmx2        qpscl2
2674      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2675  *
2676  * dx    + f   8.9545e-01e
2677  * dx    *     8.9545e-01    2.9848E-01    2.9848E-01    2.9848E-01e
2678  * vol   + f   3.0025e-01e
2679  * vol   *     3.0025e-01    1.0008E-01    1.0008E-01    1.0008E-01e
2680  * fa    +     1.6356e-01r02 1.2412e-01e
2681  * fa    *     1.6356e-01    1.2412e-01    3.3531E-01    3.3531E-01    1.2412E-01
2682  * fa    * e
2683  * fric  +     1.0000e-02r02 5.0000e-03e
2684  * fric  *     1.0000e-02    7.5000E-03          0.0           0.0    1.5000E-02
2685  * fric  * e
2686  * grav  * f   1.0000e+00e
2687  * hd    * f   1.2200e-02e
2688  * icflg * f            0e
2689  * nff   * f            1e
2690  * alp   * f   0.0000e+00e
2691  * vl    * f   0.0000e+00e
2692  * vv    * f   0.0000e+00e
2693  * tl    * f   5.6750e+02e
2694  * tv    * f   5.6750e+02e
2695  * p     * f   1.4780e+07e
2696  * pa    * f   0.0000e+00e
2697  * qppp  * f   0.0000e+00e
2698  * matid * f            6e
2699  * tw    * f   5.6750e+02e
2700  *
2701  * dx    * f   8.9545e-01e
2702  * vol   * f   1.1114e-02e
2703  * fa    * f   1.2412e-02e
2704  * fric  *     1.0000e-04r02 0.0000e+00e
2705  * grav  +     0.0000e+00r02-1.0000e+00e
2706  * grav  *     -0.0017408r02-1.0000e+00e
2707  * hd    * f   3.5000e-03e
2708  * icflg * f            0e
2709  * nff   * f            1e
2710  * alp   * f   0.0000e+00e
2711  * vl    * f   0.0000e+00e
2712  * vv    * f   0.0000e+00e
2713  * tl    * f   5.5280e+02e
2714  * tv    * f   5.5280e+02e
2715  * p     * f   1.4780e+07e
2716  * pa    * f   0.0000e+00e
2717  * qppp  * f   0.0000e+00e
2718  * matid * f            6e
2719  * tw    * f   5.5280e+02e
2720  *
2721  *******   type          num           id       ctitle
2722  tee                      86           86 $86$ core bypass
2723  *         jcell        nodes         ichf         cost         epsw
2724                1            4            1    0.0000e+00    1.0000e-05
2725  *       iconc1        ncell1          jun1          jun2          ipow1
2726               0            1           86            36              0
2727  *       iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
2728               0             0             0             0             0
2729  *       radin1           th1        houtl1        houtv1        toutl1
2730      3.3197e-01    1.6343e-02    0.0000e+00    0.0000e+00    3.0537e+02
2731  *       toutv1
2732      3.0537e+02
2733  *        qpin1        qpoff1        rqpmx1        qpscl1
2734      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2735  *       iconc2        ncell2          jun3          ipow2
2736               0            1            84              0
2737  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
2738               0             0             0             0             0
2739  *       radin2           th2        houtl2        houtv2        toutl2
2740      1.5494e+00    1.6343e-02    0.0000e+00    0.0000e+00    3.0537e+02
2741  *       toutv2
2742      3.0537e+02
2743  *        qpin2        qpoff2        rqpmx2        qpscl2
2744      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2745  *
2746  * dx    *     5.0000e-02e
2747  * vol   *     2.0660e-02e
2748  * fa    * f   4.1321e-01e
2749  * fric  * f   0.0000e+00e
2750  * grav  * f   0.0000e+00e
2751  * hd    * f   1.0000e-01e
2752  * icflg * f            0e
2753  * nff   * f            1e
2754  * alp   *     0.0000e+00e
2755  * vl    * f   0.0000e+00e
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```
2756  * vv    * f   0.0000e+00
2757  * tl    *     5.5280e+02
2758  * tv    *     5.5280e+02
2759  * p     *     1.4780e+07
2760  * pa    *     0.0000e+00
2761  * qppp  * f   0.0000e+00
2762  * matid * f           6e
2763  * tw    * f   5.5280e+02
2764  *
2765  * dx    *     2.0495e+00
2766  * vol   *     2.5438e-02
2767  * fa    * f   1.2412e-02
2768  * fric  *     1.0000e-04    0.0000e+00
2769  * grav  * f   1.0000e+00
2770  * hd    * f   3.5000e-03
2771  * icflg * f           0e
2772  * nff   * f           1e
2773  * alp   *     0.0000e+00
2774  * vl    * f   0.0000e+00
2775  * vv    * f   0.0000e+00
2776  * tl    *     5.5280e+02
2777  * tv    *     5.5280e+02
2778  * p     *     1.4780e+07
2779  * pa    *     0.0000e+00
2780  * qppp  * f   0.0000e+00
2781  * matid * f           6e
2782  * tw    * f   5.5280e+02
2783  *
2784  *******   type          num           id        ctitle
2785  tee                     95           95 $95$ vssl mid lp and dncmr bypass
2786  *        jcell         nodes         ichf         cost         epsw
2787                 2          10            1    0.0000e+00    1.0000e-05
2788  *       iconc1        ncell1         jun1         jun2         ipow1
2789                 0           3           35           95             0
2790  *       iqptr1        iqpsv1       nqptb1       nqpsv1       nqprf1
2791                 0           0            0            0             0
2792  *       radin1          th1       houtl1       houtv1       toutl1
2793      9.4000e-01    1.3600e-01    0.0000e+00    0.0000e+00    3.0537e+02
2794  *       toutv1
2795      3.0537e+02
2796  *         qpin1        qpoff1        rqpmx1        qpscl1
2797      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2798  *       iconc2        ncell2         jun3         ipow2
2799                 0           2           97             0
2800  *       iqptr2        iqpsv2       nqptb2       nqpsv2       nqprf2
2801                 0           0            0            0             0
2802  *       radin2          th2       houtl2       houtv2       toutl2
2803      1.4800e+00    1.2700e-01    0.0000e+00    0.0000e+00    3.0537e+02
2804  *       toutv2
2805      3.0537e+02
2806  *         qpin2        qpoff2        rqpmx2        qpscl2
2807      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2808  *
2809  * dx    +     1.0000e-01e
2810  * dx    *     3.3333E-02    3.3333E-02    3.3333E-02e
2811  * vol   +     3.4005e-02e
2812  * vol   *     1.1335E-02    1.1335E-02    1.1335E-02e
2813  * fa    * f   3.4005e-01e
2814  * fric  * f   0.0000e+00e
2815  * grav  * f   0.0000e+00e
2816  * hd    * f   1.0000e-01e
2817  * icflg * f           0e
2818  * nff   * f           1e
2819  * alp   * f   0.0000e+00e
2820  * vl    * f   0.0000e+00e
2821  * vv    * f   0.0000e+00e
2822  * tl    * f   5.5280e+02e
2823  * tv    * f   5.5280e+02e
2824  * p     * f   1.4780e+07e
2825  * pa    * f   0.0000e+00e
2826  * qppp  * f   0.0000e+00e
2827  * matid * f           6e
2828  * tw    * f   5.5280e+02e
2829  *
2830  * dx    *     4.3200e-01    8.4700e-01e
2831  * vol   *     6.3763e-03    1.2502e-02e
2832  * fa    * f   1.4760e-02e
2833  * fric  *     1.0000e-04r02 0.0000e+00e
2834  * grav  *     0.0000e+00r02 1.0000e+00e
2835  * hd    * f   6.3500e-02e
2836  * icflg * f           0e
2837  * nff   * f           1e
2838  * alp   * f   0.0000e+00e
2839  * vl    * f   0.0000e+00e
2840  * vv    * f   0.0000e+00e
2841  * tl    * f   5.5280e+02e
2842  * tv    * f   5.5280e+02e
2843  * p     * f   1.4780e+07e
2844  * pa    * f   0.0000e+00e
2845  * qppp  * f   0.0000e+00e
2846  * matid * f           6e
2847  * tw    * f   5.5280e+02e
```

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*
******  type          num           id        ctitle
tee                    96           96 $96$ vssl dncmr and dncmr bypass
*       jcell        nodes         ichf         cost         epsw
              2           10            1   0.0000e+00   1.0000e-05
*       iconc1       ncell1        jun1         jun2         ipow1
              0            8           34           96             0
*       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
              0            0            0            0            0
*       radin1         th1        houtl1       houtv1       toutl1
   9.4000e-01   1.3600e-01   0.0000e+00   0.0000e+00   3.0537e+02
*       toutv1
   3.0537e+02
*        qpin1        qpoff1       rqpmx1       qpscl1
   0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
*       iconc2       ncell2        jun3         ipow2
              0            6           97            0
*       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
              0            0            0            0            0
*       radin2         th2        houtl2       houtv2       toutl2
   1.4800e+00   1.2700e-01   0.0000e+00   0.0000e+00   3.0537e+02
*       toutv2
   3.0537e+02
*        qpin2        qpoff2       rqpmx2       qpscl2
   0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
*
* dx    +     7.9550e-01   8.9550e-01   5.3300e-01   3.3000e-01   4.3200e-01
* dx    *     2.6517E-01   2.6517E-01   2.6517E-01   8.9550e-01   5.3300e-01
* dx    *     3.3000e-01   4.3200e-01s
* dx    *     3.8100e-01e
* vol   +     1.1785e-01   1.3204e-01   7.5643e-02   4.6834e-02   6.1310e-02
* vol   *     3.9283E-02   3.9283E-02   3.9283E-02   1.3204e-01   7.5643e-02
* vol   *     4.6834e-02   6.1310e-02s
* vol   *     5.4072e-02e
* fa    + f   1.4192e-01e
* fa    *     1.4192E-01   1.4815E-01   1.4815E-01r06 1.4192e-01e
* fric  * f   0.0000e+00e
* grav  +    -9.9985e-01r06-1.0000e+00e
* grav  +    -0.99963215r08-1.0000e+00e
* grav  *          -1.0r08-1.0000e+00e
* hd    * f   1.0000e-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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f          6e
* tw    * f   5.5280e+02e
*
* dx    +     7.9550e-01   8.9550e-01   5.3300e-01   3.3000e-01   4.3200e-01
* dx    *     7.9549e-01   8.9550e-01   5.3300e-01   3.3000e-01   4.3200e-01
* dx    *     3.8100e-01e
* vol   +     1.1742e-02   1.3218e-02   7.8671e-03   4.8708e-03   6.3763e-03
* vol   *     1.1742e-02   1.3218e-02   7.8671e-03   4.8708e-03   6.3763e-03
* vol   *     5.6236e-03e
* fa    * f   1.4760e-02e
* fric  *     1.0000e-04r06 0.0000e+00e
* grav  *     0.0000e+00r06-1.0000e+00e
* hd    * f   6.3500e-02e
* 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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f          6e
* tw    * f   5.5280e+02e
*
******  type          num           id        ctitle
rod                   900          900 $900$ nuclear reactor core fuel rods
*         ncrx         ncrz
              1            4
*       nopowr        nridr        modez        liqlev        iaxcnd
              0            1            0             0             1
*        idbci        idbco
              0            2
*        nrods        nodes        irftr        nzmax
              3           10            0            5
*     dtxht(1)     dtxht(2)        dznht        hgapo        shelv
   0.0000e+00   0.0000e+00   0.0000e+00   1.0000e+03   1.3790e+00
*       irpwty        ndgx         ndhx         nrts        nhist
             14           6           11            5            0
*       irpwtr       irpwsv       nrpwtb       nrpwsv       nrpwrf
```

```
2940                23.             1           -14             0             0
2941  *          izpwtr          izpwsv          nzpwtb          nzpwsv          nzpwrf
2942                 0               1               1               0             0
2943  *          nmwrx           nfci            nfcil
2944                 1               1               1
2945  *          nzpwz           nzpwi           nfbpwt
2946                21               1               0
2947  *          react           tneut           rpwoff          rrpwmx          rpwscl
2948       0.0000e+00      1.6250e-05     -1.0000e+20      1.0000e+20      1.0000e+00
2949  *          rpowri          zpwin           zpwoff          rzpwmx
2950       3.6900e+07      0.0000e+00      0.0000e+00      0.0000e+00
2951  *          extsou          pldr            pdrat           fucrac
2952       0.0000e+00      0.0000e+00      1.3341e+00      7.0000e-01
2953  *    ircjtb(1,j)     ircjtb(2,j)     ircjtb(3,j)     ircjtb(4,j)         ibu(j)
2954                12               1               1               1             0
2955                 1               7               1               5             0
2956                 1               1               1               1             0
2957                 1               1               1               1             0
2958  *      ircjfm(1)       ircjfm(2)       ircjfm(3)       ircjfm(4)         isnotb
2959                 1               1               0               0             0
2960  *          powexp          bpp0            bpp1            bcr0          bcr1
2961       1.0000e+00      0.0000e+00      0.0000e+00      6.5169e-01      8.6900e+00
2962  *
2963  * nhcomo* r05          37              83e
2964  * nhcelo*              -1               1               2               3               4
2965  * nhcelo*               1e
2966  * z      *       0.0000e+00      3.8100e-01      6.7200e-01      1.1430e+00      1.6760e+00
2967  * z      * e
2968  * grav   * f     1.0000e+00e
2969  * idrod  * f              1e
2970  * rdx    *       1.3000e+03e
2971  * radrd  *       0.0000e+00      7.7449e-04      1.5489e-03      2.3235e-03      3.0979e-03
2972  * radrd  *       3.8725e-03      4.6622e-03      4.7422e-03      5.0508e-03      5.3594e-03
2973  * radrd  * e
2974  * matrd  * r06            1             3r02           2e
2975  * nfax   * f              0e
2976  * rftn   * r10 5.5370e+02r10 5.5640e+02r10 5.6015e+02r10 5.6390e+02r10 5.6660e+02
2977  * rftn   * e
2978  * rftn   * r10 5.5370e+02r10 5.5640e+02r10 5.6015e+02r10 5.6390e+02r10 5.6660e+02
2979  * rftn   * e
2980  * rftn   * r10 5.5370e+02r10 5.5640e+02r10 5.6015e+02r10 5.6390e+02r10 5.6660e+02
2981  * rftn   * e
2982  * rdpwr  *       9.5500e-01      9.6000e-01      9.6500e-01      9.7500e-01      9.9000e-01
2983  * rdpwr  *       1.0160e+00      1.0600e+00r03 0.0000e+00e
2984  * cpowr  *       1.0000e+00e
2985  * rpkf   *       1.5000e+00      5.0000e-01e
2986  * zpwzt  *       0.0000e+00      1.5200e-01      2.9200e-01      3.9400e-01      4.5600e-01
2987  * zpwzt  *       5.0300e-01      5.4600e-01      6.4800e-01      7.4900e-01      8.4600e-01
2988  * zpwzt  *       8.8600e-01      9.5300e-01      1.0540e+00      1.1810e+00      1.2570e+00
2989  * zpwzt  *       1.2990e+00      1.3590e+00      1.5110e+00      1.6130e+00      1.6640e+00
2990  * zpwzt  *       1.6760e+00e
2991  * zpwtb  *       0.0000e+00s
2992  * zpwtb  *       0.0000e+00      5.9620e-01      1.2174e+00      1.4140e+00      1.3583e+00
2993  * zpwtb  *       1.4285e+00      1.5722e+00      1.5828e+00      1.5744e+00      1.4713e+00
2994  * zpwtb  *       1.3611e+00      1.4416e+00      1.3075e+00      1.0698e+00      8.6200e-01
2995  * zpwtb  *       7.1230e-01      6.2360e-01      2.8790e-01      1.5260e-01      1.0200e-01
2996  * zpwtb  *       8.9400e-02e
2997  * rpwtb  * r02 0.0000e+00      2.0000e-01     -5.1000e-04      3.0000e-01     -1.8100e-03
2998  * rpwtb  *       5.0000e-01     -1.0160e-02      6.0000e-01     -2.0300e-02      7.0000e-01
2999  * rpwtb  *      -3.5600e-02      8.0000e-01     -5.3000e-02      9.0000e-01     -8.9300e-02
3000  * rpwtb  *       1.0000e+00     -1.4740e-01      1.1000e+00     -1.5820e-01      1.2000e+00
3001  * rpwtb  *      -1.6550e-01      1.3000e+00     -1.6700e-01      1.4000e+00     -1.6770e-01
3002  * rpwtb  *       1.5000e+00     -1.6840e-01e
3003  * rctf   *       2.9300e+02      4.0000e+02      5.0000e+02      6.5000e+02      8.0000e+02
3004  * rctf   *       1.0000e+03      1.2000e+03      1.4000e+03      1.6000e+03      1.8000e+03
3005  * rctf   *       2.0000e+03      2.2000e+03r03 0.0000e+00     -6.2700e-05     -5.3700e-05
3006  * rctf   *      -4.8000e-05     -4.2100e-05     -3.8000e-05     -3.4000e-05     -3.1000e-05
3007  * rctf   *      -2.8700e-05     -2.6800e-05     -2.5300e-05     -2.4000e-05     -2.2900e-05
3008  * rctf   * e
3009  * rctc   *       0.0000e+00      2.9300e+02      3.9430e+02      4.7460e+02      5.3320e+02
3010  * rctc   *       5.6090e+02      5.8870e+02      6.1650e+02      0.0000e+00     -6.0000e+02
3011  * rctc   *       1.0000e+02      8.0000e+02      1.5000e+03      2.2000e+03     -7.2400e-05
3012  * rctc   *      -2.0500e-04     -3.2300e-04     -5.0800e-04     -7.1900e-04     -1.0590e-03
3013  * rctc   *      -1.6090e-03     -5.8000e-05     -1.6000e-04     -2.5400e-04     -4.2400e-04
3014  * rctc   *      -6.0700e-04     -9.0100e-04     -1.3770e-03     -4.3600e-05     -1.1500e-04
3015  * rctc   *      -1.8600e-04     -3.3900e-04     -4.9600e-04     -7.4200e-04     -1.1450e-03
3016  * rctc   *      -2.9200e-05     -7.0200e-05     -1.2100e-04     -2.4900e-04     -3.8600e-04
3017  * rctc   *      -5.9300e-04     -9.3600e-04     -1.6600e-05     -2.8800e-05     -5.4500e-05
3018  * rctc   *      -1.6500e-04     -2.7600e-04     -4.4400e-04     -7.2200e-04e
3019  * rcal   * f     0.0000e+00e
3020  * rchm   * f     0.0000e+00e
3021  * beta   *       1.6900e-04      8.3200e-04      2.6400e-03      1.2200e-03      1.3800e-03
3022  * beta   *       2.4700e-04e
3023  * lamda  *       3.8700e+00      1.4000e+00      3.1100e-01      1.1500e-01      3.1700e-02
3024  * lamda  *       1.2700e-02e
3025  * cdgn   *       9.9163e+07      1.3495e+09      1.9276e+10      2.4089e+10      9.8847e+10
3026  * cdgn   *       4.4156e+10e
3027  * lamdh  *       1.7720e+00      5.7740e-01      6.7430e-02      6.2140e-03      4.7390e-04
3028  * lamdh  *       4.8100e-05      5.3440e-06      5.7260e-07      1.0360e-07      2.9590e-08
3029  * lamdh  *       7.5850e-10e
3030  * edh    *       2.9900e-03      8.2500e-03      1.5500e-02      1.9350e-02      1.1650e-02
3031  * edh    *       6.4500e-03      2.3100e-03      1.6400e-03      8.5000e-04      4.3000e-04
```

```
* edh    *      5.7000e-04e
* cdhn   *      6.2263e+04    5.2723e+05    8.4818e+06    1.1486e+08    9.0869e+08
* cdhn   *      4.0742e+09    2.5550e+09    1.9468e+09    1.0161e+09    5.1462e+08
* cdhn   *      6.8247e+08e
* fpuo2  *      0.0000e+00e
* ftd    *      9.3000e-01e
* gmix   *      9.8101e-01    0.0000e+00    1.0103e-02    1.7830e-03    0.0000e+00
* gmix   *      7.0991e-03    0.0000e+00e
* gmles  *      1.0000e+00e
* pgapt  *      3.1300e+05e
* plvol  *      0.0000e+00e
* pslen  *      0.0000e+00e
* clenn  *      0.0000e+00e
* burn   * f    0.0000e+00e
* burn   * f    0.0000e+00e
* burn   * f    0.0000e+00e
*
*
*  The following reference describes the LOFT steam generator as having 1845
*     tubes, average tube length excluding tubesheet is 4.58 m (15.04 ft),
*     secondary side area is 335 m^2 (3610 ft^2).  The model as currently
*     formulated has an average tube length of 4.55168 m (14.9333 ft) and a
*     secondary side area of 335.059 m^2 3606.55 ft^2).
*
*       Douglas L. Reeder, "LOFT System and Test Description (5.5-ft Nuclear
*          Core 1 LOCEs)," Idaho National Engineering Laboratory report
*          NUREG/CR-0247, TREE-1208, July 1978.
*
*******   type           num            id       ctitle
rod                      901           901 $901$ stgen u-tube inlet side
*          ncrx          ncrz          ittc          iext          mld
                1             4             0             0            0
*        nopowr          nridr         modez        liqlev        iaxcnd
                1             2             1             0            0
*         idbci          idbco          hdri          hdro
                2             2   1.0214e-02    1.2700e-02
*         nrods          nodes         irftr         nzmax        irftr2
                1             4             0             5            0
*      dtxht(1)       dtxht(2)         dznht          hgapo         shelv
              3.0           10.0         0.001            0.0       0.37061
* nhcomi* f              2e
* nhceli*               -2             2             3             4             5
* nhceli*                6e
* nhcomo* f             20e
* nhcelo*               -1             1             2             3             4
* nhcelo*                5e
* dz     * r03 5.6895e-01    5.6899e-01e
* grav   * f           1.0e
* idrod *                1e
* idrodo*                1e
* rdx    *            1845.e
* radrd *      5.1069e-03    5.5213e-03    5.9356e-03    6.3500e-03e
* matrd * f             12e
* nfax   * f              0e
* rftn   * f          556.0e
*
*******   type           num            id       ctitle
rod                      902           902 $902$ stgen u-tube outlet side
*          ncrx          ncrz          ittc          iext          mld
                1             4             0             0            0
*        nopowr          nridr         modez        liqlev        iaxcnd
                1             2             1             0            0
*         idbci          idbco          hdri          hdro
                2             2   1.0214e-02    1.2700e-02
*         nrods          nodes         irftr         nzmax        irftr2
                1             4             0             5            0
*      dtxht(1)       dtxht(2)         dznht          hgapo         shelv
              3.0           10.0         0.001            0.0       0.37061
* nhcomi* f              2e
* nhceli*                9            -9            -8            -7            -6
* nhceli*               -5e
* nhcomo* f             20e
* nhcelo*               -1             1             2             3             4
* nhcelo*                5e
* dz     * r03 5.6895e-01    5.6899e-01e
* grav   * f           1.0e
* idrod *                1e
* idrodo*                1e
* rdx    *            1845.e
* radrd *      5.1069e-03    5.5213e-03    5.9356e-03    6.3500e-03e
* matrd * f             12e
* nfax   * f              0e
* rftn   * f          556.0e
*
*******   type           num            id       ctitle
rod                      903           903 $903$ stgen lower downcomer wall
*          ncrx          ncrz          ittc          iext          mld
                1             4             0             0            0
*        nopowr          nridr         modez        liqlev        iaxcnd
                1             2             1             0            0
*         idbci          idbco          hdri          hdro
                2             2       1.28906    1.0160e-01
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*        nrods         nodes         irftr         nzmax        irftr2
             1             4             0             5             0
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
           3.0          10.0         0.001           0.0           0.0
* nhcomi* f           20e
* nhceli*             -1            1             2             3             4
* nhceli*              5e
* nhcomo* f           22e
* nhcelo*              9            -9            -8            -7            -6
* nhcelo*             -5e
* dz    * r04 5.6895e-01e
* grav  * f          1.0e
* idrod *             1e
* idrodo*             1e
* rdx   *           1.0e
* radrd *    6.4453e-01    6.4876e-01    6.5300e-01    6.5723e-01e
* matrd * f            6e
* nfax  * f            0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
rod                     904          904 $904$ stgen upper downcomer wall
*         ncrx         ncrz         ittc         iext          mld
             1            4            0            0            0
*       nopowr         nridr        modez       liqlev       iaxcnd
             1            2            1            0            0
*        idbci         idbco         hdri         hdro
             2            2       1.0691   2.5400e-01
*        nrods         nodes        irftr        nzmax       irftr2
             1            4            0            5            0
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
           3.0          10.0         0.001           0.0       2.27580
* nhcomi* f           20e
* nhceli*             -5            5             6             7             8
* nhceli*              8e
* nhcomo* f           22e
* nhcelo*              5            -5            -4            -3            -2
* nhcelo*             -1e
* dz    * r03 2.4700E-01    3.7050E-01e
* grav  * f          1.0e
* idrod *             1e
* idrodo*             1e
* rdx   *           1.0e
* radrd *    5.7150e-01    5.7573e-01    5.7997e-01    5.8420e-01e
* matrd * f            6e
* nfax  * f            0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
rod                     905          905 $905$ stgen lower shell wall
*         ncrx         ncrz         ittc         iext          mld
             1            9            0            0            0
*       nopowr         nridr        modez       liqlev       iaxcnd
             1            1            1            0            0
*        idbci         idbco         hdri         hdro
             2            1   2.5400e-01       1.5304
*          tlo           tvo          hlo          hvo
          305.37       305.37          0.0       1.5801
*        nrods         nodes        irftr        nzmax       irftr2
             1            4            0           10            0
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
           3.0          10.0         0.001           0.0           0.0
* nhcomi* f           22e
* nhceli*             -1            1             2             3             4
* nhceli*              5            6             7             8             9
* nhceli*              9e
* dz    * r02 3.7050E-01r03 2.4700E-01r03 5.6895E-01    5.6895e-01e
* grav  * f         -1.0e
* idrod *             1e
* rdx   *           1.0e
* radrd *    7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
* matrd * f            9e
* nfax  * f            0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
rod                     906          906 $906$ stgen upper shell wall
*         ncrx         ncrz         ittc         iext          mld
             1            3            0            0            0
*       nopowr         nridr        modez       liqlev       iaxcnd
             1            1            1            0            0
*        idbci         idbco         hdri         hdro
             2            1   2.5400e-01       1.5304
*          tlo           tvo          hlo          hvo
          305.37       305.37          0.0       1.5801
*        nrods         nodes        irftr        nzmax       irftr2
             1            4            0            4            0
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
           3.0          10.0         0.001           0.0    3.7050E-01
* nhcomi* f           21e
* nhceli*             -2            2             3             4             4
* nhceli* e
```

```
* dz    * r02 3.7050E-01    1.1115e+00
* grav  * f         -1.0e
* idrod *            1e
* rdx   *          1.0e
* radrd *     7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
* matrd * f           9e
* nfax  * f           0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
slab                    907          907 $907$ stgen primary plenum baffle
*          ncrx         ncrz         ittc         iext         mld
               1            1            0            0           0
*        nopowr        nridr        modez       liqlev       iaxcnd
               1            2            1            0           0
*         idbci        idbco        hdri         hdro
               2            2    3.3655e-01   3.3655e-01
*         width       ipatch
         1.99342            0
*          nrods        nodes       irftr        nzmax       irftr2
               1            4           0            2           0
*      dtxht(1)     dtxht(2)       dznht        hgapo        shelv
             3.0         10.0       0.001          0.0          0.0
* nhcomi* f           2e
* nhceli*            -1           1            2e
* nhcomo* f           2e
* nhcelo*            10          -10           -9e
* dz    *     3.7061e-01e
* grav  * f         1.0e
* idrod *            1e
* idrodo*            1e
* rdx   *          1.0e
* radrd *          1.0       1.0106       1.0212       1.0317e
* matrd * f           6e
* nfax  * f           0e
* rftn  *        567.50       562.60       557.70       552.80s
* rftn  *        567.50       562.60       557.70       552.80e
*
*******   type          num           id        ctitle
slab                    908          908 $908$ stgen inlet plenum wall
*          ncrx         ncrz         ittc         iext         mld
               1            1            0            0           0
*        nopowr        nridr        modez       liqlev       iaxcnd
               1            1            1            0           0
*         idbci        idbco        hdri         hdro
               2            1    3.3655e-01          1.0
*         width       ipatch
       3.74680            0
*           tlo          tvo          hlo          hvo
        305.37       305.37          0.0       12.270
*          nrods        nodes       irftr        nzmax       irftr2
               1            4           0            2           0
*      dtxht(1)     dtxht(2)       dznht        hgapo        shelv
             3.0         10.0       0.001          0.0          0.0
* nhcomi* f           2e
* nhceli*            -1           1            2e
* dz    *     3.7061e-01e
* grav  * f         1.0e
* idrod *            1e
* rdx   *          1.0e
* radrd *          1.0       1.0296       1.0593       1.0889e
* matrd * f           9e
* nfax  * f           0e
* rftn  * f       567.50e
*
*******   type          num           id        ctitle
slab                    909          909 $909$ stgen outlet plenum wall
*          ncrx         ncrz         ittc         iext         mld
               1            1            0            0           0
*        nopowr        nridr        modez       liqlev       iaxcnd
               1            1            1            0           0
*         idbci        idbco        hdri         hdro
               2            1    3.3655e-01          1.0
*         width       ipatch
       3.74680            0
*           tlo          tvo          hlo          hvo
        305.37       305.37          0.0       12.270
*          nrods        nodes       irftr        nzmax       irftr2
               1            4           0            2           0
*      dtxht(1)     dtxht(2)       dznht        hgapo        shelv
             3.0         10.0       0.001          0.0          0.0
* nhcomi* f           2e
* nhceli*            10          -10           -9e
* dz    *     3.7061e-01e
* grav  * f         1.0e
* idrod *            1e
* rdx   *          1.0e
* radrd *          1.0       1.0296       1.0593       1.0889e
* matrd * f           9e
* nfax  * f           0e
* rftn  * f       552.80e
*
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3308  *******   type           num            id        ctitle
3309  slab                     910           910 $910$ stgen inlet tubesheet
3310  *         ncrx          ncrz          ittc          iext          m1d
3311                1             1             0             0            0
3312  *       nopowr         nridr         modez        liqlev        iaxcnd
3313                1             1             1             0            0
3314  *        idbci         idbco          hdri          hdro
3315                2             0   3.3655e-01           1.0
3316  *        width        ipatch
3317          16.91739             0
3318  *        nrods         nodes         irftr         nzmax        irftr2
3319                1             4             0             2            0
3320  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3321              3.0          10.0         0.001           0.0          0.0
3322  * nhcomi* f             2e
3323  * nhceli*              -1             1             2e
3324  * dz    *     3.7061e-01e
3325  * grav  * f           1.0e
3326  * idrod *             1e
3327  * rdx   *            1.0e
3328  * radrd *     5.1054e-03    7.1669e-03    9.2283e-03   1.12898e-02e
3329  * matrd * f            9e
3330  * nfax  * f            0e
3331  * rftn  * f       567.50e
3332  *
3333  *******   type           num            id        ctitle
3334  slab                     911           911 $911$ stgen outlet tubesheet
3335  *         ncrx          ncrz          ittc          iext          m1d
3336                1             1             0             0            0
3337  *       nopowr         nridr         modez        liqlev        iaxcnd
3338                1             1             1             0            0
3339  *        idbci         idbco          hdri          hdro
3340                2             0   3.3655e-01           1.0
3341  *        width        ipatch
3342          16.91739             0
3343  *        nrods         nodes         irftr         nzmax        irftr2
3344                1             4             0             2            0
3345  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3346              3.0          10.0         0.001           0.0          0.0
3347  * nhcomi* f             2e
3348  * nhceli*              10            -10            -9e
3349  * dz    *     3.7061e-01e
3350  * grav  * f           1.0e
3351  * idrod *             1e
3352  * rdx   *            1.0e
3353  * radrd *     5.1054e-03    7.1669e-03    9.2283e-03   1.12898e-02e
3354  * matrd * f            9e
3355  * nfax  * f            0e
3356  * rftn  * f       552.80e
3357  *
3358  end
3359  *
3360  ******************
3361  * time-step data *
3362  ******************
3363  *
3364  *         dtmin         dtmax         tend         rtwfp
3365      1.0000e-03    2.0000e-01    2.5000e+01    1.0000e+03
3366  *         edint         gfint         dmpint         sedint
3367      2.5000e+01    5.0000e-01    2.5000e+01    2.5000e+01
3368  *
3369  *         dtmin         dtmax         tend         rtwfp
3370      1.0000e-03    5.0000e-01    5.0000e+01    1.0000e+03
3371  *         edint         gfint         dmpint         sedint
3372      2.5000e+01    1.0000e+00    2.5000e+01    2.5000e+01
3373  *
3374  *         dtmin         dtmax         tend         rtwfp
3375      1.0000e-03    7.0000e-01    2.0000e+02    1.0000e+03
3376  *         edint         gfint         dmpint         sedint
3377      5.0000e+01    2.0000e+00    5.0000e+01    5.0000e+01
3378  *
3379  *       endflag
3380     -1.0000e+00
```

LOFT L6-1 TRANSIENT INPUT LISTING FOR 1D VESSEL MODEL

```
free format
*       1         2         3         4         5         6         7         8
*2345678901234567890123456789012345678901234567890123456789012345678901234567890
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
              2             0              1             0
loft test l6-1, restart for the transient calculation with a 1-d vessel

* modified by Thad Knight, 3/10/96
* deck from /devass/mod2-5.3.05/loft-l6-1/1-dvess.t
*
*
*                                 ++++++++  ++++++++
*                                 + valve+  + pipe +
*                                67+  10  +68+   9  +
*                                 ++++++++  ++++++++
*                                              60
* ++++++++                                    ++++++++
* + break+                                    +prizer+
* +  25  +                                    +  13  +
* ++++++++                                    ++++++++
*    26                                 44       61
* ++++++++  ++++++++                    ++++++++  ++++++++
* + valve+  + fill +                    + pipe +  + pipe +
* +  23  +  +  24  +                    +  75  +  +  12  +
* ++++++++  ++++++++                    ++++++++  ++++++++
*    22        25                       42        64
* ++++++++  ++++++++                    ++++++++  ++++++++
* +  tee +  +  tee +                    + valve+  +prizer+
* +  21  +23+  22  + rods               +  78  +  +   8  +
* ++++++++  ++++++++ |901               ++++++++  ++++++++
*    21        24    |902                  78        10
*          ++++++++  |++++++++  ++++++++  ++++++++  ++++++++  ++++++++
*  stgen    + pipe +==+ pipe +  +  tee +  +  tee +  +vessel+  +  tee +
*   sec   21+  20  +==+   2  + 2+  74  +74+   1  + 9+region+45+  31  +32
*          ++++++++  ++++++++  ++++++++  ++++++++  +define+  ++++++++
*                       3                         + with +     36
*          ++++++++  ++++++++                      + a 1-d+  ++++++++
*          + valve+  +  tee +                      + model+  +  tee +
*         32+  77  +77+  73  +                      +      + 1+  41  +44
*          ++++++++  ++++++++                      +      +  ++++++++
*                       73                         +      +
*                    ++++++++                      +      +  (isolated)
*                    +  tee +            intact    +      +    broken
*                   5+   3  +             loop     +      +     loop
*                    ++++++++                      +      +
*              5        4                           +      +
*          ++++++++  ++++++++                       +      +
*          + pump +  + pump +                       +      +
*          +   5  +  +   4  +                       +      +
*          ++++++++  ++++++++                       +      +
*              7        6                           +      +
*                    ++++++++  ++++++++  ++++++++   +      +
*                    +  tee +  +  tee +  +  tee +   +      +
*                   7+   6  +66+  11  + 8+   7  +29+      +
*                    ++++++++  ++++++++  ++++++++   +      +
*                                 67        14      +      +
*                                          ++++++++  +      +
*                                          + fill +  +      +
*                                          +  17  +  +      +
*                                          ++++++++  ++++++++
*
* The vessel is modeled with 13 1-d hydro & 1 heat-structure components.
*
*           ++++++++++++++++++++++++++++++++++++++++++++
*           + vessel region defined with a 1-d model +
*           +                                        +
*           +                              40        +
*           +                    ++++++++  ++++++++    +
*           +                    +  tee +  +  tee +    +
*          9+--------------------+  43  +48+  34  +----+45
*           +                    ++++++++  ++++++++    +
*           +                       47                 +
*           +                    ++++++++  ++++++++    +
*           +                    +  tee +  +  tee +    +
*          29+--------------------+  40  +46+  29  +----+ 1
*           +                    ++++++++  ++++++++    +
*           +                              34          +
*           +   ++++++++         ++++++++  ++++++++    +
*           +   +  rod +         +  tee +  +  tee +    +
*           +   +  900 +         +  95  +97+  96  +    +
*           +   ++++++++         ++++++++  ++++++++    +
*           +    ||  ||           95  35    96         +
```

```
*            +   ++++++++  ++++++++  ++++++++         +
*            +   + pipe +  +  tee +  +  tee +         +
*            +   +  37  +37+  36  +  +  30  +         +
*            +   ++++++++  ++++++++  ++++++++         +
*            +         38        86    36             +
*            +         ++++++++  ++++++++             +
*            +         +  tee +  +  tee +             +
*            +         +  83  +84+  86  +             +
*            +         ++++++++  ++++++++             +
*            +            83                          +
*            +         ++++++++  ++++++++             +
*            +         +  tee +  + fill +             +
*            +         +  33  +39+  35  +             +
*            +         ++++++++  ++++++++             +
*            +            40                          +
*            +                                        +
*            ++++++++++++++++++++++++++++++++++++++++++
*
* Experiment 16-1 simulated a loss of steam load in the steam generators
* of a four-loop commercial PWR in the Loss-Of-Fluid Test (LOFT) facility.
* The steady-state initial conditions of the experiment were:
* Primary Intact Loop:    hot-leg mass flow     478.5     +-6.3      kg/s
*                         hot-leg pressure      1.478e+07+-1.1e+05 Pa
*                         hot-leg temperature   567.5     +-1.8      K
*                         cold-leg temperature  552.8     +-1.2      K
* Steam Gen. Sec. Side:   steam & fw mass flow  20.1      +-0.6      kg/s
*                         steam-dome pressure   5.37e+05 +-6.0e+04 Pa
*                         liq/vap temperature   541.7     +-0.8      K
*                         dwncmr liquid level   3.183     +-0.034    m
* Pressurizer:            pressure              1.487e+07+-2.0e+05 Pa
*                         liq/vap temperature   614.3     +-0.8      K
*                         liquid level          1.18      +-0.07     m
* The experiment's transient was initiated by closing the main steam flow
* control valve (MSFCV); the actual start of closing was observed to
* occur at 2.0 s (rather than at 0.0 s) based on parameter measurements.
* The pressurizer cycling heater (on initially) was shut off at 6.1+-0.1 s
* as the pressurizer pressure increased.  The pressurizer sprayer was in-
* itiated at 9.1+-0.1 s to reduce primary-side (PS) pressure and remained
* on until 30.4+-0.1 s.  The PS pressure continued to rise and caused the
* reactor to scram at 21.8+-0.2 s.  Thereafter, the PS pressure reached a
* maximum value at 22.0+-0.2 s.  To reduce steam-generator (SG) secondary-
* side (SS) pressure, the MSFCV began opening at 22.2+-0.2 s and began
* closing at 31.4+-0.2 s.  The pressurizer cycling heater came on at
* 31.4+-0.1 s and the pressurizer backup heater came on at 32.5+-0.1 s
* to prevent the PS to pressure from falling further.  The MSFCV opened
* and closed automatically at 91.2+-0.2 s and 97.8+-0.2 s, respectively,
* based on pressure setpoints and was manually opened and closed at
* 312.6+-0.2 s and 326.0+-0.4 s, respectively, to control SGSS pressure.
* The pressurizer backup heater was shut off at 415.4+-0.1 s and the
* experiment was ended at 700.0+-10.0 s.
*
* Experiment Events                                          Experiment Time
* ---------------------------------------------------------- ---------------
* Main Steam Flow Control Valve (MSFCV) starts to close          2.0+-0.2 s
* Pressurizer cycling heater is set off                          6.1+-0.1 s
* Pressurizer sprayer is set on                                  9.1+-0.1 s
* MSFCV reaches its closed position                             11.6+-0.2 s
* Reactor core power is scrammed based on high pressure         21.8+-0.2 s
* Primary-side pressure reaches maximum                         22.0+-0.2 s
* MSFCV starts to open based on high-pressure setpoint          22.2+-0.2 s
* Pressurizer level reaches maximum                             26.5+-0.5 s
* Pressurizer sprayer is set off                                30.4+-0.1 s
* MSFCV starts to close based on low-pressure setpoint          31.4+-0.2 s
* Pressurizer cycling heater is set on                          31.4+-0.1 s
* Pressurizer backup heater is set on                           32.5+-0.1 s
* MSFCV reaches its closed position                             40.6+-0.2 s
* MSFCV starts to open based on high-pressure setpoint          91.2+-0.2 s
* MSFCV starts to close based on low-pressure setpoint          97.8+-0.2 s
* MSFCV reaches its closed position                            104.4+-0.2 s
* MSFCV starts to open based on manual adjustment              312.6+-0.2 s
* MSFCV starts to close based on manual adjustment             326.0+-0.4 s
* MSFCV reaches its closed position                            339.4+-0.4 s
* Pressurizer backup heater is set off                         415.4+-0.1 s
* Experiment is ended                                          700.0+-10. s
*
*****************
* namelist data *
*****************
*
*     SI/English units flags:  0--SI units/1--English units
*     iogrf:  units flag for writing TRCGRF
*     ioinp:  units flag for reading TRACIN
*     iolab:  units flag for writing input to INLAB
*     ioout:  units flag for writing TRCOUT and TRCMSG
*
*     iunlab:  input user-defined units labels (0-no/>0-yes; default is 0)
*     iunout:  write units to file TRCOUT (0-no/1-yes; default is 1)
*
 $inopts dtstrt=0.01, iadded=10, icflow=2, nhtstr=12,
         iogrf=0, ioinp=0, iolab=1, ioout=0, iunlab=1, iunout=1 $
*
*        dstep         timet
```

```
180            -1    0.0000e+00
181  *       stdyst         transi          ncomp           njun           ipak
182               0              1             52             49              1
183  *        epso           epss
184     1.0000e-04    1.0000e-04
185  *       oitmax         sitmax         isolut         ncontr          nccfl
186              10             25              0              0              0
187  *         ntsv           ntcb           ntcf           ntrp           ntcp
188              21             13             46             20              2
189  *
190  *************************
191  * component-number data *
192  *************************
193  *
194  * iorder*          1         2         3         4         5
195  * iorder*          6         7         8         9        10
196  * iorder*         11        12        13        17        20
197  * iorder*         21        22       23s
198  * iorder*         24        25        29        30        31
199  * iorder*         33        34        35        36        37
200  * iorder*         40        41        43        73        74
201  * iorder*         75        77        78        83        86
202  * iorder*         95        96       900       901       902
203  * iorder*        903       904       905       906       907
204  * iorder*        908       909       910       911e
205  *
206  *************************
207  * control-parameter data *
208  *************************
209  *
210  * cp1sv *              1           16s
211  * cp1cb *             -1           -7s
212  * cp1tp *              1          -24s
213  * cp2sv *             17           21s
214  * cp2cb *             -8          -13s
215  * cp2tp *              1            0e
216  *
217  * signal variables
218  *
219  *         idsv          isvn          ilcn          icn1          icn2
220               0             0             0             0             0
221  *
222  *
223  * user-defined units-name data
224  *
225  *      lulabel       lunitsi      luniteng       ufactor        ushift
226        lumdot/m    lu(kg/s)/m  lu(lbm/s)/ft   0.671968931           0.0
227  *
228  **
229  * control blocks
230  *
231  *         idcb          icbn          icb1          icb2          icb3
232               0             0             0             0             0
233  *
234  * trips
235  *
236  *         ntse          ntct          ntsf          ntdp          ntsd
237               0             2             2             0             1
238  *
239  *         idtp          isrt          iset          itst          idsg
240               0             0             0             0             0
241  *
242  *             trip 22 initiated time-step data
243  *         ndid          ntid
244               1             1
245  *      itid(1)
246              22
247  *         dtmin         dtmax         dtend         dtsof
248     1.0000e-03    1.0000e+00    3.0000e+00    1.0000e+00
249  *         edint         gfint         dmpit         sedint
250     4.0000e+00    5.0000e-01    4.0000e+00    4.0000e+00
251  *
252  *
253  ******************
254  * component data *
255  ******************
256  *
257  end
258  *
259  ******************
260  * time-step data *
261  ******************
262  *
263  *         dtmin         dtmax         tend          rtwfp
264     1.0000e-03    2.0000e-01    4.0000e+01    1.0000e+00
265  *         edint         gfint         dmpint        sedint
266     5.0000e+01    1.0000e+00    1.2500e+02    5.0000e+01
267  *
268  *         dtmin         dtmax         tend          rtwfp
269     1.0000e-03    1.0000e+00    2.0000e+02    1.0000e+00
270  *         edint         gfint         dmpint        sedint
271     5.0000e+01    1.0000e+00    1.2500e+02    5.0000e+01
```

```
*
*         dtmin          dtmax          tend          rtwfp
     1.0000e-03     1.0000e+00     7.0000e+02     1.0000e+00
*         edint          gfint         dmpint         sedint
     5.0000e+01     1.0000e+00     1.2500e+02     5.0000e+01
*
*       endflag
    -1.0000e+00
```

APPENDIX R

LOFT L6-1 STEADY-STATE AND TRANSIENT INPUT LISTINGS FOR 3D VESSEL MODEL

This appendix contains the steady-state and transient-restart input listings for the LOFT L6-1 3D vessel model assessment problem as follows:

LOFT L6-1 STEADY-STATE INPUT LISTING FOR 3D VESSEL MODEL

```
1  free format
2  *        1         2         3         4         5         6         7         8
3  *234567890123456789012345678901234567890123456789012345678901234567890123456789
4  *
5  *************
6  * main data *
7  *************
8  *
9  *       numtcr          ieos          inopt          nmat
10              4             0              1             0
11 loft l6-1 with 3-d vessel
12 replaced 1-d vessel components with 3-d vessel  j steiner  Oct 1997
13 loft experiment l6-1 : posttest specifications modeled with a 1-d vessel
14 constrained steady-state calculation with nature of transient defined
15 *
16 * Test description problem:  Pump 1 (component 5) is set for a CSS controlled
17 *     flow of 250 kg/s and Pump 2 (component 4) is set for 240 kg/s.  This
18 *     difference needs to be confirmed from the data or otherwise resolved.
19 *
20 * modified by Thad Knight, 2/13/96
21 * deck from /devass/mod2-5.3.05/loft-l6-1/1-dvess.s
22 *   Initial changes amount to converting STGEN component to 2 PIPEs, 2 TEEs, and
23 *     2 heat structures.  I have maintained the component numbering scheme.  The
24 *     structural mass of the steam generator needs to be added later.
25 *   Renumbered the first array values for NHCOMO and NHCELLO in rod 99 to avoid
26 *     warning messages at the start of the run.
27 *   Added input [INOPTS, user-defined units-name data, and additional
28 *     control-block data cards (cards 2 and 4 as required)] to turn on
29 *     units labeling and conversion.
30 *   Changed heat structure component for the core to number 900.
31 *   Corrected some CTITLE information and modified others to be more
32 *     descriptive.
33 *   Renoded JCELLs in components 1, 3, 6, 7, 11, 21, 22, 29, 30, 31, 33, 34,
34 *     36, 40, 43, 73, 74, 83, 95, and 96 to resolve warning messages from
35 *     FEMOM about area changes in the vicinity of JCELL.  In general, I changed
36 *     arrays DX, VOL, FA, FRIC, and GRAV for these components.  I changed
37 *     other arrays as necessary to fill them.  Also, I factored the changes
38 *     across junctions 1, 9, 29, 34, 37, 45, and 74 to maintain consistency
39 *     across junctions.  I maintained the HDs on each interface of the JCELLs
40 *     because changing them would change the nonzero GRAVs at the first
41 *     interface of the side leg; I did this by duplicating HD(old JCELL) and
42 *     HD(old JCELL+1).
43 *   Changed NFF=-1 to +1 at the JCELL+1 interfaces in components 22, 30, and 33.
44 *     The changes avoid warning messages, and there are no longer area changes
45 *     at those interfaces).  I set NFF to a -1 at the JCELL+2 interfaces
46 *     in those components to calculate the loss coefficient associated with the
47 *     area change.
48 *   I ran a null transient in which I replaced the two PRIZER components with
49 *     PIPEs and FILL 35 at the top of the vessel with a BREAK.  I manually set
50 *     all void fractions to 0.0, pressures to 1.5 MPa, air partial pressures to
51 *     0.0, liquid and wall temperatures to 500.0 K, and velocities to 0.0.  I
52 *     also set all powers to zero and pump speeds to zero and disabled the
53 *     constrained steady state controllers.  The initial run revealed many
54 *     velocities > 0.1 m/s.  I reevaluated all of the GRAVs and made the
55 *     following changes to resolve elevation errors:
56 *          Component 31:  I changed the sign of all GRAVs in the main run of the
57 *               component to better represent the actual LOFT geometry.  Then to
58 *               correct a -0.1567 m elevation difference down the pipe, I
59 *               changed GRAV(7) from +1.0 to +0.72818405 (forced JUN1 and JUN2
60 *               to the same elevation).
61 *          Component 73:  I changed GRAV(2) in the main leg from +1.0 to
62 *               +0.98972962 to force the implied elevation difference between
63 *               hot and cold legs through the pump suction to 0.0 (error had the
64 *               Junction 66 0.0055 m lower than Junction 74).
65 *          Component 73:  I changed GRAV(2) in the side leg from +0.25395 to
66 *               +0.06427634 to force the elevation difference between Junctions
67 *               45 and 74 to 0.0 as implied by the recirculation line from the
68 *               broken hot leg to the pump suction (error had Junction 74
69 *               0.9479 m lower than Junction 45).
70 *          Component 10:  I increased the length of cells 1 and 2 from 0.56600 m
71 *               to 0.70537663 m to force the elevation difference between the
72 *               JCELLs of components 1 and 11 to 0.0 as implied by the
73 *               pressurizer spray line (the error had component 11 0.2788 m
74 *               higher than component 1).  I changed the volumes of the two
75 *               cells from 8.2030e-4 m^3 to 1.0223e-03 m^3to preserve the
76 *               VOL/DX.
77 *          Component 41:  I changed GRAV(2) in the side leg from 0.1990 to
78 *               0.19899989 to force the JCELLs of components 41 and 31 to the
79 *               same elevation as implied by the reflood assist bypass line
80 *               (through Junction 43) (the error had component 41 4.6e-07 m
81 *               lower than component 31).  This error appears to have been the
82 *               result of extracting the input from a TRCDMP file at some time
83 *               in the past.
84 *          Components 21 and 22:  I changed GRAV(1) and GRAV(2) on the side leg
85 *               of component 21 and GRAV(1) in the main leg of component 22 from
86 *               -0.33763 to -0.33759606 to correct an elevation error of
87 *               -5.586e-05 m in the secondary loop defined by Junctions 24, 21,
```

```
*              23, and 24.  This error appears to have been the result of
*              extracting the input from a TRCDMP file at some time in the past
*              and of renoding JCELL of component 21 (described above).
*         Components 29 and 96:  I changed GRAV(1) and GRAV(2) in the side leg
*              of component 29 and GRAV(1) in the main leg of component 96 to
*              -1.0 from the original values of -9.9985e-01, -0.99963215, and
*              -0.99963215 and DX(1) in the side leg of component 29 from 0.1 m
*              to 0.1006805 m to correct a 0.7765 mm elevation error between
*              the cold and hot legs implied by the path defined by Junctions
*              40, 83, 38, 37, 95, 35, 96, and 34 (cold leg was low relative to
*              the hot leg).  I also changed VOL(1) on the side leg of
*              component 29 from 1.4192e-02 m^3 to 0.01428858 m^3 to preserve
*              VOL/DX.
*         Component 96:  I changed DX(1) in the side leg of component 96 from
*              0.7955 m to 0.79549 m to correct a 5.0e-06 m elevation error
*              around the loop defined by Junctions 96, 35, 97, and 96.  This
*              error was the result of renoding JCELL in component 96
*              (described above).  To the accuracy that the volumes are input
*              and the original ratio VOL/DX, the change in DX(1) has no impact
*              on VOL(1).
*         Component 83:  I changed GRAV(1) in the side leg of component 83 from
*              0.0 to -0.0017408 to correct a 0.79 mm elevation error around
*              the loop defined by Junctions 37, 38, 84, 86, and 37.
*    With these changes the null transient run to 1000 s yielded maximum
*    velocities of 2.012e-03 m/s in components 95 and 96.  All other velocities
*    were less than 1.0e-03.
*  Renoded components 20 and 22 so that there is a one-to-one correspondence in
*    cells to improve the connections of the heat structure between the
*    boiler/riser and the secondary downcomer.  This change involved renoding
*    cell 5 of component 20 and cells 1 and 5 of component 22.  I reset GRAV(1)
*    and GRAV(2) of the component 21 side leg and GRAV(1) and new GRAV(2) of
*    component 22 main leg to preserve the elevation closure of the secondary
*    loop defined by Junctions 24, 21, 23, and 24.  I reran the null transient,
*    and maximum velocity in this loop is 4.861e-04 m/s.
*  Added an additional 9 heat structures (903-911) to represent the structural
*    mass of the steam generator--secondary downcomer wall, secondary shell,
*    primary-side plenum baffle, inlet plenum wall, outlet plenum wall, inlet
*    side tube sheet, and outlet side tube sheet.  The structures for the
*    secondary downcomer and secondary shell assume that the inside radii from
*    the old stgen component were correct and that a single complete (RDX=1.0)
*    structure is defined for each; the old areas were not checked and may not
*    be preserved.  The structures associated with the primary-side plenums,
*    represented as SLABs, preserve the area and thickness from the stgen
*    component.
*  Modified as necessary the signal variables to assure that they pointed
*    correctly at the appropriate components.
*
*                                  ++++++++  ++++++++
*                                  + valve+  + pipe +
*                                 67+  10  +68+   9  +
*                                  ++++++++  ++++++++
*                                            60
* ++++++++                                   ++++++++
* + break+                                   +prizer+
* +  25  +                                   +  13  +
* ++++++++                                   ++++++++
*    26                                44        61
* ++++++++  ++++++++                 ++++++++  ++++++++
* + valve+  + fill +                 + pipe +  + pipe +
* +  23  +  +  24  +                 +  75  +  +  12  +
* ++++++++  ++++++++                 ++++++++  ++++++++
*    22        25                      42        64
* ++++++++  ++++++++                 ++++++++  ++++++++
* +  tee +  +  tee +                 + valve+  +prizer+
* +  21  +23+  22  + rods            +  78  +  +   8  +
* ++++++++  ++++++++ |901            ++++++++  ++++++++
*    21        24    |902               78        10
*          ++++++++ |++++++++  ++++++++  ++++++++  ++++++++  ++++++++  ++++++++
*  stgen    + pipe +==+ pipe +  +  tee +  +  tee +  +vessel+  +  tee +
*   sec   21+  20  +==+   2  + 2+  74  +74+   1  + 9+region+45+  31  +32
*           ++++++++  ++++++++  ++++++++  ++++++++  +define+  ++++++++
*                        3                         + with +     36
*           ++++++++  ++++++++                     + a 1-d+  ++++++++
*           + valve+  +  tee +                     + model+  +  tee +
*         32+  77  +77+  73  +                     +      + 1+  41  +44
*           ++++++++  ++++++++                     +      +  ++++++++
*                        73                        +      +
*                     ++++++++                     +      +  (isolated)
*                     +  tee +           intact    +      +    broken
*                    5+   3  +            loop     +      +     loop
*                     ++++++++                     +      +
*              5         4                         +      +
*           ++++++++  ++++++++                     +      +
*           + pump +  + pump +                     +      +
*           +   5  +  +   4  +                     +      +
*           ++++++++  ++++++++                     +      +
*              7         6                         +      +
*                     ++++++++  ++++++++  ++++++++  +      +
*                     +  tee +  +  tee +  +  tee +  +      +
*                    7+   6  +66+  11  + 8+   7  +29+      +
*                     ++++++++  ++++++++  ++++++++  +      +
*                                  67        14     +      +
```

```
*                                        ++++++++  +      +
*                                        + fill +  +      +
*                                        +  17  +  +      +
*                                        ++++++++  ++++++++
*
* The vessel is modeled with 13 1-d hydro & 1 heat-structure components.
*
*            ++++++++++++++++++++++++++++++++++++++++++++
*            + vessel region defined with a 1-d model   +
*            +                                          +
*            +                              40          +
*            +                  ++++++++  ++++++++      +
*            +                  +  tee +  +  tee +      +
*          9+------------------+  43  +48+  34  +-----+45
*            +                  ++++++++  ++++++++      +
*            +                     47                   +
*            +                  ++++++++  ++++++++      +
*            +                  +  tee +  +  tee +      +
*          29+------------------+  40  +46+  29  +-----+ 1
*            +                  ++++++++  ++++++++      +
*            +                              34          +
*            +   ++++++++       ++++++++  ++++++++      +
*            +   +  rod +       +  tee +  +  tee +      +
*            +   +  900 +       +  95  +97+  96  +      +
*            +   ++++++++       ++++++++  ++++++++      +
*            +    ||  ||         95  35    96           +
*            +   ++++++++  ++++++++  ++++++++           +
*            +   + pipe +  +  tee +  +  tee +           +
*            +   +  37  +37+  36  +  +  30  +           +
*            +   ++++++++  ++++++++  ++++++++           +
*            +        38        86    36                +
*            +        ++++++++  ++++++++                +
*            +        +  tee +  +  tee +                +
*            +        +  83  +84+  86  +                +
*            +        ++++++++  ++++++++                +
*            +           83                             +
*            +        ++++++++  ++++++++                +
*            +        +  tee +  + fill +                +
*            +        +  33  +39+  35  +                +
*            +        ++++++++  ++++++++                +
*            +           40                             +
*            +                                          +
*            ++++++++++++++++++++++++++++++++++++++++++++
*
* Experiment 16-1 simulated a loss of steam load in the steam generators
* of a four-loop commercial PWR in the Loss-Of-Fluid Test (LOFT) facility.
* The steady-state initial conditions of the experiment were:
```

Primary Intact Loop:	hot-leg mass flow	478.5	+-6.3	kg/s
	hot-leg pressure	1.478e+07	+-1.1e+05	Pa
	hot-leg temperature	567.5	+-1.8	K
	cold-leg temperature	552.8	+-1.2	K
Steam Gen. Sec. Side:	steam & fw mass flow	20.1	+-0.6	kg/s
	steam-dome pressure	5.37e+05	+-6.0e+04	Pa
	liq/vap temperature	541.7	+-0.8	K
	dwncmr liquid level	3.183	+-0.034	m
Pressurizer:	pressure	1.487e+07	+-2.0e+05	Pa
	liq/vap temperature	614.3	+-0.8	K
	liquid level	1.18	+-0.07	m

```
* The experiment's transient was initiated by closing the main steam flow
* control valve (MSFCV); the actual start of closing was observed to
* occur at 2.0 s (rather than at 0.0 s) based on parameter measurements.
* The pressurizer cycling heater (on initially) was shut off at 6.1+-0.1 s
* as the pressurizer pressure increased.  The pressurizer sprayer was in-
* itiated at 9.1+-0.1 s to reduce primary-side (PS) pressure and remained
* on until 30.4+-0.1 s.  The PS pressure continued to rise and caused the
* reactor to scram at 21.8+-0.2 s.  Thereafter, the PS pressure reached a
* maximum value at 22.0+-0.2 s.  To reduce steam-generator (SG) secondary-
* side (SS) pressure, the MSFCV began opening at 22.2+-0.2 s and began
* closing at 31.4+-0.2 s.  The pressurizer cycling heater came on at
* 31.4+-0.1 s and the pressurizer backup heater came on at 32.5+-0.1 s
* to prevent the PS to pressure from falling further.  The MSFCV opened
* and closed automatically at 91.2+-0.2 s and 97.8+-0.2 s, respectively,
* based on pressure setpoints and was manually opened and closed at
* 312.6+-0.2 s and 326.0+-0.4 s, respectively, to control SGSS pressure.
* The pressurizer backup heater was shut off at 415.4+-0.1 s and the
* experiment was ended at 700.0+-10.0 s.
*
```

Experiment Events	Experiment Time
Main Steam Flow Control Valve (MSFCV) starts to close	2.0+-0.2 s
Pressurizer cycling heater is set off	6.1+-0.1 s
Pressurizer sprayer is set on	9.1+-0.1 s
MSFCV reaches its closed position	11.6+-0.2 s
Reactor core power is scrammed based on high pressure	21.8+-0.2 s
Primary-side pressure reaches maximum	22.0+-0.2 s
MSFCV starts to open based on high-pressure setpoint	22.2+-0.2 s
Pressurizer level reaches maximum	26.5+-0.5 s
Pressurizer sprayer is set off	30.4+-0.1 s
MSFCV starts to close based on low-pressure setpoint	31.4+-0.2 s
Pressurizer cycling heater is set on	31.4+-0.1 s
Pressurizer backup heater is set on	32.5+-0.1 s
MSFCV reaches its closed position	40.6+-0.2 s

```
* MSFCV starts to open based on high-pressure setpoint      91.2+-0.2 s
* MSFCV starts to close based on low-pressure setpoint      97.8+-0.2 s
* MSFCV reaches its closed position                        104.4+-0.2 s
* MSFCV starts to open based on manual adjustment          312.6+-0.2 s
* MSFCV starts to close based on manual adjustment         326.0+-0.4 s
* MSFCV reaches its closed position                        339.4+-0.4 s
* Pressurizer backup heater is set off                    415.4+-0.1 s
* Experiment is ended                                     700.0+-10. s
*
*****************
* namelist data *
*****************
*
*     SI/English units flags:  0--SI units/1--English units
*     iogrf:  units flag for writing TRCGRF
*     ioinp:  units flag for reading TRACIN
*     iolab:  units flag for writing input to INLAB
*     ioout:  units flag for writing TRCOUT and TRCMSG
*
*     iunlab:  input user-defined units labels (0-no/>0-yes; default is 0)
*     iunout:  write units to file TRCOUT (0-no/1-yes; default is 1)
*
 $inopts iadded=10, icflow=2, nhtstr=22,
         iogrf=0, ioinp=0, iolab=1, ioout=0, iunlab=1, iunout=1 $
*
*        dstep         timet
                0           0.0
*       stdyst        transi         ncomp          njun          ipak
                2             0            50            33             1
*         epso          epss
     1.0000e-04    1.0000e-04
*       oitmax        sitmax        isolut        ncontr         nccfl
               10            25             0             5             0
*         ntsv          ntcb          ntcf          ntrp          ntcp
               21            13            46            20             2
*
*************************
* component-number data *
*************************
*
* iorder*          1         2         3         4         5
* iorder*          6         7         8         9        10
* iorder*         11        12        13        17        20
* iorder*         21        22       23s
* iorder*         24        25       31s
* iorder*         41        73       74s
* iorder*         75        77        78      600s
* iorder*        801      802s
* iorder*        803       804       805       806       807
* iorder*        808       809       810       811       901
* iorder*        911       912       913       914       915
* iorder*        921       922       923       924       925
* iorder*          e
*
*************************
* control-parameter data *
*************************
*
* constrained steady-state controllers
*
*       numcss        amncss        amxcss        nmpcss        napcss
                2  9.0000e-01  1.1000e+00          7002             2
* intact-loop steam-generator type-14 controller adjusts
*    the heat-transfer across the tubes (equivalent to old type 4)
              801           0.5           1.5          7002            14
              802           0.5           1.5          7002            14
* intact-loop pump 2 type-1 controller adjusts impeller rotational speed
                4  2.0000e+02  5.0000e+02            -1             0
* intact-loop pump 1 type-1 controller adjusts impeller rotational speed
                5  2.0000e+02  5.0000e+02            -1             0
* steam-flow control valve type-2 controller adjusts upsteam pressure
               23  0.0000e+00  1.0000e+00             1             0
*
* multipass control-parameter evaluations
*
* cp1sv *              1           16s
* cp1cb *             -1           -7s
* cp1tp *              1          -24s
* cp2sv *             17           21s
* cp2cb *             -8          -13s
* cp2tp *              1           0e
*
* signal variables
*
*            problem time
*         idsv          isvn          ilcn          icn1          icn2
                1             0             0             0             0
*
*             hot-leg pressure
*         idsv          isvn          ilcn          icn1          icn2
                2            21             1             1             0
*
```

```
*            hot-leg liquid temperature
*         idsv          isvn          ilcn          icn1          icn2
             3            23             1             1             0
*
*            hot-leg liquid mass flow
*         idsv          isvn          ilcn          icn1          icn2
*            4            32             1             3             0
             4            32             1             5             0
*
*            pressurizer-dome pressure
*         idsv          isvn          ilcn          icn1          icn2
*            5            21             9             1             0
             5            21            13             1             0
*
*            pressurizer top-section liquid level
*         idsv          isvn          ilcn          icn1          icn2
             6            20            13             7             1
*
*            pressurizer middle-section liquid level
*         idsv          isvn          ilcn          icn1          icn2
             7            20            12             1             1
*
*            pressurizer bottom-section liquid level
*         idsv          isvn          ilcn          icn1          icn2
             8            20             8             1             1
*
*            cold-leg pressure at hpis connection
*         idsv          isvn          ilcn          icn1          icn2
*            9            21             7             4             0
             9            21             7             5             0
*
*            reactor-core power
*         idsv          isvn          ilcn          icn1          icn2
*           10            18            90             0             0
*           10            18           900             0             0
            10            18           901             0             0
*
*            stgen-sec pipe 20 volume-averaged alpha
*         idsv          isvn          ilcn          icn1          icn2
*           11            27            20             1            -5
            11            27            20             1            -8
*
*            stgen-sec tee 21 main volume-averaged alpha
*         idsv          isvn          ilcn          icn1          icn2
*           12            27            21             1            -2
            12            27            21             1            -4
*
*            stgen-sec tee 21 side alpha
*         idsv          isvn          ilcn          icn1          icn2
*           13            27            21             3             0
            13            27            21             5             0
*
*            stgen-sec tee 22 main volume-averaged alpha
*         idsv          isvn          ilcn          icn1          icn2
*           14            27            22             1            -4
            14            27            22             1            -9
*
*            stgen-sec tee 22 side alpha
*         idsv          isvn          ilcn          icn1          icn2
*           15            27            22             5             0
            15            27            22            10             0
*
*            stgen-sec tee 21 pressure
*         idsv          isvn          ilcn          icn1          icn2
*           16            21            21             2             0
            16            21            21             4             0
*
*               trip 8 iset
*         idsv          isvn          ilcn          icn1          icn2
            17            56             8             0             0
*
*               trip 20 iset
*         idsv          isvn          ilcn          icn1          icn2
            18            56            20             0             0
*
*               trip 22 iset
*         idsv          isvn          ilcn          icn1          icn2
            19            56            22             0             0
*
*               trip 23 iset
*         idsv          isvn          ilcn          icn1          icn2
            20            56            23             0             0
*
*               trip -24 signal
*         idsv          isvn          ilcn          icn1          icn2
            21            55           -24             0             0
*
*
* user-defined units-name data
*
*       lulabel       lunitsi      luniteng       ufactor        ushift
      lumdot/m    lu(kg/s)/m  lu(lbm/s)/ft   0.671968931           0.0
```

```
*
*
* control blocks
*
*                pressurizer liquid-level for plot
*          idcb          icbn          icb1          icb2          icb3
                -1            57             6             7             8
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      lulength      lulength      lunounit      lunounit
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     1.0000e+00    0.0000e+00    1.7500e+00    0.0000e+00    0.0000e+00
*
*          idcb          icbn          icb1          icb2          icb3
                -2            56            -1             0             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      lulength      lulength      lulength      lunounit
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     1.0000e+00    0.0000e+00    1.6400e+00   -1.1000e-01    0.0000e+00
*
*                stgen-sec downcomer liq-level for plot, cb -8, & trip 6
*          idcb          icbn          icb1          icb2          icb3
                -3            56            11             0             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       luvolume      luvolume      luvolume      lunounit      lunounit
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     2.7721e+00    0.0000e+00    2.7721e+00    0.0000e+00    0.0000e+00
*
*          idcb          icbn          icb1          icb2          icb3
                -4            59            12            13             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      luvolume      luvolume      luvolume      luvolume
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     1.0000e+00    0.0000e+00    2.6178e+00    2.2348e+00    3.8297e-01
*
*          idcb          icbn          icb1          icb2          icb3
                -5            59            14            15             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      luvolume      luvolume      luvolume      luvolume
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     1.0000e+00    0.0000e+00    1.2803e+00    1.2641e+00    1.6215e-02
*
*          idcb          icbn          icb1          icb2          icb3
                -6            57            -3            -4            -5
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      luvolume      luvolume      lunounit      lunounit
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     1.0000e+00    0.0000e+00    6.6702e+00    0.0000e+00    0.0000e+00
*
*          idcb          icbn          icb1          icb2          icb3
                -7           101            -6             9             0
*        lugain        luxmin        luxmax        lucon1        lucon2
       lunounit      lulength      lulength      lunounit      lunounit
*         cbgain        cbxmin        cbxmax        cbcon1        cbcon2
     1.0000e+00    0.0000e+00    5.6103e+00    0.0000e+00    0.0000e+00
*        luytab      luxtab(1)
       lulength       luvolume
*
*                  vapor vol      dc liq lev
*                    (m3)            (m)
* cbftb *       2.2660e+00     5.6103e+00s
* cbftb *       2.5943e+00     4.6810e+00s
* cbftb *       4.1502e+00     3.2004e+00s
* cbftb *       4.4173e+00     2.9464e+00s
* cbftb *       4.8360e+00     2.5440e+00s
* cbftb *       5.0294e+00     2.3500e+00s
* cbftb *       5.4051e+00     1.8860e+00s
* cbftb *       5.8402e+00     1.2460e+00s
* cbftb *       6.6702e+00     0.0000e+00e
*
*                stgen-sec feedwater-control controller for fill 24
*            idcb          icbn          icb1          icb2          icb3
                -8           200            -7             0             0
*          lugain        luxmin        luxmax        lucon1        lucon2
         lumdot/m      lumassfw      lumassfw      lulength      lumassfw
*           cbgain        cbxmin        cbxmax        cbcon1        cbcon2
       7.0000e+00    1.0000e+01    3.0000e+01    3.1830e+00    2.0100e+01
*            cbdt          cbtau          cbwt
       1.0000e+01    1.0000e+00    0.0000e+00
*
*            idcb          icbn          icb1          icb2          icb3
                -9           101             1             2             0
*          lugain        luxmin        luxmax        lucon1        lucon2
         lunounit      lumassfw      lumassfw      lunounit      lunounit
*           cbgain        cbxmin        cbxmax        cbcon1        cbcon2
       1.0000e+00    0.0000e+00    2.0100e+01    0.0000e+00    0.0000e+00
*          luytab      luxtab(1)
         lumassfw         lutime
*
*                    time          mass flow
*                     (s)            (kg/s)
* cbftb *       1.0000e+00     2.0100e+01s
* cbftb *       1.2000e+01     0.0000e+00e
```

```
*
*        idcb          icbn          icb1          icb2          icb3
           -10            22            -9            -8            17
*      lugain        luxmin        luxmax        lucon1        lucon2
     lunounit      lumassfw      lumassfw      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
   1.0000e+00    0.0000e+00    1.0000e+02    0.0000e+00    0.0000e+00
*
*              stgen-sec steam-flow-control controller for valve 23
*        idcb          icbn          icb1          icb2          icb3
           -11            22            19            18            20
*      lugain        luxmin        luxmax        lucon1        lucon2
     lurtime       lurtime       lurtime       lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
   5.0000e-02   -5.0000e-02    5.0000e-02    0.0000e+00    0.0000e+00
*
*        idcb          icbn          icb1          icb2          icb3
           -12            23           -11             0             0
*      lugain        luxmin        luxmax        lucon1        lucon2
     lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
   1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    6.3800e-01
*
*        idcb          icbn          icb1          icb2          icb3
           -13           101           -12            12             0
*      lugain        luxmin        luxmax        lucon1        lucon2
     lunounit      lunounit      lunounit      lunounit      lunounit
*       cbgain        cbxmin        cbxmax        cbcon1        cbcon2
   1.0000e+00    0.0000e+00    1.0000e+00    0.0000e+00    0.0000e+00
*      luytab     luxtab(1)
     lunounit      lunounit
*
*                  xpos          favlve
*                   (-)           (-)
* cbftb *      0.0000e+00    0.0000e+00s
* cbftb *      1.0000e-01    7.3360e-02s
* cbftb *      2.0000e-01    1.5334e-01s
* cbftb *      3.0000e-01    2.4500e-01s
* cbftb *      4.0000e-01    3.4000e-01s
* cbftb *      5.0000e-01    4.4000e-01s
* cbftb *      5.7500e-01    5.1733e-01s
* cbftb *      6.0000e-01    5.4666e-01s
* cbftb *      7.0000e-01    6.6000e-01s
* cbftb *      8.0000e-01    7.7248e-01s
* cbftb *      9.0000e-01    8.8665e-01s
* cbftb *      1.0000e+00    1.0000e+00e
*
* trips
*
*         ntse          ntct          ntsf          ntdp          ntsd
             0             2             2             0             1
*
*                system low-pressure scram trip
*         idtp          isrt          iset          itst          idsg
             1             1             0             1             2
*      setp(1)       setp(2)
   1.4360e+07    1.4361e+07
*      dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*                system high-pressure scram trip
*         idtp          isrt          iset          itst          idsg
             2             2             0             1             2
*      setp(1)       setp(2)
   1.5769e+07    1.5770e+07
*      dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*             intact-loop hot-leg high-temperature scram trip
*         idtp          isrt          iset          itst          idsg
             3             2             0             1             3
*      setp(1)       setp(2)
   5.8320e+02    5.8330e+02
*      dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*              intact-loop low-mass-flow scram trip
*         idtp          isrt          iset          itst          idsg
             4             1             0             1             4
*      setp(1)       setp(2)
   4.3350e+02    4.3400e+02
*      dtsp(1)       dtsp(2)
   2.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
```

```
*            high core-averaged-power scram trip
*        idtp          isrt          iset          itst          idsg
             5             2             0             1            10
*     setp(1)       setp(2)
   5.1000e+07    5.1500e+07
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            stgen-sec downcomer low-liquid-level scram trip
*        idtp          isrt          iset          itst          idsg
             6             1             0             1            -7
*     setp(1)       setp(2)
   2.0000e+00    2.0100e+00
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            steady-state or transient flag trip
*        idtp          isrt          iset          itst          idsg
             7            -1            -1             1             1
*     setp(1)       setp(2)
  -2.0000e-05   -1.0000e-05
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            stgen-sec feedwater fill & steam-flow-control valve trip
*        idtp          isrt          iset          itst          idsg
             8             2             0             1             1
*     setp(1)       setp(2)
  -2.0000e-05   -1.0000e-05
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            warm-up-lines trip
*        idtp          isrt          iset          itst          idsg
             9             2             0             1             1
*     setp(1)       setp(2)
  -2.0000e-05    1.0000e+20
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            intact-loop pump-shutdown trip
*        idtp          isrt          iset          itst          idsg
            10             2             0             1             1
*     setp(1)       setp(2)
  -2.0000e-05    1.0000e+20
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            pressurizer power-operated-relief-valve trip
*        idtp          isrt          iset          itst          idsg
            11            -3             0             1             5
*     setp(1)       setp(2)       setp(3)       setp(4)
   1.6560e+07    1.6570e+07    1.6690e+07    1.6700e+07
*     dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
   0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0

*            pressurizer spray-valve trip
*        idtp          isrt          iset          itst          idsg
            12            -3             0             1             5
*     setp(1)       setp(2)       setp(3)       setp(4)
   1.4900e+07    1.5000e+07    1.5140e+07    1.5240e+07
*     dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
   0.0000e+00    1.0000e+04    1.0000e+04    0.0000e+00
*     ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0

*            pressurizer cycling-heaters trip flag
*        idtp          isrt          iset          itst          idsg
            13             1             1             1             5
*     setp(1)       setp(2)
   1.4750e+07    1.4930e+07
*     dtsp(1)       dtsp(2)
   0.0000e+00    0.0000e+00
*     ifsp(1)       ifsp(2)
             0             0

*            pressurizer backup-heaters trip flag
*        idtp          isrt          iset          itst          idsg
```

```
            14             1             0             1             5
*      setp(1)       setp(2)
    1.4620e+07    1.4800e+07
*      dtsp(1)       dtsp(2)
    0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*             steady state and transient ON trip
*         idtp          isrt          iset          itst          idsg
            15             2             1             1             1
*      setp(1)       setp(2)
   -2.0000e-05   -1.0000e-05
*      dtsp(1)       dtsp(2)
    0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*             emergency-core-coolant low-pressure hpis trip
*         idtp          isrt          iset          itst          idsg
            17             1             0             1             2
*      setp(1)       setp(2)
    1.3297e+07    1.5500e+07
*      dtsp(1)       dtsp(2)
    0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*             stgen-sec steam-flow-control valve closure trip
*             forced closure at 2 s into the 16-1 transient
*         idtp          isrt          iset          itst          idsg
            20            -2             0             1             1
*      setp(1)       setp(2)
   -2.0000e-05   -1.0000e-05
*      dtsp(1)       dtsp(2)
    0.0000e+00    2.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*             stgen-sec pressure-regulator trip after reactor scram
*         idtp          isrt          iset          itst          idsg
            22            -3             0             1            16
*      setp(1)       setp(2)       setp(3)       setp(4)
    6.7500e+06    6.8800e+06    6.8900e+06    6.9900e+06
*      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
    3.5000e-01    1.0000e+04    1.0000e+04    2.0000e+00
*      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             1             1             2             2
*
*             coincidence scram trip
*         idtp          isrt          iset          itst          idsg
            23             2             0             3             1
*      setp(1)       setp(2)
    4.0000e-01    6.0000e-01
*      dtsp(1)       dtsp(2)
    1.0000e+04    0.0000e+00
*      ifsp(1)       ifsp(2)
             0             0
*
*             trip-controlled trip for pressurizer heaters
*         idtp          isrt          iset          itst          idsg
           -24            -3            -1             3             2
*      setp(1)       setp(2)       setp(3)       setp(4)
   -6.0000e-01   -4.0000e-01    4.0000e-01    6.0000e-01
*      dtsp(1)       dtsp(2)       dtsp(3)       dtsp(4)
    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)       ifsp(3)       ifsp(4)
             0             0             0             0
*
*             trip-controlled trip 23 signal (coincidence trip)
*          idtn          intn
             1             6
*       itn(1)        itn(2)        itn(3)        itn(4)        itn(5)
             1             2             3             4             5
*       itn(6)
             6
*
*             trip-controlled trip 24 signal (pressurizer heaters)
*          idtn          intn
             2             4
*       itn(1)        itn(2)        itn(3)        itn(4)
            13            14             7             7
*
*             trip set-point-factor table for trip 22
*          idft          idsg          inft
             1             1             6
*        ftx()         fty()
    0.0000e+00    1.0000e+00    7.5000e+01    1.0000e+00    7.5100e+01
    9.8519e-01    2.0000e+02    9.8519e-01    2.0010e+02    9.7778e-01
    7.0000e+02    9.7778e-01
*
*             trip set-point-factor table for trip 22
```

```
824  *         idft          idsg          inft
825                2             1             6
826  *        ftx()         fty()
827       0.0000e+00    1.0000e+00    7.5000e+01    1.0000e+00    7.5100e+01
828       9.9805e-01    2.0000e+02    9.9805e-01    2.0010e+02    9.9376e-01
829       7.0000e+02    9.9376e-01
830  *
831  *              trip 22 initiated time-step data
832  *          ndid          ntid
833                1             1
834  *       itid(1)
835                22
836  *         dtmin         dtmax         dtend         dtsof
837       1.0000e-03    1.0000e+00    3.0000e+00    1.0000e+00
838  *         edint         gfint         dmpit         sedint
839       4.0000e+00    5.0000e-01    4.0000e+00    4.0000e+00
840  *
841  ******************
842  * component data *
843  ******************
844  *
845  *******   type            num            id         ctitle
846  tee                         1             1   $1$ intact-loop hot leg
847  *         jcell         nodes          ichf          cost          epsw
848                 3             4             1    0.0000e+00    1.0000e-05
849  *        iconc1        ncell1         jun1          jun2          ipow1
850                 0             4             9            74              0
851  *        iqptr1        iqpsv1       nqptb1        nqpsv1        nqprf1
852                 0             0             0             0              0
853  *        radin1           th1        houtl1        houtv1        toutl1
854       1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
855  *        toutv1
856       3.0537e+02
857  *         qpin1         qpoff1        rqpmx1        qpscl1
858       0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
859  *        iconc2        ncell2         jun3          ipow2
860                 0             3            10              0
861  *        iqptr2        iqpsv2       nqptb2        nqpsv2        nqprf2
862                 0             0             0             0              0
863  *        radin2           th2        houtl2        houtv2        toutl2
864       2.3300e-02    8.6968e-03    0.0000e+00    1.2270e+01    3.0537e+02
865  *        toutv2
866       3.0537e+02
867  *         qpin2         qpoff2        rqpmx2        qpscl2
868       0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
869  *
870  * dx    +     1.8415e+00    1.0795e+00e
871  * dx    *     1.8415e+00    3.5983E-01    3.5983E-01    3.5983E-01e
872  * vol   +     1.1667e-01    6.8527e-02e
873  * vol   *     1.1667e-01    2.2842E-02    2.2842E-02    2.2842E-02e
874  * fa    + f   6.3425e-02e
875  * fa    * r 2 6.3425e-02    6.3480E-02    6.3480E-02    6.3425E-02e
876  * fric  +     3.7203e-02    1.1170e-02    2.0282e-02e
877  * fric  *     3.8186E-02    1.4822E-02          0.0           0.0    3.0891E-02
878  * fric  * e
879  * grav  * f   0.0000e+00e
880  * hd    * f   2.8417e-01e
881  * icflg * f            0e
882  * nff   * f            1e
883  * alp   * f   0.0000e+00e
884  * vl    * f   0.0000e+00e
885  * vv    * f   0.0000e+00e
886  * tl    * f   5.6750e+02e
887  * tv    * f   5.6750e+02e
888  * p     * f   1.4780e+07e
889  * pa    * f   0.0000e+00e
890  * qppp  * f   0.0000e+00e
891  * matid * f            7e
892  * tw    * f   5.6750e+02e
893  *
894  * dx    *     2.1499e+00    2.1213e+00    2.2217e+00e
895  * vol   *     3.1149e-03    3.0744e-03    5.7059e-03e
896  * fa    * r03 1.4493e-03    5.7321e-03e
897  * fric  *     1.0000e-04    5.5032e-03r02 0.0000e+00e
898  * grav  *     5.4510e-01r02 0.0000e+00    6.0410e-01e
899  * hd    * r03 4.2957e-02    8.5430e-02e
900  * icflg * f            0e
901  * nff   * r02          1r02          -1e
902  * alp   * f   0.0000e+00e
903  * vl    * f   0.0000e+00e
904  * vv    * f   0.0000e+00e
905  * tl    * f   6.1411e+02e
906  * tv    * f   6.1411e+02e
907  * p     * f   1.4780e+07e
908  * pa    * f   0.0000e+00e
909  * qppp  * f   0.0000e+00e
910  * matid * f            7e
911  * tw    * f   6.1411e+02e
912  *
913  * the old STGEN component 2 has been converted into the following:
914  *     PIPE component 2
915  *     PIPE component 20
```

```
*     TEE  component 21
*     TEE  component 22
*     ROD  component 901 (placed before time-step data)
*     ROD  component 902 (placed before time-step data)
*******   type            num             id        ctitle
pipe                        2              2  $2$ steam generator primary
*        ncells          nodes           jun1          jun2          epsw
             10              0              2             3        1.0e-5
*          ichf          iconc          iacc          ipow
               1              0              0             0
*         radin             th         houtl         houtv         toutl
     5.1069e-03    1.2431e-03            0.0           0.0        305.67
*         toutv          powin         powoff        rpowmx        powscl
          305.67            0.0            0.0           0.0           1.0
*
* dx    *      3.7061e-01r03 5.6895e-01r02 5.6899e-01r03 5.6895e-01    3.7061e-01
* dx    * e
* vol   *      3.3541e-01r03 8.6009e-02r02 8.6015e-02r03 8.6009e-02    3.3541e-01
* vol   * e
* fa    *      8.8959e-02r09 1.5117e-01    8.8959e-02e
* fric  *      2.0941e-01    3.5994e-03r07 0.0000e+00    5.9416e-03    1.5112e-01
* fric  * e
* grav  *      6.1566e-01r04 1.0000e+00    0.0000e+00r04-1.0000e+00   -6.1566e-01
* grav  * e
* hd    *      3.3655e-01r09 1.0214e-02    3.3655e-01e
* icflg * f             0e
* nff   * f             1e
* alp   * f    0.0000e+00e
* vl    * f    0.0000e+00e
* vv    * f    0.0000e+00e
* tl    *      5.6750e+02    5.6587e+02    5.6423e+02    5.6260e+02    5.6097e+02
* tl    *      5.5933e+02    5.5770e+02    5.5607e+02    5.5443e+02    5.5280e+02
* tl    * e
* tv    *      5.6750e+02    5.6587e+02    5.6423e+02    5.6260e+02    5.6097e+02
* tv    *      5.5933e+02    5.5770e+02    5.5607e+02    5.5443e+02    5.5280e+02
* tv    * e
* p     * f    1.4780e+07e
* pa    * f    0.0000e+00e
*
*******   type            num             id        ctitle
pipe                       20             20  $20$ steam generator boiler
*        ncells          nodes           jun1          jun2          epsw
             8              0             24            21        1.0e-5
*          ichf          iconc          iacc          ipow
               1              0              0             0
*         radin             th         houtl         houtv         toutl
     5.1069e-03    1.2431e-03            0.0           0.0        305.67
*         toutv          powin         powoff        rpowmx        powscl
          305.67            0.0            0.0           0.0           1.0
*
* dx    + r04 5.6895e-01    1.1115e+00e
* dx    * r04 5.6895e-01r03 2.4700E-01    3.7050E-01e
* vol   + r04 4.4356e-01    9.9786e-01e
* vol   * r04 4.4356e-01r03 0.22174667       0.33262e
* fa    +      2.1890e-01r03 7.7961e-01r02 8.9776e-01e
* fa    *      2.1890e-01r03 7.7961e-01r05 8.9776e-01e
* fric  +      2.0000e-02r05 0.0000e+00e
* fric  *      2.0000e-02r08 0.0000e+00e
* grav  +      0.0000e+00r05 1.0000e+00e
* grav  *      0.0000e+00r08 1.0000e+00e
* hd    + r05 6.3500e-03    1.0691e+00e
* hd    * r05 6.3500e-03r04 1.0691e+00e
* icflg * f             0e
* nff   * f             1e
* alp   + r03 0.0000e+00    3.5000e-01    1.0000e+00e
* alp   * r03 0.0000e+00    3.5000e-01r04 1.0000e+00e
* vl    * f    0.0000e+00e
* vv    * f    0.0000e+00e
* tl    * f    5.4157e+02e
* tv    * f    5.4157e+02e
* p     * f    5.3700e+06e
* pa    * f    0.0000e+00e
*
*******   type            num             id        ctitle
tee                        21             21  $21$ steam generator steam dome
*         jcell          nodes          ichf          cost          epsw
               2              0              1           0.0        1.0e-5
*        iconc1         ncell1           jun1          jun2          ipow1
               0              4             21            22              0
*        radin1            th1         houtl1        houtv1        toutl1
       0.53455           0.05            0.0           0.0        305.67
*        toutv1          pwin1        pwoff1        rpwmx1        pwscl1
          305.67            0.0            0.0           0.0           1.0
*        iconc2         ncell2           jun3          ipow2
               0              1             23              0
*        radin2            th2         houtl2        houtv2        toutl2
       0.53455           0.05            0.0           0.0        305.67
*        toutv2          pwin2        pwoff2        rpwmx2        pwscl2
          305.67            0.0            0.0           0.0           1.0
*
* dx    + f    1.1115e+00e
* dx    *      3.7050E-01    3.7050E-01    3.7050E-01    1.1115e+00e
```

```
1008  * vol   +     9.9786e-01    1.2370e+00
1009  * vol   *     3.3262E-01    3.3262E-01    3.3262E-01    1.2370e+00
1010  * fa    +     8.9776e-01    1.1129e+00    4.6329e-02e
1011  * fa    *     8.9776e-01    8.9776E-01    8.9776E-01    1.1129e+00    4.6329e-02
1012  * fa    * e
1013  * fric  +     0.0000e+00    1.0000e+30    2.4460e-01e
1014  * fric  *     0.0000e+00           0.0    1.0000e+30           0.0    2.4460e-01
1015  * fric  * e
1016  * grav  * f   1.0000e+00e
1017  * hd    + r02 1.0691e+00    2.4290e-01e
1018  * hd    * r04 1.0691e+00    2.4290e-01e
1019  * icflg * f            0e
1020  * nff   * f            1e
1021  * alp   * f   1.0000e+00e
1022  * vl    * f   0.0000e+00e
1023  * vv    * f   0.0000e+00e
1024  * tl    * f   5.4157e+02e
1025  * tv    * f   5.4157e+02e
1026  * p     * f   5.3700e+06e
1027  * pa    * f   0.0000e+00e
1028  *
1029  * dx    *     7.4100e-01e
1030  * vol   *     3.8297e-01e
1031  * fa    * f   5.1683e-01e
1032  * fric  *     1.0000e-04    0.0000e+00e
1033  * grav  + f  -3.3763e-01e
1034  * grav  + f  -0.33759606e
1035  * grav  * f  -0.40463059e
1036  * hd    * f   2.5400e-01e
1037  * icflg * f            0e
1038  * nff   * f            1e
1039  * alp   *     1.0000e+00e
1040  * vl    * f   0.0000e+00e
1041  * vv    * f   0.0000e+00e
1042  * tl    *     5.4157e+02e
1043  * tv    *     5.4157e+02e
1044  * p     *     5.3700e+06e
1045  * pa    *     0.0000e+00e
1046  *
1047  *******   type           num            id        ctitle
1048  tee                      22            22  $22$ steam generator downcomer
1049  *         jcell         nodes          ichf          cost          epsw
1050                 4             0             1           0.0        1.0e-5
1051  *        iconc1        ncell1          jun1          jun2          ipow1
1052                 0             9            23            24              0
1053  *        radin1           th1        houtl1        houtv1        toutl1
1054         0.53455          0.05           0.0           0.0        305.67
1055  *        toutv1         pwin1        pwoff1        rpwmx1        pwscl1
1056         305.67           0.0           0.0           0.0           1.0
1057  *        iconc2        ncell2          jun3         ipow2
1058                 0             1            25             0
1059  *        radin2           th2        houtl2        houtv2        toutl2
1060         0.0508          0.02           0.0           0.0        305.67
1061  *        toutv2         pwin2        pwoff2        rpwmx2        pwscl2
1062         305.67           0.0           0.0           0.0           1.0
1063  *
1064  * dx    + r02 7.4100e-01    1.7069e+00    5.6895e-01e
1065  * dx    +     7.4100e-01r03 2.4700E-01    1.7069e+00    5.6895e-01e
1066  * dx    * r02 3.7050E-01r03 2.4700E-01r03 5.6895E-01    5.6895e-01e
1067  * vol   + r02 3.8297e-01    3.7363e-01    1.2454e-01e
1068  * vol   +     3.8297e-01r03 1.2766E-01    3.7363e-01    1.2454e-01e
1069  * vol   * r02 1.9149E-01r03 1.2766E-01r03 1.2454E-01    1.2454e-01e
1070  * fa    + r02 5.1683e-01r03 2.1890e-01e
1071  * fa    + r02 5.1683e-01    5.1683E-01    5.1683E-01r03 2.1890e-01e
1072  * fa    * r05 5.1683e-01r05 2.1890e-01e
1073  * fric  + r04 0.0000e+00    2.0000e-02e
1074  * fric  + r06 0.0000e+00    2.0000e-02e
1075  * fric  * r09 0.0000e+00    2.0000e-02e
1076  * grav  +    -3.3763e-01r03-1.0000e+00    0.0000e+00e
1077  * grav  +    -0.33759606r05-1.0000e+00    0.0000e+00e
1078  * grav  * r02-0.40463059r07-1.0000e+00    0.0000e+00e
1079  * hd    + r02 2.5400e-01r02 1.0160e-01    6.3500e-03e
1080  * hd    + r03 2.5400e-01r03 1.0160e-01    6.3500e-03e
1081  * hd    * r04 2.5400e-01r05 1.0160e-01    6.3500e-03e
1082  * icflg * f            0e
1083  * nff   + r02          1           -1r02          1e
1084  * nff   + r04          1           -1r02          1e
1085  * nff   * r05          1           -1r04          1e
1086  * alp   +     1.0000e+00r03 0.0000e+00e
1087  * alp   +     1.0000e+00r05 0.0000e+00e
1088  * alp   * r02 1.0000e+00r07 0.0000e+00e
1089  * vl    * f   0.0000e+00e
1090  * vv    * f   0.0000e+00e
1091  * tl    +     5.4157e+02r03 5.2500e+02e
1092  * tl    +     5.4157e+02r05 5.2500e+02e
1093  * tl    * r02 5.4157e+02r07 5.2500e+02e
1094  * tv    * f   5.4157e+02e
1095  * p     * f   5.3700e+06e
1096  * pa    * f   0.0000e+00e
1097  *
1098  * dx    *     2.0000e+00e
1099  * vol   *     1.6215e-02e
```

```
1100  * fa    * f   8.1073e-03e
1101  * fric  *     1.0000e-04    0.0000e+00e
1102  * grav  * f   0.0000e+00e
1103  * hd    * f   1.0160e-01e
1104  * icflg * f           0e
1105  * nff   * f           1e
1106  * alp   *     0.0000e+00e
1107  * vl    * f   0.0000e+00e
1108  * vv    * f   0.0000e+00e
1109  * tl    *     5.0000e+02e
1110  * tv    *     5.0000e+02e
1111  * p     *     5.3700e+06e
1112  * pa    *     0.0000e+00e
1113  *
1114  *******   type          num           id        ctitle
1115  tee                       3            3  $3$ pump suction
1116  *         jcell         nodes         ichf         cost         epsw
1117                5             4            1   0.0000e+00   1.0000e-05
1118  *       iconc1        ncell1         jun1         jun2         ipow1
1119                0             9            4            5             0
1120  *       iqptr1        iqpsv1       nqptb1       nqpsv1       nqprf1
1121                0             0            0            0             0
1122  *        radin1           th1       houtl1       houtv1       toutl1
1123     1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1124  *        toutv1
1125     3.0537e+02
1126  *         qpin1        qpoff1       rqpmx1        qpscl1
1127     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1128  *       iconc2        ncell2         jun3         ipow2
1129                0             1           73             0
1130  *       iqptr2        iqpsv2       nqptb2       nqpsv2       nqprf2
1131                0             0            0            0             0
1132  *        radin2           th2       houtl2       houtv2       toutl2
1133     1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1134  *        toutv2
1135     3.0537e+02
1136  *         qpin2        qpoff2       rqpmx2        qpscl2
1137     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1138  *
1139  * dx    +     3.0480e-01    3.3020e-01    5.5880e-01    6.8580e-01    5.5880e-01
1140  * dx    *     3.0480e-01    3.3020e-01    5.5880e-01    2.0081E-01    2.8417E-01
1141  * dx    *     2.0081E-01    5.5880e-01s
1142  * dx    *     3.3020e-01    3.0480e-01e
1143  * vol   +     1.1044e-02    1.6424e-02    3.5396e-02    4.3497e-02    3.5396e-02
1144  * vol   *     1.1044e-02    1.6424e-02    3.5396e-02    1.2737E-02    1.8024E-02
1145  * vol   *     1.2737E-02    3.5396e-02s
1146  * vol   *     1.6424e-02    1.1044e-02e
1147  * fa    + r02 3.6613e-02r04 6.3425e-02r02 3.6613e-02e
1148  * fa    * r02 3.6613e-02r02 6.3425e-02    6.3425E-02    6.3425E-02r02 6.3425E-02
1149  * fa    * r02 3.6613e-02e
1150  * fric  +     2.8678e-02    3.6439e-02    2.1983e-03    1.1068e-01    1.1068e-01
1151  * fric  *     2.8678e-02    3.6439e-02    2.1983e-03    1.8135E-01          0.0
1152  * fric  *           0.0     1.8135E-01s
1153  * fric  *     2.1983e-03    3.6439e-02    2.8678e-02e
1154  * grav  +    -6.2659e-01r02-1.0000e+00r02 0.0000e+00r02 1.0000e+00    6.2659e-01
1155  * grav  *    -6.2659e-01r02-1.0000e+00r04 0.0000e+00r02 1.0000e+00    6.2659e-01
1156  * grav  * e
1157  * hd    + r02 2.1591e-01r04 2.8417e-01r02 2.1591e-01e
1158  * hd    * r02 2.1591e-01r06 2.8417e-01r02 2.1591e-01e
1159  * icflg * f           0e
1160  * nff   * f           1e
1161  * alp   * f   0.0000e+00e
1162  * vl    * f   0.0000e+00e
1163  * vv    * f   0.0000e+00e
1164  * tl    * f   5.5280e+02e
1165  * tv    * f   5.5280e+02e
1166  * p     * f   1.4780e+07e
1167  * pa    * f   0.0000e+00e
1168  * qppp  * f   0.0000e+00e
1169  * matid * f           7e
1170  * tw    * f   5.5280e+02e
1171  *
1172  * dx    *     7.3120e-01e
1173  * vol   *     4.6268e-02e
1174  * fa    * f   6.3425e-02e
1175  * fric  *     1.6244e-01    0.0000e+00e
1176  * grav  * f   0.0000e+00e
1177  * hd    * f   2.8417e-01e
1178  * icflg * f           0e
1179  * nff   * f           1e
1180  * alp   *     0.0000e+00e
1181  * vl    * f   0.0000e+00e
1182  * vv    * f   0.0000e+00e
1183  * tl    *     5.5280e+02e
1184  * tv    *     5.5280e+02e
1185  * p     *     1.4780e+07e
1186  * pa    *     0.0000e+00e
1187  * qppp  * f   0.0000e+00e
1188  * matid * f           7e
1189  * tw    * f   5.5280e+02e
1190  *
1191  *******   type          num           id        ctitle
```

```
1192  pump                      4           4  $4$ pump 2
1193  *       ncells        nodes        junl        jun2        epsw
1194                2            4           4           6   1.0000e-05
1195  *         ichf        iconc       ipmpty         irp         ipm
1196                1            0           1           1           1
1197  *       ipmptr       ipmpsv       npmptb      npmpsv      npmprf
1198                10           1          -10           0           0
1199  *       iqp3tr       iqp3sv       nqp3tb      nqp3sv      nqp3rf
1200                0            0           0           0           0
1201  *        radin           th        houtl       houtv       toutl
1202     1.0795e-01   2.8580e-02   0.0000e+00   1.2270e+01   3.0537e+02
1203  *        toutv        effmi
1204     3.0537e+02   3.1744e+02
1205  *         tfr0         tfr1         tfr2         tfr3         tfrb
1206     3.6813e+00   0.0000e+00   2.3119e+02   0.0000e+00   0.0000e+00
1207  *        tfrl0        tfrl1        tfrl2        tfrl3
1208     3.6813e+00   0.0000e+00   2.3119e+02   0.0000e+00
1209  *         rhead        rtork        rflow        rrho       romega
1210     9.4154e+02   5.0000e+02   3.1500e-01   6.1400e+02   3.6966e+02
1211  *        omegan       omgoff       romgmx       omgscl       npmpsd
1212     3.6966e+02  -1.0000e+00   1.0000e+20   3.6966e+02            0
1213  *         qp3in        qp3off       rqp3mx       qp3scl
1214     0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
1215  *        option
1216                2
1217  *
1218  * dx     * f    1.3521e+00e
1219  * vol    * f    4.9555e-02e
1220  * fa     * f    3.6613e-02e
1221  * fric   *      2.8678e-02r02 0.0000e+00e
1222  * grav   *      6.2659e-01r02 0.0000e+00e
1223  * hd     * f    2.1591e-01e
1224  * icflg  * f             0e
1225  * nff    * f             1e
1226  * alp    * f    0.0000e+00e
1227  * ml     *      0.0000e+00    2.4000e+02    0.0000e+00e
1228  * mv     * f    0.0000e+00e
1229  * tl     * f    5.5280e+02e
1230  * tv     * f    5.5280e+02e
1231  * p      * f    1.4780e+07e
1232  * pa     * f    0.0000e+00e
1233  * qppp   * f    0.0000e+00e
1234  * matid  * f             7e
1235  * tw     * f    5.5280e+02e
1236  *
1237  * pmptb  *      0.0000e+00    1.0000e+00    5.0000e+00    6.4516e-01    1.0000e+01
1238  * pmptb  *      4.3548e-01    1.8000e+01    2.2581e-01    2.0000e+01    1.2903e-01
1239  * pmptb  *      2.5000e+01    6.4516e-02    3.0000e+01    4.4355e-02    4.0000e+01
1240  * pmptb  *      2.4806e-02    4.4000e+01    1.9355e-02    4.6500e+01    0.0000e+00
1241  * pmptb  * e
1242  *
1243  *******   type          num          id       ctitle
1244  pump                      5           5  $5$ pump 1
1245  *       ncells        nodes        junl        jun2        epsw
1246                2            4           5           7   1.0000e-05
1247  *         ichf        iconc       ipmpty         irp         ipm
1248                1            0           1           1           1
1249  *       ipmptr       ipmpsv       npmptb      npmpsv      npmprf
1250                10           1          -10           0           0
1251  *       iqp3tr       iqp3sv       nqp3tb      nqp3sv      nqp3rf
1252                0            0           0           0           0
1253  *        radin           th        houtl       houtv       toutl
1254     1.0795e-01   2.8580e-02   0.0000e+00   1.2270e+01   3.0537e+02
1255  *        toutv        effmi
1256     3.0537e+02   3.1744e+02
1257  *         tfr0         tfr1         tfr2         tfr3         tfrb
1258     3.6813e+00   0.0000e+00   2.3119e+02   0.0000e+00   0.0000e+00
1259  *        tfrl0        tfrl1        tfrl2        tfrl3
1260     3.6813e+00   0.0000e+00   2.3119e+02   0.0000e+00
1261  *         rhead        rtork        rflow        rrho       romega
1262     9.4154e+02   5.0000e+02   3.1500e-01   6.1400e+02   3.6966e+02
1263  *        omegan       omgoff       romgmx       omgscl       npmpsd
1264     3.6966e+02  -1.0000e+00   1.0000e+20   3.6966e+02            0
1265  *         qp3in        qp3off       rqp3mx       qp3scl
1266     0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
1267  *        option
1268                2
1269  *
1270  * dx     * f    1.3521e+00e
1271  * vol    * f    4.9555e-02e
1272  * fa     * f    3.6613e-02e
1273  * fric   *      2.8678e-02r02 0.0000e+00e
1274  * grav   *      6.2659e-01r02 0.0000e+00e
1275  * hd     * f    2.1591e-01e
1276  * icflg  * f             0e
1277  * nff    * f             1e
1278  * alp    * f    0.0000e+00e
1279  * ml     *      0.0000e+00    2.5000e+02    0.0000e+00e
1280  * mv     * f    0.0000e+00e
1281  * tl     * f    5.5280e+02e
1282  * tv     * f    5.5280e+02e
1283  * p      * f    1.4780e+07e
```

```
* pa    * f   0.0000e+00
* qppp  * f   0.0000e+00
* matid * f            7e
* tw    * f   5.5280e+02e
*
* pmptb *     0.0000e+00    1.0000e+00    5.0000e+00    6.4516e-01    1.0000e+01
* pmptb *     4.3548e-01    1.8000e+01    2.2581e-01    2.0000e+01    1.2903e-01
* pmptb *     2.5000e+01    6.4516e-02    3.0000e+01    4.4355e-02    4.0000e+01
* pmptb *     2.4806e-02    4.4000e+01    1.9355e-02    4.6500e+01    0.0000e+00
* pmptb * e
*
*******   type           num            id        ctitle
tee                        6             6  $6$ pump discharge
*         jcell          nodes         ichf          cost          epsw
                             4            4             1    0.0000e+00    1.0000e-05
*        iconc1         ncell1         jun1          jun2          ipow1
                             0            5             7            66              0
*        iqptr1         iqpsv1       nqptb1        nqpsv1        nqprf1
                             0            0             0             0              0
*        radin1           th1        houtl1        houtv1        toutl1
     1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
*        toutv1
     3.0537e+02
*         qpin1        qpoff1        rqpmx1        qpscl1
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        iconc2         ncell2         jun3          ipow2
                             0            1             6             0
*        iqptr2         iqpsv2       nqptb2        nqpsv2        nqprf2
                             0            0             0             0              0
*        radin2           th2        houtl2        houtv2        toutl2
     1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
*        toutv2
     3.0537e+02
*         qpin2        qpoff2        rqpmx2        qpscl2
     0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    +     1.3081e+00    3.3020e-01    8.1280e-01e
* dx    *     1.3081e+00    3.3020e-01    2.7093E-01    2.7093E-01    2.7093E-01
* dx    * e
* vol   +     4.7856e-02    1.6424e-02    5.1552e-02e
* vol   *     4.7856e-02    1.6424e-02    1.7184E-02    1.7184E-02    1.7184E-02
* vol   * e
* fa    + r02 3.6613e-02r02 6.3425e-02e
* fa    * r02 3.6613e-02    6.3425e-02    6.3425E-02    6.3425E-02    6.3425E-02
* fa    * e
* fric  +     0.0000e+00    2.3841e-02    6.7127e-02    5.2244e-02e
* fric  *     0.0000e+00    2.3841e-02    1.2764E-01           0.0           0.0
* fric  *     1.5673E-01e
* grav  * f   0.0000e+00e
* hd    + r02 2.1591e-01r02 2.8417e-01e
* hd    * r02 2.1591e-01r04 2.8417e-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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.5280e+02e
*
* dx    *     3.9370e-01e
* vol   *     1.4442e-02e
* fa    * f   3.6613e-02e
* fric  *     3.5099e-01    0.0000e+00e
* grav  * f   0.0000e+00e
* hd    * f   2.1591e-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     *     1.4780e+07e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.5280e+02e
*
*******   type           num            id        ctitle
tee                        7             7  $7$ intact-loop cold leg
*         jcell          nodes         ichf          cost          epsw
                             2            4             1    0.0000e+00    1.0000e-05
*        iconc1         ncell1         jun1          jun2          ipow1
                             0            4             8            29              0
*        iqptr1         iqpsv1       nqptb1        nqpsv1        nqprf1
                             0            0             0             0              0
*        radin1           th1        houtl1        houtv1        toutl1
```

```
     1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
*       toutv1
    3.0537e+02
*        qpin1         qpoff1         rqpmx1         qpscl1
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*        iconc2         ncell2          jun3          ipow2
             0              1            14              0
*        iqptr2         iqpsv2         nqptb2         nqpsv2         nqprf2
             0              0              0              0              0
*        radin2           th2         houtl2         houtv2         toutl2
    4.3663e-02    1.3487e-02    0.0000e+00    0.0000e+00    3.0537e+02
*       toutv2
    3.0537e+02
*        qpin2         qpoff2         rqpmx2         qpscl2
    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
*
* dx    +     7.0874e-01    1.3970e+00e
* dx    *     2.3625E-01    2.3625E-01    2.3625E-01    1.3970e+00e
* vol   +     4.4741e-02    8.8603e-02e
* vol   *     1.4914E-02    1.4914E-02    1.4914E-02    8.8603e-02e
* fa    + f   6.3425e-02e
* fa    *     6.3425E-02    6.3128E-02    6.3128E-02r02 6.3425e-02e
* fric  + r02 0.0000e+00    2.0000e-02e
* fric  * r04 0.0000e+00    1.8719E-02e
* grav  * f   0.0000e+00e
* hd    + f   2.8417e-01e
* hd    * r04 2.8417E-01    2.8418E-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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.5280e+02e
*
* dx    *     1.5000e+00e
* vol   *     8.9838e-03e
* fa    * f   5.9892e-03e
* fric  *     1.0000e-04    3.3380e-01e
* grav  *    -1.0000e+00    0.0000e+00e
* hd    * f   8.7325e-02e
* icflg * f            0e
* nff   * f            1e
* alp   *     0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    *     5.0000e+02e
* tv    *     5.0000e+02e
* p     *     1.4780e+07e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.0000e+02e
*
*******   type           num            id        ctitle
prizer                    8             8  $8$ pressurizer bottom
*        ncells         nodes          jun1          jun2
              1             4            64            10
*          ichf          iconc         qp3in
              1             0    0.0000e+00
*         radin            th         houtl         houtv         toutl
    4.2418e-01    7.4930e-02    0.0000e+00    2.7411e+00    3.0537e+02
*         toutv         qheat          pset         dpmax          zhtr
    3.0537e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* dx    *     2.0000e-01e
* vol   *     1.2770e-02e
* fa    *     5.6526e-01    5.7321e-03e
* fric  * f   0.0000e+00e
* grav  *    -1.0000e+00   -6.0410e-01e
* hd    *     8.4836e-01    8.5430e-02e
* icflg * f            0e
* nff   * f           -1e
* alp   *     0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    *     6.1411e+02e
* tv    *     6.1411e+02e
* p     *     1.4780e+07e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            9e
* tw    * f   6.1411e+02e
*
*******   type           num            id        ctitle
pipe                      9             9  $9$ prizer top and prizer spray
*        ncells         nodes          jun1          jun2          epsw
```

```
1468                1            4           60           68    1.0000e-05
1469  *          ichf        iconc         iacc         ipow
1470                1            0            0            1
1471  *        ipowtr       ipowsv       npowtb       npowsv       npowrf
1472                7            1            2            0            0
1473  *        iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
1474                0            0            0            0            0
1475  *        radin2          th2       houtl2       houtv2       toutl2
1476     2.3300e-02   8.7970e-03   0.0000e+00   1.2270e+01   3.0537e+02
1477  *        toutv2       pwin2       pwoff2       rpwmx2       pwscl2
1478     3.0537e+02   0.0000e+00   0.0000e+00   1.0000e+20   5.0000e+03
1479  *         qpin2        qpoff2       rqpmx2       qpscl2
1480     0.0000e+00   0.0000e+00   0.0000e+00   1.0000e+00
1481  *
1482  * dx    *     4.6022e-02e
1483  * vol   *     6.6699e-05e
1484  * fa    *     1.4493e-04    1.4493e-03e
1485  * fric  * f   0.0000e+00e
1486  * grav  * f  -1.0000e+00e
1487  * hd    * f   4.2957e-02e
1488  * icflg * f            0e
1489  * nff   *             -1            1e
1490  * alp   *     0.0000e+00e
1491  * vl    * f   0.0000e+00e
1492  * vv    * f   0.0000e+00e
1493  * tl    *     4.5000e+02e
1494  * tv    *     4.5000e+02e
1495  * p     *     1.4780e+07e
1496  * pa    *     0.0000e+00e
1497  * qppp  * f   0.0000e+00e
1498  * matid * f            6e
1499  * tw    * f   4.5000e+02e
1500  *
1501  * powtb2* r02 0.0000e+00    2.0000e+01    1.0000e+00e
1502  *
1503  *******   type          num           id        ctitle
1504  valve                    10           10  $10$ prizer spray control valve
1505  *        ncells        nodes         jun1         jun2         epsw
1506                3            4           67           68    1.0000e-05
1507  *          ichf        iconc         ivty         ivps        nvtb2
1508                1            0            3            2            0
1509  *          ivtr         ivsv       nvtb1         nvsv         nvrf
1510                12           1           -2            0            0
1511  *        iqp3tr       iqp3sv       nqp3tb       nqp3sv       nqp3rf
1512                0            0            0            0            0
1513  *        ivtrov       ivtyov
1514                0            0
1515  *          rvmx         rvov       fminov       fmaxov
1516     1.0000e+20   0.0000e+00   0.0000e+00   1.0000e+00
1517  *         radin           th        houtl        houtv        toutl
1518     3.3000e-02   8.6970e-03   0.0000e+00   1.2270e+01   3.0537e+02
1519  *         toutv        avlve        hvlve        favlve        xpos
1520     3.0537e+02   1.4490e-03   4.2957e-02   6.8600e-03  -1.0000e+00
1521  *         qp3in        qp3off       rqp3mx       qp3scl
1522     0.0000e+00   0.0000e+00   1.0000e+20   1.0000e+00
1523  *
1524  * dx    + r02 5.6600e-01    7.0000e-01e
1525  * dx    * r02 0.70537663    7.0000e-01e
1526  * vol   + r02 8.2030e-04    1.0145e-03e
1527  * vol   * r02 1.0223e-03    1.0145e-03e
1528  * fa    * f   1.4493e-03e
1529  * fric  *     0.0000e+00    1.0500e+01r02 0.0000e+00e
1530  * grav  * f   1.0000e+00e
1531  * hd    * f   4.2957e-02e
1532  * icflg * f            0e
1533  * nff   * f            1e
1534  * alp   * f   0.0000e+00e
1535  * vl    * f   0.0000e+00e
1536  * vv    * f   0.0000e+00e
1537  * tl    * f   4.5000e+02e
1538  * tv    * f   4.5000e+02e
1539  * p     * f   1.4780e+07e
1540  * pa    * f   0.0000e+00e
1541  * qppp  * f   0.0000e+00e
1542  * matid * f            7e
1543  * tw    * f   4.5000e+02e
1544  *
1545  * vtb1  *     0.0000e+00    6.8600e-03    1.0000e-01    1.0000e+00e
1546  *
1547  *******   type          num           id        ctitle
1548  tee                      11           11  $11$ prizer spray source
1549  *         jcell        nodes         ichf         cost         epsw
1550                2            4            1   0.0000e+00    1.0000e-05
1551  *        iconc1       ncell1         jun1         jun2         ipow1
1552                0            3           66            8            0
1553  *        iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
1554                0            0            0            0            0
1555  *        radin1          th1       houtl1       houtv1       toutl1
1556     1.4209e-01   3.5710e-02   0.0000e+00   1.2270e+01   3.0537e+02
1557  *        toutv1
1558     3.0537e+02
1559  *         qpin1        qpoff1       rqpmx1       qpscl1
```

```
1560      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1561  *       iconc2        ncell2          jun3          ipow2
1562                0             1            67              0
1563  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
1564                0             0             0             0             0
1565  *       radin2           th2        houtl2        houtv2        toutl2
1566      2.3300e-02    8.6970e-03    0.0000e+00    1.2270e+01    3.0537e+02
1567  *       toutv2
1568      3.0537e+02
1569  *         qpin2         qpoff2         rqpmx2         qpscl2
1570      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1571  *
1572  * dx    +     1.1684e+00e
1573  * dx    *     3.8947E-01    3.8947E-01    3.8947E-01e
1574  * vol   +     7.4190e-02e
1575  * vol   *     2.4730E-02    2.4730E-02    2.4730E-02e
1576  * fa    + f   6.3425e-02e
1577  * fa    *     6.3425e-02    6.3497E-02    6.3497E-02    6.3425E-02e
1578  * fric  +     5.2244e-02    0.0000e+00e
1579  * fric  *     1.5673E-01           0.0           0.0    0.0000e+00e
1580  * grav  * f   0.0000e+00e
1581  * hd    * f   2.8417e-01e
1582  * icflg * f            0e
1583  * nff   * f            1e
1584  * alp   * f   0.0000e+00e
1585  * vl    * f   0.0000e+00e
1586  * vv    * f   0.0000e+00e
1587  * tl    * f   5.5280e+02e
1588  * tv    * f   5.5280e+02e
1589  * p     * f   1.4780e+07e
1590  * pa    * f   0.0000e+00e
1591  * qppp  * f   0.0000e+00e
1592  * matid * f            7e
1593  * tw    * f   5.5280e+02e
1594  *
1595  * dx    *     7.4602e-01e
1596  * vol   *     1.0812e-03e
1597  * fa    * f   1.4493e-03e
1598  * fric  *     1.0000e-04    0.0000e+00e
1599  * grav  * f   1.0000e+00e
1600  * hd    * f   4.2957e-02e
1601  * icflg * f            0e
1602  * nff   * f            1e
1603  * alp   * f   0.0000e+00e
1604  * vl    * f   0.0000e+00e
1605  * vv    * f   0.0000e+00e
1606  * tl    * f   4.5000e+02e
1607  * tv    * f   4.5000e+02e
1608  * p     * f   1.4780e+07e
1609  * pa    * f   0.0000e+00e
1610  * qppp  * f   0.0000e+00e
1611  * matid * f            7e
1612  * tw    * f   4.5000e+02e
1613  *
1614  *******   type          num           id       ctitle
1615  pipe                    12           12  $12$ pressurizer lower middle
1616  *       ncells         nodes         jun1          jun2          epsw
1617                1             4           61            64    1.0000e-05
1618  *         ichf         iconc         iacc          ipow
1619                1             0            0             1
1620  *       ipowtr        ipowsv        npowtb        npowsv        npowrf
1621               -24            21            8             0             0
1622  *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
1623                0             0             0             0             0
1624  *        radin            th         houtl         houtv         toutl
1625      4.2418e-01    7.4930e-02    0.0000e+00    2.7411e+00    3.0537e+02
1626  *        toutv         powin        powoff         rpowmx        powscl
1627      3.0537e+02    0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1628  *         qp3in        qp3off        rqp3mx         qp3scl
1629      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1630  *
1631  * dx    *     1.5000e-01e
1632  * vol   *     8.4789e-02e
1633  * fa    * f   5.6526e-01e
1634  * fric  * f   0.0000e+00e
1635  * grav  * f  -1.0000e+00e
1636  * hd    * f   8.4836e-01e
1637  * icflg * f            0e
1638  * nff   *              1           -1e
1639  * alp   *     0.0000e+00e
1640  * vl    * f   0.0000e+00e
1641  * vv    * f   0.0000e+00e
1642  * tl    *     6.1411e+02e
1643  * tv    *     6.1411e+02e
1644  * p     *     1.4780e+07e
1645  * pa    *     0.0000e+00e
1646  * qppp  * f   0.0000e+00e
1647  * matid * f            9e
1648  * tw    * f   6.1411e+02e
1649  *
1650  * powtb *    -1.2500e+00    3.9800e+02   -7.5000e-01    3.9800e+02   -5.0000e-01
1651  * powtb *     0.0000e+00    5.0000e-01    0.0000e+00    7.5000e-01    3.6000e+04
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* powtb *     1.2500e+00    3.6000e+04    1.7500e+00    4.8000e+04    2.2500e+00
* powtb *     4.8000e+04e
*
*******   type           num           id        ctitle
prizer                    13           13  $13$ pressurizer upper middle
*       ncells         nodes         jun1          jun2
              7             4           60            61
*         ichf         iconc        qp3in
              1             0    0.0000e+00
*        radin            th        houtl         houtv         toutl
    4.2418e-01    7.4930e-02    0.0000e+00    2.7411e+00    3.0537e+02
*        toutv         qheat         pset         dpmax         zhtr
    3.0537e+02    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* dx    *     1.3073e-01    4.0000e-01r05 2.0000e-01e
* vol   *     6.7133e-02    2.0259e-01r05 1.1305e-01e
* fa    *     1.4493e-04    5.0647e-01r06 5.6526e-01e
* fric  * f   0.0000e+00e
* grav  *     1.0000e+00r07-1.0000e+00e
* hd    *     4.2957e-02r07 8.4836e-01e
* icflg * f           0e
* nff   *            -1r07          1e
* alp   * r02 1.0000e+00    2.9032e-01r04 0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   6.1411e+02e
* tv    * f   6.1411e+02e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f           9e
* tw    * f   6.1411e+02e
*
*******   type           num           id        ctitle
fill                      17           17  $17$ hpis injection
*         jun1          ifty         ioff
             14             8            1
*         iftr          ifsv         nftb          nfsv          nfrf
             17             1          -12             0             0
*       twtold         rfmx        concin         felv
    0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
*         dxin         volin        alpin         vlin         tlin
    1.5000e+00    8.9838e-03    0.0000e+00    0.0000e+00    3.7500e+02
*          pin          pain        flowin         vvin         tvin
    1.4780e+07    0.0000e+00    0.0000e+00    0.0000e+00    3.7500e+02
*        vmscl         vvscl
    1.0000e+00    1.0000e+00
*
* vmtb  * r02 0.0000e+00    2.0000e-01    2.4375e-01    1.6000e+00    3.8875e+00
* vmtb  *     2.0600e+01    3.8937e+00    2.1600e+01    1.4750e+00    2.2600e+01
* vmtb  *     3.7500e-01    2.3600e+01    2.5000e-01    2.6600e+01    1.5937e-01
* vmtb  *     3.3600e+01    1.2500e-01    3.9600e+01    1.2500e-01    4.0100e+01
* vmtb  *     0.0000e+00    1.0000e+04    0.0000e+00e
*
*******   type           num           id        ctitle
valve                     23           23  $23$ steam line valve
*       ncells         nodes         jun1          jun2          epsw
              6             0           22            26    1.0000e-05
*         ichf         iconc        ivty          ivps         nvtb2
              1             0            3             6             0
*         ivtr          ivsv       nvtbl          nvsv          nvrf
              8           -13            0             0             0
*       ivtrov        ivtyov
              0             0
*         rvmx          rvov       fminov        fmaxov
    1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
*        radin            th        houtl         houtv         toutl
    1.2140e-01    1.5100e-02    0.0000e+00    0.0000e+00    3.0537e+02
*        toutv         avlve        hvlve         favlve         xpos
    3.0537e+02    3.7580e-02    2.1870e-01    5.8973e-01    6.3800e-01
*
* dx    * f   5.0119e+00e
* vol   * f   2.3220e-01e
* fa    * f   4.6329e-02e
* fric  *     2.4460e-01r04 0.0000e+00    6.4900e+00    0.0000e+00e
* grav  *     1.0000e+00r06 0.0000e+00e
* hd    * f   2.4290e-01e
* icflg * r05         0            1            0e
* nff   * r06         1           -1e
* alp   * f   1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   5.4157e+02e
* tv    * f   5.4157e+02e
* p     *     5.3700e+06    5.3628e+06    5.3556e+06    5.3483e+06    5.3411e+06
* p     *     2.1500e+06e
* pa    * f   0.0000e+00e
*
*******   type           num           id        ctitle
fill                      24           24  $24$ steam generator feedwater
*         jun1          ifty         ioff
             25             8            0
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1744  *         iftr          ifsv          nftb          nfsv          nfrf
1745                15          -10             0             0             0
1746  *        twtold         rfmx         concin         felv
1747      0.0000e+00    1.0000e+20    0.0000e+00    0.0000e+00
1748  *         dxin         volin         alpin         vlin          tlin
1749      2.0000e+00    1.6215e-02    0.0000e+00    0.0000e+00    4.7900e+02
1750  *          pin          pain         flowin         vvin          tvin
1751      5.3700e+06    0.0000e+00    2.0100e+01    0.0000e+00    4.7900e+02
1752  *
1753  *******    type           num           id         ctitle
1754  break                     25            25   $25$ stm gen sec brk
1755  *         jun1          ibty          isat          ioff
1756                26             0             3             0
1757  *         dxin         volin         alpin          tin           pin
1758      5.0119e+00    2.3220e+01    1.0000e+00    4.8800e+02    2.1500e+06
1759  *         pain         concin         rbmx         poff          belv
1760      0.0000e+00    0.0000e+00    0.0000e+00    2.1500e+06    0.0000e+00
1761  *
1762  *******    type           num           id         ctitle
1763  tee                       31            31   $31$ broken loop hot leg
1764  *         jcell         nodes         ichf          cost          epsw
1765                3             4             1    0.0000e+00    1.0000e-05
1766  *        iconc1        ncell1          jun1          jun2         ipow1
1767                0            20            45            32             0
1768  *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
1769                0             0             0             0             0
1770  *        radin1          th1         hout11         houtv1         tout11
1771      1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1772  *        toutv1
1773      3.0537e+02
1774  *         qpin1        qpoff1        rqpmx1        qpscl1
1775      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1776  *        iconc2        ncell2          jun3         ipow2
1777                0             3            43             0
1778  *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
1779                0             0             0             0             0
1780  *        radin2          th2         hout12         houtv2         tout12
1781      1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
1782  *        toutv2
1783      3.0537e+02
1784  *         qpin2        qpoff2        rqpmx2        qpscl2
1785      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1786  *
1787  * dx    +     9.2939e-01    5.5880e-01    1.3890e+00    2.9921e-01    8.5396e-01
1788  * dx    *     9.2939e-01    1.6825E-01    2.2230E-01    1.6825E-01    1.3890e+00
1789  * dx    *     2.9921e-01    8.5396e-01s
1790  * dx    *     1.6921e+00    1.0772e+00    2.6314e-01    1.0772e+00    1.6921e+00
1791  * dx    *     1.5080e+00    3.3020e-01    2.7940e-01    4.9530e-01    2.9921e-01
1792  * dx    *     8.3185e-01    2.9921e-01    5.0000e-01e
1793  * vol   +     5.8701e-02    3.5442e-02    5.0618e-02    2.4919e-03    3.8990e-02
1794  * vol   *     5.8701e-02    1.0671E-02    1.4099E-02    1.0671E-02    5.0618e-02
1795  * vol   *     2.4919e-03    3.8990e-02s
1796  * vol   *     1.7868e-01    1.1383e-01    2.7779e-02    1.1383e-01    1.7868e-01
1797  * vol   *     4.3550e-02    2.0105e-03    1.7726e-02    1.9441e-02    2.4919e-03
1798  * vol   *     6.9660e-03    2.4919e-03    2.4542e-03e
1799  * fa    + r03 6.3425e-02r02 8.3677e-03r06 1.0562e-01    8.3677e-03r02 6.3425e-02
1800  * fa    * r05 6.3425e-02r02 8.3677e-03r06 1.0562e-01    8.3677e-03r02 6.3425e-02
1801  * fa    * r04 8.3677e-03    2.0694e-02e
1802  * fric  +     7.0547e-02    5.1558e-02    5.9983e-02    3.7870e-02    3.7944e-02
1803  * fric  *     7.4149E-02    6.9903E-02          0.0           0.0    7.5026E-02
1804  * fric  *     3.7870e-02    3.7944e-02s
1805  * fric  *     6.1057e-02    1.9809e-01    0.0000e+00    1.7157e-02    0.0000e+00
1806  * fric  *     2.1500e-01    2.6383e-01    4.8453e-01    5.8143e-02    1.1840e-01
1807  * fric  *     0.0000e+00    2.5031e-02    6.2037e-03    5.0970e-01e
1808  * grav  + r04 0.0000e+00r03-1.0000e+00r02 0.0000e+00r04 1.0000e+00r02 0.0000e+00
1809  * grav  + r02-1.0000e+00r02 0.0000e+00e
1810  * grav  * r06 0.0000e+00    0.72818405r02+1.0000e+00r02 0.0000e+00r04-1.0000e+00
1811  * grav  * r02 0.0000e+00r02+1.0000e+00r02 0.0000e+00e
1812  * hd    + r03 2.8418e-01r02 1.0322e-01r06 3.6671e-01    1.0322e-01r02 2.8418e-01
1813  * hd    * r05 2.8418e-01r02 1.0322e-01r06 3.6671e-01    1.0322e-01r02 2.8418e-01
1814  * hd    * r04 1.0322e-01    2.5720e-01e
1815  * icflg * f           0e
1816  * nff   * f           1e
1817  * alp   * f   0.0000e+00e
1818  * vl    * f   0.0000e+00e
1819  * vv    * f   0.0000e+00e
1820  * tl    * f   5.6750e+02e
1821  * tv    * f   5.6750e+02e
1822  * p     * f   1.4780e+07e
1823  * pa    * f   0.0000e+00e
1824  * qppp  * f   0.0000e+00e
1825  * matid * f           7e
1826  * tw    * f   5.6750e+02e
1827  *
1828  * dx    *     1.3890e+00    8.1400e-01    5.1044e+00e
1829  * vol   *     5.4000e-02    3.1400e-02    1.9860e-01e
1830  * fa    * f   3.8800e-02e
1831  * fric  *     1.1160e-01r03 0.0000e+00e
1832  * grav  *     0.0000e+00    2.2420e-01    1.9120e-01    0.0000e+00e
1833  * hd    * r03 2.2230e-01    1.4100e-03e
1834  * icflg * f           0e
1835  * nff   * f           1e
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1836  * alp    * f    0.0000e+00
1837  * vl     * f    0.0000e+00
1838  * vv     * f    0.0000e+00
1839  * tl     * f    5.5280e+02
1840  * tv     * f    5.5280e+02
1841  * p      * f    1.4780e+07
1842  * pa     * f    0.0000e+00
1843  * qppp   * f    0.0000e+00
1844  * matid  * f             7e
1845  * tw     * f    5.5280e+02
1846  *
1847  *******    type           num            id        ctitle
1848  tee                        41            41   $41$ broken loop cold leg
1849  *         jcell         nodes          ichf          cost          epsw
1850                2             4             1    0.0000e+00    1.0000e-05
1851  *        iconc1        ncell1          jun1          jun2          ipow1
1852                0             2             1            44              0
1853  *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
1854                0             0             0             0             0
1855  *        radin1           th1        houtl1        houtv1        toutl1
1856      1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1857  *        toutv1
1858      3.0537e+02
1859  *          qpin1         qpoff1        rqpmx1        qpscl1
1860      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1861  *        iconc2        ncell2          jun3          ipow2
1862                0             2            43              0
1863  *        iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
1864                0             0             0             0             0
1865  *        radin2           th2        houtl2        houtv2        toutl2
1866      1.0795e-01    2.8580e-02    0.0000e+00    1.2270e+01    3.0537e+02
1867  *        toutv2
1868      3.0537e+02
1869  *          qpin2         qpoff2        rqpmx2        qpscl2
1870      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1871  *
1872  * dx     * f    1.1858e+00
1873  * vol    * f    7.5209e-02
1874  * fa     * f    6.3425e-02
1875  * fric   +      2.0000e-02    1.0990e-01    1.7900e-02e
1876  * fric   *      2.7309E-02    1.0990e-01    1.7900e-02e
1877  * grav   * f    0.0000e+00
1878  * hd     * f    2.8418e-01e
1879  * icflg  * f             0e
1880  * nff    * f             1e
1881  * alp    * f    0.0000e+00
1882  * vl     * f    0.0000e+00
1883  * vv     * f    0.0000e+00
1884  * tl     * f    5.5280e+02
1885  * tv     * f    5.5280e+02
1886  * p      * f    1.4780e+07
1887  * pa     * f    0.0000e+00
1888  * qppp   * f    0.0000e+00
1889  * matid  * f             7e
1890  * tw     * f    5.5280e+02
1891  *
1892  * dx     *      8.8500e-01    7.2834e+00e
1893  * vol    *      3.4338e-02    2.8260e-01e
1894  * fa     * f    3.8800e-02e
1895  * fric   *      1.0000e-04r02 0.0000e+00e
1896  * grav   +      0.0000e+00    1.9900e-01    0.0000e+00e
1897  * grav   *      0.0000e+00    0.19899989    0.0000e+00e
1898  * hd     * r02  2.2230e-01    1.4100e-03e
1899  * icflg  * f             0e
1900  * nff    * f             1e
1901  * alp    * f    0.0000e+00
1902  * vl     * f    0.0000e+00
1903  * vv     * f    0.0000e+00
1904  * tl     * f    5.5280e+02
1905  * tv     * f    5.5280e+02
1906  * p      * f    1.4780e+07
1907  * pa     * f    0.0000e+00
1908  * qppp   * f    0.0000e+00
1909  * matid  * f             7e
1910  * tw     * f    5.5280e+02
1911  *
1912  *******    type           num            id        ctitle
1913  tee                        73            73   $73$ recir line from blhl to ilps
1914  *         jcell         nodes          ichf          cost          epsw
1915                4             4             1    0.0000e+00    1.0000e-05
1916  *        iconc1        ncell1          jun1          jun2          ipow1
1917                0             6            73             3              0
1918  *        iqptr1        iqpsv1        nqptb1        nqpsv1        nqprf1
1919                0             0             0             0             0
1920  *        radin1           th1        houtl1        houtv1        toutl1
1921      1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1922  *        toutv1
1923      3.0537e+02
1924  *          qpin1         qpoff1        rqpmx1        qpscl1
1925      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1926  *        iconc2        ncell2          jun3          ipow2
1927                0             2            77              0
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1928  *       iqptr2        iqpsv2        nqptb2        nqpsv2        nqprf2
1929                0             0             0             0             0
1930  *       radin2           th2        houtl2        houtv2        toutl2
1931      2.3300e-02    8.6970e-03    0.0000e+00    0.0000e+00    3.0537e+02
1932  *       toutv2
1933      3.0537e+02
1934  *         qpin2        qpoff2        rqpmx2        qpscl2
1935      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
1936  *
1937  * dx    +     5.5880e-01    5.0800e-01    3.5560e-01    3.8100e-01e
1938  * dx    *     5.5880e-01    5.0800e-01    1.1853E-01    1.1853E-01    1.1853E-01
1939  * dx    *     3.8100e-01e
1940  * vol   +     3.5396e-02    3.2281e-02    2.6052e-02    3.1715e-02e
1941  * vol   *     3.5396e-02    3.2281e-02    8.6840E-03    8.6840E-03    8.6840E-03
1942  * vol   *     3.1715e-02e
1943  * fa    + r03 6.3425e-02    8.3195e-02    8.8959e-02e
1944  * fa    * r03 6.3425e-02    7.3262E-02    7.3262E-02    8.3195e-02    8.8959e-02
1945  * fa    * e
1946  * fric  +     0.0000e+00    6.4676e-02    0.0000e+00    8.4551e-04    1.5112e-01
1947  * fric  *     0.0000e+00    6.4676e-02    0.0000E+00           0.0           0.0
1948  * fric  *     1.2468E-03    1.5112e-01e
1949  * grav  +     0.0000e+00r03 1.0000e+00    6.1566e-01e
1950  * grav  *     0.0000e+00    0.98972962r04 1.0000e+00    6.1566e-01e
1951  * hd    + r03 2.8417e-01    3.2546e-01    3.3655e-01e
1952  * hd    * r04 2.8417e-01r02 3.2546e-01    3.3655e-01e
1953  * icflg * f             0e
1954  * nff   * f             1e
1955  * alp   * f   0.0000e+00e
1956  * vl    * f   0.0000e+00e
1957  * vv    * f   0.0000e+00e
1958  * tl    * f   5.5280e+02e
1959  * tv    * f   5.5280e+02e
1960  * p     * f   1.4780e+07e
1961  * pa    * f   0.0000e+00e
1962  * qppp  * f   0.0000e+00e
1963  * matid * f             7e
1964  * tw    * f   5.5280e+02e
1965  *
1966  * dx    * f   5.0000e+00e
1967  * vol   * f   7.2465e-03e
1968  * fa    * f   1.4493e-03e
1969  * fric  *     1.0000e-04r02 0.0000e+00e
1970  * grav  +     0.0000e+00    2.5395e-01    0.0000e+00e
1971  * grav  *     0.0000e+00    0.06427634    0.0000e+00e
1972  * hd    * f   4.2960e-02e
1973  * icflg * f             0e
1974  * nff   * f             1e
1975  * alp   * f   0.0000e+00e
1976  * vl    * f   0.0000e+00e
1977  * vv    * f   0.0000e+00e
1978  * tl    * f   5.6750e+02e
1979  * tv    * f   5.6750e+02e
1980  * p     * f   1.4780e+07e
1981  * pa    * f   0.0000e+00e
1982  * qppp  * f   0.0000e+00e
1983  * matid * f             7e
1984  * tw    * f   5.6750e+02e
1985  *
1986  *******   type          num           id        ctitle
1987  tee                     74           74  $74$ recir line from blcl to ilhl
1988  *         jcell        nodes         ichf         cost         epsw
1989                4            4            1    0.0000e+00    1.0000e-05
1990  *       iconc1       ncell1         jun1         jun2         ipow1
1991                0            7           74            2             0
1992  *       iqptr1       iqpsv1       nqptb1       nqpsv1       nqprf1
1993                0            0            0            0            0
1994  *       radin1          th1       houtl1       houtv1       toutl1
1995      1.4209e-01    3.5710e-02    0.0000e+00    1.2270e+01    3.0537e+02
1996  *       toutv1
1997      3.0537e+02
1998  *         qpin1        qpoff1        rqpmx1        qpscl1
1999      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2000  *       iconc2       ncell2         jun3         ipow2
2001                0            2           78            0
2002  *       iqptr2       iqpsv2       nqptb2       nqpsv2       nqprf2
2003                0            0            0            0            0
2004  *       radin2          th2       houtl2       houtv2       toutl2
2005      2.3300e-02    8.7970e-03    0.0000e+00    0.0000e+00    3.0537e+02
2006  *       toutv2
2007      3.0537e+02
2008  *         qpin2        qpoff2        rqpmx2        qpscl2
2009      0.0000e+00    0.0000e+00    1.0000e+20    1.0000e+00
2010  *
2011  * dx    +     1.0160e+00    5.5880e-01    1.7780e-01    3.5560e-01    5.3340e-01
2012  * dx    *     1.0160e+00    5.5880e-01    5.9267E-02    5.9267E-02    5.9267E-02
2013  * dx    *     3.5560e-01    5.3340e-01e
2014  * vol   +     4.9555e-02    3.5396e-02    1.1327e-02    2.6052e-02    4.3325e-02
2015  * vol   *     4.9555e-02    3.5396e-02    3.7757E-03    3.7757E-03    3.7757E-03
2016  * vol   *     2.6052e-02    4.3325e-02e
2017  * fa    + r05 6.3425e-02    8.8959e-02e
2018  * fa    * r03 6.3425e-02    6.3706E-02    6.3706E-02r02 6.3425E-02    8.8959e-02
2019  * fa    * e
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* fric  +     2.0282e-02    3.8262e-02    1.0416e-01    4.5334e-03    3.6089e-02
* fric  *     3.0891E-02    3.8262e-02    1.2414E-01           0.0           0.0
* fric  *     5.8287E-03    3.6089e-02s
* fric  *     2.0941e-01e
* grav  + r05 0.0000e+00    6.1566e-01e
* grav  * r07 0.0000e+00    6.1566e-01e
* hd    + r04 2.8417e-01    3.2546e-01    3.3655e-01e
* hd    * r06 2.8417e-01    3.2546e-01    3.3655e-01e
* icflg * f            0e
* nff   * f            1e
* alp   * f   0.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   5.6750e+02e
* tv    * f   5.6750e+02e
* p     * f   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.6750e+02e
*
* dx    *     4.4785e+00    5.0000e+00
* vol   *     6.4907e-03    7.2465e-03e
* fa    * f   1.4493e-03e
* fric  *     1.0000e-04r02 0.0000e+00
* grav  * f   0.0000e+00e
* hd    * f   4.2960e-02e
* 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   1.4780e+07e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid * f            7e
* tw    * f   5.5280e+02e
*
******* type          num           id        ctitle
pipe                   75           75  $75$ blcl outlet pipe
*       ncells        nodes         jun1          jun2          epsw
              1            0           44            42    1.0000e-05
*         ichf        iconc         iacc          ipow
              1            0            0             0
*        radin           th        houtl         houtv         toutl
    9.5880e-01   1.5992e-01   0.0000e+00    0.0000e+00    3.0537e+02
*        toutv
    3.0537e+02
*
* dx    *     5.0000e-01e
* vol   *     3.1714e-02e
* fa    *     6.3427e-02    1.2858e-05e
* fric  *     1.7900e-02    6.5246e-03e
* grav  * f   0.0000e+00e
* hd    *     2.8418e-01    4.0462e-03e
* 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     *     1.4780e+07e
* pa    *     0.0000e+00e
*
******* type          num           id        ctitle
valve                  77           77  $77$ recirc vlve (blhl to ilps)
*       ncells        nodes         jun1          jun2          epsw
              2            0           77            32    1.0000e-05
*         ichf        iconc         ivty          ivps         nvtb2
              1            0            3             2             0
*         ivtr         ivsv        nvtbl          nvsv         nvrf
              9            1           -2             0             0
*       ivtrov        ivtyov
              0            0
*         rvmx         rvov       fminov        fmaxov
    1.0000e+20   0.0000e+00   0.0000e+00    1.0000e+00
*        radin           th        houtl         houtv         toutl
    3.3000e-02   8.6970e-03   0.0000e+00    0.0000e+00    3.0537e+02
*        toutv         avlve         hvlve         favlve         xpos
    3.0537e+02   1.4490e-03   4.2957e-02    1.0000e+00    1.0000e+00
*
* dx    * f   5.0000e-01e
* vol   *     7.2465e-04    1.0347e-02e
* fa    * r02 1.4493e-03    2.0694e-02e
* fric  * r02 0.0000e+00    5.0970e-01e
* grav  * f   0.0000e+00e
* hd    * r02 4.2960e-02    2.5720e-01e
* icflg * f            0e
* nff   *              1           -1            1e
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2112  * alp    * f   0.0000e+00e
2113  * vl     * f   0.0000e+00e
2114  * vv     * f   0.0000e+00e
2115  * tl     * f   5.6750e+02e
2116  * tv     * f   5.6750e+02e
2117  * p      * f   1.4780e+07e
2118  * pa     * f   0.0000e+00e
2119  *
2120  * vtb1   *     0.0000e+00    1.0000e+00    5.0000e-01    0.0000e+00e
2121  *
2122  *******   type           num            id        ctitle
2123  valve                     78            78  $78$ recirc vlve (blcl to ilhl)
2124  *        ncells         nodes          jun1          jun2          epsw
2125                 2             0            78            42    1.0000e-05
2126  *          ichf          iconc          ivty          ivps          nvtb2
2127                 1             0             3             2             0
2128  *          ivtr           ivsv         nvtb1          nvsv          nvrf
2129                 9             1            -2             0             0
2130  *        ivtrov         ivtyov
2131                 0             0
2132  *          rvmx           rvov         fminov         fmaxov
2133     1.0000e+20    0.0000e+00    0.0000e+00    1.0000e+00
2134  *         radin             th         houtl          houtv         toutl
2135     3.3000e-02    8.6970e-03    0.0000e+00    0.0000e+00    3.0537e+02
2136  *         toutv          avlve          hvlve         favlve          xpos
2137     3.0537e+02    1.4490e-03    4.2957e-02    1.0000e+00    1.0000e+00
2138  *
2139  * dx     * f   5.0000e-01e
2140  * vol    *     7.2465e-04    2.6644e-04e
2141  * fa     * r02 1.4493e-03    1.2858e-05e
2142  * fric   * r02 0.0000e+00    6.5246e-03e
2143  * grav   * f   0.0000e+00e
2144  * hd     * r02 4.2960e-02    4.0462e-03e
2145  * icflg  * f             0e
2146  * nff    *               1            -1             1e
2147  * alp    * f   0.0000e+00e
2148  * vl     * f   0.0000e+00e
2149  * vv     * f   0.0000e+00e
2150  * tl     * f   5.5280e+02e
2151  * tv     * f   5.5280e+02e
2152  * p      * f   1.4780e+07e
2153  * pa     * f   0.0000e+00e
2154  *
2155  * vtb1   *     0.0000e+00    1.0000e+00    5.0000e-01    0.0000e+00e
2156  *
2157  *******   type           num            id        ctitle
2158  vessel                   600           600  $600$ (t=2,r=2,z=9) cell 3-d vessel
2159  *          nasx          nrsx          ntsx          ncsr         ivssbf
2160                 9             2             2             4             0
2161  *          idcu          idcl          idcr          icru          icrl
2162                 8             2             1             6             2
2163  *          icrr         ilcsp         iucsp          iuhp         iconc
2164                 1             0             0             0             0
2165  *         igeom         nvent         nvvtb
2166                 0             0             0
2167  *         shelv          epsw
2168     -4.9880e+00    1.0000e-05
2169  *
2170  * z      *     5.3200e-01    1.3790e+00    1.7600e+00    2.1920e+00    2.522e+00
2171  * z      *     3.0550e+00    4.8460e+00    5.1300e+00    5.9000e+00e
2172  * rad    *     3.2900e-01    4.7000e-01e
2173  * th     *     1.8000e+02    3.6000e+02e
2174  *
2175  *         lisrl         lisrc         lisrf         ljuns
2176                 8             1             3             9
2177                 8             2             3            45
2178                 8             3             3            29
2179                 8             4             3             1
2180  *
2181  * level   1
2182  *
2183  * cfzl-t* f   0.0000e+00e
2184  * cfzl-z* f   0.0000e+00e
2185  * cfzl-r* f   0.0000e+00e
2186  * cfzv-t* f   0.0000e+00e
2187  * cfzv-z* f   0.0000e+00e
2188  * cfzv-r* f   0.0000e+00e
2189  * vol    * f   1.0000e+00e
2190  * fa-t   * f   1.0000e+00e
2191  * fa-z   * f   1.0000e+00e
2192  * fa-r   * r02 1.0000e+00r02 0.0000e+00e
2193  * hd-t   * f   1.0000e-01e
2194  * hd-z   * f   1.0000e-01e
2195  * hd-r   * f   1.0000e-01e
2196  * alpn   * f   0.0000e+00e
2197  * vvn-t  * f   0.0000e+00e
2198  * vvn-z  * f   0.0000e+00e
2199  * vvn-r  * f   0.0000e+00e
2200  * vln-t  * f   0.0000e+00e
2201  * vln-z  * f   0.0000e+00e
2202  * vln-r  * f   0.0000e+00e
2203  * tvn    * f   5.5280e+02e
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2204  * tln    * f    5.5280e+02e
2205  * pn     * f    1.4780e+07e
2206  * pan    * f    0.0000e+00e
2207  *
2208  * level   2
2209  *
2210  * cfzl-t* f    0.0000e+00e
2211  * cfzl-z* r02 2.4437e-02r02 0.0000e+00e
2212  * cfzl-r* f    0.0000e+00e
2213  * cfzv-t* f    0.0000e+00e
2214  * cfzv-z* r02 2.4437e-02r02 0.0000e+00e
2215  * cfzv-r* f    0.0000e+00e
2216  * vol    * r02 9.4800e-01r02 5.3450e-01e
2217  * fa-t   * r02 8.3720e-01r02 4.4460e-01e
2218  * fa-z   * r02 4.8100e-01r02 3.7500e-01e
2219  * fa-r   * r02 2.3600e-01r02 0.0000e+00e
2220  * hd-t   * r02 1.2200e-02r02 1.0000e-01e
2221  * hd-z   * r02 1.2200e-02r02 1.0000e-01e
2222  * hd-r   * r02 1.2200e-02r02 1.0000e-01e
2223  * alpn   * f    0.0000e+00e
2224  * vvn-t  * f    0.0000e+00e
2225  * vvn-z  * f    0.0000e+00e
2226  * vvn-r  * f    0.0000e+00e
2227  * vln-t  * f    0.0000e+00e
2228  * vln-z  * f    0.0000e+00e
2229  * vln-r  * f    0.0000e+00e
2230  * tvn    * f    5.5280e+02e
2231  * tln    * f    5.5280e+02e
2232  * pn     * f    1.4780e+07e
2233  * pan    * f    0.0000e+00e
2234  *
2235  * level   3
2236  *
2237  * cfzl-t* f    0.0000e+00e
2238  * cfzl-z* f    0.0000e+00e
2239  * cfzl-r* f    0.0000e+00e
2240  * cfzv-t* f    0.0000e+00e
2241  * cfzv-z* f    0.0000e+00e
2242  * cfzv-r* f    0.0000e+00e
2243  * vol    * r02 5.5120e-01r02 3.7500e-01e
2244  * fa-t   * r02 2.5100e-01r02 3.6200e-01e
2245  * fa-z   * r02 4.8100e-01r02 3.7500e-01e
2246  * fa-r   * f    0.0000e+00e
2247  * hd-t   * r02 1.2200e-02r02 1.0000e-01e
2248  * hd-z   * r02 1.2200e-02r02 1.0000e-01e
2249  * hd-r   * r02 1.2200e-02r02 1.0000e-01e
2250  * alpn   * f    0.0000e+00e
2251  * vvn-t  * f    0.0000e+00e
2252  * vvn-z  * f    0.0000e+00e
2253  * vvn-r  * f    0.0000e+00e
2254  * vln-t  * f    0.0000e+00e
2255  * vln-z  * f    0.0000e+00e
2256  * vln-r  * f    0.0000e+00e
2257  * tvn    * r02 5.5460e+02r02 5.5280e+02e
2258  * tln    * r02 5.5460e+02r02 5.5280e+02e
2259  * pn     * f    1.4780e+07e
2260  * pan    * f    0.0000e+00e
2261  *
2262  * level   4
2263  *
2264  * cfzl-t* f    0.0000e+00e
2265  * cfzl-z* f    0.0000e+00e
2266  * cfzl-r* f    0.0000e+00e
2267  * cfzv-t* f    0.0000e+00e
2268  * cfzv-z* f    0.0000e+00e
2269  * cfzv-r* f    0.0000e+00e
2270  * vol    * r02 5.5120e-01r02 3.7500e-01e
2271  * fa-t   * r02 2.5100e-01r02 3.6200e-01e
2272  * fa-z   * r02 4.8100e-01r02 3.7500e-01e
2273  * fa-r   * f    0.0000e+00e
2274  * hd-t   * r02 1.2200e-02r02 1.0000e-01e
2275  * hd-z   * r02 1.2200e-02r02 1.0000e-01e
2276  * hd-r   * r02 1.2200e-02r02 1.0000e-01e
2277  * alpn   * f    0.0000e+00e
2278  * vvn-t  * f    0.0000e+00e
2279  * vvn-z  * f    0.0000e+00e
2280  * vvn-r  * f    0.0000e+00e
2281  * vln-t  * f    0.0000e+00e
2282  * vln-z  * f    0.0000e+00e
2283  * vln-r  * f    0.0000e+00e
2284  * tvn    * r02 5.5820e+02r02 5.5280e+02e
2285  * tln    * r02 5.5820e+02r02 5.5280e+02e
2286  * pn     * f    1.4780e+07e
2287  * pan    * f    0.0000e+00e
2288  *
2289  * level   5
2290  *
2291  * cfzl-t* f    0.0000e+00e
2292  * cfzl-z* f    0.0000e+00e
2293  * cfzl-r* f    0.0000e+00e
2294  * cfzv-t* f    0.0000e+00e
2295  * cfzv-z* f    0.0000e+00e
```

```
2296  * cfzv-r* f   0.0000e+00e
2297  * vol   * r02 5.5120e-01r02 3.7500e-01e
2298  * fa-t  * r02 2.5100e-01r02 3.6200e-01e
2299  * fa-z  * r02 4.8100e-01r02 3.7500e-01e
2300  * fa-r  * f   0.0000e+00e
2301  * hd-t  * r02 1.2200e-02r02 1.0000e-01e
2302  * hd-z  * r02 1.2200e-02r02 1.0000e-01e
2303  * hd-r  * r02 1.2200e-02r02 1.0000e-01e
2304  * alpn  * f   0.0000e+00e
2305  * vvn-t * f   0.0000e+00e
2306  * vvn-z * f   0.0000e+00e
2307  * vvn-r * f   0.0000e+00e
2308  * vln-t * f   0.0000e+00e
2309  * vln-z * f   0.0000e+00e
2310  * vln-r * f   0.0000e+00e
2311  * tvn   * r02 5.6210e+02r02 5.5280e+02e
2312  * tln   * r02 5.6210e+02r02 5.5280e+02e
2313  * pn    * f   1.4780e+07e
2314  * pan   * f   0.0000e+00e
2315  *
2316  * level   6
2317  *
2318  * cfzl-t* f   0.0000e+00e
2319  * cfzl-z* r02 1.0000e-02r02 0.0000e+00e
2320  * cfzl-r* f   0.0000e+00e
2321  * cfzv-t* f   0.0000e+00e
2322  * cfzv-z* r02 1.0000e-02r02 0.0000e+00e
2323  * cfzv-r* f   0.0000e+00e
2324  * vol   * r02 5.5120e-01r02 3.7500e-01e
2325  * fa-t  * r02 2.5100e-01r02 3.6200e-01e
2326  * fa-z  * r02 4.8100e-01r02 3.7500e-01e
2327  * fa-r  * f   0.0000e+00e
2328  * hd-t  * r02 1.2200e-02r02 1.0000e-01e
2329  * hd-z  * r02 1.2200e-02r02 1.0000e-01e
2330  * hd-r  * r02 1.2200e-02r02 1.0000e-01e
2331  * alpn  * f   0.0000e+00e
2332  * vvn-t * f   0.0000e+00e
2333  * vvn-z * f   0.0000e+00e
2334  * vvn-r * f   0.0000e+00e
2335  * vln-t * f   0.0000e+00e
2336  * vln-z * f   0.0000e+00e
2337  * vln-r * f   0.0000e+00e
2338  * tvn   * r02 5.6570e+02r02 5.5280e+02e
2339  * tln   * r02 5.6570e+02r02 5.5280e+02e
2340  * pn    * f   1.4780e+07e
2341  * pan   * f   0.0000e+00e
2342  *
2343  * level   7
2344  *
2345  * cfzl-t* f   0.0000e+00e
2346  * cfzl-z* r02 3.2000e-02r02 1.0000e-04e
2347  * cfzl-r* f   0.0000e+00e
2348  * cfzv-t* f   0.0000e+00e
2349  * cfzv-z* r02 3.2000e-02r02 1.0000e-04e
2350  * cfzv-r* f   0.0000e+00e
2351  * vol   * r02 9.8600e-01r02 4.1660e-01e
2352  * fa-t  * r02 3.6600e-01r02 3.6200e-01e
2353  * fa-z  * r02 3.6500e-01r02 3.7500e-01e
2354  * fa-r  * f   0.0000e+00e
2355  * hd-t  * r02 1.2200e-02r02 1.0000e-01e
2356  * hd-z  * r02 1.2200e-02r02 1.0000e-01e
2357  * hd-r  * r02 1.2200e-02r02 1.0000e-01e
2358  * alpn  * f   0.0000e+00e
2359  * vvn-t * f   0.0000e+00e
2360  * vvn-z * f   0.0000e+00e
2361  * vvn-r * f   0.0000e+00e
2362  * vln-t * f   0.0000e+00e
2363  * vln-z * f   0.0000e+00e
2364  * vln-r * f   0.0000e+00e
2365  * tvn   * r02 5.6750e+02r02 5.5280e+02e
2366  * tln   * r02 5.6750e+02r02 5.5280e+02e
2367  * pn    * f   1.4780e+07e
2368  * pan   * f   0.0000e+00e
2369  *
2370  * level   8
2371  *
2372  * cfzl-t* f   0.0000e+00e
2373  * cfzl-z* f   0.0000e+00e
2374  * cfzl-r* f   0.0000e+00e
2375  * cfzv-t* f   0.0000e+00e
2376  * cfzv-z* f   0.0000e+00e
2377  * cfzv-r* f   0.0000e+00e
2378  * vol   * r02 9.8600e-01r02 1.0000e+00e
2379  * fa-t  * r02 3.6600e-01r02 3.6200e-01e
2380  * fa-z  * r02 3.6500e-01r02 0.0000e+00e
2381  * fa-r  * f   0.0000e+00e
2382  * hd-t  * r02 1.2200e-02r02 1.0000e-01e
2383  * hd-z  * r02 1.2200e-02r02 1.0000e-01e
2384  * hd-r  * r02 1.2200e-02r02 1.0000e-01e
2385  * alpn  * f   0.0000e+00e
2386  * vvn-t * f   0.0000e+00e
2387  * 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   * r02 5.6750e+02r02 5.5280e+02e
* tln   * r02 5.6750e+02r02 5.5280e+02e
* pn    * f   1.4780e+07e
* pan   * f   0.0000e+00e
*
* level   9
*
* 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   * r02 9.8600e-01r02 0.0000e+00e
* fa-t  * r02 3.6600e-01r02 0.0000e+00e
* fa-z  * f   0.0000e+00e
* fa-r  * f   0.0000e+00e
* hd-t  * r02 1.2200e-02r02 1.0000e-01e
* hd-z  * r02 1.2200e-02r02 1.0000e-01e
* hd-r  * r02 1.2200e-02r02 1.0000e-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   5.6750e+02e
* tln   * f   5.6750e+02e
* pn    * f   1.4780e+07e
* pan   * f   0.0000e+00e
*
**********************************************************************
*                  steam generator heat structures                   *
**********************************************************************
*
*******   type           num            id        ctitle
rod                       801           801  $801$ stgen u-tube inlet side
*          ncrx          ncrz          ittc          iext          mld
                1             4             0             0            0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1             2             1             0            0
*         idbci         idbco          hdri          hdro
                2             2    1.0214e-02    1.2700e-02
*         nrods         nodes         irftr         nzmax        irftr2
                1             4             0             5            0
*      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              3.0          10.0         0.001           0.0       0.37061
* nhcomi* f           2e
* nhceli*            -2             2             3             4             5
* nhceli*             6e
* nhcomo* f          20e
* nhcelo*            -1             1             2             3             4
* nhcelo*             5e
* dz    * r03 5.6895e-01    5.6899e-01e
* grav  * f          1.0e
* idrod *            1e
* idrodo*            1e
* rdx   *          1845.e
* radrd *     5.1069e-03    5.5213e-03    5.9356e-03    6.3500e-03e
* matrd * f          12e
* nfax  * f           0e
* rftn  * f        556.0e
*
*******   type           num            id        ctitle
rod                       802           802  $802$ stgen u-tube outlet side
*          ncrx          ncrz          ittc          iext          mld
                1             4             0             0            0
*        nopowr         nridr         modez        liqlev        iaxcnd
                1             2             1             0            0
*         idbci         idbco          hdri          hdro
                2             2    1.0214e-02    1.2700e-02
*         nrods         nodes         irftr         nzmax        irftr2
                1             4             0             5            0
*      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              3.0          10.0         0.001           0.0       0.37061
* nhcomi* f           2e
* nhceli*             9            -9            -8            -7            -6
* nhceli*            -5e
* nhcomo* f          20e
* nhcelo*            -1             1             2             3             4
* nhcelo*             5e
* dz    * r03 5.6895e-01    5.6899e-01e
* grav  * f          1.0e
* idrod *            1e
* idrodo*            1e
* rdx   *          1845.e
* radrd *     5.1069e-03    5.5213e-03    5.9356e-03    6.3500e-03e
```

```
* matrd * f           12e
* nfax  * f            0e
* rftn  * f       556.0e
*
*******   type          num           id        ctitle
rod                      803          803  $803$ stgen lower downcomer wall
*          ncrx         ncrz         ittc         iext          mld
              1            4            0            0            0
*        nopowr         nridr        modez       liqlev       iaxcnd
              1            2            1            0            0
*         idbci         idbco         hdri         hdro
              2            2      1.28906   1.0160e-01
*         nrods         nodes        irftr        nzmax       irftr2
              1            4            0            5            0
*      dtxht(1)      dtxht(2)       dznht        hgapo        shelv
            3.0         10.0       0.001          0.0          0.0
* nhcomi* f           20e
* nhceli*             -1            1            2            3            4
* nhceli*              5e
* nhcomo* f           22e
* nhcelo*              9           -9           -8           -7           -6
* nhcelo*             -5e
* dz    * r04 5.6895e-01e
* grav  * f          1.0e
* idrod *             1e
* idrodo*             1e
* rdx   *           1.0e
* radrd *     6.4453e-01    6.4876e-01    6.5300e-01    6.5723e-01e
* matrd * f           6e
* nfax  * f           0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
rod                      804          804  $804$ stgen upper downcomer wall
*          ncrx         ncrz         ittc         iext          mld
              1            4            0            0            0
*        nopowr         nridr        modez       liqlev       iaxcnd
              1            2            1            0            0
*         idbci         idbco         hdri         hdro
              2            2       1.0691   2.5400e-01
*         nrods         nodes        irftr        nzmax       irftr2
              1            4            0            5            0
*      dtxht(1)      dtxht(2)       dznht        hgapo        shelv
            3.0         10.0       0.001          0.0      2.27580
* nhcomi* f           20e
* nhceli*             -5            5            6            7            8
* nhceli*              8e
* nhcomo* f           22e
* nhcelo*              5           -5           -4           -3           -2
* nhcelo*             -1e
* dz    * r03 2.4700E-01    3.7050E-01e
* grav  * f          1.0e
* idrod *             1e
* idrodo*             1e
* rdx   *           1.0e
* radrd *     5.7150e-01    5.7573e-01    5.7997e-01    5.8420e-01e
* matrd * f           6e
* nfax  * f           0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
rod                      805          805  $805$ stgen lower shell wall
*          ncrx         ncrz         ittc         iext          mld
              1            9            0            0            0
*        nopowr         nridr        modez       liqlev       iaxcnd
              1            1            1            0            0
*         idbci         idbco         hdri         hdro
              2            1   2.5400e-01       1.5304
*           tlo           tvo          hlo          hvo
         305.37       305.37          0.0       1.5801
*         nrods         nodes        irftr        nzmax       irftr2
              1            4            0           10            0
*      dtxht(1)      dtxht(2)       dznht        hgapo        shelv
            3.0         10.0       0.001          0.0          0.0
* nhcomi* f           22e
* nhceli*             -1            1            2            3            4
* nhceli*              5            6            7            8            9
* nhceli*              9e
* dz    * r02 3.7050E-01r03 2.4700E-01r03 5.6895E-01    5.6895e-01e
* grav  * f         -1.0e
* idrod *             1e
* rdx   *           1.0e
* radrd *     7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
* matrd * f           9e
* nfax  * f           0e
* rftn  * f       541.57e
*
*******   type          num           id        ctitle
rod                      806          806  $806$ stgen upper shell wall
*          ncrx         ncrz         ittc         iext          mld
              1            3            0            0            0
*        nopowr         nridr        modez       liqlev       iaxcnd
```

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2572                1             1             1             0             0
2573  *          idbci         idbco          hdri          hdro
2574                2             1    2.5400e-01        1.5304
2575  *           tlo           tvo           hlo           hvo
2576           305.37        305.37           0.0        1.5801
2577  *          nrods         nodes         irftr         nzmax        irftr2
2578                1             4             0             4             0
2579  *       dtxht(1)      dtxht(2)        dznht         hgapo         shelv
2580               3.0          10.0         0.001           0.0    3.7050E-01
2581  * nhcomi* f             21e
2582  * nhceli*               -2             2             3             4             4
2583  * nhceli* e
2584  * dz     * r02 3.7050E-01    1.1115e+00e
2585  * grav   * f           -1.0e
2586  * idrod  *              1e
2587  * rdx    *             1.0e
2588  * radrd  *     7.1120e-01    7.2919e-01    7.4718e-01    7.6518e-01e
2589  * matrd  * f             9e
2590  * nfax   * f             0e
2591  * rftn   * f          541.57e
2592  *
2593  *******   type           num           id        ctitle
2594  slab                     807          807  $807$ stgen primary plenum baffle
2595  *           ncrx          ncrz         ittc          iext          mld
2596                1             1             0             0             0
2597  *         nopowr         nridr        modez        liqlev        iaxcnd
2598                1             2             1             0             0
2599  *          idbci         idbco         hdri          hdro
2600                2             2    3.3655e-01    3.3655e-01
2601  *          width        ipatch
2602          1.99342             0
2603  *          nrods         nodes         irftr         nzmax        irftr2
2604                1             4             0             2             0
2605  *       dtxht(1)      dtxht(2)        dznht         hgapo         shelv
2606               3.0          10.0         0.001           0.0           0.0
2607  * nhcomi* f             2e
2608  * nhceli*              -1             1             2e
2609  * nhcomo* f             2e
2610  * nhcelo*              10           -10            -9e
2611  * dz     *     3.7061e-01e
2612  * grav   * f           1.0e
2613  * idrod  *              1e
2614  * idrodo*              1e
2615  * rdx    *             1.0e
2616  * radrd  *             1.0        1.0106        1.0212        1.0317e
2617  * matrd  * f             6e
2618  * nfax   * f             0e
2619  * rftn   *          567.50        562.60        557.70        552.80s
2620  * rftn   *          567.50        562.60        557.70        552.80e
2621  *
2622  *******   type           num           id        ctitle
2623  slab                     808          808  $808$ stgen inlet plenum wall
2624  *           ncrx          ncrz         ittc          iext          mld
2625                1             1             0             0             0
2626  *         nopowr         nridr        modez        liqlev        iaxcnd
2627                1             1             1             0             0
2628  *          idbci         idbco         hdri          hdro
2629                2             1    3.3655e-01           1.0
2630  *          width        ipatch
2631          3.74680             0
2632  *           tlo           tvo           hlo           hvo
2633           305.37        305.37           0.0        12.270
2634  *          nrods         nodes         irftr         nzmax        irftr2
2635                1             4             0             2             0
2636  *       dtxht(1)      dtxht(2)        dznht         hgapo         shelv
2637               3.0          10.0         0.001           0.0           0.0
2638  * nhcomi* f             2e
2639  * nhceli*              -1             1             2e
2640  * dz     *     3.7061e-01e
2641  * grav   * f           1.0e
2642  * idrod  *              1e
2643  * rdx    *             1.0e
2644  * radrd  *             1.0        1.0296        1.0593        1.0889e
2645  * matrd  * f             9e
2646  * nfax   * f             0e
2647  * rftn   * f          567.50e
2648  *
2649  *******   type           num           id        ctitle
2650  slab                     809          809  $809$ stgen outlet plenum wall
2651  *           ncrx          ncrz         ittc          iext          mld
2652                1             1             0             0             0
2653  *         nopowr         nridr        modez        liqlev        iaxcnd
2654                1             1             1             0             0
2655  *          idbci         idbco         hdri          hdro
2656                2             1    3.3655e-01           1.0
2657  *          width        ipatch
2658          3.74680             0
2659  *           tlo           tvo           hlo           hvo
2660           305.37        305.37           0.0        12.270
2661  *          nrods         nodes         irftr         nzmax        irftr2
2662                1             4             0             2             0
2663  *       dtxht(1)      dtxht(2)        dznht         hgapo         shelv
```

```
2664            3.0          10.0         0.001           0.0           0.0
2665  * nhcomi* f             2e
2666  * nhceli*              10           -10            -9e
2667  * dz    *     3.7061e-01e
2668  * grav  * f           1.0e
2669  * idrod *              1e
2670  * rdx   *             1.0e
2671  * radrd *             1.0         1.0296        1.0593        1.0889e
2672  * matrd * f             9e
2673  * nfax  * f             0e
2674  * rftn  * f        552.80e
2675  *
2676  *******   type            num            id        ctitle
2677  slab                      810           810  $810$ stgen inlet tubesheet
2678  *          ncrx           ncrz          ittc          iext           mld
2679                1              1             0             0             0
2680  *        nopowr          nridr         modez         liqlev        iaxcnd
2681                1              1             1             0             0
2682  *         idbci          idbco          hdri          hdro
2683                2              0    3.3655e-01           1.0
2684  *         width         ipatch
2685         16.91739              0
2686  *          nrods          nodes         irftr         nzmax        irftr2
2687                1              4             0             2             0
2688  *      dtxht(1)       dtxht(2)         dznht         hgapo         shelv
2689              3.0           10.0         0.001           0.0           0.0
2690  * nhcomi* f             2e
2691  * nhceli*              -1             1             2e
2692  * dz    *     3.7061e-01e
2693  * grav  * f           1.0e
2694  * idrod *              1e
2695  * rdx   *             1.0e
2696  * radrd *     5.1054e-03    7.1669e-03    9.2283e-03    1.12898e-02e
2697  * matrd * f             9e
2698  * nfax  * f             0e
2699  * rftn  * f        567.50e
2700  *
2701  *******   type            num            id        ctitle
2702  slab                      811           811  $811$ stgen outlet tubesheet
2703  *          ncrx           ncrz          ittc          iext           mld
2704                1              1             0             0             0
2705  *        nopowr          nridr         modez         liqlev        iaxcnd
2706                1              1             1             0             0
2707  *         idbci          idbco          hdri          hdro
2708                2              0    3.3655e-01           1.0
2709  *         width         ipatch
2710         16.91739              0
2711  *          nrods          nodes         irftr         nzmax        irftr2
2712                1              4             0             2             0
2713  *      dtxht(1)       dtxht(2)         dznht         hgapo         shelv
2714              3.0           10.0         0.001           0.0           0.0
2715  * nhcomi* f             2e
2716  * nhceli*              10           -10            -9e
2717  * dz    *     3.7061e-01e
2718  * grav  * f           1.0e
2719  * idrod *              1e
2720  * rdx   *             1.0e
2721  * radrd *     5.1054e-03    7.1669e-03    9.2283e-03    1.12898e-02e
2722  * matrd * f             9e
2723  * nfax  * f             0e
2724  * rftn  * f        552.80e
2725  *
2726  ************************************************************************
2727  *                          vessel heat structures                      *
2728  ************************************************************************
2729  *
2730  *******   type            num            id        ctitle
2731  rod                       901           901  $901$ fuel rods
2732  *          ncrx           ncrz
2733                2              4
2734  *        nopowr          nridr         modez         liqlev        iaxcnd
2735                0              1             0             0             1
2736  *         idbci          idbco
2737                0              2
2738  *          nrods          nodes         irftr         nzmax
2739                2             10             0             5
2740  *      dtxht(1)       dtxht(2)         dznht         hgapo         shelv
2741     0.0000e+00     0.0000e+00    0.0000e+00    1.0000e+03    1.3790e+00
2742  *        irpwty          ndgx          ndhx          nrts          nhist
2743               14             6            11             5             0
2744  *        irpwtr         irpwsv         nrpwtb        nrpwsv        nrpwrf
2745               23             1            -14             0             0
2746  *        izpwtr         izpwsv         nzpwtb        nzpwsv        nzpwrf
2747                0              1             1             0             0
2748  *         nmwrx          nfci          nfcil
2749                1              1             1
2750  *         nzpwz         nzpwi         nfbpwt
2751               21              1             0
2752  *         react          tneut         rpwoff        rrpwmx        rpwscl
2753     0.0000e+00     1.6250e-05   -1.0000e+20    1.0000e+20    1.0000e+00
2754  *        rpowri          zpwin         zpwoff        rzpwmx
2755     3.6900e+07     0.0000e+00    0.0000e+00    0.0000e+00
```

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*       extsou          pldr          pdrat         fucrac
   0.0000e+00    0.0000e+00    1.3341e+00    7.0000e-01
*  ircjtb(1,j)   ircjtb(2,j)   ircjtb(3,j)   ircjtb(4,j)        ibu(j)
             12             1             1             1             0
              1             7             1             5             0
              1             1             1             1             0
              1             1             1             1             0
*    ircjfm(1)     ircjfm(2)     ircjfm(3)     ircjfm(4)        isnotb
              1             1             0             0             0
*       powexp          bpp0          bpp1          bcr0          bcr1
   1.0000e+00    0.0000e+00    0.0000e+00    6.5169e-01    8.6900e+00
*
* nhcomo* f          600e
* nhcelo*              2             3             4             5             6
* nhcelo*             7e
* z      *    1.3790e+00    1.7600e+00    2.1920e+00    2.5220e+00s
* z      *    3.0550e+00e
* grav   * f  1.0000e+00e
* idrod  *             1            2e
* rdx    * f  6.5000e+02e
* radrd  *    0.0000e+00    7.7449e-04    1.5489e-03    2.3235e-03s
* radrd  *    3.0979e-03    3.8725e-03    4.6622e-03    4.7422e-03s
* radrd  *    5.0508e-03    5.3594e-03e
* matrd  * r06         1          3r02          2e
* nfax   * f           0e
* rftn   * r10 5.5370e+02r10 5.5640e+02r10 5.6015e+02r10 5.6390e+02s
* rftn   * r10 5.6660e+02e
* rftn   * r10 5.5370e+02r10 5.5640e+02r10 5.6015e+02r10 5.6390e+02s
* rftn   * r10 5.6660e+02e
* rdpwr  *    9.5500e-01    9.6000e-01    9.6500e-01    9.7500e-01s
* rdpwr  *    9.9000e-01    1.0160e+00    1.0600e+00r03 0.0000e+00e
* cpowr  * f  1.0000e+00e
* zpwzt  *    0.0000e+00    1.5200e-01    2.9200e-01    3.9400e-01    4.5600e-01
* zpwzt  *    5.0300e-01    5.4600e-01    6.4800e-01    7.4900e-01    8.4600e-01
* zpwzt  *    8.8600e-01    9.5300e-01    1.0540e+00    1.1810e+00    1.2570e+00
* zpwzt  *    1.2990e+00    1.3590e+00    1.5110e+00    1.6130e+00    1.6640e+00
* zpwzt  *    1.6760e+00e
* zpwtb  *    0.0000e+00s
* zpwtb  *    0.0000e+00    5.9620e-01    1.2174e+00    1.4140e+00    1.3583e+00
* zpwtb  *    1.4285e+00    1.5722e+00    1.5828e+00    1.5744e+00    1.4713e+00
* zpwtb  *    1.3611e+00    1.4416e+00    1.3075e+00    1.0698e+00    8.6200e-01
* zpwtb  *    7.1230e-01    6.2360e-01    2.8790e-01    1.5260e-01    1.0200e-01
* zpwtb  *    8.9400e-02e
* rpwtb  * r02 0.0000e+00    2.0000e-01   -5.1000e-04    3.0000e-01   -1.8100e-03
* rpwtb  *    5.0000e-01   -1.0160e-02    6.0000e-01   -2.0300e-02    7.0000e-01
* rpwtb  *   -3.5600e-02    8.0000e-01   -5.3000e-02    9.0000e-01   -8.9300e-02
* rpwtb  *    1.0000e+00   -1.4740e-01    1.1000e+00   -1.5820e-01    1.2000e+00
* rpwtb  *   -1.6550e-01    1.3000e+00   -1.6700e-01    1.4000e+00   -1.6770e-01
* rpwtb  *    1.5000e+00   -1.6840e-01e
* rctf   *    2.9300e+02    4.0000e+02    5.0000e+02    6.5000e+02    8.0000e+02
* rctf   *    1.0000e+03    1.2000e+03    1.4000e+03    1.6000e+03    1.8000e+03
* rctf   *    2.0000e+03    2.2000e+03r03 0.0000e+00   -6.2700e-05   -5.3700e-05
* rctf   *   -4.8000e-05   -4.2100e-05   -3.8000e-05   -3.4000e-05   -3.1000e-05
* rctf   *   -2.8700e-05   -2.6800e-05   -2.5300e-05   -2.4000e-05   -2.2900e-05
* rctf   * e
* rctc   *    0.0000e+00    2.9300e+02    3.9430e+02    4.7460e+02    5.3320e+02
* rctc   *    5.6090e+02    5.8870e+02    6.1650e+02    0.0000e+00   -6.0000e+02
* rctc   *    1.0000e+02    8.0000e+02    1.5000e+03    2.2000e+03   -7.2400e-05
* rctc   *   -2.0500e-04   -3.2300e-04   -5.0800e-04   -7.1900e-04   -1.0590e-03
* rctc   *   -1.6090e-03   -5.8000e-05   -1.6000e-04   -2.5400e-04   -4.2400e-04
* rctc   *   -6.0700e-04   -9.0100e-04   -1.3770e-03   -4.3600e-05   -1.1500e-04
* rctc   *   -1.8600e-04   -3.3900e-04   -4.9600e-04   -7.4200e-04   -1.1450e-03
* rctc   *   -2.9200e-05   -7.0200e-05   -1.2100e-04   -2.4900e-04   -3.8600e-04
* rctc   *   -5.9300e-04   -9.3600e-04   -1.6600e-05   -2.8800e-05   -5.4500e-05
* rctc   *   -1.6500e-04   -2.7600e-04   -4.4400e-04   -7.2200e-04e
* rcal   * f  0.0000e+00e
* rcbm   * f  0.0000e+00e
* beta   *    1.6900e-04    8.3200e-04    2.6400e-03    1.2200e-03    1.3800e-03
* beta   *    2.4700e-04e
* lamda  *    3.8700e+00    1.4000e+00    3.1100e-01    1.1500e-01    3.1700e-02
* lamda  *    1.2700e-02e
* cdgn   *    9.9163e+07    1.3495e+09    1.9276e+10    2.4089e+10    9.8847e+10
* cdgn   *    4.4156e+10e
* lamdh  *    1.7720e+00    5.7740e-01    6.7430e-02    6.2140e-03    4.7390e-04
* lamdh  *    4.8100e-05    5.3440e-06    5.7260e-07    1.0360e-07    2.9590e-08
* lamdh  *    7.5850e-10e
* edh    *    2.9900e-03    8.2500e-03    1.5500e-02    1.9350e-02    1.1650e-02
* edh    *    6.4500e-03    2.3100e-03    1.6400e-03    8.5000e-04    4.3000e-04
* edh    *    5.7000e-04e
* cdhn   *    6.2263e+04    5.2723e+05    8.4818e+06    1.1486e+08    9.0869e+08
* cdhn   *    4.0742e+09    2.5550e+09    1.9468e+09    1.0161e+09    5.1462e+08
* cdhn   *    6.8247e+08e
* fpuo2  * f  0.0000e+00e
* ftd    * f  9.3000e-01e
* gmix   *    9.8101e-01    0.0000e+00    1.0103e-02    1.7830e-03    0.0000e+00
* gmix   *    7.0991e-03    0.0000e+00s
* gmix   *    9.8101e-01    0.0000e+00    1.0103e-02    1.7830e-03    0.0000e+00
* gmix   *    7.0991e-03    0.0000e+00e
* gmles  * f  1.0000e+00e
* pgapt  * f  3.1300e+05e
* plvol  * f  0.0000e+00e
* pslen  * f  0.0000e+00e
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2848  * clenn * f   0.0000e+00e
2849  * burn  * f   0.0000e+00e
2850  * burn  * f   0.0000e+00e
2851  *
2852  *******   type           num            id        ctitle
2853  rod                      911           911  $911$ vessel-wall structure (lp-1)
2854  *          ncrx          ncrz
2855                2             1
2856  *        nopowr          nridr         modez        liqlev        iaxcnd
2857                1             1             0             0             0
2858  *         idbci          idbco
2859                0             2
2860  *         nrods          nodes         irftr         nzmax
2861                2             4             0             2
2862  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
2863       3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
2864  *
2865  * nhcomo* f          600e
2866  * nhcelo*              0             1             2e
2867  * z     *     0.0000e+00    5.3200e-01e
2868  * grav  *     1.0000e+00e
2869  * idrod *              3             4e
2870  * rdx   * f   2.3640e-01e
2871  * radrd *     4.6990e-01    6.9200e-01    7.2700e-01    7.3279e-01e
2872  * matrd * f            6e
2873  * nfax  *              0e
2874  * rftn  * f   5.5280e+02e
2875  * rftn  * f   5.5280e+02e
2876  *
2877  *******   type           num            id        ctitle
2878  rod                      912           912  $912$ vessel-wall structure (lp-2)
2879  *          ncrx          ncrz
2880                2             1
2881  *        nopowr          nridr         modez        liqlev        iaxcnd
2882                1             1             0             0             0
2883  *         idbci          idbco
2884                0             2
2885  *         nrods          nodes         irftr         nzmax
2886                2             4             0             2
2887  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
2888       3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    5.3200e-01
2889  *
2890  * nhcomo* f          600e
2891  * nhcelo*              1             2             3e
2892  * z     *     5.3200e-01    1.3790e+00e
2893  * grav  *     1.0000e+00e
2894  * idrod *              3             4e
2895  * rdx   * f   4.1520e-01e
2896  * radrd *     4.6990e-01    6.9200e-01    7.2700e-01    7.3279e-01e
2897  * matrd * f            6e
2898  * nfax  *              0e
2899  * rftn  * f   5.5280e+02e
2900  * rftn  * f   5.5280e+02e
2901  *
2902  *******   type           num            id        ctitle
2903  rod                      913           913  $913$ vessel-wall structure (dc-1)
2904  *          ncrx          ncrz
2905                2             4
2906  *        nopowr          nridr         modez        liqlev        iaxcnd
2907                1             1             0             0             0
2908  *         idbci          idbco
2909                0             2
2910  *         nrods          nodes         irftr         nzmax
2911                2             4             0             7
2912  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
2913       3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    1.3790e+00
2914  *
2915  * nhcomo* f          600e
2916  * nhcelo*              2             3             4             5s
2917  * nhcelo*              6            7e
2918  * z     *     1.3790e+00    1.7600e+00    2.1920e+00    2.5220e+00s
2919  * z     *     3.0550e+00e
2920  * grav  * f   1.0000e+00e
2921  * idrod *              3             4e
2922  * rdx   * f   6.3160e-01e
2923  * radrd *     4.6990e-01    6.9200e-01    7.2700e-01    7.3279e-01e
2924  * matrd * f            6e
2925  * nfax  * f            0e
2926  * rftn  * f   5.5280e+02e
2927  * rftn  * f   5.5280e+02e
2928  *
2929  *******   type           num            id        ctitle
2930  rod                      914           914  $914$ vessel-wall structure (dc-2)
2931  *          ncrx          ncrz
2932                2             1
2933  *        nopowr          nridr         modez        liqlev        iaxcnd
2934                1             1             0             0             0
2935  *         idbci          idbco
2936                0             2
2937  *         nrods          nodes         irftr         nzmax
2938                2             4             0             2
2939  *      dtxht(1)       dtxht(2)        dznht         hgapo         shelv
```

```
2940      3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    3.0550e+00
2941  *
2942  * nhcomo* f          600e
2943  * nhcelo*              6             7             8e
2944  * z     *     3.0550e+00    4.8460e+00
2945  * grav  *     1.0000e+00e
2946  * idrod *              3             4e
2947  * rdx   * f   5.9347e-01e
2948  * radrd *     4.6990e-01    6.9200e-01    7.2700e-01    7.3279e-01e
2949  * matrd * f            6e
2950  * nfax  *              0e
2951  * rftn  * f   5.5280e+02e
2952  * rftn  * f   5.5280e+02e
2953  *
2954  *******   type          num           id       ctitle
2955  rod                     915          915  $915$ vessel-wall structure (ia-1)
2956  *         ncrx          ncrz
2957                2             1
2958  *       nopowr         nridr        modez        liqlev        iaxcnd
2959                1             1            0             0             0
2960  *        idbci         idbco
2961                0             2
2962  *        nrods         nodes        irftr         nzmax
2963                2             4            0             2
2964  *     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
2965      3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    4.8460e+00
2966  *
2967  * nhcomo* f          600e
2968  * nhcelo*              7             8             9e
2969  * z     *     4.8460e+00    5.1300e+00e
2970  * grav  *     1.0000e+00e
2971  * idrod *              3             4e
2972  * rdx   * f   2.5236e+00e
2973  * radrd *     4.6990e-01    6.9200e-01    7.2700e-01    7.3279e-01e
2974  * matrd * f            6e
2975  * nfax  *              0e
2976  * rftn  * f   5.5280e+02e
2977  * rftn  * f   5.5280e+02e
2978  *
2979  *******   type          num           id       ctitle
2980  rod                     921          921  $921$ vessel-wall structure (bottom)
2981  *         ncrx          ncrz
2982                2             1
2983  *       nopowr         nridr        modez        liqlev        iaxcnd
2984                1             1            0             0             0
2985  *        idbci         idbco
2986                0             2
2987  *        nrods         nodes        irftr         nzmax
2988                2             4            0             2
2989  *     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
2990      3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    0.0000e+00
2991  *
2992  * nhcomo* f          600e
2993  * nhcelo*              0             1             2e
2994  * z     *     0.0000e+00    5.3200e-01e
2995  * grav  *     1.0000e+00e
2996  * idrod *              1             2e
2997  * rdx   * f   5.7260e-02e
2998  * radrd *     7.3279e-01    8.5100e-01    8.8600e-01    8.9186e-01e
2999  * matrd * f            6e
3000  * nfax  *              0e
3001  * rftn  * f   5.5280e+02e
3002  * rftn  * f   5.5280e+02e
3003  *
3004  *******   type          num           id       ctitle
3005  rod                     922          922  $922$ core-support structure
3006  *         ncrx          ncrz
3007                2             1
3008  *       nopowr         nridr        modez        liqlev        iaxcnd
3009                1             1            0             0             0
3010  *        idbci         idbco
3011                0             2
3012  *        nrods         nodes        irftr         nzmax
3013                2             4            0             2
3014  *     dtxht(1)      dtxht(2)        dznht         hgapo         shelv
3015      3.0000e+00    1.0000e+01    5.0000e-03    0.0000e+00    5.3200e-01
3016  *
3017  * nhcomo* f          600e
3018  * nhcelo*              1             2             3e
3019  * z     *     5.3200e-01    1.3790e+00e
3020  * grav  *     1.0000e+00e
3021  * idrod *              1             2e
3022  * rdx   * f   1.3450e+00e
3023  * radrd *     3.8100e-01    4.0410e-01    4.1310e-01    4.1910e-01e
3024  * matrd * f            6e
3025  * nfax  *              0e
3026  * rftn  * f   5.5280e+02e
3027  * rftn  * f   5.5280e+02e
3028  *
3029  *******   type          num           id       ctitle
3030  rod                     923          923  $923$ upper-plenum structure (5&6)
3031  *         ncrx          ncrz
```

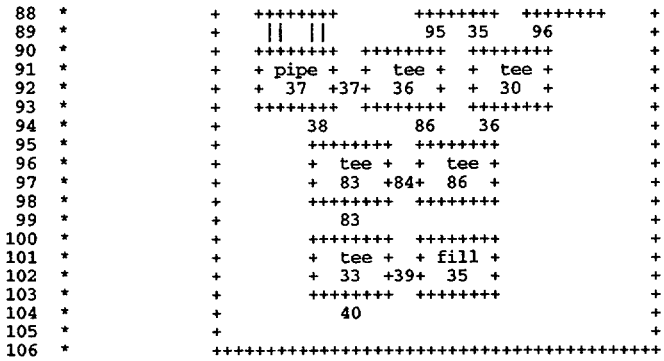
```
3032                2              1
3033  *       nopowr          nridr          modez          liqlev         iaxcnd
3034                1              1              0              0              0
3035  *        idbci          idbco
3036                0              2
3037  *        nrods          nodes          irftr          nzmax
3038                2              4              0              2
3039  *     dtxht(1)       dtxht(2)       dznht          hgapo          shelv
3040     3.0000e+00     1.0000e+01     5.0000e-03     0.0000e+00     3.0550e+00
3041  *
3042  * nhcomo* f           600e
3043  * nhcelo*                6              7              8e
3044  * z     *      3.0550e+00     4.8460e+00e
3045  * grav  *      1.0000e+00e
3046  * idrod *                1              2e
3047  * rdx   * f    3.2189e+00e
3048  * radrd *      3.3197e-01     3.6000e-01     3.7500e-01     3.8100e-01e
3049  * matrd * f              6e
3050  * nfax  *                0e
3051  * rftn  * f    5.6750e+02e
3052  * rftn  * f    5.6750e+02e
3053  *
3054  *******   type           num            id         ctitle
3055  rod                     924           924  $924$ upper-plenum structure (7)
3056  *          ncrx          ncrz
3057                2              1
3058  *       nopowr          nridr          modez          liqlev         iaxcnd
3059                1              1              0              0              0
3060  *        idbci          idbco
3061                0              2
3062  *        nrods          nodes          irftr          nzmax
3063                2              4              0              2
3064  *     dtxht(1)       dtxht(2)       dznht          hgapo          shelv
3065     3.0000e+00     1.0000e+01     5.0000e-03     0.0000e+00     4.8460e+00
3066  *
3067  * nhcomo* f           600e
3068  * nhcelo*                7              8              9e
3069  * z     *      4.8460e+00     5.1300e+00e
3070  * grav  *      1.0000e+00e
3071  * idrod *                1              2e
3072  * rdx   * f    5.7870e+00e
3073  * radrd *      3.3197e-01     3.6000e-01     3.7500e-01     3.8100e-01e
3074  * matrd * f              6e
3075  * nfax  *                0e
3076  * rftn  * f    5.6750e+02e
3077  * rftn  * f    5.6750e+02e
3078  *
3079  *******   type           num            id         ctitle
3080  rod                     925           925  $925$ upper-plenum structure (8)
3081  *          ncrx          ncrz
3082                2              1
3083  *       nopowr          nridr          modez          liqlev         iaxcnd
3084                1              1              0              0              0
3085  *        idbci          idbco
3086                0              2
3087  *        nrods          nodes          irftr          nzmax
3088                2              4              0              2
3089  *     dtxht(1)       dtxht(2)       dznht          hgapo          shelv
3090     3.0000e+00     1.0000e+01     5.0000e-03     0.0000e+00     5.1300e+00
3091  *
3092  * nhcomo* f           600e
3093  * nhcelo*                8              9             10e
3094  * z     *      5.1300e+00     5.9000e+00e
3095  * grav  *      1.0000e+00e
3096  * idrod *                1              2e
3097  * rdx   * f    2.8230e+00e
3098  * radrd *      3.3197e-01     3.6000e-01     3.7500e-01     3.8100e-01e
3099  * matrd * f              6e
3100  * nfax  *                0e
3101  * rftn  * f    5.6750e+02e
3102  * rftn  * f    5.6750e+02e
3103  *
3104  end
3105  *
3106  ******************
3107  * time-step data *
3108  ******************
3109  *
3110  *          dtmin          dtmax          tend           rtwfp
3111       1.0000e-03     2.0000e-01     2.5000e+01     1.0000e+03
3112  *          edint          gfint          dmpint         sedint
3113       2.5000e+01     5.0000e-01     2.6000e+01     2.5000e+01
3114  *
3115  *          dtmin          dtmax          tend           rtwfp
3116       1.0000e-03     5.0000e-01     5.0000e+01     1.0000e+03
3117  *          edint          gfint          dmpint         sedint
3118       2.4500e+01     1.0000e+00     2.6000e+01     2.4500e+01
3119  *
3120  *          dtmin          dtmax          tend           rtwfp
3121       1.0000e-03     7.0000e-01     2.0000e+02     1.0000e+03
3122  *          edint          gfint          dmpint         sedint
3123       5.0000e+01     2.0000e+00     1.5100e+02     5.0000e+01
```

```
3124  *
3125  *       endflag
3126       -1.0000e+00
```

LOFT L6-1 TRANSIENT INPUT DECK FOR 3D VESSEL MODEL

```
free format
*       1         2         3         4         5         6         7         8
*2345678901234567890123456789012345678901234567890123456789012345678901234567890
*
*************
* main data *
*************
*
*       numtcr          ieos          inopt          nmat
            4             0              1             0
loft l6-1 with 3-d vessel
replaced 1-d vessel components with 3-d vessel  j steiner  Oct 1997
loft test l6-1, restart for the transient calculation with a 1-d vessel

* modified by Thad Knight, 3/10/96
* deck from /devass/mod2-5.3.05/loft-l6-1/1-dvess.t
*
*
*                                +++++++++  +++++++++
*                                + valve+   + pipe +
*                               67+  10  +68+    9  +
*                                +++++++++  +++++++++
*                                             60
* +++++++++                                  +++++++++
* + break+                                   +prizer+
* +  25  +                                   +  13  +
* +++++++++                                  +++++++++
*    26                                44        61
* +++++++++  +++++++++              +++++++++  +++++++++
* + valve+   + fill +               + pipe +   + pipe +
* +  23  +   +  24  +               +  75  +   +  12  +
* +++++++++  +++++++++              +++++++++  +++++++++
*    22         25                    42         64
* +++++++++  +++++++++              +++++++++  +++++++++
* +  tee +   +  tee +               + valve+   +prizer+
* +  21  +23+  22  + rods           +  78  +   +    8  +
* +++++++++  +++++++++ |901         +++++++++  +++++++++
*    21         24     |902            78         10
*            +++++++++ |+++++++++  +++++++++  +++++++++  +++++++++  +++++++++
*  stgen     + pipe +==+ pipe +    +  tee +   +  tee +   +vessel+   +  tee +
*   sec    21+  20  +==+    2   + 2+  74  +74+    1   + 9+region+45+  31  +32
*            +++++++++  +++++++++  +++++++++  +++++++++  +define+   +++++++++
*                         3                              + with +      36
*            +++++++++  +++++++++                        + a 1-d+   +++++++++
*            + valve+   +  tee +                         + model+   +  tee +
*          32+  77  +77+  73  +                          +       + 1+  41  +44
*            +++++++++  +++++++++                        +       +   +++++++++
*                         73                             +       +
*                       +++++++++                        +       +  (isolated)
*                       +  tee +                intact   +       +    broken
*                      5+   3  +                 loop    +       +     loop
*                       +++++++++                        +       +
*                  5              4                      +       +
*            +++++++++  +++++++++                        +       +
*            + pump +   + pump +                         +       +
*            +   5  +   +   4  +                         +       +
*            +++++++++  +++++++++                        +       +
*                7              6                       +       +
*                       +++++++++  +++++++++  +++++++++  +       +
*                       +  tee +   +  tee +   +  tee +   +       +
*                      7+   6  +66+  11  + 8+    7  +29+         +
*                       +++++++++  +++++++++  +++++++++  +       +
*                                     67         14      +       +
*                                                +++++++++       +
*                                                + fill +        +
*                                                +  17  +        +
*                                                +++++++++  +++++++++
*
* The vessel is modeled with 13 1-d hydro & 1 heat-structure components.
*
*             ++++++++++++++++++++++++++++++++++++++++++++
*             + vessel region defined with a 1-d model +
*             +                                        +
*             +                                   40   +
*             +                        +++++++++  +++++++++    +
*             +                        +  tee +   +  tee +    +
*           9+-----------------------+  43  +48+   34  +-----+45
*             +                        +++++++++  +++++++++    +
*             +                           47                   +
*             +                        +++++++++  +++++++++    +
*             +                        +  tee +   +  tee +    +
*           29+-----------------------+  40  +46+   29  +-----+ 1
*             +                        +++++++++  +++++++++    +
*             +                                   34           +
*             +   +++++++++            +++++++++  +++++++++    +
*             +   +  rod +             +  tee +   +  tee +    +
*             +   +  900 +             +  95  +97+   96  +    +
```




```
*
* Experiment 16-1 simulated a loss of steam load in the steam generators
* of a four-loop commercial PWR in the Loss-Of-Fluid Test (LOFT) facility.
* The steady-state initial conditions of the experiment were:
```

Primary Intact Loop:	hot-leg mass flow	478.5	+-6.3	kg/s
	hot-leg pressure	1.478e+07	+-1.1e+05	Pa
	hot-leg temperature	567.5	+-1.8	K
	cold-leg temperature	552.8	+-1.2	K
Steam Gen. Sec. Side:	steam & fw mass flow	20.1	+-0.6	kg/s
	steam-dome pressure	5.37e+05	+-6.0e+04	Pa
	liq/vap temperature	541.7	+-0.8	K
	dwncmr liquid level	3.183	+-0.034	m
Pressurizer:	pressure	1.487e+07	+-2.0e+05	Pa
	liq/vap temperature	614.3	+-0.8	K
	liquid level	1.18	+-0.07	m

```
* The experiment's transient was initiated by closing the main steam flow
* control valve (MSFCV); the actual start of closing was observed to
* occur at 2.0 s (rather than at 0.0 s) based on parameter measurements.
* The pressurizer cycling heater (on initially) was shut off at 6.1+-0.1 s
* as the pressurizer pressure increased.  The pressurizer sprayer was in-
* itiated at 9.1+-0.1 s to reduce primary-side (PS) pressure and remained
* on until 30.4+-0.1 s.  The PS pressure continued to rise and caused the
* reactor to scram at 21.8+-0.2 s.  Thereafter, the PS pressure reached a
* maximum value at 22.0+-0.2 s.  To reduce steam-generator (SG) secondary-
* side (SS) pressure, the MSFCV began opening at 22.2+-0.2 s and began
* closing at 31.4+-0.2 s.  The pressurizer cycling heater came on at
* 31.4+-0.1 s and the pressurizer backup heater came on at 32.5+-0.1 s
* to prevent the PS to pressure from falling further.  The MSFCV opened
* and closed automatically at 91.2+-0.2 s and 97.8+-0.2 s, respectively,
* based on pressure setpoints and was manually opened and closed at
* 312.6+-0.2 s and 326.0+-0.4 s, respectively, to control SGSS pressure.
* The pressurizer backup heater was shut off at 415.4+-0.1 s and the
* experiment was ended at 700.0+-10.0 s.
*
```

* Experiment Events	Experiment Time
* Main Steam Flow Control Valve (MSFCV) starts to close	2.0+-0.2 s
* Pressurizer cycling heater is set off	6.1+-0.1 s
* Pressurizer sprayer is set on	9.1+-0.1 s
* MSFCV reaches its closed position	11.6+-0.2 s
* Reactor core power is scrammed based on high pressure	21.8+-0.2 s
* Primary-side pressure reaches maximum	22.0+-0.2 s
* MSFCV starts to open based on high-pressure setpoint	22.2+-0.2 s
* Pressurizer level reaches maximum	26.5+-0.5 s
* Pressurizer sprayer is set off	30.4+-0.1 s
* MSFCV starts to close based on low-pressure setpoint	31.4+-0.2 s
* Pressurizer cycling heater is set on	31.4+-0.1 s
* Pressurizer backup heater is set on	32.5+-0.1 s
* MSFCV reaches its closed position	40.6+-0.2 s
* MSFCV starts to open based on high-pressure setpoint	91.2+-0.2 s
* MSFCV starts to close based on low-pressure setpoint	97.8+-0.2 s
* MSFCV reaches its closed position	104.4+-0.2 s
* MSFCV starts to open based on manual adjustment	312.6+-0.2 s
* MSFCV starts to close based on manual adjustment	326.0+-0.4 s
* MSFCV reaches its closed position	339.4+-0.4 s
* Pressurizer backup heater is set off	415.4+-0.1 s
* Experiment is ended	700.0+-10. s

```
*
*****************
* namelist data *
*****************
*
*     SI/English units flags:  0--SI units/1--English units
*     iogrf:  units flag for writing TRCGRF
*     ioinp:  units flag for reading TRACIN
*     iolab:  units flag for writing input to INLAB
*     ioout:  units flag for writing TRCOUT and TRCMSG
*
*     iunlab:  input user-defined units labels (0-no/>0-yes; default is 0)
*     iunout:  write units to file TRCOUT (0-no/1-yes; default is 1)
*
 $inopts dtstrt=0.01, iadded=10, icflow=2, nhtstr=22,
         iogrf=0, ioinp=0, iolab=1, ioout=0, iunlab=1, iunout=1 $
```

```
*
*        dstep          timet
              -1    0.0000e+00
*       stdyst         transi          ncomp           njun           ipak
               0              1             50             33              1
*         epso           epss
     1.0000e-04    1.0000e-04
*       oitmax         sitmax         isolut         ncontr         nccfl
              10             25              0              0              0
*         ntsv           ntcb           ntcf           ntrp           ntcp
              21             13             46             20              2
*
*************************
* component-number data *
*************************
*
* iorder*          1         2         3         4         5
* iorder*          6         7         8         9        10
* iorder*         11        12        13        17        20
* iorder*         21        22       23s
* iorder*         24        25       31s
* iorder*         41        73       74s
* iorder*         75        77        78      600s
* iorder*        801      802s
* iorder*        803       804       805       806       807
* iorder*        808       809       810       811       901
* iorder*        911       912       913       914       915
* iorder*        921       922       923       924       925
* iorder*          e
*
*************************
* control-parameter data *
*************************
*
* cp1sv *             1           16s
* cp1cb *            -1           -7s
* cp1tp *             1          -24s
* cp2sv *            17           21s
* cp2cb *            -8          -13s
* cp2tp *             1            0e
*
* signal variables
*
*         idsv           isvn           ilcn           icn1           icn2
               0              0              0              0              0
*
*
* user-defined units-name data
*
*      lulabel        lunitsi       luniteng        ufactor         ushift
      lumdot/m    lu(kg/s)/m  lu(lbm/s)/ft   0.671968931            0.0
*
**
* control blocks
*
*         idcb           icbn           icb1           icb2           icb3
               0              0              0              0              0
*
* trips
*
*         ntse           ntct           ntsf           ntdp           ntsd
               0              2              2              0              1
*
*         idtp           isrt           iset           itst           idsg
               0              0              0              0              0
*
*             trip 22 initiated time-step data
*          ndid           ntid
               1              1
*      itid(1)
              22
*
*         dtmin          dtmax         dtend          dtsof
     1.0000e-03    1.0000e+00    3.0000e+00    1.0000e+00
*         edint          gfint         dmpit         sedint
     4.0000e+00    5.0000e-01    4.0000e+00    4.0000e+00
*
*
******************
* component data *
******************
*
end
*
******************
* time-step data *
******************
*
*         dtmin          dtmax          tend          rtwfp
     1.0000e-03    2.0000e-01    4.0000e+01    1.0000e+00
*         edint          gfint         dmpint         sedint
     5.0000e+01    1.0000e+00    1.2500e+02    5.0000e+01
```

```
*
*          dtmin          dtmax          tend          rtwfp
     1.0000e-03     1.0000e+00     2.0000e+02     1.0000e+00
*          edint          gfint         dmpint         sedint
     5.0000e+01     1.0000e+00     1.2500e+02     5.0000e+01
*
*          dtmin          dtmax          tend          rtwfp
     1.0000e-03     1.0000e+00     7.0000e+02     1.0000e+00
*          edint          gfint         dmpint         sedint
     5.0000e+01     1.0000e+00     1.2500e+02     5.0000e+01
*
*       endflag
    -1.0000e+00
```

APPENDIX S

CCTF RUN 54 INPUT LISTING

The corrected CCTF-54 input model generally required one or more transient restarts after the first transient calculation to complete the calculation. A second transient restart input listing starts on p. S-45.

```
free format
*
*************
* main data *
*************
*
*     numtcr       ieos      inopt       nmat
        145          0         1          4
Corrected CCTF-54 Input Model   By J. F. Lime Oct 1999
Two corrections were made to the CCTF-54 input model:
(1) The azimuthal noding was corrected from 180/180 degrees to 90/270 degrees
to matched the intact loop noding. The three intact loops were modeled as one
combined intact loop. Therefore, the azimuthal noding of the vessel should
match how the intact loops were modeled.
(2) The axial power shape was corrected to model the 17-step axial-power profile
of the actual heater rod. The previous CCTF-54 model had a coarsely-noded
7-level axial-power shape.
*
cctf run54 developmental assessment calculation
trac-pf1 mod2 version 5.0
this model was developed by running the trac input deck from
/cctf/run54/tracin through gocvrt.  the following changes were
made to the original model.
a)  the junction flow areas were adjusted to take care of the following
    error messages:
 the junction flow area 1.6604e-01 of component   3 is greater than the vol/dx
 flow area 8.8885e-02 of the cell across the junction and 1.5532e-01 of cell  1

 the junction flow area 4.9812e-01 of component   8 is greater than the vol/dx
 flow area 4.6593e-01 of the cell across the junction and 2.6665e-01 of cell 12

 the azmuthal flow area 1.0797e-01 of vessel   1 interface (r= 3,t= 1,z= 1) is
 greater than the cell vol/rdt flow areas 8.3137e-02 and 8.3137e-02 on each side

 the azmuthal flow area 1.0797e-01 of vessel   1 interface (r= 3,t= 2,z= 1) is
 greater than the cell vol/rdt flow areas 8.3137e-02 and 8.3137e-02 on each side

 the azmuthal flow area 1.5189e-01 of vessel   1 interface (r= 4,t= 1,z= 1) is
 greater than the cell vol/rdt flow areas 1.3670e-01 and 1.3670e-01 on each side

 the azmuthal flow area 1.5189e-01 of vessel   1 interface (r= 4,t= 2,z= 1) is
 greater than the cell vol/rdt flow areas 1.3670e-01 and 1.3670e-01 on each side

 the   axial  flow area 2.6140e-02 of vessel   1 interface (r= 1,t= 1,z=11) is
 greater than the cell vol/dz  flow areas 2.1173e-02 and 1.8559e-02 on each side

 the   axial  flow area 2.6140e-02 of vessel   1 interface (r= 1,t= 2,z=11) is
 greater than the cell vol/dz  flow areas 2.1173e-02 and 1.8559e-02 on each side

 the   axial  flow area 7.8419e-02 of vessel   1 interface (r= 2,t= 1,z=11) is
 greater than the cell vol/dz  flow areas 6.3519e-02 and 5.5678e-02 on each side

 the   axial  flow area 7.8419e-02 of vessel   1 interface (r= 2,t= 2,z=11) is
 greater than the cell vol/dz  flow areas 6.3519e-02 and 5.5677e-02 on each side

 the   axial  flow area 1.1751e-01 of vessel   1 interface (r= 3,t= 1,z=11) is
 greater than the cell vol/dz  flow areas 9.8712e-02 and 8.3435e-02 on each side

 the   axial  flow area 1.1751e-01 of vessel   1 interface (r= 3,t= 2,z=11) is
 greater than the cell vol/dz  flow areas 9.8712e-02 and 8.3435e-02 on each side

 b)  the hydraulic diameter of the first and last junctions of the
     steam generator secondary were set to a non-zero value (even though
     the flow area is zero) to get the code to run.

c)  the nff's were all set to -1
   to cause an automatic calculation of
   abrupt expansion/contraction additive form losses.

d)  the new reflood model was turned on (namelist newrfd=1 was added)
    and added funh, nhsca, and zsgrid arrays.

e)  the time step sizes were increased.

f)  the rod axial power shape was adjusted to take advantage of mod2's
    ability to input an exact power distribution.  this involved
```

```
77      reworking the zpwzt and zpwtb arrays.  the number of coarse mesh
78      nodes went from 7 to 19, the maximum number of fine mesh cells went
79      from 100 to 200, and the dtxht criterial was reduced.
80
81  g)  the rod power history was expanded from 10 points to over 1200 points
82      (based on experimental data) to better match the input power.
83
84  h)  the temperatures everywhere except the lower plenum and fills were
85      changed from 393.0 to 414.2 (the average of the te30yxx thermocouple
86      data from the test) to better match the initial fluid and wall temps.
87
88  i)  took out the bump in the cold leg ecc fill liquid temperature table
89
90  j) extended the material property tables in case the code wants to
91     calculate temperatures in excess of 1200 k.
92
93  k) added namelist variable nosets=2 to cause the code to calculate the
94     sets3d equation every time step.
95
96  l) increase the maximum time step size beyond 84 seconds.
97
98  m) set all of the vessel cfzl-z's to negative numbers to get an automatic
99     calculation of abrupt expansion/contraction form losses.
100
101 n) the rod nodalization was set back the way it originally was (7 coarse
102    meshes with a 1-to-1 relationship with the hydro cells).  the
103    integration option was also set back the way it originally was as well.
104
105 o) to damp the loop oscillations, all the roughness numbers were
106    changed from 0.0 to 4.5720e-05
107
108 p) the heat conductor temperatures in the reactor vessel, ring 4 were set
109    from 4.142e+02 to 4.680e+02 for levels 2 and above.  the inner rings
110    were changed from 4.142e+02 to 4.230e+02.  this is consistent with the
111    initial conditions in the data report, page 31 table 3.1
112
113 q) the maximum time step size was reduced to avoid the water hammer in
114    the downcomer soon after cold leg injection begins.
115
116 r) added 30 heat slabs to represent the core barrel
117
118 s) moved the location of the ring 3-ring 4 boundary from inside the core
119    barrel to outside of the core barrel.  the vessel rad(3), vol, fa-t,
120    fa-z, hd-t and hd-z arrays were recomputed.  this was done to eliminate
121    vol and fa values greater than 1.0
122
123 t) the radial cfzl-r in level 1 was set to a small negative number to
124    cause form loss computation.
125
126 u) set idcu=idcl=idcr=0 to turn off special downcomer models
127
128 v) set the dtxht(1), dtxht(2), dznht, and nzmax parameters back to the
129    old mod1 values, and took out the core barrel heat slabs to make the
130    calculation directly comparable to the original MOD1 calculation.
131
132
133
134  ---===---
135
136 the original comment cards are as follows:
137
138 cctf run 54 posttest analysis with trac-pf1(mod 1) ver 11.8 (8/24/84)
139   * * * * *  revised loop components  * * * * *
140 jaeri recommendations used for some heater rod material properties.
141 new vapor loss coefficients in vessel core
142 new radial loss coefficients in levels 4 - 10
143 akimotos noding for combined and broken cold legs
144 vessel noding:
145    four radial rings
146    two azimuthal zones
147    sixteen axial levels
148       three levels in lower plenum
149       seven levels in core
150       six levels in upper plenum
151 system noding:
152    three intact loops lumped into one loop
153    cold leg between vessel and break is modeled without the expansion
154 *
155 ****************
156 * namelist data *
157 ****************
158 *
159  &inopts
160   nrslv=1,iadded=10,nhtstr=24,newrfd=3,
161  iblaus=1, imfr=3,
162  &end
163 *
164 *        dstep          timet
165                0    0.0000e+00
166 *       stdyst         transi          ncomp           njun           ipak
167                0             1             43             17              1
168 *         epso           epss
```

```
    1.0000e-04    1.0000e-04
*       oitmax         sitmax        isolut         ncontr
             10             10             0              0
*         ntsv           ntcb          ntcf           ntrp           ntcp
              9              8             0              3              1
*
*************************
* component-number data *
*************************
*
* iorder*              1              2              3              4              5
* iorder*              6              7              8             11             12
* iorder*             13             14             15             16             17
* iorder*             18             19             25             28s
            999            998            997            996            995
            994           993s
            974           973s
            918            917            916           915s
            914            913            912            911            910
            909            908           907s
784s
670 669e
*
*
*****************************
* material-properties data *
*****************************
*
* matb  *             55             58             59             60e
* ptbln * r02          7r02           5e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    8.3500e+03    4.4487e+02    1.2337e+01    1.0000e+00
    5.0000e+02    8.3500e+03    4.9042e+02    1.5834e+01    1.0000e+00
    7.0000e+02    8.3500e+03    5.3948e+02    1.9331e+01    1.0000e+00
    9.0000e+02    8.3500e+03    5.8987e+02    2.2828e+01    1.0000e+00
    1.1000e+03    8.3500e+03    6.3939e+02    2.6324e+01    1.0000e+00
    1.3000e+03    8.3500e+03    6.8588e+02    2.9821e+01    1.0000e+00
    2.0000e+03    8.3500e+03    6.8588e+02    2.9821e+01    1.0000e+00
e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    3.8000e+03    8.4970e+02    3.5870e+01    1.0000e+00
    5.0000e+02    3.8000e+03    9.6550e+02    2.0173e+01    1.0000e+00
    7.0000e+02    3.8000e+03    1.0813e+03    1.2529e+01    1.0000e+00
    9.0000e+02    3.8000e+03    1.1971e+03    8.9514e+00    1.0000e+00
    1.1000e+03    3.8000e+03    1.3129e+03    7.1615e+00    1.0000e+00
    1.3000e+03    3.8000e+03    1.4287e+03    6.1228e+00    1.0000e+00
    2.0000e+03    3.8000e+03    1.4287e+03    6.1228e+00    1.0000e+00
e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    2.8000e+03    9.8640e+02    1.6300e+00    1.0000e+00
    6.0000e+02    2.8000e+03    1.1358e+03    1.4200e+00    1.0000e+00
    9.0000e+02    2.8000e+03    1.2852e+03    1.2100e+00    1.0000e+00
    1.3000e+03    2.8000e+03    1.4844e+03    9.3000e-01    1.0000e+00
    2.0000e+03    2.8000e+03    1.4844e+03    9.3000e-01    1.0000e+00
e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    8.4103e+03    4.4029e+02    1.4340e+01    8.4000e-01
    6.0000e+02    8.2925e+03    5.0636e+02    1.9331e+01    8.4000e-01
    9.0000e+02    8.1747e+03    5.7242e+02    2.4322e+01    8.4000e-01
    1.2000e+03    8.0569e+03    6.3839e+02    2.9314e+01    8.4000e-01
   2.0000e+03    8.0569e+03    6.3839e+02    2.9314e+01    8.4000e-01
e
*
*
*************************
* control-parameter data *
*************************
*
*
* signal variables
*     idsv      isvn      ilcn      icn1      icn2
        101         0         0         0         0  * problem time
        102         0         1         0         0  * time-step size
        103        27         1      1001     -8001  * lower-plenum level-1 vap. vol. fr.
        104        27         1      1002     -6003  * lower-plenum levels 2 and 3 vap. vol. fr.
        105        27         1      7002     -8016  * downcomer vap. vol. fr.
        106        27         1      1004     -6010  * core vap. vol. fr.
        107        27         1      1011     -6016  * upper-plenum vap. vol. fr.
        108        75         1      1001     -8001  * lower-plenum level-1 liquid density
        109        76         1      1002     -6003  * lower-plenum levels 2 and 3 liquid density
*
* control blocks
*  idcb       icbn      icb1      icb2      icb3
*             cbgain    cbxmin    cbxmax    cbcon1    cbcon2
*
*            constant number 1
    -1          9         *const*
                1.0       1.0       1.0       1.0
```

```
*
*            weighted lower-plenum vapor volume fraction
   -2        59        *wsum*    103       104
             1.0       0.0       1.0       0.5396    0.4604
*
*            lower-plenum liquid volume fraction
   -3        54        *subtr*   -1        -2
             0.0       0.0       0.0       0.0       0.0
*
*            downcomer liquid volume fraction
   -4        54        *subtr*   -1        105
             0.0       0.0       0.0       0.0       0.0
*
*            core liquid volume fraction
   -5        54        *subtr*   -1        106
             0.0       0.0       0.0       0.0       0.0
*
*            upper plenum liquid volume fraction
   -6        54        *subtr*   -1        107
             0.0       0.0       0.0       0.0       0.0
*
*            weighted lower-plenum liquid density
   -7        59        *wsum*    108       109
             1.0       0.0       1.0e20    0.5396    0.4604
*
*            lower plenum delta-p=2.0594e-05 x rholiq x liquid volume fraction
   -8        39        *multi*   -7        -3
        2.0594e-05    -1.0e20    1.0e20    0.0       0.0
*
* trips
*         ntse          ntct          ntsf          ntdp          ntsd
              0             0             0             3             0
*         idtp          isrt          iset          itst          idsg
             1001             2             0             1           101
*      setp(1)       setp(2)
     8.3999e+01    8.4000e+01
*      dtsp(1)       dtsp(2)
     0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
              0             0
*         idtp          isrt          iset          itst          idsg
             1002             2             1             1           101
*      setp(1)       setp(2)
     0.0000e+00    0.0000e+00
*      dtsp(1)       dtsp(2)
     0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
              0             0
*         idtp          isrt          iset          itst          idsg
             1003             2             0             1           101
*      setp(1)       setp(2)
     0.0000e+00    0.0000e+00
*      dtsp(1)       dtsp(2)
     0.0000e+00    0.0000e+00
*      ifsp(1)       ifsp(2)
              0             0
*         ndmp
              3
*       idmp()
             1001          1002          1003
*
******************
* component data *
******************
*
*******    type          num           id        ctitle
vessel              1       1 $1$ cctf reactor vessel
*         nasx          nrsx          ntsx          ncsr        ivssbf
             16             4             2             5             0
*         idcu          idcl          idcr          icru          icrl
             16             1             3            10             3
*        0             0             0            10          3   #5.3.05 deck input
*         icrr          ilcsp         iucsp         iuhp          iconc
              3             0             0             0             0
*        igeom         nvent         nvvtb        nsgrid
              0             0             0           *6* 0
*        shelv          epsw
     0.0000e+00    4.5720e-05
* z      *     9.1500e-01    1.9000e+00    2.1000e+00    2.4050e+00    3.0150e+00
* z      *     3.6250e+00    4.2350e+00    4.8450e+00    5.4550e+00    5.7600e+00
* z      *     6.0000e+00    6.2400e+00    6.5000e+00    6.9600e+00    7.4000e+00
* z      *     8.6470e+00e
* rad    *     1.2900e-01    2.5800e-01    4.8050e-01    5.4200e-01e
* th     *    90.0    360.0 e
* funh   * r2 0.11948214 r2 0.15865495 s
* funh   * r2 0.20909698 r2 1.0 e
* nhsca * f 999 e
* zsgrid   2.670 3.335 4.000 s
* zsgrid   4.665 5.330 5.758 e
*        lisrl         lisrc         lisrf         ljuns
              15            7             3             1
              15            5             3             2
```

```
353              15              8              3              3
354              15              6              3              4
355               1              7              3              5
356  *
357  * level   1
358  *
359  * cfzl-t* f   -1.0000e-04e
360  * cfzl-z* f   -1.0000e-04e
361  * cfzl-r* f -1.0000e-04e
362  * cfzv-t* f   0.0000e-04e
363  * cfzv-z* f   0.0000e-04e
364  * cfzv-r* f   0.0000e-04e
365  * vol   * r04 7.4000e-01r02 8.0254e-01r02 1.0000e+00e
366  * fa-t  * r04 4.0000e-01r02 8.0342e-01r02 1.0000e+00e
367  * fa-z  * r04 4.2000e-01r02 3.4356e-01r02 1.0000e+00e
368  * fa-r  * r04 4.0000e-01r02 5.9471e-01r02 0.0000e+00e
369  * hd-t  * r04 2.2800e-02r02 0.39676 r02 0.119e
370  * hd-z  * r04 1.3000e-02r02 2.8800e-02r02 0.123e
371  * hd-r  * r04 2.2800e-02r02 0.4855r02 0.0000e+00e
372  * alpn  * f   0.0000e+00e
373  * vvn-t * f   0.0000e+00e
374  * vvn-z * f   0.0000e+00e
375  * vvn-r * f   0.0000e+00e
376  * vln-t * f   0.0000e+00e
377  * vln-z * f   0.0000e+00e
378  * vln-r * f   0.0000e+00e
379  * tvn   * f   3.9300e+02e
380  * tln   * f   3.9300e+02e
381  * pn    * f   2.0000e+05e
382  * pan   * f   0.0000e+00e
383  *
384  * level   2
385  *
386  * cfzl-t* f   -1.0000e-04e
387  * cfzl-z* f   -1.0000e-04e
388  * cfzl-r* f   0.0000e-04e
389  * cfzv-t* f   0.0000e-04e
390  * cfzv-z* f   0.0000e-04e
391  * cfzv-r* f   0.0000e-04e
392  * vol   * r04 7.4000e-01r02 7.3602e-01r02 1.0000e+00e
393  * fa-t  * r04 4.0000e-01r02 2.4692e-01 r02 1.0000e+00e
394  * fa-z  * r04 5.9000e-01r02 6.7592e-01r02 1.0000e+00e
395  * fa-r  * r04 4.0000e-01r04 0.0000e+00e
396  * hd-t  * r04 2.2800e-02r02 2.4060e-01r02 0.123e+00e
397  * hd-z  * r04 1.3000e-02r02 4.6000e-02r02 1.2300e-01e
398  * hd-r  * r04 2.2800e-02r04 0.0000e+00e
399  * alpn  * f   1.0000e+00e
400  * vvn-t * f   0.0000e+00e
401  * vvn-z * f   0.0000e+00e
402  * vvn-r * f   0.0000e+00e
403  * vln-t * f   0.0000e+00e
404  * vln-z * f   0.0000e+00e
405  * vln-r * f   0.0000e+00e
406  * tvn   * f   4.1420e+02e
407  * tln   * f   4.1420e+02e
408  * pn    * f   2.0000e+05e
409  * pan   * f   0.0000e+00e
410  *
411  * level   3
412  *
413  * cfzl-t* f   -1.0000e-04e
414  * cfzl-z* r04 -1.1102e-01r02 -1.2189e-01r02 -1.0000e-04e
415  * cfzl-r* f   0.0000e-04e
416  * cfzv-t* f   0.0000e-04e
417  * cfzv-z* r04 4.4407e-01r02 4.8756e-01r02 0.0000e-04e
418  * cfzv-r* f   0.0000e-04e
419  * vol   * r04 5.9000e-01r02 0.45738r02 1.0000e+00e
420  * fa-t  * r04 2.5000e-01r02 0.24692 r02 1.0 e
421  * fa-z  * r02 1.1400e-01r02 1.1460e-01r02 0.04944r02 1.00e
422  * fa-r  * r04 2.5000e-01r04 0.0000e+00e
423  * hd-t  * r04 1.4400e-02r02 2.4060e-01r02 0.123e
424  * hd-z  * r04 1.2460e-02r02 1.3680e-02r02 1.2300e-01e
425  * hd-r  * r04 1.4400e-02r04 0.0000e+00e
426  * alpn  * f   1.0000e+00e
427  * vvn-t * f   0.0000e+00e
428  * vvn-z * f   0.0000e+00e
429  * vvn-r * f   0.0000e+00e
430  * vln-t * f   0.0000e+00e
431  * vln-z * f   0.0000e+00e
432  * vln-r * f   0.0000e+00e
433  * tvn   * f   4.1420e+02e
434  * tln   * f   4.1420e+02e
435  * pn    * f   2.0000e+05e
436  * pan   * f   0.0000e+00e
437  *
438  * level   4
439  * cfzl-t* f   -1.0000e-04e
440  * cfzl-z* f   -1.0000e-04e
441  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
442  * cfzv-t* f   0.0000e-04e
443  * cfzv-z* f   0.0000e-04e
444  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
```

```
445  * vol    * r04 5.3000e-01r02 0.26161 r02 1.0e
446  * fa-t   * r04 2.5000e-01r02 0.09312 r02 1.0e
447  * fa-z   * r04 5.3000e-01r02 0.26161 r02 1.0e
448  * fa-r   * r04 2.5000e-01r04 0.0000e+00e
449  * hd-t   * r06 6.3000e-03r02 1.2300e-01e
450  * hd-z   * r04 1.2460e-02r02 1.3680e-02r02 0.123e
451  * hd-r   * r04 6.3000e-03r04 0.0000e+00e
452  * alpn   * f   1.0000e+00e
453  * vvn-t  * f   0.0000e+00e
454  * vvn-z  * f   0.0000e+00e
455  * vvn-r  * f   0.0000e+00e
456  * vln-t  * f   0.0000e+00e
457  * vln-z  * f   0.0000e+00e
458  * vln-r  * f   0.0000e+00e
459  * tvn    * f   4.1420e+02e
460  * tln    * f   4.1420e+02e
461  * pn     * f   2.0000e+05e
462  * pan    * f   0.0000e+00e
463  *
464  * level   5
465  *
466  * cfzl-t* f   -1.0000e-04e
467  * cfzl-z* r04 -2.4509e-02r02 -2.6909e-02r02 -1.0000e-04e
468  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
469  * cfzv-t* f   0.0000e-04e
470  * cfzv-z* r04 2.4509e-02r02 2.6909e-02r02 0.0000e-04e
471  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
472  * vol    * r04 5.3000e-01r02 0.26161 r02 1.0e
473  * fa-t   * r04 2.5000e-01r02 0.09312 r02 1.0e
474  * fa-z   * r04 5.3000e-01r02 0.26161 r02 1.0e
475  * fa-r   * r04 2.5000e-01r04 0.0000e+00e
476  * hd-t   * r06 6.3000e-03r02 1.2300e-01e
477  * hd-z   * r04 1.2460e-02r02 1.3680e-02r02 0.123e
478  * hd-r   * r04 6.3000e-03r04 0.0000e+00e
479  * alpn   * f   1.0000e+00e
480  * vvn-t  * f   0.0000e+00e
481  * vvn-z  * f   0.0000e+00e
482  * vvn-r  * f   0.0000e+00e
483  * vln-t  * f   0.0000e+00e
484  * vln-z  * f   0.0000e+00e
485  * vln-r  * f   0.0000e+00e
486  * tvn    * f   4.1420e+02e
487  * tln    * f   4.1420e+02e
488  * pn     * f   2.0000e+05e
489  * pan    * f   0.0000e+00e
490  *
491  * level   6
492  *
493  * cfzl-t* f   -1.0000e-04e
494  * cfzl-z* r04 -2.4509e-02r02 -2.6909e-02r02 -1.0000e-04e
495  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
496  * cfzv-t* f   0.0000e-04e
497  * cfzv-z* r04 2.4509e-02r02 2.6909e-02r02 0.0000e-04e
498  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
499  * vol    * r04 5.3000e-01r02 0.26161 r02 1.0e
500  * fa-t   * r04 2.5000e-01r02 0.09312 r02 1.0e
501  * fa-z   * r04 5.3000e-01r02 0.26161 r02 1.0e
502  * fa-r   * r04 2.5000e-01r04 0.0000e+00e
503  * hd-t   * r06 6.3000e-03r02 1.2300e-01e
504  * hd-z   * r04 1.2460e-02r02 1.3680e-02r02 0.123e
505  * hd-r   * r04 6.3000e-03r04 0.0000e+00e
506  * alpn   * f   1.0000e+00e
507  * vvn-t  * f   0.0000e+00e
508  * vvn-z  * f   0.0000e+00e
509  * vvn-r  * f   0.0000e+00e
510  * vln-t  * f   0.0000e+00e
511  * vln-z  * f   0.0000e+00e
512  * vln-r  * f   0.0000e+00e
513  * tvn    * f   4.1420e+02e
514  * tln    * f   4.1420e+02e
515  * pn     * f   2.0000e+05e
516  * pan    * f   0.0000e+00e
517  *
518  * level   7
519  *
520  * cfzl-t* f   -1.0000e-04e
521  * cfzl-z* r04 -2.4509e-02r02 -2.6909e-02r02 -1.0000e-04e
522  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
523  * cfzv-t* f   0.0000e-04e
524  * cfzv-z* r04 2.4509e-02r02 2.6909e-02r02 0.0000e-04e
525  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
526  * vol    * r04 5.3000e-01r02 0.26161 r02 1.0e
527  * fa-t   * r04 2.5000e-01r02 0.09312 r02 1.0e
528  * fa-z   * r04 5.3000e-01r02 0.26161 r02 1.0e
529  * fa-r   * r04 2.5000e-01r04 0.0000e+00e
530  * hd-t   * r06 6.3000e-03r02 1.2300e-01e
531  * hd-z   * r04 1.2460e-02r02 1.3680e-02r02 0.123e
532  * hd-r   * r04 6.3000e-03r04 0.0000e+00e
533  * alpn   * f   1.0000e+00e
534  * vvn-t  * f   0.0000e+00e
535  * vvn-z  * f   0.0000e+00e
536  * vvn-r  * f   0.0000e+00e
```

```
537  * vln-t * f   0.0000e+00e
538  * vln-z * f   0.0000e+00e
539  * vln-r * f   0.0000e+00e
540  * tvn   * f   4.1420e+02e
541  * tln   * f   4.1420e+02e
542  * pn    * f   2.0000e+05e
543  * pan   * f   0.0000e+00e
544  *
545  * level   8
546  *
547  * cfzl-t* f   -1.0000e-04e
548  * cfzl-z* r04 -2.4509e-02r02 -2.6909e-02r02 -1.0000e-04e
549  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
550  * cfzv-t* f   0.0000e-04e
551  * cfzv-z* r04 2.4509e-02r02 2.6909e-02r02 0.0000e-04e
552  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
553  * vol   * r04 5.3000e-01r02 0.26161 r02 1.0e
554  * fa-t  * r04 2.5000e-01r02 0.09312 r02 1.0e
555  * fa-z  * r04 5.3000e-01r02 0.26161 r02 1.0e
556  * fa-r  * r04 2.5000e-01r04 0.0000e+00e
557  * hd-t  * r06 6.3000e-03r02 1.2300e-01e
558  * hd-z  * r04 1.2460e-02r02 1.3680e-02r02 0.123e
559  * hd-r  * r04 6.3000e-03r04 0.0000e+00e
560  * alpn  * f   1.0000e+00e
561  * vvn-t * f   0.0000e+00e
562  * vvn-z * f   0.0000e+00e
563  * vvn-r * f   0.0000e+00e
564  * vln-t * f   0.0000e+00e
565  * vln-z * f   0.0000e+00e
566  * vln-r * f   0.0000e+00e
567  * tvn   * f   4.1420e+02e
568  * tln   * f   4.1420e+02e
569  * pn    * f   2.0000e+05e
570  * pan   * f   0.0000e+00e
571  *
572  * level   9
573  *
574  * cfzl-t* f   -1.0000e-04e
575  * cfzl-z* r04 -2.4509e-02r02 -2.6909e-02r02 -1.0000e-04e
576  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
577  * cfzv-t* f   0.0000e-04e
578  * cfzv-z* r04 2.4509e-02r02 2.6909e-02r02 0.0000e-04e
579  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
580  * vol   * r04 5.3000e-01r02 0.26161 r02 1.0e
581  * fa-t  * r04 2.5000e-01r02 0.09312 r02 1.0e
582  * fa-z  * r04 5.3000e-01r02 0.26161 r02 1.0e
583  * fa-r  * r04 2.5000e-01r04 0.0000e+00e
584  * hd-t  * r06 6.3000e-03r02 1.2300e-01e
585  * hd-z  * r04 1.2460e-02r02 1.3680e-02r02 0.123e
586  * hd-r  * r04 6.3000e-03r04 0.0000e+00e
587  * alpn  * f   1.0000e+00e
588  * vvn-t * f   0.0000e+00e
589  * vvn-z * f   0.0000e+00e
590  * vvn-r * f   0.0000e+00e
591  * vln-t * f   0.0000e+00e
592  * vln-z * f   0.0000e+00e
593  * vln-r * f   0.0000e+00e
594  * tvn   * f   4.1420e+02e
595  * tln   * f   4.1420e+02e
596  * pn    * f   2.0000e+05e
597  * pan   * f   0.0000e+00e
598  *
599  * level  10
600  *
601  * cfzl-t* f   -1.0000e-04e
602  * cfzl-z* r04 -5.7191e-02r02 -6.2791e-02r02 -1.0000e-04e
603  * cfzl-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
604  * cfzv-t* f   0.0000e-04e
605  * cfzv-z* r04 5.7191e-02r02 6.2791e-02r02 0.0000e-04e
606  * cfzv-r* r04 8.7633e-02r02 1.3910e+01r02 0.0000e-04e
607  * vol   * r04 5.3000e-01r02 0.26161 r02 1.0e
608  * fa-t  * r04 2.5000e-01r02 0.09312 r02 1.0e
609  * fa-z  * r04 5.3000e-01r02 0.26161 r02 1.0e
610  * fa-r  * r04 2.5000e-01r04 0.0000e+00e
611  * hd-t  * r06 6.3000e-03r02 1.2300e-01e
612  * hd-z  * r04 1.2460e-02r02 1.3680e-02r02 0.123e
613  * hd-r  * r04 6.3000e-03r04 0.0000e+00e
614  * alpn  * f   1.0000e+00e
615  * vvn-t * f   0.0000e+00e
616  * vvn-z * f   0.0000e+00e
617  * vvn-r * f   0.0000e+00e
618  * vln-t * f   0.0000e+00e
619  * vln-z * f   0.0000e+00e
620  * vln-r * f   0.0000e+00e
621  * tvn   * f   4.1420e+02e
622  * tln   * f   4.1420e+02e
623  * pn    * f   2.0000e+05e
624  * pan   * f   0.0000e+00e
625  *
626  * level  11
627  *
628  * cfzl-t* f   -1.0000e-04e
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629  * cfzl-z* r04 -6.2300e-02r02 -6.8400e-02r02 -1.0000e-04e
630  * cfzl-r* f   0.0000e-04e
631  * cfzv-t* f   0.0000e-04e
632  * cfzv-z* r04 6.2300e-02r02 6.8400e-02r02 0.0000e-04e
633  * cfzv-r* f   0.0000e-04e
634  * vol   * r04 8.1000e-01r02 0.37998 r02 1.0e
635  * fa-t  * r04 6.2000e-01r02 0.32647 r02 1.0e
636  * fa-z  * r04 8.1000e-01r02 0.37998 r02 1.0e
637  * fa-r  * r04 6.2000e-01r04 0.0000e+00e
638  * hd-t  * r06 6.3000e-03r02 0.123e
639  * hd-z  * r04 1.2460e-02r02 1.3680e-02r02 0.123e
640  * hd-r  * r04 6.3000e-03r04 0.0000e+00e
641  * alpn  * f   1.0000e+00e
642  * vvn-t * f   0.0000e+00e
643  * vvn-z * f   0.0000e+00e
644  * vvn-r * f   0.0000e+00e
645  * vln-t * f   0.0000e+00e
646  * vln-z * f   0.0000e+00e
647  * vln-r * f   0.0000e+00e
648  * tvn   * f   4.1420e+02e
649  * tln   * f   4.1420e+02e
650  * pn    * f   2.0000e+05e
651  * pan   * f   0.0000e+00e
652  *
653  * level  12
654  *
655  * cfzl-t* f   -1.0000e-04e
656  * cfzl-z* f   -1.0000e-04e
657  * cfzl-r* f   0.0000e-04e
658  * cfzv-t* f   0.0000e-04e
659  * cfzv-z* f   0.0000e-04e
660  * cfzv-r* f   0.0000e-04e
661  * vol   * r04 7.1000e-01r02 0.3208 r02 1.0e
662  * fa-t  * r04 5.0000e-01r02 0.29465 r02 1.0 e
663  * fa-z  * r02 3.8180e-01r02 3.3700e-01r02 1.6499e-01r02 1.00e
664  * fa-r  * r04 5.0000e-01r04 0.0000e+00e
665  * hd-t  * r06 1.2800e-02r02 0.123e
666  * hd-z  * r06 1.2800e-02r02 0.123e
667  * hd-r  * r04 1.2800e-02r04 0.0000e+00e
668  * alpn  * f   1.0000e+00e
669  * vvn-t * f   0.0000e+00e
670  * vvn-z * f   0.0000e+00e
671  * vvn-r * f   0.0000e+00e
672  * vln-t * f   0.0000e+00e
673  * vln-z * f   0.0000e+00e
674  * vln-r * f   0.0000e+00e
675  * tvn   * f   4.1420e+02e
676  * tln   * f   4.1420e+02e
677  * pn    * f   2.0000e+05e
678  * pan   * f   0.0000e+00e
679  *
680  * level  13
681  *
682  * cfzl-t* f   -1.0000e-04e
683  * cfzl-z* f   -1.0000e-04e
684  * cfzl-r* f   0.0000e-04e
685  * cfzv-t* f   0.0000e-04e
686  * cfzv-z* f   0.0000e-04e
687  * cfzv-r* f   0.0000e-04e
688  * vol   * r02 9.2900e-01r02 9.1000e-01r02 0.67137r02 1.0e
689  * fa-t  * r04 9.0000e-01r02 4.4845e-01r02 1.00e
690  * fa-z  * r02 9.2900e-01r02 6.5000e-01r02 3.9774e-01r02 1.00e
691  * fa-r  * r04 7.9000e-01r04 0.0000e+00e
692  * hd-t  * r06 2.5000e-01r02 0.123e
693  * hd-z  * r02 6.1500e-01r02 2.3780e-01r02 2.1260e-01r02 0.123e
694  * hd-r  * r04 2.5000e-01r04 0.0000e+00e
695  * alpn  * f   1.0000e+00e
696  * vvn-t * f   0.0000e+00e
697  * vvn-z * f   0.0000e+00e
698  * vvn-r * f   0.0000e+00e
699  * vln-t * f   0.0000e+00e
700  * vln-z * f   0.0000e+00e
701  * vln-r * f   0.0000e+00e
702  * tvn   * f   4.1420e+02e
703  * tln   * f   4.1420e+02e
704  * pn    * f   2.0000e+05e
705  * pan   * f   0.0000e+00e
706  *
707  * level  14
708  *
709  * cfzl-t* f   -1.0000e-04e
710  * cfzl-z* f   -1.0000e-04e
711  * cfzl-r* f   0.0000e-04e
712  * cfzv-t* f   0.0000e-04e
713  * cfzv-z* f   0.0000e-04e
714  * cfzv-r* f   0.0000e-04e
715  * vol   * r02 9.2900e-01r02 9.2000e-01r02 0.67137r02 1.0 e
716  * fa-t  * r04 6.0000e-01r02 0.45375 r02 1.00e
717  * fa-z  * r02 9.2900e-01r02 9.1000e-01r02 0.3686 r02 1.0 e
718  * fa-r  * r04 6.0000e-01r04 0.0000e+00e
719  * hd-t  * r06 2.5000e-01r02 0.123e
720  * hd-z  * r02 6.1500e-01r02 2.3780e-01r02 2.1260e-01r02 0.123e
```

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721  * hd-r  * r04 2.5000e-01r04 0.0000e+00e
722  * alpn  * f   1.0000e+00e
723  * vvn-t * f   0.0000e+00e
724  * vvn-z * f   0.0000e+00e
725  * vvn-r * f   0.0000e+00e
726  * vln-t * f   0.0000e+00e
727  * vln-z * f   0.0000e+00e
728  * vln-r * f   0.0000e+00e
729  * tvn   * f   4.1420e+02e
730  * tln   * f   4.1420e+02e
731  * pn    * f   2.0000e+05e
732  * pan   * f   0.0000e+00e
733  *
734  * level  15
735  *
736  * cfzl-t* f   -1.0000e-04e
737  * cfzl-z* f   -1.0000e-04e
738  * cfzl-r* f   0.0000e-04e
739  * cfzv-t* f   0.0000e-04e
740  * cfzv-z* f   0.0000e-04e
741  * cfzv-r* f   0.0000e-04e
742  * vol   * r02 9.2900e-01r02 9.2000e-01r02 0.67137r02 1.0 e
743  * fa-t  * r04 6.0000e-01r02 0.45375 r02 1.00e
744  * fa-z  * r02 9.2900e-01r02 9.2000e-01r02 0.3686 r02 1.0 e
745  * fa-r  * r04 6.0000e-01r04 0.0000e+00e
746  * hd-t  * r06 2.5000e-01r02 0.123e
747  * hd-z  * r02 6.1500e-01r02 2.3780e-01r02 2.1260e-01r02 0.123e
748  * hd-r  * r04 2.5000e-01r04 0.0000e+00e
749  * alpn  * f   1.0000e+00e
750  * vvn-t * f   0.0000e+00e
751  * vvn-z * f   0.0000e+00e
752  * vvn-r * f   0.0000e+00e
753  * vln-t * f   0.0000e+00e
754  * vln-z * f   0.0000e+00e
755  * vln-r * f   0.0000e+00e
756  * tvn   * f   4.1420e+02e
757  * tln   * f   4.1420e+02e
758  * pn    * f   2.0000e+05e
759  * pan   * f   0.0000e+00e
760  *
761  * level  16
762  *
763  * cfzl-t* f   -1.0000e-04e
764  * cfzl-z* f   -1.0000e-04e
765  * cfzl-r* f   0.0000e-04e
766  * cfzv-t* f   0.0000e-04e
767  * cfzv-z* f   0.0000e-04e
768  * cfzv-r* f   0.0000e-04e
769  * vol   * r02 9.2900e-01r02 9.2000e-01r02 0.67137r02 1.0 e
770  * fa-t  * r04 6.0000e-01r02 0.45375 r02 1.00e
771  * fa-z  * r02 9.2900e-01r02 9.2000e-01r02 0.3686 r02 1.0 e
772  * fa-r  * r04 6.0000e-01r04 0.0000e+00e
773  * hd-t  * r06 2.5000e-01r02 0.123e
774  * hd-z  * r02 6.1500e-01r02 2.3780e-01r02 2.1260e-01r02 0.123e
775  * hd-r  * r04 2.5000e-01r04 0.0000e+00e
776  * alpn  * f   1.0000e+00e
777  * vvn-t * f   0.0000e+00e
778  * vvn-z * f   0.0000e+00e
779  * vvn-r * f   0.0000e+00e
780  * vln-t * f   0.0000e+00e
781  * vln-z * f   0.0000e+00e
782  * vln-r * f   0.0000e+00e
783  * tvn   * f   4.1420e+02e
784  * tln   * f   4.1420e+02e
785  * pn    * f   2.0000e+05e
786  * pan   * f   0.0000e+00e
787  *
788  *******   type          num           id       ctitle
789  tee           6       6 $6$ cold leg--combined loop
790  *        jcell         nodes         ichf          cost          epsw
791               18             2            1    7.0700e-01    4.5720e-05
792  *       iconc1        ncell1         jun1          jun2          ipow1
793                 0            22           12             3              0
794  *       iqptr1        iqpsv1       nqptb1        nqpsv1        nqprf1
795                 0             0            0             0              0
796  *       radin1          th1        houtl1        houtv1        toutl1
797      3.0200e-01    1.0000e-02    0.0000e+00    0.0000e+00    2.9300e+02
798  *       toutv1
799      2.9300e+02
800  *         qpin1        qpoff1        rqpmx1        qpscl1
801      0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
802  *       iconc2        ncell2         jun3          ipow2
803                 0             1           11             0
804  *       iqptr2        iqpsv2       nqptb2        nqpsv2        nqprf2
805                 0             0            0             0              0
806  *       radin2          th2        hout12        houtv2        toutl2
807      4.0700e-02    4.0000e-03    0.0000e+00    0.0000e+00    2.9300e+02
808  *       toutv2
809      2.9300e+02
810  *         qpin2        qpoff2        rqpmx2        qpscl2
811      0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
812  *
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```
* dx    *     3.0000e-01    2.1650e-01    2.1310e-01    9.9140e-01    1.8866e+00
* dx    *     2.1400e+00    2.2800e+00    9.4000e-01    9.0000e-01    3.2900e-01
* dx    *     2.7500e-01    2.5200e-01    5.2400e-01    2.6000e-01    4.4000e-01
* dx    * r02 6.8500e-01    8.0000e-01r03 8.5730e-01    8.0000e-01e
* vol   *     1.3978e-01    1.7177e-01    8.7117e-02    5.6265e-02    1.0707e-01
* vol   *     1.2145e-01    1.2940e-01    5.3349e-02    5.1078e-02    3.0387e-02
* vol   *     5.6388e-02    2.2821e-02    4.7454e-02    2.8650e-01    2.4972e-02
* vol   * r02 3.8868e-02    4.5402e-02r03 4.8654e-02    4.5402e-02e
* fa    *     4.659e-01    4.3413e-01    3.4821e-01r07 5.6760e-02    2.1265e-02
* fa    * r03 9.0561e-02r09 5.6760e-02e
* fric  * r10 0.0000e+00    2.1500e-01r06       0.0r02       .001 f   0.0000e+00e
* grav  * r03-1.0000e+00   -7.6604e-01r02-1.0000e+00r02 0.0000e+00r06 1.0000e+00
* grav  * r09 0.0000e+00e
* hd    *     3.9570e-01    3.6880e-01    3.2940e-01r07 1.5520e-01    9.5000e-02
* hd    * r03 4.7340e-02r09 1.5520e-01e
* nff   * r17         -1r02          1 f          -1e
* alp   * f   1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   4.1420e+02e
* tv    * f   4.1420e+02e
* p     * f   2.0000e+05e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid *              6e
* tw    * f   4.1420e+02e
*
* dx    *     1.0000e+00e
* vol   *     5.2050e-03e
* fa    * f   5.2050e-03e
* fric  *          .001 f   0.0000e+00e
* grav  * f   7.0700e-01e
* hd    * f   4.7000e-02e
* nff   *              1             -1e
* alp   *     1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    *     4.1420e+02e
* tv    *     4.1420e+02e
* p     *     2.0000e+05e
* pa    *     0.0000e+00e
* qppp  * f   0.0000e+00e
* matid *              6e
* tw    * f   3.6250e+02e
*
*******   type          num           id        ctitle
pipe            7       7 $7$ hot leg--combined loop
*       ncells         nodes         jun1         jun2         epsw
              3             2            4           13    4.5720e-05
*         ichf         iconc         iacc         ipow
              1             0            0            0
*       iqp3tr        iqp3sv       nqp3tb       nqp3sv       nqp3rf
              0             0            0            0            0
*        radin            th        houtl        houtv        toutl
    2.3280e-01    5.0000e-03    0.0000e+00    0.0000e+00    2.9300e+02
*        toutv
    2.9300e+02
*        qp3in       qp3off       rqp3mx       qp3scl
    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
* dx    *     3.3810e+00    2.4860e+00    7.9800e-01e
* vol   *     1.9190e-01    1.4110e-01    2.9700e-01e
* fa    * r03 5.6750e-02    3.7240e-01e
* fric  * f   0.0000e+00e
* grav  * r02 0.0000e+00    7.6600e-01    1.0000e+00e
* hd    * r03 1.5520e-01    4.7960e-01e
* nff   * f           -1e
* alp   * f   1.0000e+00e
* vl    * f   0.0000e+00e
* vv    * f   0.0000e+00e
* tl    * f   4.1420e+02e
* tv    * f   4.1420e+02e
* p     * f   2.0000e+05e
* pa    * f   0.0000e+00e
* qppp  * f   0.0000e+00e
* matid *              6e
* tw    * f   4.1420e+02e
*
*******   type          num           id        ctitle
pipe            8       8   $8$ ilsg primary
*
*       ncells         nodes         jun1         jun2         epsw
             12             0           13           12    4.5720e-5
*
*         ichf         iconc         iacc         ipow
              1             0            0            0
*
*        radin            th        houtl        houtv        toutl
    9.8000e-03    2.9000e-03          0.0          0.0        300.0
*
*        toutv         powin        powoff       rpowmx       powscl
        300.0            0.           0.           0.           1.
```

```
905  *
906  * dx    *     7.9800e-01r02 5.0000e-01    1.5240e+00r04 2.5240e+00    1.5240e+00
907  * dx    * r02 5.0000e-01    7.9800e-01e
908  * vol   *     2.9700e-01r02 7.1500e-02    2.1780e-01r04 3.6090e-01    2.1780e-01
909  * vol   * r02 7.1500e-02    2.1279e-01e
910  * fa    *     3.7240e-01r11 1.4300e-01    4.659e-01e
911  * fric  * f   0.0000e+00e
912  * grav  * r06 1.0000e+00    0.0000e+00r06-1.0000e+00e
913  * hd    *     4.7960e-01r11 1.9600e-02    3.9570e-01e
914  * nff   * f           -1e
915  * alp   * f   1.0000e+00e
916  * vl    * f   0.0000e+00e
917  * vv    * f   0.0000e+00e
918  * tl    * f   4.1420e+02e
919  * tv    * f   4.1420e+02e
920  * p     * f   2.0000e+05e
921  * pa    * f   0.0000e+00e
922  *
923  *******   type          num           id        ctitle
924  pipe            28      28   $28$ ilsg secondary
925  *
926  *       ncells          nodes          jun1          jun2          epsw
927                5              0            16            17     4.5720e-5
928  *
929  *         ichf          iconc          iacc          ipow
930                1              0             0             0
931  *
932  *        radin             th         houtl         houtv         toutl
933                0.             0.           0.0           0.0         300.0
934  *
935  *        toutv          powin        powoff        rpowmx        powscl
936                300.0          0.            0.            0.            1.
937  *
938  * dx    * r02 5.0000e-01    1.5240e+00    2.5240e+00    2.7510e+00e
939  * vol   *     1.7940e+00    5.9400e-01    1.8060e+00    2.9920e+00    3.3150e+00
940  e
941  * fa    *     0.0000e+00r04 1.1853e+00    0.0000e+00e
942  * fric  * f   0.0000e+00e
943  * grav  * f   1.0000e+00e
944  * hd    *f  1.0240e-01 e
945  * nff   * f           -1e
946  * alp   * r04 0.0000e+00    2.5400e-01e
947  * vl    * f   0.0000e+00e
948  * vv    * f   0.0000e+00e
949  * tl    *     4.8000e+02    5.2500e+02r03 5.4000e+02e
950  * tv    *     4.8000e+02    5.2500e+02r03 5.4000e+02e
951  * p     *     5.2500e+06    5.2400e+06    5.2300e+06    5.2200e+06    5.2100e+06
952  e
953  * pa    * f   0.0000e+00e
954  *
955  *******   type          num           id        ctitle
956  pipe            2       2 $2$ broken cold leg-vessel side
957  *       ncells          nodes          jun1          jun2          epsw
958                6              3             1             7     4.5720e-05
959  *         ichf          iconc          iacc          ipow
960                1              0             0             0
961  *       iqp3tr         iqp3sv        nqp3tb        nqp3sv        nqp3rf
962                0              0             0             0             0
963  *        radin             th         houtl         houtv         toutl
964     1.3000e-01    5.0000e-03    0.0000e+00    0.0000e+00    2.9300e+02
965  *        toutv
966     2.9300e+02
967  *        qp3in         qp3off        rqp3mx        qp3scl
968     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
969  *
970  * dx    * r02 1.3700e+00    9.7000e-01r02 1.7600e+00    2.0000e+00e
971  * vol   * r02 2.5850e-02    7.1340e-02r02 1.2940e-01    1.4710e-01e
972  * fa    * r03 1.8870e-02r04 7.3540e-02e
973  * fric  * r02 0.0000e+00    9.0000e-02r02 2.0000e-02r02 1.0000e-02e
974  * grav  * r03 0.0000e+00   -7.5000e-01   -1.0000e+00   -5.5000e-01    0.0000e+00
975  e
976  * hd    * r03 1.5500e-01r04 3.0600e-01e
977  * nff   * f           -1e
978  * alp   * f   1.0000e+00e
979  * vl    * f   0.0000e+00e
980  * vv    * f   0.0000e+00e
981  * tl    * f   4.1420e+02e
982  * tv    * f   4.1420e+02e
983  * p     * f   2.0000e+05e
984  * pa    * f   0.0000e+00e
985  * qppp  * f   0.0000e+00e
986  * matid * f          6e
987  * tw    * f   4.1420e+02e
988  *
989  *******   type          num           id        ctitle
990  pipe            3       3 $3$ broken cold leg-st gen side
991  *       ncells          nodes          jun1          jun2          epsw
992               21              2             9             8     4.5720e-05
993  *         ichf          iconc          iacc          ipow
994                1              0             0             0
995  *       iqp3tr         iqp3sv        nqp3tb        nqp3sv        nqp3rf
996                0              0             0             0             0
```

```
997  *        radin            th         houtl         houtv         toutl
998      1.0100e-01    9.0000e-03    0.0000e+00    0.0000e+00    2.9300e+02
999  *        toutv
1000     2.9300e+02
1001 *        qp3in        qp3off        rqp3mx        qp3scl
1002     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
1003 *
1004 * dx    *     3.0000e-01    2.1650e-01    2.1310e-01    9.9140e-01    1.8866e+00
1005 * dx    *     2.1400e+00    2.2800e+00    9.4000e-01    9.0000e-01    3.2900e-01
1006 * dx    *     2.7500e-01    2.5200e-01    5.2400e-01    2.6000e-01    4.4000e-01
1007 * dx    * r02 6.8500e-01    8.0000e-01    8.8990e-01    3.5250e+00    2.1500e+00
1008 e
1009 * vol   *     4.6595e-02    5.7256e-02    2.9039e-02    1.8755e-02    3.5691e-02
1010 * vol   *     4.0484e-02    4.3133e-02    1.7783e-02    1.7026e-02    1.0129e-02
1011 * vol   *     1.8796e-02    7.6070e-03    1.5818e-02    9.5500e-02    8.3240e-03
1012 * vol   * r02 1.2956e-02    1.5134e-02    1.6837e-02    6.6690e-02    1.4990e-01
1013 e
1014 * fa    *     1.5532e-01    1.4471e-01    1.1607e-01r07 1.8920e-02    7.0882e-03
1015 * fa    * r03 3.0187e-02r07 1.8920e-02    6.9700e-02e
1016 * fric  * r10 0.0000e+00    2.1500e-01r11 0.0000e+00e
1017 * grav  * r03-1.0000e+00   -7.6604e-01r02-1.0000e+00r02 0.0000e+00r06 1.0000e+00
1018 * grav  * r06 0.0000e+00    4.5820e-01    0.0000e+00e
1019 * hd    *     3.9570e-01    3.6880e-01    3.2940e-01r07 1.5520e-01    9.5000e-02
1020 * hd    * r03 4.7340e-02r07 1.5520e-01    2.9790e-01e
1021 * nff   * f          -1e
1022 * alp   * f   1.0000e+00e
1023 * vl    * f   0.0000e+00e
1024 * vv    * f   0.0000e+00e
1025 * tl    * f   4.1420e+02e
1026 * tv    * f   4.1420e+02e
1027 * p     * f   2.0000e+05e
1028 * pa    * f   0.0000e+00e
1029 * qppp  * f   0.0000e+00e
1030 * matid *             6e
1031 * tw    * f   4.1420e+02e
1032 *
1033 *******   type          num           id        ctitle
1034 pipe            4       4 $4$ hot leg--broken loop
1035 *       ncells         nodes          jun1          jun2          epsw
1036             3             2             2            10    4.5720e-05
1037 *         ichf         iconc          iacc          ipow
1038             1             0             0             0
1039 *       iqp3tr        iqp3sv        nqp3tb        nqp3sv        nqp3rf
1040             0             0             0             0             0
1041 *        radin            th         houtl         houtv         toutl
1042     7.7600e-02    5.0000e-03    0.0000e+00    0.0000e+00    2.9300e+02
1043 *        toutv
1044     2.9300e+02
1045 *        qp3in        qp3off        rqp3mx        qp3scl
1046     0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
1047 *
1048 * dx    *     3.3810e+00    2.4860e+00    7.9800e-01e
1049 * vol   *     6.3960e-02    4.7030e-02    9.9000e-02e
1050 * fa    * r03 1.8920e-02    1.2410e-01e
1051 * fric  * f   0.0000e+00e
1052 * grav  * r02 0.0000e+00    7.6600e-01    1.0000e+00e
1053 * hd    * r03 1.5520e-01    4.7960e-01e
1054 * nff   * f          -1e
1055 * alp   * f   1.0000e+00e
1056 * vl    * f   0.0000e+00e
1057 * vv    * f   0.0000e+00e
1058 * tl    * f   4.1420e+02e
1059 * tv    * f   4.1420e+02e
1060 * p     * f   2.0000e+05e
1061 * pa    * f   0.0000e+00e
1062 * qppp  * f   0.0000e+00e
1063 * matid *             6e
1064 * tw    * f   4.1420e+02e
1065 *
1066 *******   type          num           id        ctitle
1067 pipe            5       5   $5$ blsg primary
1068 *
1069 *       ncells         nodes          jun1          jun2          epsw
1070             12             0            10             9     4.5720e-5
1071 *
1072 *         ichf         iconc          iacc          ipow
1073             1             0             0             0
1074 *
1075 *        radin            th         houtl         houtv         toutl
1076     9.8000e-03    2.9000e-03           0.0           0.0         300.0
1077 *
1078 *        toutv         powin        powoff        rpowmx        powscl
1079         300.0            0.            0.            0.            1.
1080 *
1081 * dx    *     7.9800e-01r02 5.0000e-01    1.5240e+00r04 2.5240e+00    1.5240e+00
1082 * dx    * r02 5.0000e-01    7.9800e-01e
1083 * vol   *     9.9000e-02r02 2.3800e-02    7.2600e-02r04 1.2030e-01    7.2600e-02
1084 * vol   * r02 2.3800e-02    7.0930e-02e
1085 * fa    *     1.2410e-01r11 4.7670e-02    1.5532e-01e
1086 * fric  * f   0.0000e+00e
1087 * grav  * r06 1.0000e+00    0.0000e+00r06-1.0000e+00e
1088 * hd    *     4.7960e-01r11 1.9600e-02    3.9570e-01e
```

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1089  * nff    * f           -1e
1090  * alp    * f    1.0000e+00e
1091  * vl     * f    0.0000e+00e
1092  * vv     * f    0.0000e+00e
1093  * tl     * f    4.1420e+02e
1094  * tv     * f    4.1420e+02e
1095  * p      * f    2.0000e+05e
1096  * pa     * f    0.0000e+00e
1097  *
1098  *******   type          num          id        ctitle
1099  pipe            25      25   $25$ blsg secondary
1100  *
1101  *       ncells         nodes         jun1         jun2         epsw
1102                5             0           14           15    4.5720e-5
1103  *
1104  *         ichf         iconc         iacc         ipow
1105                1             0            0            0
1106  *
1107  *        radin            th        houtl        houtv        toutl
1108                0.            0.          0.0          0.0        300.0
1109  *
1110  *        toutv         powin        powoff        rpowmx        powscl
1111                300.0         0.           0.           0.            1.
1112  *
1113  * dx     * r02 5.0000e-01    1.5240e+00    2.5240e+00    2.7510e+00e
1114  * vol    *     5.9800e-01    1.9800e-01    6.0200e-01    9.9720e-01    1.1050e+00
1115  e
1116  * fa     *     0.0000e+00r04 3.9510e-01    0.0000e+00e
1117  * fric   * f    0.0000e+00e
1118  * grav   * f    1.0000e+00e
1119  * hd     *f 1.0240e-01e
1120  * nff    * f           -1e
1121  * alp    * r04 0.0000e+00    2.5400e-01e
1122  * vl     * f    0.0000e+00e
1123  * vv     * f    0.0000e+00e
1124  * tl     *     4.8400e+02    5.2200e+02r03 5.4000e+02e
1125  * tv     *     4.8400e+02    5.2200e+02r03 5.4000e+02e
1126  * p      *     5.2500e+06    5.2400e+06    5.2300e+06    5.2200e+06    5.2100e+06
1127  e
1128  * pa     * f    0.0000e+00e
1129  *
1130  *******   type          num          id        ctitle
1131  pipe            11      11 $11$ lower plenum ecc pipe
1132  *       ncells         nodes         jun1         jun2         epsw
1133                1             0            5            6    4.5720e-05
1134  *         ichf         iconc         iacc         ipow
1135                0             0            0            0
1136  *        radin            th        houtl        houtv        toutl
1137      7.7600e-02    1.0000e-03    0.0000e+00    0.0000e+00    2.9300e+02
1138  *        toutv
1139      2.9300e+02
1140  *
1141  * dx     *     1.0000e-01e
1142  * vol    *     1.8900e-03e
1143  * fa     * f    1.8900e-02e
1144  * fric   * f    0.0000e+00e
1145  * grav   * f    0.0000e+00e
1146  * hd     * f    1.5200e-01e
1147  * nff    * f           -1e
1148  * alp    *     0.0000e+00e
1149  * vl     * f    0.0000e+00e
1150  * vv     * f    0.0000e+00e
1151  * tl     *     4.1420e+02e
1152  * tv     *     4.1420e+02e
1153  * p      *     2.0000e+05e
1154  * pa     *     0.0000e+00e
1155  *
1156  *******   type          num          id        ctitle
1157  fill            12      12 $12$ lower plenum ecc fill
1158  *         jun1          ifty         ioff
1159                6             9            0
1160  *         iftr          ifsv         nftb         nfsv         nfrf
1161             1003           101            7            0            0
1162  *       twtold         rfmx        concin         felv
1163      0.0000e+00    1.0000e+05    0.0000e+00    0.0000e+00
1164  *         dxin         volin        alpin         vlin         tlin
1165      1.0000e-01    1.8900e-02    0.0000e+00    0.0000e+00    4.1420e+02
1166  *          pin          pain        flowin         vvin         tvin
1167      2.0000e+05    0.0000e+00    0.0000e+00    0.0000e+00    4.1420e+02
1168  *        vmscl         vvscl
1169      1.0000e+00    1.0000e+00
1170  *        tlscl         tvscl         pscl         pascl        conscl
1171      1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00
1172  *
1173  * vmtb   * r02 0.0000e+00    8.0000e+01    0.0000e+00    8.4000e+01    4.8681e+00
1174  * vmtb   *     9.1000e+01    5.5105e+00    9.4000e+01    5.0868e+00    9.9000e+01
1175  * vmtb   *     0.0000e+00    6.0000e+02    0.0000e+00e
1176  * vvtb   * r02 0.0000e+00    5.0000e+01    0.0000e+00    1.0000e+02    0.0000e+00
1177  * vvtb   *     1.5000e+02    0.0000e+00    2.0000e+02    0.0000e+00    3.0000e+02
1178  * vvtb   *     0.0000e+00    6.0000e+02    0.0000e+00e
1179  * tltb   *     0.0000e+00    3.9300e+02    8.0000e+01    3.9300e+02    8.8200e+01
1180  * tltb   *     3.9300e+02    8.8500e+01    3.1000e+02    1.6000e+02    3.1000e+02
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* tltb  *     2.0000e+02    3.1000e+02    6.0000e+02    3.1000e+02e
* tvtb  *     0.0000e+00    4.1420e+02    5.0000e+01    4.1420e+02    1.0000e+02
* tvtb  *     4.1420e+02    1.5000e+02    4.1420e+02    2.0000e+02    4.1420e+02
* tvtb  *     3.0000e+02    4.1420e+02    6.0000e+02    4.1420e+02e
* alptb * r02 0.0000e+00    5.0000e+01    0.0000e+00    1.0000e+02    0.0000e+00
* alptb *     1.5000e+02    0.0000e+00    2.0000e+02    0.0000e+00    3.0000e+02
* alptb *     0.0000e+00    6.0000e+02    0.0000e+00e
* ptb   *     0.0000e+00    2.0000e+05    5.0000e+01    2.0000e+05    1.0000e+02
* ptb   *     2.0000e+05    1.5000e+02    2.0000e+05    2.0000e+02    2.0000e+05
* ptb   *     3.0000e+02    2.0000e+05    6.0000e+02    2.0000e+05e
* patb  * r02 0.0000e+00    5.0000e+01    0.0000e+00    1.0000e+02    0.0000e+00
* patb  *     1.5000e+02    0.0000e+00    2.0000e+02    0.0000e+00    3.0000e+02
* patb  *     0.0000e+00    6.0000e+02    0.0000e+00e
*
*******   type          num           id        ctitle
fill          13      13 $13$ cold leg ecc fill
*          jun1          ifty          ioff
             11             9             0
*          iftr          ifsv          nftb          nfsv          nfrf
           1003           101             8             0             0
*        twtold          rfmx         concin          felv
    0.0000e+00    1.0000e+05    0.0000e+00    0.0000e+00
*          dxin          volin         alpin          vlin          tlin
    1.0000e+00    5.2050e-03    0.0000e+00    0.0000e+00    3.8300e+02
*           pin          pain         flowin          vvin          tvin
    2.0000e+05    0.0000e+00    0.0000e+00    0.0000e+00    4.1420e+02
*         vmscl         vvscl
    1.0000e+00    1.0000e+00
*          tlscl         tvscl          pscl          pascl         conscl
    1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00    1.0000e+00
*
* vmtb  * r02 0.0000e+00    9.2000e+01    0.0000e+00    9.6000e+01    1.3660e+01
* vmtb  *     9.9000e+01    1.6442e+01    1.0400e+02    1.6473e+01    1.0900e+02
* vmtb  *     3.1820e+00    1.2100e+00    2.1810e+00    6.0000e+02    2.1864e+00
e
* vvtb  * r02 0.0000e+00    5.0000e+01    0.0000e+00    1.0000e+02    0.0000e+00
* vvtb  *     1.5000e+02    0.0000e+00    2.0000e+02    0.0000e+00    3.0000e+02
* vvtb  *     0.0000e+00    5.0000e+02    0.0000e+00    6.0000e+02    0.0000e+00
e
* tltb  *     0.0000e+00    3.8700e+02    8.1000e+01    3.8700e+02    9.2000e+01
* tltb  *     3.8700e+02    9.5000e+01    3.1000e+02    9.6000e+01    3.0900e+02
* tltb  *     1.0700e+02    3.0800e+02    1.2300e+02    3.1100e+02    6.0000e+02
* tltb  *     3.1100e+02e
* tvtb  *     0.0000e+00    4.1420e+02    5.0000e+01    4.1420e+02    1.0000e+02
* tvtb  *     4.1420e+02    1.5000e+02    4.1420e+02    2.0000e+02    4.1420e+02
* tvtb  *     3.0000e+02    4.1420e+02    5.0000e+02    4.1420e+02    6.0000e+02
* tvtb  *     4.1420e+02e
* alptb * r02 0.0000e+00    5.0000e+01    0.0000e+00    1.0000e+02    0.0000e+00
* alptb *     1.5000e+02    0.0000e+00    2.0000e+02    0.0000e+00    3.0000e+02
* alptb *     0.0000e+00    5.0000e+02    0.0000e+00    6.0000e+02    0.0000e+00
e
* ptb   *     0.0000e+00    2.0000e+05    5.0000e+01    2.0000e+05    1.0000e+02
* ptb   *     2.0000e+05    1.5000e+02    2.0000e+05    2.0000e+02    2.0000e+05
* ptb   *     3.0000e+02    2.0000e+05    5.0000e+02    2.0000e+05    6.0000e+02
* ptb   *     2.0000e+05e
* patb  * r02 0.0000e+00    5.0000e+01    0.0000e+00    1.0000e+02    0.0000e+00
* patb  *     1.5000e+02    0.0000e+00    2.0000e+02    0.0000e+00    3.0000e+02
* patb  *     0.0000e+00    5.0000e+02    0.0000e+00    6.0000e+02    0.0000e+00
e
*
*******   type          num           id        ctitle
break         14      14 $14$ cold leg break-vessel side
*          jun1          ibty          isat          ioff
             7             1             3             1
*          ibtr          ibsv          nbtb          nbsv          nbrf
             0           101            23             0             0
*          dxin          volin         alpin          tin           pin
    1.6670e+00    3.1500e-02    1.0000e+00    4.1420e+02    2.0000e+05
*           pain         concin          rbmx          poff          belv
    0.0000e+00    0.0000e+00    1.5000e+05    0.0000e+00    0.0000e+00
*          pscl          tlscl         tvscl          pascl         conscl
    1.0000e+00    1.0000e-06    1.0000e+00    1.0000e+00    1.0000e+00
* ptb   *     0.0000e+00    2.0280e+05    2.6000e+01    2.0280e+05    2.7000e+01
* ptb   *     2.0310e+05    8.2000e+01    2.0310e+05    9.4000e+01    2.2080e+05
* ptb   *     9.6000e+01    2.2390e+05    1.0400e+02    2.0700e+05    1.0800e+02
* ptb   *     2.1100e+05    1.1400e+02    2.0920e+05    1.2700e+02    2.2060e+05
* ptb   *     1.8500e+02    2.0550e+05    2.2000e+02    2.0280e+05    2.5600e+02
* ptb   *     2.0180e+05    3.0200e+02    2.0280e+05    3.3200e+02    2.0460e+05
* ptb   *     3.6500e+02    2.0490e+05    3.9100e+02    2.0460e+05    4.8000e+02
* ptb   *     2.0370e+05    5.0400e+02    2.0430e+05    5.3600e+02    2.0280e+05
* ptb   *     5.5400e+02    2.0120e+05    5.7000e+02    2.0240e+05    6.0000e+02
* ptb   *     2.0340e+05e
*
*******   type          num           id        ctitle
break         15      15 $15$ cold leg break-st gen side
*          jun1          ibty          isat          ioff
             8             1             3             1
*          ibtr          ibsv          nbtb          nbsv          nbrf
             0           101            23             0             0
*          dxin          volin         alpin          tin           pin
    2.1500e+00    1.4990e-01    1.0000e+00    4.1420e+02    2.0000e+05
*           pain         concin          rbmx          poff          belv
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```
    0.0000e+00    0.0000e+00    1.5000e+05    0.0000e+00    0.0000e+00
*         pscl          tlscl          tvscl          pascl          conscl
    1.0000e+00    1.0000e-06    1.0000e+00    1.0000e+00    1.0000e+00
* ptb   *     0.0000e+00    2.0280e+05    2.6000e+01    2.0280e+05    2.7000e+01
* ptb   *     2.0310e+05    8.2000e+01    2.0310e+05    9.4000e+01    2.2080e+05
* ptb   *     9.6000e+01    2.2390e+05    1.0400e+02    2.0700e+05    1.0800e+02
* ptb   *     2.1100e+05    1.1400e+02    2.0920e+05    1.2700e+02    2.2060e+05
* ptb   *     1.8500e+02    2.0550e+05    2.2000e+02    2.0280e+05    2.5600e+02
* ptb   *     2.0180e+05    3.0200e+02    2.0280e+05    3.3200e+02    2.0460e+05
* ptb   *     3.6500e+02    2.0490e+05    3.9100e+02    2.0460e+05    4.8000e+02
* ptb   *     2.0370e+05    5.0400e+02    2.0430e+05    5.3600e+02    2.0280e+05
* ptb   *     5.5400e+02    2.0120e+05    5.7000e+02    2.0240e+05    6.0000e+02
* ptb   *     2.0340e+05e
*
*******   type           num            id       ctitle
fill            18      18 $18$ st. gen. sec.-combined loop
*         jun1           ifty          ioff
               16              1             0
*       twtold          rfmx         concin          felv
    0.0000e+00    1.0000e+05    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    2.5240e+00    2.9916e+00    0.0000e+00    0.0000e+00    5.4000e+02
*          pin           pain         flowin          vvin          tvin
    5.2500e+06    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
*******   type           num            id       ctitle
fill            19      19 $19$ st. gen. sec.-combined loop
*         jun1           ifty          ioff
               17              1             0
*       twtold          rfmx         concin          felv
    0.0000e+00    1.0000e+05    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    2.7510e+00    3.3153e+00    0.0000e+00    0.0000e+00    5.4000e+02
*          pin           pain         flowin          vvin          tvin
    5.2500e+06    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
*******   type           num            id       ctitle
fill            16      16 $16$ st. gen. sec.-broken loop
*         jun1           ifty          ioff
               14              1             0
*       twtold          rfmx         concin          felv
    0.0000e+00    1.0000e+05    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    2.5240e+00    9.9720e-01    0.0000e+00    0.0000e+00    5.4000e+02
*          pin           pain         flowin          vvin          tvin
    5.2500e+06    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
*******   type           num            id       ctitle
fill            17      17 $17$ st. gen. sec.-broken loop
*         jun1           ifty          ioff
               15              1             0
*       twtold          rfmx         concin          felv
    0.0000e+00    1.0000e+05    0.0000e+00    0.0000e+00
*         dxin          volin          alpin          vlin          tlin
    2.7510e+00    1.1051e+00    0.0000e+00    0.0000e+00    5.4000e+02
*          pin           pain         flowin          vvin          tvin
    5.2500e+06    0.0000e+00    0.0000e+00    0.0000e+00    0.0000e+00
*
*     type           num            id     ctitle
 rod          999          999 $999$ fuel rod component
*          ncrx          ncrz
               6             7                                              * card 2
*        nopowr         nridr         modez        liqlev        iaxcnd
               0             0             1             1 * card 3
*         idbci         idbco          hdri          hdro
               0             2    0.0000e+00    1.3650e-02
*         nrods         nodes         irftr         nzmax        irftr2
               6             6          1002           250          1002
*      dtxht(1)      dtxht(2)         dznht         hgapo         shelv
    2.5000e+00    1.0000e+01    1.0000e-03    1.0000e+10    2.1000e+00
*        irpwty          ndgx          ndhx          nrts          nhist
               7             0             0            10             0 * card 11
*        irpwtr         irpwsv        nrpwtb        nrpwsv        nrpwrf
            1002           101         -1201             0             0 * card 14
*        izpwtr         izpwsv        nzpwtb        nzpwsv        nzpwrf
            1002           101             1             0             0 * card 15
*         nmwrx          nfci         nfcil
               0             0             0                             * card 16
*         nzpwz         nzpwi         nfbpwt
              18            -1             0                             * card 17
*         react         tneut         rpwoff        rrpwmx        rpwscl
    0.0000e+00    0.0000e+00    0.0000e+00    1.0000e+30    1.0000e+00 * card 18
*        rpowri         zpwin         zpwoff        rzpwmx
    2.5713e+03    0.0000e+00    0.0000e+00    1.0000e+09                 * card 19
*        extsou          pldr          pdrat         fucrac
    0.0000e+00    0.0000e+00    1.3364e+00    1.0000e+00                 * card 20
*        nhcomo
f             1e
*        nhcelo
              -4s
               4s
               5s
```

```
1365              6s
1366              7s
1367              8s
1368              9s
1369             10s
1370             11e
1371  *           z
1372     2.1000e+00s
1373     2.4050e+00s
1374     3.0150e+00s
1375     3.6250e+00s
1376     4.2350e+00s
1377     4.8450e+00s
1378     5.4550e+00s
1379     5.7600e+00e
1380  *         grav
1381  f         1.0e
1382  *  rdx  *  57.0  171.0  171.0  513.0 s
1383  *  rdx  *  228.0  684.0 e
1384  * radrd *     0.0000e+00    2.7000e-03    3.3000e-03    4.3500e-03    4.8500e-03
1385  * radrd *     5.3500e-03e
1386  * matrd *              58            55            59r02          60e
1387  * nfax  * f            1e
1388  * rftn  * f 414.2 e
1389  * rftn  * f 414.2 e
1390  * rftn  * f 414.2 e
1391  * rftn  * f 414.2 e
1392  * rftn  * f 414.2 e
1393  * rftn  * f 414.2 e
1394  * rdpwr *     0.0000e+00    7.0980e-01    1.0000e+00r03 0.0000e+00e
1395  * cpowr * r02 1.3600e+00r02 1.2000e+00r02 7.6000e-01e
1396  * rpkf    f 1.     e
1397  * zpwzt *
1398    2.1 s
1399    2.355 s
1400    2.605 s
1401    2.815 s
1402    3.015 s
1403    3.215 s
1404    3.425 s
1405    3.625 s
1406    3.825 s
1407    4.035 s
1408    4.235 s
1409    4.435 s
1410    4.645 s
1411    4.845 s
1412    5.045 s
1413    5.255 s
1414    5.505 s
1415    5.76 e
1416  * zpwtb *
1417      0.0 s
1418    0.406 s
1419    0.651 s
1420    0.854 s
1421    1.01 s
1422    1.15 s
1423    1.26 s
1424    1.34 s
1425    1.38 s
1426    1.4 s
1427    1.38 s
1428    1.34 s
1429    1.26 s
1430    1.15 s
1431    1.01 s
1432    0.854 s
1433    0.651 s
1434    0.406 s
1435     0.0 e
1436  *
1437  * rpwtb computed from experimental data by summing
1438  * data channels wt01m, wt02m, . . . wt09m
1439  *
1440   0.e+00 2.5713e+03 s
1441   5.e-01 5.9609e+03 s
1442   1.e+00 1.64843e+05 s
1443   1.5e+00 1.51367e+06 s
1444   2.e+00 4.0619e+06 s
1445   2.5e+00 6.7131e+06 s
1446   3.e+00 8.343e+06 s
1447   3.5e+00 8.7462e+06 s
1448   4.e+00 8.6925e+06 s
1449   4.5e+00 8.6017e+06 s
1450   5.e+00 8.6903e+06 s
1451   5.5e+00 8.931e+06 s
1452   6.e+00 9.1316e+06 s
1453   6.5e+00 9.202e+06 s
1454   7.e+00 9.2066e+06 s
1455   7.5e+00 9.2016e+06 s
1456   8.e+00 9.2215e+06 s
```

1457 8.5e+00 9.2696e+06 s
1458 9.e+00 9.3102e+06 s
1459 9.5e+00 9.3192e+06 s
1460 1.e+01 9.313e+06 s
1461 1.05e+01 9.3117e+06 s
1462 1.1e+01 9.3278e+06 s
1463 1.15e+01 9.3434e+06 s
1464 1.2e+01 9.3462e+06 s
1465 1.25e+01 9.3429e+06 s
1466 1.3e+01 9.3417e+06 s
1467 1.35e+01 9.3424e+06 s
1468 1.4e+01 9.3451e+06 s
1469 1.45e+01 9.3482e+06 s
1470 1.5e+01 9.3494e+06 s
1471 1.55e+01 9.3465e+06 s
1472 1.6e+01 9.3409e+06 s
1473 1.65e+01 9.3431e+06 s
1474 1.7e+01 9.3483e+06 s
1475 1.75e+01 9.3507e+06 s
1476 1.8e+01 9.3517e+06 s
1477 1.85e+01 9.3491e+06 s
1478 1.9e+01 9.3463e+06 s
1479 1.95e+01 9.3479e+06 s
1480 2.e+01 9.3518e+06 s
1481 2.05e+01 9.3537e+06 s
1482 2.1e+01 9.3525e+06 s
1483 2.15e+01 9.3503e+06 s
1484 2.2e+01 9.3544e+06 s
1485 2.25e+01 9.3547e+06 s
1486 2.3e+01 9.3506e+06 s
1487 2.35e+01 9.3484e+06 s
1488 2.4e+01 9.3469e+06 s
1489 2.45e+01 9.3472e+06 s
1490 2.5e+01 9.3471e+06 s
1491 2.55e+01 9.3503e+06 s
1492 2.6e+01 9.3527e+06 s
1493 2.65e+01 9.35e+06 s
1494 2.7e+01 9.3473e+06 s
1495 2.75e+01 9.3485e+06 s
1496 2.8e+01 9.3499e+06 s
1497 2.85e+01 9.3503e+06 s
1498 2.9e+01 9.348e+06 s
1499 2.95e+01 9.349e+06 s
1500 3.e+01 9.3508e+06 s
1501 3.05e+01 9.3705e+06 s
1502 3.1e+01 9.4026e+06 s
1503 3.15e+01 9.4152e+06 s
1504 3.2e+01 9.3908e+06 s
1505 3.25e+01 9.368e+06 s
1506 3.3e+01 9.3592e+06 s
1507 3.35e+01 9.3635e+06 s
1508 3.4e+01 9.3635e+06 s
1509 3.45e+01 9.358e+06 s
1510 3.5e+01 9.3551e+06 s
1511 3.55e+01 9.3541e+06 s
1512 3.6e+01 9.356e+06 s
1513 3.65e+01 9.3548e+06 s
1514 3.7e+01 9.3527e+06 s
1515 3.75e+01 9.3529e+06 s
1516 3.8e+01 9.3519e+06 s
1517 3.85e+01 9.3498e+06 s
1518 3.9e+01 9.3496e+06 s
1519 3.95e+01 9.3493e+06 s
1520 4.e+01 9.3495e+06 s
1521 4.05e+01 9.3502e+06 s
1522 4.1e+01 9.3508e+06 s
1523 4.15e+01 9.3502e+06 s
1524 4.2e+01 9.3495e+06 s
1525 4.25e+01 9.3508e+06 s
1526 4.3e+01 9.3512e+06 s
1527 4.35e+01 9.3496e+06 s
1528 4.4e+01 9.3475e+06 s
1529 4.45e+01 9.3488e+06 s
1530 4.5e+01 9.3503e+06 s
1531 4.55e+01 9.3492e+06 s
1532 4.6e+01 9.3461e+06 s
1533 4.65e+01 9.3463e+06 s
1534 4.7e+01 9.3491e+06 s
1535 4.75e+01 9.3491e+06 s
1536 4.8e+01 9.3479e+06 s
1537 4.85e+01 9.3487e+06 s
1538 4.9e+01 9.3493e+06 s
1539 4.95e+01 9.3493e+06 s
1540 5.e+01 9.3512e+06 s
1541 5.05e+01 9.3528e+06 s
1542 5.1e+01 9.3532e+06 s
1543 5.15e+01 9.3503e+06 s
1544 5.2e+01 9.3493e+06 s
1545 5.25e+01 9.3493e+06 s
1546 5.3e+01 9.3507e+06 s
1547 5.35e+01 9.3516e+06 s
1548 5.4e+01 9.3517e+06 s

1549 5.45e+01 9.3508e+06 s
1550 5.5e+01 9.352e+06 s
1551 5.55e+01 9.3516e+06 s
1552 5.6e+01 9.3502e+06 s
1553 5.65e+01 9.3499e+06 s
1554 5.7e+01 9.3529e+06 s
1555 5.75e+01 9.3518e+06 s
1556 5.8e+01 9.3497e+06 s
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1558 5.9e+01 9.3501e+06 s
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1560 6.e+01 9.3534e+06 s
1561 6.05e+01 9.3552e+06 s
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1563 6.15e+01 9.3536e+06 s
1564 6.2e+01 9.3529e+06 s
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1566 6.3e+01 9.3518e+06 s
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1569 6.45e+01 9.3523e+06 s
1570 6.5e+01 9.3502e+06 s
1571 6.55e+01 9.3518e+06 s
1572 6.6e+01 9.3524e+06 s
1573 6.65e+01 9.3525e+06 s
1574 6.7e+01 9.3514e+06 s
1575 6.75e+01 9.3517e+06 s
1576 6.8e+01 9.3533e+06 s
1577 6.85e+01 9.3534e+06 s
1578 6.9e+01 9.3528e+06 s
1579 6.95e+01 9.3489e+06 s
1580 7.e+01 9.3499e+06 s
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1599 7.95e+01 9.3553e+06 s
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1621 9.05e+01 9.2499e+06 s
1622 9.1e+01 8.8152e+06 s
1623 9.15e+01 8.1582e+06 s
1624 9.2e+01 7.7817e+06 s
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1626 9.3e+01 7.8594e+06 s
1627 9.35e+01 7.8961e+06 s
1628 9.4e+01 7.8788e+06 s
1629 9.45e+01 7.8214e+06 s
1630 9.5e+01 7.7652e+06 s
1631 9.55e+01 7.7253e+06 s
1632 9.6e+01 7.6994e+06 s
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1634 9.7e+01 7.6638e+06 s
1635 9.75e+01 7.6421e+06 s
1636 9.8e+01 7.6206e+06 s
1637 9.85e+01 7.6054e+06 s
1638 9.9e+01 7.5887e+06 s
1639 9.95e+01 7.5698e+06 s
1640 1.e+02 7.5482e+06 s

1641 1.005e+02 7.5316e+06 s
1642 1.01e+02 7.5172e+06 s
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1661 1.105e+02 7.2491e+06 s
1662 1.11e+02 7.2382e+06 s
1663 1.115e+02 7.2241e+06 s
1664 1.12e+02 7.2092e+06 s
1665 1.125e+02 7.199e+06 s
1666 1.13e+02 7.1924e+06 s
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1753 1.565e+02 6.5004e+06 s
1754 1.57e+02 6.4884e+06 s
1755 1.575e+02 6.4813e+06 s
1756 1.58e+02 6.4789e+06 s
1757 1.585e+02 6.4786e+06 s
1758 1.59e+02 6.4775e+06 s
1759 1.595e+02 6.4733e+06 s
1760 1.6e+02 6.4678e+06 s
1761 1.605e+02 6.4606e+06 s
1762 1.61e+02 6.4523e+06 s
1763 1.615e+02 6.4457e+06 s
1764 1.62e+02 6.4452e+06 s
1765 1.625e+02 6.4438e+06 s
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1767 1.635e+02 6.426e+06 s
1768 1.64e+02 6.4148e+06 s
1769 1.645e+02 6.4072e+06 s
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1771 1.655e+02 6.3996e+06 s
1772 1.66e+02 6.3978e+06 s
1773 1.665e+02 6.3948e+06 s
1774 1.67e+02 6.391e+06 s
1775 1.675e+02 6.3876e+06 s
1776 1.68e+02 6.385e+06 s
1777 1.685e+02 6.3813e+06 s
1778 1.69e+02 6.3752e+06 s
1779 1.695e+02 6.3662e+06 s
1780 1.7e+02 6.3585e+06 s
1781 1.705e+02 6.3545e+06 s
1782 1.71e+02 6.3529e+06 s
1783 1.715e+02 6.3534e+06 s
1784 1.72e+02 6.3537e+06 s
1785 1.725e+02 6.3542e+06 s
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1794 1.77e+02 6.3069e+06 s
1795 1.775e+02 6.3044e+06 s
1796 1.78e+02 6.2978e+06 s
1797 1.785e+02 6.2908e+06 s
1798 1.79e+02 6.2869e+06 s
1799 1.795e+02 6.2844e+06 s
1800 1.8e+02 6.2812e+06 s
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1913 2.365e+02 5.9454e+06 s
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1916 2.38e+02 5.9091e+06 s

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2254 4.07e+02 4.9331e+06 s
2255 4.075e+02 4.9344e+06 s
2256 4.08e+02 4.9353e+06 s
2257 4.085e+02 4.9349e+06 s
2258 4.09e+02 4.9348e+06 s
2259 4.095e+02 4.9348e+06 s
2260 4.1e+02 4.9345e+06 s
2261 4.105e+02 4.9362e+06 s
2262 4.11e+02 4.9384e+06 s
2263 4.115e+02 4.936e+06 s
2264 4.12e+02 4.9266e+06 s
2265 4.125e+02 4.914e+06 s
2266 4.13e+02 4.907e+06 s
2267 4.135e+02 4.9032e+06 s
2268 4.14e+02 4.9014e+06 s
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2270 4.15e+02 4.9018e+06 s
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2284 4.22e+02 4.882e+06 s

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2560 5.6e+02 4.47e+06 s

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2634   5.97e+02 4.3796e+06 s
2635   5.975e+02 4.3785e+06 s
2636   5.98e+02 4.3786e+06 s
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2639   5.995e+02 4.3794e+06 s
2640   6.e+02 4.3786e+06 e
2641  * fpuo2 * f    0.0000e+00e
2642  * ftd   * f    1.0000e+00e
2643  * gmix  * f    0.0000e+00e
2644  * gmles * f    0.0000e+00e
2645  * pgapt * f    0.0000e+00e
2646  * plvol * f    0.0000e+00e
2647  * pslen * f    0.0000e+00e
2648  * clenn * f    0.0000e+00e
2649  * burn  * f    0.0000e+00e
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* burn  * f   0.0000e+00e
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slab             998        998  $998$ lev 1 ring 1-3 slabs
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*         ncrx          ncrz
              6             1
*
*        nopowr         nridr         modez        liqlev        iaxcnd
              1             1             1             0             0
*
*         idbci         idbco
              0             2
*
*         width
           1.0929
*
*         nrods         nodes         irftr         nzmax        irftr2
              6             4             0             5             0
*
*      dtxht(1)      dtxht(2)        dznht         hgapo         shelv
              5.           25.          .002            0.            0.
*
*        nhcomo
f             1e
*
*        nhcelo             +             +             +             +
             -1             1            2e
*
*           dz              +             +             +             +
            .915e
*
*         grav
f    1.0000E+00e
*
*         idrod             +             +             +             +
              1             2             3             4             5
              6e
*
*   rdx  *  1.088  3.264  5.266  15.798 s
*   rdx  *  5.266  15.798 e
*
*         radrd
            0.0          .002          .0035         .0043e
*
*         matrd
f             6e
*
*          nfax
f             1e
*
*          rftn
f          393.e
f          393.e
f          393.e
f          393.e
f          393.e
f          393.e
*
*     type           num            id     ctitle
slab             997        997  $997$ lev 1 ring 4 slabs
*
*         ncrx          ncrz
              2             1
*
*        nopowr         nridr         modez        liqlev        iaxcnd
              1             1             1             0             0
*
*         idbci         idbco
              0             2
*
*         width
           1.0929
*
*         nrods         nodes         irftr         nzmax        irftr2
              2             4             0             5             0
*
*      dtxht(1)      dtxht(2)        dznht         hgapo         shelv
              5.           25.          .002            0.            0.
*
*        nhcomo
f             1e
*
*        nhcelo             +             +             +             +
             -1             1            2e
*
*           dz              +             +             +             +
            .915e
*
*         grav
f    1.0000E+00e
*
```

```
2745  *        idrod             +             +             +             +
2746                7             8e
2747  *
2748  *  rdx  *  2.07  6.21 e
2749  *
2750  *        radrd
2751                0.0           .04           .08           .09e
2752  *
2753  *        matrd
2754  r 2           9             6e
2755  *
2756  *         nfax
2757  f             1e
2758  *
2759  *         rftn
2760  f         393.e
2761  f         393.e
2762  *
2763  *
2764  *     type           num           id     ctitle
2765  slab             996         996  $996$ lev 2 ring 1-3 slabs
2766  *
2767  *         ncrx          ncrz
2768                6             1
2769  *
2770  *       nopowr         nridr         modez        liqlev        iaxcnd
2771                1             1             1             0             0
2772  *
2773  *        idbci         idbco
2774                0             2
2775  *
2776  *        width
2777              1.0152
2778  *
2779  *        nrods         nodes         irftr         nzmax        irftr2
2780                6             4             0             5          0
2781  *
2782  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
2783                5.           25.          .002            0.            0.
2784  *
2785  *       nhcomo
2786  f             1e
2787  *
2788  *       nhcelo             +             +             +             +
2789                -2            2            3e
2790  *
2791  *           dz             +             +             +             +
2792             .985e
2793  *
2794  *         grav
2795  f   1.0000E+00e
2796  *
2797  *        idrod             +             +             +             +
2798                1             2             3             4             5
2799                6e
2800  *
2801  *  rdx  *  1.17  3.51  5.67  17.01 s
2802  *  rdx  *  7.36  11.04 e
2803  *
2804  *        radrd
2805                0.0           .002          .0035         .0043e
2806  *
2807  *        matrd
2808  f             6e
2809  *
2810  *         nfax
2811  f             1e
2812  *
2813  *         rftn
2814  f         393.e
2815  f         393.e
2816  f         393.e
2817  f         393.e
2818  f         393.e
2819  f         393.e
2820  *
2821  *     type           num           id     ctitle
2822  slab             995         995  $995$ lev 2 ring 4 slabs
2823  *
2824  *         ncrx          ncrz
2825                2             1
2826  *
2827  *       nopowr         nridr         modez        liqlev        iaxcnd
2828                1             1             1             0             0
2829  *
2830  *        idbci         idbco
2831                0             2
2832  *
2833  *        width
2834              1.0152
2835  *
2836  *        nrods         nodes         irftr         nzmax        irftr2
```

```
2837                2              4          0          5          0
2838  *
2839  *     dtxht(1)       dtxht(2)         dznht        hgapo         shelv
2840                5.             25.          .002           0.           0.
2841  *
2842  *       nhcomo
2843  f             1e
2844  *
2845  *       nhcelo              +              +              +              +
2846                -2             2             3e
2847  *
2848  *           dz              +              +              +              +
2849             .985e
2850  *
2851  *         grav
2852  f   1.0000E+00e
2853  *
2854  *        idrod              +              +              +              +
2855                7             8e
2856  *
2857  *  rdx  *  0.79  2.37 e
2858  *
2859  *        radrd
2860               0.0           .04           .08           .09e
2861  *
2862  *        matrd
2863  r 2           9             6e
2864  *
2865  *         nfax
2866  f             1e
2867  *
2868  *         rftn
2869  f         393.e
2870  f         393.e
2871  *
2872  *
2873  *     type           num           id     ctitle
2874  slab              994          994  $994$ lev 3 ring 1-3 slabs
2875  *
2876  *         ncrx          ncrz
2877                6             1
2878  *
2879  *       nopowr         nridr         modez        liqlev        iaxcnd
2880                1             1             1             0             0
2881  *
2882  *        idbci         idbco
2883                0             2
2884  *
2885  *        width
2886             5.0000
2887  *
2888  *        nrods         nodes         irftr         nzmax        irftr2
2889                6             4             0             5          0
2890  *
2891  *     dtxht(1)       dtxht(2)         dznht        hgapo         shelv
2892                5.             25.          .002           0.           0.
2893  *
2894  *       nhcomo
2895  f             1e
2896  *
2897  *       nhcelo              +              +              +              +
2898                -3             3             4e
2899  *
2900  *           dz              +              +              +              +
2901             .200e
2902  *
2903  *         grav
2904  f   1.0000E+00e
2905  *
2906  *        idrod              +              +              +              +
2907                1             2             3             4             5
2908                6e
2909  *
2910  *  rdx  *  0.33  0.99  1.608  4.824 s
2911  *  rdx  *  1.91  5.73 e
2912  *
2913  *        radrd
2914               0.0           .002          .0035          .0043e
2915  *
2916  *        matrd
2917  f             6e
2918  *
2919  *         nfax
2920  f             1e
2921  *
2922  *         rftn
2923  f         393.e
2924  f         393.e
2925  f         393.e
2926  f         393.e
2927  f         393.e
2928  f         393.e
```

```
*
*     type           num           id     ctitle
slab             993         993  $993$ lev 3 ring 4 slabs
*
*         ncrx          ncrz
              2             1
*
*       nopowr         nridr         modez        liqlev        iaxcnd
              1             1             1             0             0
*
*        idbci         idbco
              0             2
*
*        width
           5.0000
*
*        nrods         nodes         irftr         nzmax        irftr2
              2             4             0             5             0
*
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              5.           25.          .002            0.            0.
*
*       nhcomo
f             1e
*
*       nhcelo             +             +             +             +
             -3             3            4e
*
*           dz             +             +             +             +
           .200e
*
*         grav
f    1.0000E+00e
*
*        idrod             +             +             +             +
              7            8e
*
*  rdx  *  0.16  0.48 e
*
*        radrd
            0.0           .04           .08          .09e
*
*        matrd
r 2           9            6e
*
*         nfax
f             1e
*
*         rftn
f          393.e
f          393.e
*
*     type           num           id     ctitle
slab             974         974  $974$ lev 4-10 ring 1-3 slabs
*
*         ncrx          ncrz
              6             7
*
*       nopowr         nridr         modez        liqlev        iaxcnd
              1             1             1             0             0
*
*        idbci         idbco
              0             2
*
*        width
           1.6393
*
*        nrods         nodes         irftr         nzmax        irftr2
              6             4             0            15             0
*
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              5.           25.          .002            0.           2.1
*
*       nhcomo
f             1e
*
*       nhcelo             +             +             +             +
             -4             4             5             6             7
              8             9            10           11e
*
*           dz             +             +             +             +
           .305          .610          .610          .610          .610
           .610          .305e
*
*         grav
f    1.0000E+00e
*
*        idrod             +             +             +             +
              1             2             3             4             5
             6e
*
*  rdx  *  0.1586  0.4758  0.6612  1.9836 s
```

```
3021  *  rdx  *  1.235  3.705 e
3022  *
3023  *        radrd
3024             0.0          .002          .0035          .0043e
3025  *
3026  *        matrd
3027  f           6e
3028  *
3029  *         nfax
3030  f           1e
3031  *
3032  *         rftn
3033  f         393.e
3034  f         393.e
3035  f         393.e
3036  f         393.e
3037  f         393.e
3038  f         393.e
3039  *
3040  *
3041  *     type           num           id     ctitle
3042  slab             973         973  $973$ lev 4-10 ring 4 slabs
3043  *
3044  *          ncrx          ncrz
3045                2             7
3046  *
3047  *        nopowr          nridr          modez         liqlev         iaxcnd
3048                1             1              1              0              0
3049  *
3050  *         idbci          idbco
3051                0             2
3052  *
3053  *         width
3054             1.6393
3055  *
3056  *         nrods          nodes          irftr          nzmax         irftr2
3057                2             4              0             15              0
3058  *
3059  *     dtxht(1)       dtxht(2)          dznht          hgapo          shelv
3060               5.            25.           .002             0.           2.1
3061  *
3062  *       nhcomo
3063  f           1e
3064  *
3065  *       nhcelo              +              +              +              +
3066               -4             4              5              6              7
3067                8             9             10             11e
3068  *
3069  *           dz              +              +              +              +
3070             .305           .610           .610           .610           .610
3071             .610           .305e
3072  *
3073  *         grav
3074  f   1.0000E+00e
3075  *
3076  *        idrod              +              +              +              +
3077                7             8e
3078  *
3079  *  rdx  *  0.519  1.557 e
3080  *
3081  *        radrd
3082             0.0           .04           .08           .09e
3083  *
3084  *        matrd
3085  r 2           9             6e
3086  *
3087  *         nfax
3088  f           1e
3089  *
3090  *         rftn
3091  f         393.e
3092  f         393.e
3093  *
3094  *     type           num           id     ctitle
3095  slab             918         918  $918$ lev 11 ring 1-3 slabs
3096  *
3097  *          ncrx          ncrz
3098                6             1
3099  *
3100  *        nopowr          nridr          modez         liqlev         iaxcnd
3101                1             1              1              0              0
3102  *
3103  *         idbci          idbco
3104                0             2
3105  *
3106  *         width
3107             4.1667
3108  *
3109  *         nrods          nodes          irftr          nzmax         irftr2
3110                6             4              0              5              0
3111  *
3112  *     dtxht(1)       dtxht(2)          dznht          hgapo          shelv
```

```
3113              5.            25.           .002             0.             0.
3114  *
3115  *       nhcomo
3116  f            1e
3117  *
3118  *       nhcelo              +             +              +              +
3119                -11           11            12e
3120  *
3121  *           dz              +             +              +              +
3122              .240e
3123  *
3124  *         grav
3125  f   1.0000E+00e
3126  *
3127  *        idrod              +             +              +              +
3128                1             2             3              4              5
3129                6e
3130  *
3131  *  rdx  *  0.2  0.6  0.965  2.895 s
3132  *  rdx  *  1.192  3.576 e
3133  *
3134  *        radrd
3135              0.0          .002          .0035          .0043e
3136  *
3137  *        matrd
3138  f            6e
3139  *
3140  *         nfax
3141  f            1e
3142  *
3143  *         rftn
3144  f         393.e
3145  f         393.e
3146  f         393.e
3147  f         393.e
3148  f         393.e
3149  f         393.e
3150  *
3151  *     type           num            id     ctitle
3152  slab            917         917  $917$ lev 11 ring 4 slabs
3153  *
3154  *          ncrx           ncrz
3155                2              1
3156  *
3157  *        nopowr          nridr          modez         liqlev         iaxcnd
3158                1              1              1              0              0
3159  *
3160  *         idbci          idbco
3161                0              2
3162  *
3163  *         width
3164             4.1667
3165  *
3166  *         nrods          nodes          irftr          nzmax         irftr2
3167                2              4              0              5              0
3168  *
3169  *     dtxht(1)       dtxht(2)          dznht          hgapo          shelv
3170                5.            25.           .002             0.             0.
3171  *
3172  *       nhcomo
3173  f            1e
3174  *
3175  *       nhcelo              +             +              +              +
3176                -11           11            12e
3177  *
3178  *           dz              +             +              +              +
3179              .240e
3180  *
3181  *         grav
3182  f   1.0000E+00e
3183  *
3184  *        idrod              +             +              +              +
3185                7             8e
3186  *
3187  *  rdx  *  0.204  0.612 e
3188  *
3189  *        radrd
3190              0.0          .04           .08           .09e
3191  *
3192  *        matrd
3193  r 2           9             6e
3194  *
3195  *         nfax
3196  f            1e
3197  *
3198  *         rftn
3199  f         393.e
3200  f         393.e
3201  *
3202  *
3203  *     type           num            id     ctitle
3204  slab            916         916  $916$ lev 12 ring 1-3 slabs
```

```
3205  *
3206  *         ncrx          ncrz
3207                6             1
3208  *
3209  *       nopowr         nridr         modez        liqlev        iaxcnd
3210                1             1             1             0             0
3211  *
3212  *        idbci         idbco
3213                0             2
3214  *
3215  *        width
3216              4.1667
3217  *
3218  *        nrods         nodes         irftr         nzmax        irftr2
3219                6             4             0             5          0
3220  *
3221  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3222                5.           25.          .002            0.            0.
3223  *
3224  *       nhcomo
3225  f             1e
3226  *
3227  *       nhcelo             +             +             +             +
3228                -12           12           13e
3229  *
3230  *           dz             +             +             +             +
3231              .240e
3232  *
3233  *         grav
3234  f    1.0000E+00e
3235  *
3236  *        idrod             +             +             +             +
3237                1             2             3             4             5
3238                6e
3239  *
3240  *  rdx  *  0.0369  0.1107  0.1474  0.4422 s
3241  *  rdx  *  0.374  1.122 e
3242  *
3243  *        radrd
3244              0.0          .002         .0035         .0043e
3245  *
3246  *        matrd
3247  f             6e
3248  *
3249  *         nfax
3250  f             1e
3251  *
3252  *         rftn
3253  f         393.e
3254  f         393.e
3255  f         393.e
3256  f         393.e
3257  f         393.e
3258  f         393.e
3259  *
3260  *     type           num           id     ctitle
3261  slab             915         915  $915$ lev 12 ring 4 slabs
3262  *
3263  *         ncrx          ncrz
3264                2             1
3265  *
3266  *       nopowr         nridr         modez        liqlev        iaxcnd
3267                1             1             1             0             0
3268  *
3269  *        idbci         idbco
3270                0             2
3271  *
3272  *        width
3273              4.1667
3274  *
3275  *        nrods         nodes         irftr         nzmax        irftr2
3276                2             4             0             5          0
3277  *
3278  *     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
3279                5.           25.          .002            0.            0.
3280  *
3281  *       nhcomo
3282  f             1e
3283  *
3284  *       nhcelo             +             +             +             +
3285                -12           12           13e
3286  *
3287  *           dz             +             +             +             +
3288              .240e
3289  *
3290  *         grav
3291  f    1.0000E+00e
3292  *
3293  *        idrod             +             +             +             +
3294                7            8e
3295  *
3296  *  rdx  *  0.204  0.612 e
```

```
3297  *
3298  *        radrd
3299            0.0           .04           .08           .09e
3300  *
3301  *        matrd
3302  r 2           9             6e
3303  *
3304  *         nfax
3305  f             1e
3306  *
3307  *         rftn
3308  f         393.e
3309  f         393.e
3310  *
3311  *
3312  *     type           num           id     ctitle
3313  slab             914         914  $914$ lev 13 ring 1-3 slabs
3314  *
3315  *         ncrx          ncrz
3316              6             1
3317  *
3318  *       nopowr         nridr         modez        liqlev        iaxcnd
3319              1             1             1             0             0
3320  *
3321  *        idbci         idbco
3322              0             2
3323  *
3324  *        width
3325           3.8462
3326  *
3327  *        nrods         nodes         irftr         nzmax        irftr2
3328              6             4             0             5             0
3329  *
3330  *     dtxht(1)      dtxht(2)         dznht         hgapo          shelv
3331              5.           25.          .002            0.            0.
3332  *
3333  *       nhcomo
3334  f             1e
3335  *
3336  *       nhcelo             +             +             +             +
3337                -13           13            14e
3338  *
3339  *           dz             +             +             +             +
3340             .260e
3341  *
3342  *         grav
3343  f    1.0000E+00e
3344  *
3345  *        idrod             +             +             +             +
3346              1             2             3             4             5
3347                6e
3348  *
3349  *  rdx  *  0.0195  0.0585  0.156  0.468 s
3350  *  rdx  *  0.44  1.32 e
3351  *
3352  *        radrd
3353            0.0          .002         .0035         .0043e
3354  *
3355  *        matrd
3356  f             6e
3357  *
3358  *         nfax
3359  f             1e
3360  *
3361  *         rftn
3362  f         393.e
3363  f         393.e
3364  f         393.e
3365  f         393.e
3366  f         393.e
3367  f         393.e
3368  *
3369  *     type           num           id     ctitle
3370  slab             913         913  $913$ lev 13 ring 4 slabs
3371  *
3372  *         ncrx          ncrz
3373              2             1
3374  *
3375  *       nopowr         nridr         modez        liqlev        iaxcnd
3376              1             1             1             0             0
3377  *
3378  *        idbci         idbco
3379              0             2
3380  *
3381  *        width
3382           3.8462
3383  *
3384  *        nrods         nodes         irftr         nzmax        irftr2
3385              2             4             0             5             0
3386  *
3387  *     dtxht(1)      dtxht(2)         dznht         hgapo          shelv
3388              5.           25.          .002            0.            0.
```

```
3389  *
3390  *       nhcomo
3391  f            1e
3392  *
3393  *       nhcelo              +              +              +              +
3394                -13            13            14e
3395  *
3396  *          dz               +              +              +              +
3397               .260e
3398  *
3399  *         grav
3400  f   1.0000E+00e
3401  *
3402  *       idrod               +              +              +              +
3403                7             8e
3404  *
3405  *  rdx  *  0.221  0.663 e
3406  *
3407  *       radrd
3408               0.0           .04            .08           .09e
3409  *
3410  *       matrd
3411  r 2           9             6e
3412  *
3413  *        nfax
3414  f            1e
3415  *
3416  *        rftn
3417  f        393.e
3418  f        393.e
3419  *
3420  *     type           num            id     ctitle
3421  slab             912          912  $912$ lev 14 ring 1-3 slabs
3422  *
3423  *         ncrx          ncrz
3424                6             1
3425  *
3426  *       nopowr          nridr         modez        liqlev        iaxcnd
3427                1             1             1             0             0
3428  *
3429  *        idbci          idbco
3430                0             2
3431  *
3432  *        width
3433              2.1739
3434  *
3435  *        nrods          nodes         irftr         nzmax        irftr2
3436                6             4             0             5          0
3437  *
3438  *     dtxht(1)       dtxht(2)         dznht         hgapo         shelv
3439                5.            25.           .002          0.            0.
3440  *
3441  *       nhcomo
3442  f            1e
3443  *
3444  *       nhcelo              +              +              +              +
3445                -14            14            15e
3446  *
3447  *          dz               +              +              +              +
3448               .460e
3449  *
3450  *         grav
3451  f   1.0000E+00e
3452  *
3453  *       idrod               +              +              +              +
3454                1             2             3             4             5
3455                6e
3456  *
3457  *  rdx  *  0.04  0.12  0.2636  0.7908 s
3458  *  rdx  *  0.667  2.001 e
3459  *
3460  *       radrd
3461               0.0           .002          .0035         .0043e
3462  *
3463  *       matrd
3464  f            6e
3465  *
3466  *        nfax
3467  f            1e
3468  *
3469  *        rftn
3470  f        393.e
3471  f        393.e
3472  f        393.e
3473  f        393.e
3474  f        393.e
3475  f        393.e
3476  *
3477  *     type           num            id     ctitle
3478  slab             911          911  $911$ lev 14 ring 4 slabs
3479  *
3480  *         ncrx          ncrz
```

```
3481                2             1
3482  *
3483  *         nopowr          nridr          modez         liqlev         iaxcnd
3484                1             1              1              0              0
3485  *
3486  *          idbci          idbco
3487                0             2
3488  *
3489  *          width
3490             2.1739
3491  *
3492  *          nrods          nodes          irftr          nzmax         irftr2
3493                2             4              0              5              0
3494  *
3495  *       dtxht(1)       dtxht(2)         dznht          hgapo          shelv
3496                5.            25.            .002           0.             0.
3497  *
3498  *         nhcomo
3499  f              1e
3500  *
3501  *         nhcelo              +              +              +              +
3502                -14           14             15e
3503  *
3504  *             dz              +              +              +              +
3505             .460e
3506  *
3507  *           grav
3508  f    1.0000E+00e
3509  *
3510  *          idrod              +              +              +              +
3511                7             8e
3512  *
3513  *   rdx  *  0.3916  1.1748 e
3514  *
3515  *          radrd
3516               0.0           .04            .08            .09e
3517  *
3518  *          matrd
3519  r 2           9             6e
3520  *
3521  *           nfax
3522  f              1e
3523  *
3524  *           rftn
3525  f           393.e
3526  f           393.e
3527  *
3528  *
3529  *      type            num            id      ctitle
3530  slab              910          910   $910$ lev 15 ring 1-3 slabs
3531  *
3532  *           ncrx           ncrz
3533                6             1
3534  *
3535  *         nopowr          nridr          modez         liqlev         iaxcnd
3536                1             1              1              0              0
3537  *
3538  *          idbci          idbco
3539                0             2
3540  *
3541  *          width
3542             2.2727
3543  *
3544  *          nrods          nodes          irftr          nzmax         irftr2
3545                6             4              0              5              0
3546  *
3547  *       dtxht(1)       dtxht(2)         dznht          hgapo          shelv
3548                5.            25.            .002           0.             0.
3549  *
3550  *         nhcomo
3551  f              1e
3552  *
3553  *         nhcelo              +              +              +              +
3554                -15           15             16e
3555  *
3556  *             dz              +              +              +              +
3557             .440e
3558  *
3559  *           grav
3560  f    1.0000E+00e
3561  *
3562  *          idrod              +              +              +              +
3563                1             2              3              4              5
3564                6e
3565  *
3566  *   rdx  *  0.06575  0.19725  0.2636  0.7908 s
3567  *   rdx  *  0.667  2.001 e
3568  *
3569  *          radrd
3570               0.0           .002           .0035          .0043e
3571  *
3572  *          matrd
```

```
f            6e
*
*         nfax
f            1e
*
*         rftn
f         393.e
f         393.e
f         393.e
f         393.e
f         393.e
f         393.e
*
*     type           num           id     ctitle
slab             909         909  $909$ lev 15 ring 4 slabs
*
*         ncrx          ncrz
              2             1
*
*       nopowr         nridr         modez        liqlev        iaxcnd
              1             1             1             0             0
*
*        idbci         idbco
              0             2
*
*        width
           2.2727
*
*        nrods         nodes         irftr         nzmax        irftr2
              2             4             0             5             0
*
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              5.           25.          .002            0.            0.
*
*       nhcomo
f            1e
*
*       nhcelo             +             +             +             +
             -15            15           16e
*
*          dz              +             +             +             +
            .440e
*
*        grav
f   1.0000E+00
*
*       idrod             +             +             +             +
              7            8e
*
*  rdx  *  0.3916  1.1748 e
*
*       radrd
              0.0           .04           .08           .09e
*
*       matrd
r 2           9            6e
*
*        nfax
f            1e
*
*        rftn
f         393.e
f         393.e
*
*
*     type           num           id     ctitle
slab             908         908  $908$ lev 16 ring 1-3 slabs
*
*         ncrx          ncrz
              6             1
*
*       nopowr         nridr         modez        liqlev        iaxcnd
              1             1             1             0             0
*
*        idbci         idbco
              0             2
*
*        width
            .8019
*
*        nrods         nodes         irftr         nzmax        irftr2
              6             4             0             5             0
*
*     dtxht(1)      dtxht(2)         dznht         hgapo         shelv
              5.           25.          .002            0.            0.
*
*       nhcomo
f            1e
*
*       nhcelo             +             +             +             +
             -16            16           16e
*
```

```
3665  *          dz              +              +              +              +
3666           1.247e
3667  *
3668  *         grav
3669  f    1.0000E+00e
3670  *
3671  *        idrod            +              +              +              +
3672               1              2              3              4              5
3673               6e
3674  *
3675  *  rdx  *  0.17825  0.53475  0.7146  2.1438 s
3676  *  rdx  *  1.808  5.424 e
3677  *
3678  *        radrd
3679             0.0          .002          .0035          .0043e
3680  *
3681  *        matrd
3682  f             6e
3683  *
3684  *         nfax
3685  f             1e
3686  *
3687  *         rftn
3688  f         393.e
3689  f         393.e
3690  f         393.e
3691  f         393.e
3692  f         393.e
3693  f         393.e
3694  *
3695  *     type           num            id     ctitle
3696  slab             907          907  $907$ lev 16 ring 4 slabs
3697  *
3698  *          ncrx          ncrz
3699                2             1
3700  *
3701  *        nopowr          nridr          modez         liqlev         iaxcnd
3702                1             1              1              0              0
3703  *
3704  *         idbci          idbco
3705                0             2
3706  *
3707  *         width
3708           .8019
3709  *
3710  *         nrods          nodes          irftr          nzmax         irftr2
3711                2             4              0              5              0
3712  *
3713  *     dtxht(1)       dtxht(2)          dznht          hgapo          shelv
3714                5.            25.             .002           0.             0.
3715  *
3716  *       nhcomo
3717  f             1e
3718  *
3719  *       nhcelo            +              +              +              +
3720             -16            16             16e
3721  *
3722  *          dz              +              +              +              +
3723           1.247e
3724  *
3725  *         grav
3726  f    1.0000E+00e
3727  *
3728  *        idrod            +              +              +              +
3729               7              8e
3730  *
3731  *  rdx  *  1.062  3.186 e
3732  *
3733  *        radrd
3734             0.0           .04           .08           .09e
3735  *
3736  *        matrd
3737  r 2           9              6e
3738  *
3739  *         nfax
3740  f             1e
3741  *
3742  *         rftn
3743  f         393.e
3744  f         393.e
3745  *
3746  * start of core barrel heat slabs
3747  *
3748  *     type           num            id     ctitle
3749  slab             784          784 $784$ lev 2-16 ring 4 cb slabs
3750  *
3751  *          ncrx          ncrz
3752                2            15
3753  *
3754  *        nopowr          nridr          modez         liqlev         iaxcnd
3755                1             2              1              0              0
3756  *
```

```
*        idbci          idbco
             2              2
*
*       width
       1.4844
*
*        nrods          nodes          irftr          nzmax
             2              5              0             31
*
*     dtxht(1)       dtxht(2)          dznht          hgapo          shelv
             3.             1.          .002             0.          .915
*
*       nhcomi
f            1e
*
*       nhceli              +              +              +              +
            -2              2              3              4              5
             6              7              8              9             10
            11             12             13             14             15
            16            16e
*
*
*       nhcomo
f            1e
*
*       nhcelo              +              +              +              +
            -2              2              3              4              5
             6              7              8              9             10
            11             12             13             14             15
            16            16e
*
*           dz              +              +              +              +
          .985           .200           .305           .610           .610
          .610           .610           .610           .305           .240
          .240           .260           .460           .440         1.247e
*
*         grav
f   1.0000E+00e
*
*        idrod              +              +              +              +
             5             6e
*
*       idrodo              +              +              +              +
             7             8e
*
*  rdx  *  0.5  1.5 e
*
*        radrd              +              +              +              +
           0.0           .002           .008           .014          .016e
*
*        matrd
f            6e
*
*         nfax
f            1e
*
*         rftn
f         423.e
f         423.e
*
* end of core barrel heat slabs
*
*          type            num             id        ctitle
rod                670         670    $670$ ilsg tubes
*
*          ncrx           ncrz           ittc                           cd 2
             1             10              0
*
*        nopowr          nridr         modez         liqlev         iaxcnd   cd 3
             1              0              1              0              0
*
*        idbci          idbco          hdri          hdro                   cd 4
             2              2         .0196         .0254
*
*        nrods          nodes          irftr         nzmax                  cd 9
             1              3              0           100
*
*     dtxht(1)       dtxht(2)          dznht          hgapo          shelv   cd 10
             3.            10.          5.e-3          6.e4             0.
*
*       nhcomi
f            8e
*
*       nhceli
            -2s
             2s
             3s
             4s
             5s
             6s
             7s
             8s
```

```
3849                9s
3850               10s
3851               11s
3852               12e
3853  *
3854  *        nhcomo
3855  f            28e
3856  *
3857  *        nhcelo
3858               -1s
3859                1s
3860                2s
3861                3s
3862                4s
3863                5s
3864               -5s
3865               -4s
3866               -3s
3867               -2s
3868               -1s
3869               -1e
3870  *        +              +              +              +              +
3871  * dz     * r02 5.0000e-01    1.5240e+00r04 2.5240e+00    1.5240e+00s
3872  * dz     * r02 5.0000e-01e
3873  * grav   * r04          1.          .7071        -.7071r04         -1.e
3874  *  rdx   *            474.e
3875  * radrd  *           .0098         .01125          .0127e
3876  * matrd  * r02           6e
3877  * nfax   * r10           3e
3878  *        +              +              +              +              +
3879  * rftn   * r03 4.1420e+02r03 4.8000e+02r03 5.2500e+02r12 5.4000e+02s
3880  * rftn   * r03 5.2500e+02r03 4.8000e+02r03 4.1420e+02r03 4.1420e+02e
3881  *
3882  *          type           num            id        ctitle
3883  rod                  669         669     $669$ blsg tubes
3884  *
3885  *          ncrx          ncrz          ittc                              cd 2
3886                1            10             0
3887  *
3888  *        nopowr          nridr         modez         liqlev         iaxcnd   cd 3
3889                1             0             1              0              0
3890  *
3891  *          idbci         idbco          hdri          hdro                 cd 4
3892                2             2         .0196          .0254
3893  *
3894  *          nrods         nodes         irftr         nzmax                cd 9
3895                1             3             0           100
3896  *
3897  *      dtxht(1)      dtxht(2)         dznht         hgapo         shelv   cd 10
3898                3.           10.         5.e-3          6.e4          0.
3899  *
3900  *        nhcomi
3901  f            5e
3902  *
3903  *        nhceli
3904               -2s
3905                2s
3906                3s
3907                4s
3908                5s
3909                6s
3910                7s
3911                8s
3912                9s
3913               10s
3914               11s
3915               12e
3916  *
3917  *        nhcomo
3918  f            25e
3919  *
3920  *        nhcelo
3921               -1s
3922                1s
3923                2s
3924                3s
3925                4s
3926                5s
3927               -5s
3928               -4s
3929               -3s
3930               -2s
3931               -1s
3932               -1e
3933  *        +              +              +              +              +
3934  * dz     * r02 5.0000e-01    1.5240e+00r04 2.5240e+00    1.5240e+00s
3935  * dz     * r02 5.0000e-01e
3936  * grav   * r04          1.          .7071        -.7071r04         -1.e
3937  *  rdx   *            158.e
3938  * radrd  *           .0098         .01125          .0127e
3939  * matrd  * r02           6e
3940  * nfax   * r10           3e
```

```
3941  *       +               +               +               +               +
3942  * rftn  * r03 4.1420e+02r03 4.8400e+02r03 5.2200e+02r12 5.4000e+02s
3943  * rftn  * r03 5.2200e+02r03 4.8400e+02r03 4.1420e+02r03 4.1420e+02e
3944  *
3945  end
3946  *
3947  ******************
3948  * time-step data *
3949  ******************
3950  *
3951  *         dtmin           dtmax           tend          rtwfp
3952       1.0000e-06      2.0000e-02      8.0000e+01      0.0000e+00
3953  *         edint           gfint          dmpint          sedint
3954       4.0000e+01      1.0000e+00      4.0000e+01      4.0000e+01
3955  *
3956  *         dtmin           dtmax           tend          rtwfp
3957       1.0000e-06      5.0000e-03      1.0000e+02      0.0000e+00
3958  *         edint           gfint          dmpint          sedint
3959       2.0000e+01      1.0000e+00      2.0000e+01      2.0000e+01
3960  *
3961  *         dtmin           dtmax           tend          rtwfp
3962       1.0000e-06      5.0000e-03      2.0000e+02      0.0000e+00
3963  *         edint           gfint          dmpint          sedint
3964       2.5000e+01      1.0000e+00      2.5000e+01      2.5000e+01
3965  *
3966  *         dtmin           dtmax           tend          rtwfp
3967       1.0000e-06      1.0000e-02      4.0000e+02      0.0000e+00
3968  *         edint           gfint          dmpint          sedint
3969       5.0000e+01      1.0000e+00      5.0000e+01      5.0000e+01
3970  *
3971  *         dtmin           dtmax           tend          rtwfp
3972       1.0000e-06      2.0000e-02      6.0000e+02      0.0000e+00
3973  *         edint           gfint          dmpint          sedint
3974       1.0000e+02      1.0000e+00      1.0000e+02      1.0000e+02
3975  *
3976  *         dtmin           dtmax           tend          rtwfp
3977  *       endflag
3978      -1.0000e+00
```

CCTF-54 TRANSIENT-RESTART INPUT LISTING

```
free format
*
*************
* main data *
*************
*
*      numtcr       ieos      inopt       nmat
         145          0         1          4
Corrected CCTF-54 Input Model   By J. F. Lime Oct 1999
Two corrections were made to the CCTF-54 input model:
(1) The azimuthal noding was corrected from 180/180 degrees to 90/270 degrees
to matched the intact loop noding. The three intact loops were modeled as one
combined intact loop. Therefore, the azimuthal noding of the vessel should
match how the intact loops were modeled.
(2) The axial power shape was corrected to model the 17-step axial-power profile
of the actual heater rod. The previous CCTF-54 model had a coarsely-noded
7-level axial-power shape.
*
cctf run54 developmental assessment calculation
trac-pf1 mod2 version 5.0
this model was developed by running the trac input deck from
/cctf/run54/tracin through gocvrt.  the following changes were
made to the original model.
a)  the junction flow areas were adjusted to take care of the following
    error messages:
 the junction flow area 1.6604e-01 of component   3 is greater than the vol/dx
 flow area 8.8885e-02 of the cell across the junction and 1.5532e-01 of cell  1

 the junction flow area 4.9812e-01 of component   8 is greater than the vol/dx
 flow area 4.6593e-01 of the cell across the junction and 2.6665e-01 of cell 12

 the azmuthal flow area 1.0797e-01 of vessel   1 interface (r= 3,t= 1,z= 1) is
 greater than the cell vol/rdt flow areas 8.3137e-02 and 8.3137e-02 on each side

 the azmuthal flow area 1.0797e-01 of vessel   1 interface (r= 3,t= 2,z= 1) is
 greater than the cell vol/rdt flow areas 8.3137e-02 and 8.3137e-02 on each side

 the azmuthal flow area 1.5189e-01 of vessel   1 interface (r= 4,t= 1,z= 1) is
 greater than the cell vol/rdt flow areas 1.3670e-01 and 1.3670e-01 on each side

 the azmuthal flow area 1.5189e-01 of vessel   1 interface (r= 4,t= 2,z= 1) is
 greater than the cell vol/rdt flow areas 1.3670e-01 and 1.3670e-01 on each side

 the   axial  flow area 2.6140e-02 of vessel   1 interface (r= 1,t= 1,z=11) is
 greater than the cell vol/dz  flow areas 2.1173e-02 and 1.8559e-02 on each side

 the   axial  flow area 2.6140e-02 of vessel   1 interface (r= 1,t= 2,z=11) is
 greater than the cell vol/dz  flow areas 2.1173e-02 and 1.8559e-02 on each side

 the   axial  flow area 7.8419e-02 of vessel   1 interface (r= 2,t= 1,z=11) is
 greater than the cell vol/dz  flow areas 6.3519e-02 and 5.5678e-02 on each side

 the   axial  flow area 7.8419e-02 of vessel   1 interface (r= 2,t= 2,z=11) is
 greater than the cell vol/dz  flow areas 6.3519e-02 and 5.5677e-02 on each side

 the   axial  flow area 1.1751e-01 of vessel   1 interface (r= 3,t= 1,z=11) is
 greater than the cell vol/dz  flow areas 9.8712e-02 and 8.3435e-02 on each side

 the   axial  flow area 1.1751e-01 of vessel   1 interface (r= 3,t= 2,z=11) is
 greater than the cell vol/dz  flow areas 9.8712e-02 and 8.3435e-02 on each side

 b)  the hydraulic diameter of the first and last junctions of the
     steam generator secondary were set to a non-zero value (even though
     the flow area is zero) to get the code to run.

c)  the nff's were all set to -1
   to cause an automatic calculation of
   abrupt expansion/contraction additive form losses.

d)  the new reflood model was turned on (namelist newrfd=1 was added)
    and added funh, nhsca, and zsgrid arrays.

e)  the time step sizes were increased.

f)  the rod axial power shape was adjusted to take advantage of mod2's
    ability to input an exact power distribution.  this involved
    reworking the zpwzt and zpwtb arrays.  the number of coarse mesh
    nodes went from 7 to 19, the maximum number of fine mesh cells went
    from 100 to 200, and the dtxht criterial was reduced.

g)  the rod power history was expanded from 10 points to over 1200 points
    (based on experimental data) to better match the input power.

h)  the temperatures everywhere except the lower plenum and fills were
    changed from 393.0 to 414.2 (the average of the te30yxx thermocouple
    data from the test) to better match the initial fluid and wall temps.

i)  took out the bump in the cold leg ecc fill liquid temperature table
```

```
89
90  j) extended the material property tables in case the code wants to
91     calculate temperatures in excess of 1200 k.
92
93  k) added namelist variable nosets=2 to cause the code to calculate the
94     sets3d equation every time step.
95
96  l) increase the maximum time step size beyond 84 seconds.
97
98  m) set all of the vessel cfzl-z's to negative numbers to get an automatic
99     calculation of abrupt expansion/contraction form losses.
100
101 n) the rod nodalization was set back the way it originally was (7 coarse
102    meshes with a 1-to-1 relationship with the hydro cells).  the
103    integration option was also set back the way it originally was as well.
104
105 o) to damp the loop oscillations, all the roughness numbers were
106    changed from 0.0 to 4.5720e-05
107
108 p) the heat conductor temperatures in the reactor vessel, ring 4 were set
109    from 4.142e+02 to 4.680e+02 for levels 2 and above.  the inner rings
110    were changed from 4.142e+02 to 4.230e+02.  this is consistent with the
111    initial conditions in the data report, page 31 table 3.1
112
113 q) the maximum time step size was reduced to avoid the water hammer in
114    the downcomer soon after cold leg injection begins.
115
116 r) added 30 heat slabs to represent the core barrel
117
118 s) moved the location of the ring 3-ring 4 boundary from inside the core
119    barrel to outside of the core barrel.  the vessel rad(3), vol, fa-t,
120    fa-z, hd-t and hd-z arrays were recomputed.  this was done to eliminate
121    vol and fa values greater than 1.0
122
123 t) the radial cfzl-r in level 1 was set to a small negative number to
124    cause form loss computation.
125
126 u) set idcu=idcl=idcr=0 to turn off special downcomer models
127
128 v) set the dtxht(1), dtxht(2), dznht, and nzmax parameters back to the
129    old mod1 values, and took out the core barrel heat slabs to make the
130    calculation directly comparable to the original MOD1 calculation.
131
132
133
134  --------
135
136 the original comment cards are as follows:
137
138 cctf run 54 posttest analysis with trac-pf1(mod 1) ver 11.8 (8/24/84)
139   * * * * *  revised loop components  * * * * *
140 jaeri recommendations used for some heater rod material properties.
141 new vapor loss coefficients in vessel core
142 new radial loss coefficients in levels 4 - 10
143 akimotos noding for combined and broken cold legs
144 vessel noding:
145    four radial rings
146    two azimuthal zones
147    sixteen axial levels
148       three levels in lower plenum
149       seven levels in core
150       six levels in upper plenum
151 system noding:
152    three intact loops lumped into one loop
153    cold leg between vessel and break is modeled without the expansion
154 *
155 *****************
156 * namelist data *
157 *****************
158 *
159  &inopts
160   nrslv=1,iadded=10,nhtstr=24,newrfd=3, imfr=3,
161  iblaus=1,
162  &end
163 *
164 *        dstep          timet
165           4241    80.015229
166 *       stdyst         transi          ncomp           njun           ipak
167               0              1             43             17              1
168 *         epso           epss
169     1.0000e-04     1.0000e-04
170 *       oitmax         sitmax         isolut         ncontr
171              10             10              0              0
172 *         ntsv           ntcb           ntcf           ntrp           ntcp
173                9              8              0              3              1
174 *
175 ************************
176 * component-number data *
177 ************************
178 *
179 * iorder*              1              2              3              4              5
180 * iorder*              6              7              8             11             12
```

```
* iorder*              13              14              15              16              17
* iorder*              18              19              25              28s
            999             998             997             996             995
            994             993s
            974             973s
            918             917             916             915s
            914             913             912             911             910
            909             908             907s
784s
670 669e
*
*
****************************
* material-properties data *
****************************
*
* matb  *              55              58              59              60e
* ptbln * r02           7r02            5e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    8.3500e+03    4.4487e+02    1.2337e+01    1.0000e+00
    5.0000e+02    8.3500e+03    4.9042e+02    1.5834e+01    1.0000e+00
    7.0000e+02    8.3500e+03    5.3948e+02    1.9331e+01    1.0000e+00
    9.0000e+02    8.3500e+03    5.8987e+02    2.2828e+01    1.0000e+00
    1.1000e+03    8.3500e+03    6.3939e+02    2.6324e+01    1.0000e+00
    1.3000e+03    8.3500e+03    6.8588e+02    2.9821e+01    1.0000e+00
    2.0000e+03    8.3500e+03    6.8588e+02    2.9821e+01    1.0000e+00
e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    3.8000e+03    8.4970e+02    3.5870e+01    1.0000e+00
    5.0000e+02    3.8000e+03    9.6550e+02    2.0173e+01    1.0000e+00
    7.0000e+02    3.8000e+03    1.0813e+03    1.2529e+01    1.0000e+00
    9.0000e+02    3.8000e+03    1.1971e+03    8.9514e+00    1.0000e+00
    1.1000e+03    3.8000e+03    1.3129e+03    7.1615e+00    1.0000e+00
    1.3000e+03    3.8000e+03    1.4287e+03    6.1228e+00    1.0000e+00
    2.0000e+03    3.8000e+03    1.4287e+03    6.1228e+00    1.0000e+00
e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    2.8000e+03    9.8640e+02    1.6300e+00    1.0000e+00
    6.0000e+02    2.8000e+03    1.1358e+03    1.4200e+00    1.0000e+00
    9.0000e+02    2.8000e+03    1.2852e+03    1.2100e+00    1.0000e+00
    1.3000e+03    2.8000e+03    1.4844e+03    9.3000e-01    1.0000e+00
    2.0000e+03    2.8000e+03    1.4844e+03    9.3000e-01    1.0000e+00
e
*
*   prptb(1,i)    prptb(2,i)    prptb(3,i)    prptb(4,i)    prptb(5,i)
    3.0000e+02    8.4103e+03    4.4029e+02    1.4340e+01    8.4000e-01
    6.0000e+02    8.2925e+03    5.0636e+02    1.9331e+01    8.4000e-01
    9.0000e+02    8.1747e+03    5.7242e+02    2.4322e+01    8.4000e-01
    1.2000e+03    8.0569e+03    6.3839e+02    2.9314e+01    8.4000e-01
   2.0000e+03    8.0569e+03    6.3839e+02    2.9314e+01    8.4000e-01
e
*
*
*************************
* control-parameter data *
*************************
*
*
* signal variables
*     idsv      isvn      ilcn      icn1      icn2
 0
*
* control blocks
*  idcb      icbn      icb1      icb2      icb3
*            cbgain    cbxmin    cbxmax    cbcon1    cbcon2
*
 0
*
* trips
*          ntse          ntct          ntsf          ntdp          ntsd
               0             0             0             3             0
*
 0
*          ndmp
 0
*             3
*        idmp()
            1001          1002          1003
*
******************
* component data *
******************
*
end
*
******************
* time-step data *
******************
*
```

```
273  *         dtmin          dtmax          tend          rtwfp
274       1.0000e-06     5.0000e-03     1.0000e+02     0.0000e+00
275  *         edint          gfint         dmpint         sedint
276       1.0000e+01     1.0000e+00     1.0000e+01     1.0000e+01
277  *
278  *         dtmin          dtmax          tend          rtwfp
279       1.0000e-06     5.0000e-03     2.0000e+02     0.0000e+00
280  *         edint          gfint         dmpint         sedint
281       2.5000e+01     1.0000e+00     2.5000e+01     2.5000e+01
282  *
283  *         dtmin          dtmax          tend          rtwfp
284       1.0000e-06     1.0000e-02     4.0000e+02     0.0000e+00
285  *         edint          gfint         dmpint         sedint
286       5.0000e+01     1.0000e+00     5.0000e+01     5.0000e+01
287  *
288  *         dtmin          dtmax          tend          rtwfp
289       1.0000e-06     2.0000e-02     6.0000e+02     0.0000e+00
290  *         edint          gfint         dmpint         sedint
291       1.0000e+02     1.0000e+00     1.0000e+02     1.0000e+02
292  *
293  *         dtmin          dtmax          tend          rtwfp
294  *       endflag
295      -1.0000e+00
```