GPU Nuclear

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December 8, 1995
C321-95-2350

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

Gentlemen:

Subject: Oyster Creek Nuclear Generating Station (OCNGS)
Docket No. 50-219
Facility Operating License No. DPR-16
Response to the Followup to the Request for Additional Information Regarding Generic Letter (GL) 92-08

NRC letter dated September 27, 1995 requested additional information regarding ampacity derating evaluations for Thermo-Lag fire barriers installed at OCNGS. The Attachment to this letter provides an itemized response for the specific areas of the NRC request for additional information.

Sincerely,

J. J. Barton
Vice President and Director,
Oyster Creek

Attachment
DJD/plp

c: Administrator, Region I
OCNGS NRC Resident Inspector
OCNGS NRC Project Manager

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Attachment

Followup Request for Additional Information Regarding
Generic Letter (GL) 92-08
"Thermo-Lag 330-1 Fire Barriers"
Pursuant to 10 CFR 50.54(f)

1.0 Request for Additional Information (RAI) of February 10, 1994

a. NRC Request

The licensee is requested to submit its ampacity derating evaluations, including any applicable test reports, in order to provide an adequate response to Generic Letter 92-08 Reporting Requirement 2(c).

Response

GPU Nuclear letter dated December 27, 1994 provided the results of OCNGS ampacity derating calculations performed in 1987 to support the initial installation of Thermo-Lag fire barriers at OCNGS. This calculation is documented in Burns and Roe (B&R), Inc. Calculation No. 3731-29-E007, Revision 0, "Adequacy of Fire Wrapped Cables for Appendix R Modifications." This calculation indicates that the maximum available derating margins for these circuits exceeded the 8% for 1-hour fire rated barriers and 11% for 3-hour fire rated barriers as specified by TSI.

GPU Nuclear Calculation No. C-1302-814-5350-002 has been performed to determine the calculated ampere derating for Thermo-Lag protected power circuits. Instrumentation and control circuits typically carry low current in relation to cable size and cable derating is not a concern. Therefore, these circuits have not been included in this calculation. The Thermo-Lag barrier derating factor, based on TSI design values and values derived from Texas Utilities(TU)/Tennessee Valley Authority (TVA) testing, is applied after all other applicable derating factors have been calculated. This calculation utilizes circuit information including derating factors for ambient temperature and the number of conductors in a raceway. The following conservatisms are also incorporated in the above calculation:

(1) 125% of full load current is used for circuits which feed motors or circuits which are energized continuously.

(2) 100% of full load current is used for circuits which are not energized continuously.

(3) All circuit currents are based on the rating of the equipment. Actual loads are normally lower.

Table 1 provides the results of this conservative calculation. This Table indicates that the OCNGS Thermo-Lag protected power circuits can be adequately derated to account for ambient temperatures, multiple conductors in a raceway, and Thermo-Lag fire barrier wrap based on TU/TVA testing, while fully satisfying the calculated actual circuit current requirements.

GPU Nuclear has not incorporated the results of any ampacity test reports other than the referenced TU/TVA testing, which we understand NRC has previously reviewed.

2.0 Request for Additional Information (RAI) of December 29, 1994

a. NRC Request

The staff recognizes that most licensees may have excess ampacity margin using valid test data. However, those licensees who utilize industry test data must evaluate whether installed configurations are representative of the tested configurations. The subject evaluations should also analyze any deviations of the installed configuration with respect to the test configuration. The licensee did not indicate that CPSES Unit 2 Thermo-Lag fire barrier configurations were representative of OCNGS configurations.

Response

The following discussion provides a comparison of installed Thermo-Lag configurations at OCNGS with those tested by TU for Comanche Peak and those tested by TVA to determine Thermo-Lag ampacity derating factors.

The TU CPSES Test Report, "Electrical Test to Determine the Ampacity Derating of a Protective Envelope for Class IE Electrical Circuits, Project No. 12340-94583, 95165-95168, 95246," dated March 19, 1993, yielded ampacity derating values for one hour fire rated conduit, cable tray and air drop fire barriers. OCNGS uses Thermo-Lag on conduit and air drops, not cable tray. OCNGS uses one hour and three hour rated fire barrier configurations. For three hour rated conduit configurations, comparison is made with testing performed by TVA as documented in TVA Report, "Fire Endurance and Ampacity Testing of One and Three-hour Rated Thermo-Lag Electrical Raceway Fire Barrier Systems."

Enclosure 2 of NRC letter to NEI dated October 16, 1995 asserts that barrier construction is the most important variable in the applicability of test results. Attributes of construction which are important are as follows:

Size of any air gap(s)
Barrier Thickness
Barrier Geometry
Raceway Emissivity
Intervening thermal resistance (i.e. Flexi-Blanket used in CPSES tests)

The TU tests for conduits were conducted on 3/4 inch, 2 inch, and 5 inch conduits. At OCNGS, the size of protected conduits ranges from 1 to 4 inches. The following is a comparison of OCNGS and TU construction attributes:

A. 1-Hour Barriers-Conduit

OCNGS		TU	
Size	1,1.25,1.5,2" dia.	Size:	.75-2" dia.
Raceway Material	Galvanized Steel	Raceway Material	Galvanized Steel
TSI Thickness	.5"	TSI Thickness	.75"
Preformed Conduit	Yes	Preformed Conduit	Yes
Topcoat	No	Topcoat-TSI 350	Yes
Air gaps	No	Air Gaps	No
Steel Bands	Yes Max. 12" Spacing	Steel Bands	Yes 12 "Spacing
Size	2.5,3,3.5,4" dia.	Size	5" dia.
Raceway Material	Galvanized Steel	Raceway Material	Galvanized Steel
TSI Thickness	.5"	TSI Thickness	.5"
Preformed Conduit	Yes	Preformed Conduit	Yes
Topcoat	No	Topcoat-TSI 350	Yes
Air Gaps	No	Air Gaps	No
Steel Bands	Yes Max. 12" Spacing	Steel Bands	Yes 12" Spacing

In comparing OCNGS with TU tested configurations, the lack of an air gap is assumed for both configurations since preformed TSI conduit sections are designed to fit directly around conduit. Note that TU did not test the derating effect around condulets.

The differences between OCNGS and TU configurations are in the thickness of the TSI for conduits up to 2" diameter. Because the TU configurations used .75" of TSI vs. .5" at OCNGS, the additional insulating effect of the TU configurations results in the TU test bounding the OCNGS configurations. The results of testing on the 5" diameter conduit should be comparable with OCNGS configurations ranging from 2.5 to 4" as they are the same with the following exception. The presence of the topcoat on the TU configurations is the one common difference between TU and OCNGS configurations. However, the presence of the topcoat tends to result in higher derating values. It is therefore reasonable and conservative to apply derating values obtained in the TU tests for conduit configurations at Oyster Creek.

B. 1-Hour Barriers-Air Drops (TU)

In comparing OCNGS and TU configurations, a specific evaluation is not necessary as in the case of the 1-Hour Barriers for conduit. The nature of the difference in the two configurations should be overriding in establishing that the TU tests bound OCNGS configurations. TU's configurations use 3 layers of TSI flexi-blanket material while OCNGS configurations use 2 layers of TSI flexi-blanket material. Based upon this inherent conservatism, it is reasonable to conclude that the TU test data on air drops bounds the OCNGS configurations.

C. 3-Hour Barriers-Conduit (TVA)

OCNGS		TVA	
Size:	4" dia.	Size:	1"-4" dia.
Raceway Material:	Galvanized Steel	Raceway Material:	Galvanized Steel
TSI Thickness:	1-1.25"	TSI Thickness:	1.25"
Preformed Conduit:	Yes	Preformed Conduit:	Yes
Upgrade:	No	Upgrade:	Yes*
Air gaps:	No	Air Gaps:	No
Steel Bands:	Yes-Max. 12" Spacing	Steel Bands:	Yes-12" Spacing

*The TVA configurations were reinforced with external stainless steel stress skin and Thermo-Lag 770-1 trowel grade material. Then at least two layers of 3/8" thick Thermo-lag 770-1 Mats buttered with Thermo-Lag 770-1 trowel grade material were installed over the reinforced base Thermo-Lag 330-1 assembly.

The differences between the OCNGS and TVA configurations are in the upgrade employed by TVA. Because the TVA configurations used additional mats and trowel grade material, the additional insulating effect of the TVA configurations should result in the TVA test bounding the OCNGS configurations. It is noted that the TVA test results are expressed in terms of a correction factor, not percent derating factor.

Based on the above comparisons, it is reasonable to apply ampacity test results from TU and TVA for those configurations discussed above. The TU and TVA barrier construction bounds OCNGS configurations with respect to ampacity testing. The following ampacity derating factors were obtained from the TU and TVA tests and applied to the OCNGS power circuits in the attached Table 1.

- One-Hour Fire Wrap (Test by TU)

  6.67 to 10.7 percent - Use 11.0 percent for bounding conservatism.

- Three-Hour Fire Wrap (Test by TVA)

  13.0 percent plus an additional 5 percent to account for possible variations in the surface emissivities of installed conduits - Use 18 percent for bounding conservatism.

b. NRC Request

In its submittal of December 27, 1994, the licensee referred to site specific calculations. If those calculations represent the licensee's final determination of ampacity derating parameters for Thermo-Lag fire barriers please forward a copy of the subject calculations for staff review. The licensee is requested to provide its site-specific schedule and plans for the resolution of the ampacity derating issue for Thermo-Lag fire barriers.

Response

The site specific calculation referenced in the GPU Nuclear letter dated December 27, 1994 is the B&R Calculation No. 3731-29-E007, Revision 0, "Adequacy of Fire Wrapped Cables for Appendix R Modifications." This calculation and the additional GPU Nuclear Calculation No. C-1302-814-5350-002 are described in detail in response to RAI 1.0, item a. above. These calculations are available onsite for NRC review and represent the final determination of ampacity derating for the existing installed Thermo-Lag fire barriers.

As stated in RAI response 1.0 item a. above, the existing OCNGS Thermo-Lag protected Appendix R power circuits can accommodate the design ampacity derating factors derived from the TU/TVA comparison described in RAI 2.0, item a. above. In addition, there is derating margin available to accommodate any possible Thermo-Lag upgrades, where applicable. Future Thermo-Lag upgrade designs will evaluate the specific ampacity derating effects for each upgrade installation configuration. Potential upgrades will be identified as a result of the Thermo-Lag barrier evaluations to be completed by December 31, 1995 and implemented no later than December 1998, in accordance with GPU Nuclear letter to NRC (C321-95-2184) dated July 17, 1995.

c. NRC Request

At this time the staff is not aware of any existing or planned NEI initiative which will address the ampacity derating issue. If a NEI test program or analysis is expected to be utilized by the licensee please provide specific program details and incorporate any input by NEI into the licensee's overall schedule.

Response

GPU Nuclear is currently not planning to utilize any NEI test program or analysis to address ampacity derating for OCNGS. Based on the ampacity derating calculations and TU/TVA test configuration comparisons described above, the ampacity derating factors utilized for OCNGS are adequate. Additional derating for potential future Thermo-Lag upgrades will be evaluated on a case-by-case basis, where appropriate.

d. NRC Request

Finally, the staff expects that the licensee will submit in conjunction with the resolution of the fire endurance issue, the test procedures or alternatively, a description of the analytical methodology including typical calculations which will be used to determine the ampacity derating parameters for the Thermo-Lag fire barriers that are installed at Oyster Creek Nuclear Generating Station.

Response

The calculations used to determine the ampacity derating parameters for the Thermo-Lag fire barriers installed at OCNGS are described in detail above. These calculations are available for NRC review. No additional testing or analysis is currently planned to address existing ampacity issues.

Table 1
Calculation for Thermo-Lag Ampacity Derating for OCNGS

ITEM #	CIRCUIT #	CIRCUIT DESCRIPTION	CABLE SIZE	CALCU-LATED / ACTUAL LOAD AMPS	CABLE RATED AMPS @ 30°C	DERATED AMPS DUE TO			
						AMBIENT >30°C	MULTIPLE CONDUCTORS IN RACEWAY	FIRE WRAP (USING TSI DATA)	FIRE WRAP (USING TU/TVA DATA)
1	11GP1402	Inst. PNL 4C Feed to RSP	2-1/C #8	24	55	50	40	36	35.6
2	11NP1403	Inst. PNL 4C Feeder to Fire Det. Pnl.	2-1/C #12	10	30	27.3	21.8	20	19.4
3	112P1406	Halon Syst Protection	2-1/C #12	5.5	30	27	19	17	16.9
4*	11-861	HVAC Control PNL	2/C #10	20	40	36	25	23	22.3
5*	12-600	Battery Charger C1	3-1/C #2/0	12.5 Actual	195	177.5	177.5	163	158
6*	12-601	Battery Charger C2	3-1/C #2/0	12.5 Actual	195	177.5	177.5	163	158
7*	12-602	Battery Room C Ventilation Fan F1	1-3/C #10	4.3	40	36.4	36.4	33.5	32.4
8*	12-603	Battery Room C Ventilation Fan F2	1-3/C #10	4.3	40	36.4	36.4	33.5	32.4
9	12-604	Battery Room C Vent Heater/Fan	1-3/C #10	24	40	36.4	36.4	33.5	32.4
10*	12NP0825	"A" SWGR Rm HVAC Fan	3-1/C #12	17.5	30	27.3	21.8	20	19.4

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11*	12NP0826	"A" SWGR RM HVAC Fan	3-1/C #12	17.5	30	27.3	21.8	20	19.4
12*	12GP0816	Power to Valve V-14-37	4-1/C #10	10	40	36	25	23	22.3
13*	12GP0817	Power to Valve V-14-32	3-1/C #12	10.25	30	27.3	19.1	17	17
14	122PO845	Refueling Platform	3-1/C #6	30	75	68	48	44	42.7
15*	14-25	460V USS 1B2	3-1/C 500 MCM	399	475	475	475	437	423
16*	14-28	460V USS 1B3	3-1/C 2/0	150	205	205	205	188	182
17	14-31	400 HP Emerg. Serv. Water Pump 1-3	3-1/C 2/0 1/C #6	67	205	205	205	188	182
18*	62-93	125V DC to 460V SWGR 1B3	2-1/C #6	56	150	136.5	109.2	100.5	97.2
19*	62-100	125V DC to 4160V SWGR 1D	2-1/C #4	56	95	86.5	69.2	63.7	61.6
20*	62-153	125V DC POWER to DC-2 PNL	2-1/C 2/0	85	195	177	177	163	157

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21*	62-158	125V DC to 460 SWGR 1A2	2-1/C #2	56	130	118.3	118.3	108	105
22*	62-161	125V DC Power to PNL F	2-1/C 2/0	150	195	177	177	163	157
23	62-165	DC Power to RPS PNL 6XR	1-2/C #10	15	40	36.4	25.5	23.4	22.7
24	62-168	DC Power to PNL 11F	1-2/C #10	5	40	36.4	25.5	23.4	22.7
25	62-169	DC Power to PNL 1F/2F	1-2/C #12	14	30	27.3	19.1	17	17
26	62-170	DC Power to PNL 3F	1-2/C #10	10	40	36.4	25.5	23	22.7
27*	62GP0229	125V DC Power to 460V SWGR 1B3	2-2/C #6	56	150	136.5	109.2	100	97
28*	62GP0228	DC Power to 4160V SWGR 1D	2-1/C #4	56	95	86.5	69.2	63	61.6
29*	62GP0225	DC Power to V-16-2	11-1/C #8	18.5	55	50	35	32	31
30*	62GP0226	DC Power to V-16-14	11-1/C #8	18.5	55	50	35	32	31

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						AMBIENT >30°C	MULTIPLE CONDUCTORS IN RACEWAY	FIRE WRAP (USING TSI DATA)	FIRE WRAP (USING TU/TVA DATA)
31*	86-71 3-Hour Wrap	4160V SWGR 1D	2 X 3-1/C 500 MCC	543	950	950	950	845	779
32	21-2038	Drywell Personnel	2/C #12	6.25	30	27	13.5	12.4	12
33	12-317	Valve NG02C	4-1/C #12	6	30	27	13.5	12.4	12
34	12-318	Valve NG02E	4-1/C #12	6	30	27	13.5	12.4	12
35	12-320	Valve NG03C	4-1/C #12	6	30	27	13.5	12.4	12
36	12-321	Valve NG03E	3-1/C #12	6	30	27	13.5	12.4	12
37	12-323	Valve NG08-C	4-1/C #12	0.91	30	27	13.5	12.4	12
38	12-324	Valve NG08-E	4-1/C #12	0.91	30	27	13.5	12.4	12
39	12GP0827	Valve NG03-E	4-1/C #12	10	30	27	14.0	13	12.4
40	12-328	Valve NG02-B	4-1/C #12	6	30	27	13.5	12.4	12
41	12-330	Valve NG03-B	4-1/C #12	6	30	27	13.5	12.4	12
42	12-332	Valve NG08-B	4-1/C #12	6	30	27	13.5	12.4	12
43	12-335	Valve V-17-54	4-1/C #12	4.9	30	27	13.5	12.4	12
44	12-341A	Valve V-1-107	4-1/C #12	0.69	30	27	13.5	12.4	12

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						AMBIENT >30°C	MULTIPLE CONDUCTORS IN RACEWAY	FIRE WRAP (USING TSI DATA)	FIRE WRAP (USING TU/TVA DATA)
45	12-342	Valve V-14-37	4-1/C #12	10.3	30	27	13.5	12.4	12
46	12-329	Valve NG02-D	4-1/C #12	6	30	27	13.5	12.4	12
47	12-331	Valve NG-03-D	4-1/C #12	6	30	27	13.5	12.4	12
48	12-333	Valve NG-08D	4-1/C #12	0.91	30	27	13.5	12.4	12
49	12-443	Valve V-5-166	4-1/C #12	0.91	30	27	13.5	12.4	12
50	12-446	Valve V-5-148	4-1/C #12	0.91	30	27	13.5	12.4	12
51	12-325	Valve V-16-1	4-1/C #12	4.9	30	27	13.5	12.4	12
52	11-293	SRM #1 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
53	11-294	SRM #2 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
54	11-297	IRM #1 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
55	11-298	IRM #2 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
56	11-299	IRM #3 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
57	11-300	IRM #4 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
58	11-295	SRM #3 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1

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						AMBIENT >30°C	MULTIPLE CONDUCTORS IN RACEWAY	FIRE WRAP (USING TSI DATA)	FIRE WRAP (USING TU/TVA DATA)
59	11-296	SRM #4 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
60	11-301	IRM #5 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
61	11-302	IRM #6 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
62	11-303	IRM #7 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
63	11-304	IRM #8 Motor Feed	3-1/C #16	0.29	18	16	8	7.3	7.1
64*	86-66	EDG-2, Diff. Protn	4-1/C 19/22	5	40	36	28.8	26.5	25.6
65*	86GC0016	EDG-2, Diff. Protn	4-1/C #10	5	40	36	25.2	23.2	22.4

*Appendix R Circuit