GE Nuclear Energy

J. E. Quinn, Projects Manager
LMR and SBWR Programs

General Electric Company
175 Curtner Avenue, M/C 165 San Jose, CA 95125-1014
408 925-1005 (phone) 408 925-3991 (facsimile)

August 30, 1995

MFN 171-95
Docket STN 52-004

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington DC 20555

Attention: Theodore E. Quay, Director
Standardization Project Directorate

Subject: **SBWR - Information on PANTHERS/PCC Data Needed from General Electric**

Reference: Letter from J. Wilson (NRC) to P. F. Billig (GE), *Information on PANTHERS/PCC Data Needed from General Electric*, August 16, 1995.

Attached are responses to questions received by GE on August 16, 1995 (Reference) regarding the PANTHERS/PCC data. These questions and responses were discussed during the August 21 and 22, 1995 NRC-ACRS-GE Meeting in San Jose, CA.

Sincerely,

James E. Quinn,
Projects Manager

Attachment: Responses to information requested by the NRC on PANTHERS/PCC test data.

cc:

P. A. Boehnert	(NRC/ACRS)	(2 paper copies w/att. plus E-Mail w/o att.)
I. Catton	(ACRS)	(1 paper copy w/att. plus E-Mail w/o att.)
S. Q. Ninh	(NRC)	(2 paper copies w/att. plus E-Mail w/o att.)
J. H. Wilson	(NRC)	(1 paper copy w/att. plus E-Mail w/o att.)

D040
1/1

RESPONSES TO NRC QUESTIONS ON PANTHERS/PCC DATA

I. For derived quantities:

1. The ".DTA" files give the directly measured parameters from the tests. The second line gives the plant code for the instrument that is recorded. The fourth line gives the units. The data follows on the remaining lines.

   The ".CFG" file describes the configuration employed for each test. The file is read by the "personal computer for derived quantities calculation" and tells it which formula and what input values to use. The first character in each line is a flag (flag) indicating whether that line is used (1) or not used (0). Next is the derived quantity name (NOME), units (UNITA), and subroutine name (OPERAZIONE) that is used to calculate the quantity. The next ten numbers (PAR1 to PAR10) are input channels. When the input channel is less than 100, the value comes from the directly measured instruments. The attached table, PCCEL1.XLS, gives the plant code for these channels. Not all measured instruments are sent to the derived quantities computer. When the input channel is between 100 and 200, the value is a constant which comes from the ".CST" file. The first line in the ".CST" file is channel 101, the next 102, and so on. The attached table, PCCEL2.XLS, gives a sample listing for these channels. If the input channel is greater than 200, it corresponds to the output channel of an earlier derived quantity. The next number (PAR11) gives the output channel for the derived quantity. The attached table, PCCEL3.XLS, also gives the output channels. After PAR11, are a comment and three flags directing the output to the screen (video), the historical data file (storico), and the steady-state check (stabilit).

   The formulas used for the major derived quantities (flow rate, thermal power, and water level) are given in Section 5.2.2 of the Thermal-Hydraulic Data Report (SIET document 00393RP95).

   The derived quantities are documented in the ".DAT" files.

RESPONSES TO NRC QUESTIONS ON PANTHERS/PCC DATA

2. The following documents and drawings have been provided to the NRC describing all instrument locations:

00095RS91	PANTHERS-PCC DAS SPECIFICATION
00157ST92	TECHNICAL SPECIFICATION FOR INSTRUMENT INSTALLATION
00393RP95	THERMAL HYDRAULIC DATA REPORT OF PANTHERS-PCC TESTS
00209DD93	PANTHERS-PCC: P&ID

As-built drawings:

24.02.21	STEAM SUPPLY LINE UP TO MIXING POINT
24.02.22	AIR SUPPLY LINE UP TO MIXING POINT
24.02.23	AIR-STEAM MIXTURE SUPPLY LINE FROM MIXING POINT TO PCC INLET SECTION
24.02.24	PCC/CT PRESSURE EQUALIZING LINE
24.02.27	CT WATER DISCHARGING LINE
24.02.13	DRAIN LINE
24.02.28	VENT LINE
24.02.29	VT AIR-STEAM DISCHARGING LINE
24.00.33	IC & PCC POOLS MAKE UP LINE
24.00.34	IC & PCC POOLS DRAIN LINE
24.02.31	VT AIR-STEAM 8" DISCHARGING LINE

II. Other questions

1. There were no temperature probes inside the heat exchanger tubes.

2. For the differential pressures (DP###, F####, and L####) the "Pressure Tap Elevation" refers to the measured difference in elevation between the upper and lower tap. For the absolute pressure measurements (P####), it refers to the elevation difference between the tap and the transducer. The drawings listed in response to I.2 give the instrument locations.

3. In Table A2, the "penetration depth" is the measured distance from the inner wall into the fluid stream that the probe is located. The drawings listed in response to I.2 give the instrument locations. In Table A3, the "cavity depth" is the design depth from the tube outer wall of the groove where the instrument is located. This is shown in Figure A2.1 of the TECHNICAL SPECIFICATION FOR INSTRUMENT INSTALLATION (00157ST92).

RESPONSES TO NRC QUESTIONS ON PANTHERS/PCC DATA

4. The measurement locations are given in the third column. Figure 3.5 describes the orientation in the pool. The instruments measure temperature of the water in the pool at that location.

5. The drawings listed in response to I.2 give the instrument locations.

6. "DTW ####" gives the delta-T across the tubes at the location given by "####". The inner wall temperatures are not directly recorded. The data files contain the outer wall measurements (TW ####E) and the delta-T (DTW ####).

7. All failed instruments, which give non-numerical entries, are given in the Apparent Test Results (ATR) Reports for each test.

Information on PANTHERS/PCC test data needed from General Electric

I. For derived quantities:

1. Given a .CST, .CFG, and .DTA file, please provide a formula for tying the parameter measured from a certain channel number to its physical location on the facility.

2. With respect to question 1, please provide a facility diagram clearly indicating the location of the measurements and the plant code/instrument ID associated with each measurement.

II. Other questions:

1. Were any measurements taken of the fluid temperature inside the PCC HX tubes? If so, where are the sensors for these measurements described (Plant code, physical location, and diagram)?

2. Referring to Table A1 of the T-H Test Report: Some of the elevations (mm) given for the pressure instruments did not appear to be in the range of elevations listed in Figure 3.1 of the T-H test report. Is there a reference point for these measurements? Or, is there another diagram showing where the measurements in the table are located on the test facility?

3. Referring to Table A2 of the T-H Test Report: What is the meaning of the "penetration depth" of the fluid TCs, as given in the last column of the table? Is there a diagram showing where these measurements are located on the test facility? Also, referring to Table A3, what is the meaning of the "cavity depth" given in the last column?

4. Referring to Table A4 of the T-H Test Report: No verbal description is given regarding the location of these instruments. Are they measuring anything besides temperature at certain locations within the PCC pool?

5. Referring to Table 3.3 of the T-H Test Report: What is the location on the test facility of the flow instruments listed in the table? This question may have already been answered in the response to question I.3.

6. Some files contain apparently undefined Plant Codes. For example, in file SLPTH161.DTA, what measurement is "DTW B014" ? Can't find in any list. Is this the delta-T across the tube wall? Also, cannot find TW-XXXX"i" measurements; that is, the measurements of the internal tube wall temperature.

7. Do the data files contain any other non-numerical entries in the data columns besides "OVER RNG" and "OVERVOLT" (for example, see file t01th01.dtb)? Considering all the data files, how prevalent are the non-numerical entries?

INPUT CHANNELS			
#	Plant code	PODS Ch #	Description
1	P-1001	18	
2	P-7001	19	
3	P-2001	20	
4	P-4001	21	
5	P-4002	22	
6	P-A001	23	
7	P-5001	24	
8	P-L001	25	
9	P-I001	26	
10	P-T001	27	
11	P-T002	28	
12	L-L002	29	
13	L-L003	30	
14	L-I001	31	
15	L-I002	32	
16	L-O001	33	
17	L-O002	34	
18	L-Q001	35	
19	L-Q002	36	
20	L-P001	37	
21	F-1001	38	
22	F-1002	39	
23	F-1003	40	
24	F-3001	41	
25	F-2001	42	
26	F-2002	43	
27	F-L001	44	
28	F-T001	45	
29	F-T002	46	
30	F-M001	47	
31	F-R001	48	
32	T-1001	74	
33	T-7001	75	
34	T-3001	76	
35	T-2001	77	
36	T-9001	78	
37	T-4001	79	
38	T-4002	80	
39	T-4003	81	
40	T-A001	82	
41	T-A002	83	
42	T-C001	84	
43	T-C002	85	
44	T-D001	86	
45	T-F001	87	
46	T-5001	88	
47	T-5002	89	
48	T-L001	90	
49	T-L002	91	
50	T-L003	92	

INPUT CHANNELS			
#	Plant code	PODS Ch #	Description
51	T-L004	93	
52	T-L005	94	
53	T-6001	95	
54	T-6002	96	
55	T-I001	97	
56	T-I002	98	
57	T-I003	99	
58	T-T001	100	
59	T-O001	101	
60	T-M001	102	
61	T-R001	103	
62	T-N001	104	
63	P-6001	177	
64	T-P016	202	
65	T-P019	205	
66	T-P027	223	
67	T-P035	230	
68	T-P039	231	dupplicazione del 242
69	T-ELIO	232	t orifizioelio duppl slot ~~100~~ 178
70	P-ELIO	233	p orifizio elio duppl slot 17
71	DP-ELIO	234	dp orifizio elio duppl slot 16
72	T T002	251	duppl slot 179
73	F T003H	252	duppl slot 45
74	F T003L	253	duppl slot 46
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			
100			

CONSTANT CHANNELS				
#	Name	Value	Units	Note
101	tipofluido	1		
102	D1 x F-steam	0.06665	m	
103	d2 x F-steam	0.04185	m	
104	D1 x F-air orif. piccolo	0.02664	m	
105	d2 x F-air orif. piccolo	0.00698	m	
106	D1 x F-air. orif. grande	0.10226	m	
107	d2 x F-air. orif. grande	0.0242	m	
108	D1 x F-liq. (F-3001)	0.0243	m	
109	d2 x F-liq. (F-3001)	0.0078	m	
110	m x F-cond (F-I001)	4.5348E-07	m^3/Pa*s	
111	k x F-cond (F-I001)	0		
112	m x F-m	4.91667E-07	m^3/Pa*s	
113	k x F-m	0		
114	m x F-r	4.92696E-07	m^3/Pa*s	
115	k x F-r	0		
116	p x F-m	1200	kPa	
117	p x F-r	200	kPa	
118	D1 x F-out orif. grande	0.1282	m	
119	d2 x F-out orif. grande	0.09463	m	
120	D1 x F-out orif. piccolo	0.0525	m	
121	d2 x F-out orif. piccolo	0.01315	m	
122	h x L-L001	9.091	m	
123	h x L-L002	2.247	m	
124	h x L-L003	4.595	m	
125	h x L-I001	2.657	m	
126	h x L-I002	0	m	
127	h x L-O001	5.015	m	
128	h x L-O002	1.1	m	
129	h x L-Q001	4.34	m	
130	h x L-Q002	1.715	m	
131	h x L-P001	4.205	m	
132	P x L-O, L-Q, L-P	160	kPa	
133	Intervallo di scansione	5	s	
134	Superficie sezione VT	2.2112	m^2	
135	additivo L-Q1/P1	0.8	m	
136	D1 x orif. 8"	0.20271	m	
137	d2 x orif 8"	0.12392	m	
138	D1 x orif. elio	0.0243	m	
139	d2 x orif. elio	0.0032	m	
140				
141				
142				
143				
144				
145				
146				
147				
148				
149				
150	Zero di appoggio	0		per elaborazione

OUTPUT CHANNELS				
#	Name	Units	Note	Function
201	F-steam	kg/s	portata ingresso vapore surriscaldato	.1,2,3
202	F-air	kg/s	portata ingresso aria	.4,5,6,7
203	F-liq	kg/s	portata acqua di desurruscaldamento	8
204	F-cond	kg/s	portata scarico CT	9
205	F-m	kg/s	portata alimneto piscina	10
206	F-r	kg/s	portata scarico piscina	11
207	F-out	kg/s	portata scarico VT	.13,14,15,16
208	Xair-out		titolo aria mix. scarico VT	12
209	Tavg-pool	°C	temp. media piscina PCC	17
210	LCT- L1	m	livello CT totale	19
211	LCT-L2	m	livello CT parziale	20
212				
213	Lvent-l1	m	livello VT alto	21
214	Lvent-l2	m	livello VT basso	22
215	Lcatch-O1	m	livello cacth tank	23
216	Lcatch-O2	m	livello sifone cacth tank	24
217	Lpool-Q1	m	livello piscina IC totale	25
218	Lpool-Q2	m	livello piscina IC parziale	26
219	Lpool-P1	m	livello piscina PCC	27
220	Tavg-LCT	°C	temp. media CT	18
221	Fair-out	kg/s	portata aria uscita VT	47
222	Fsteam-out	kg/s	portata vap. uscita VT	48
223				
224	Lvent-old	m	livello scansione precedente	28
225				
226				
227	H-steam	kJ/kg	entalpia vapore ingresso	29
228	H-air	kJ/kg	entalpia aria ingresso	30
229	H-liq	kJ/kg	entalpia acqua desurriscaldamento	31
230	H-cond	kJ/kg	entalpia acqua scarico CT	32
231	H-m	kJ/kg	entalpia acqua make-up line	33
232	H-r	kJ/kg	entalpia scarico piscina	34
233	Hair-out	kJ/kg	entalpia aria scarico VT	37
234	Hsteam-out	kJ/kg	entalpia vapore scarico VT	36
235				
236	H-5	kJ/kg	entalpia liq. in drain line	38
237	Ppvap-out	kPa	press. parziale vapore scarico VT	35
238				
239	W-steam	kW	potenza vapore ingresso	39
240	W-air	kW	potenza aira ingresso	40
241	W-liq	kW	potenza liquido desurr. ingresso	41
242	W-cond	kW	potenza uscente CT	42
243				
244				
245	W-out	kW	potenza uscente miscela VT	43
246				
247				
248	W-exc	kW	potenza scambiata dal primario	44
249				
250	Fin-tot	kg/s	portata totale entrante	45

OUTPUT CHANNELS				
#	Name	Units	Note	Function
251	Fout-tot	kg/s	portata totale uscente	46
252	Xair-in		titolo di aria in ingresso	49
253	Diff-Ftot	%	diff. percentuale tra Fin-tot e Fout-tot	50
254	Diff-Fair	%	diff. percentuale tra F-air e Fair-out	51
255	P-4002	KPa		52
256	T-4002	°C		53
257	Fsteam-true	kg/s	portata tot. Fsteam + F-liq	54
258	T-surr	°C	temp. surr. in PCC	55
259	F-Hei	kg/s	portata elio	56
260	F-Totgas	kg/s	portata aria + elio in PCC	57
261				
262				
263				
264				
265				
266				
267				
268				
269				
270				
271				
272				
273				
274				
275				
276				
277				
278				
279				
280				
281				
282				
283				
284				
285				
286				
287				
288				
289				
290				
291				
292				
293				
294				
295				
296				
297				
298				
299				
300				