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(ACCELERATED RIDS PROCESSING)

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9411290151 DOC. DATE: 94/11/21 NOTARIZED: NO DOCKET #
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 50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylv 05000388
 AUTH. NAME AUTHOR AFFILIATION
 BYRAM, R.G. Pennsylvania Power & Light Co.
 RECIP. NAME RECIPIENT AFFILIATION
 Document Control Branch (Document Control Desk)

SUBJECT: Provides info that demonstrates that large margin to reactivity insertion accident offsite dose criteria exists & that even w/lowest expected failure threshold, offsite doses do not exceed regulatory limits, in response to IN 94-64.

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NOV 21 1994

U.S. Nuclear Regulatory Commission
Attn.: Document Control Desk
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**SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO NRC QUESTIONS ON
EXTENDED FUEL BURNUP PROPOSAL
PLA-4229 FILES A17-2/R41-2**

Docket Nos. 50-387/NPF-14
and 50-388/NPF-22

- References:
1. PLA-4147, R.G. Byram to C.L. Miller, "Request for Extended Fuel Exposure Limits," dated May 31, 1994.
 2. NRC Letter, C. Poslusny to R.G. Byram, "Request for Additional Information Related to Approval of the PP&L Request for Approval of Extended Fuel Exposure for SSES Units 1 and 2 (TAC Nos. M89731 and M89732)", dated October 19, 1994.

Dear Sir:

NRC Information Notice 94-64 notified licensees of recent data which suggests that failure thresholds for a reactivity insertion accident (RIA) may be burnup dependent and that licensees may wish to consider this preliminary information in submittals for extension of fuel burnup levels. Reference 1, which proposes extending the burnup limits for PP&L's Siemens 9x9-2 fuel from 40,000 MWD/MTU to 45,000 MWD/MTU, was under NRC review at the time the Information Notice was issued. The NRC has indicated (via Reference 2 and various telecons) that even though this proposal does not extend burnup limits beyond those currently approved for other fuel designs, additional information is needed to address the concerns with the recent data expressed in the Information Notice.

Accordingly, PP&L is providing information that demonstrates that a large margin to the RIA offsite dose criteria exists, and that even with the lowest expected failure threshold, the offsite doses do not exceed regulatory limits. PP&L believes that the failure thresholds considered in this evaluation are very conservative. They are being provided as an interim approach until the recent data can be fully analyzed and a determination made with respect to the need for more appropriate failure thresholds.

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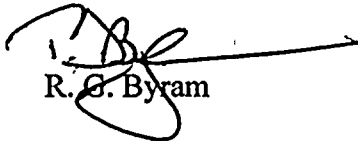
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In a telecon held with the NRC on November 2, 1994, PP&L was requested to provide the number of fuel pins calculated to fail for a control rod drop accident assuming failure thresholds of 30, 50, and 85 cal/gm. The data in Attachment 1 shows that the offsite dose results are well within the regulatory criteria (i.e., 25% of 10CFR100 limits) even when the 30 cal/gm threshold is considered. PP&L believes that these results clearly indicate that a significant margin of safety is retained if the referenced application is approved.

Via Reference 2, the NRC also requested additional information regarding the control rod drop accident analysis results for Susquehanna SES. That information is provided in Attachment 2 for typical fuel cycles near the requested exposures.

PP&L requests that the NRC review of this supplemental information be handled expeditiously in support of our ongoing efforts to order proper enrichments for future cycles. Any questions on this submittal should be directed to Mr. R. Sgarro at (610) 774-7914.

Very truly yours,



R. G. Byram

Attachments

cc: NRC Region I
Mr. C. Poslusny, Jr., NRC Sr. Project Manager - OWFN
Ms. M. Banerjee, NRC Sr. Resident Inspector - SSES
Mr. L. Phillips, NRR/SRXB - OWFN

ATTACHMENT 1

CRDA RADIOLOGICAL CONSEQUENCES AT VARIOUS FAILURE THRESHOLDS

Failure Threshold (CAL/GM)	Failed Fuel Rods ¹	Regulatory Offsite Dose Limit ² (REM)	Calculated Offsite Dose (REM)			
			Exclusion Area		LPZ	
			WB	THY	WB	THY
30	6478	WB : 6.25 THY: 75	0.64	11	.033	1.6
50	4424	WB : 6.25 THY : 75	0.43	7.5	.023	1.1
85	3081	WB : 6.25 THY : 75	0.30	5.2	.016	0.77

1. Based on PP&L's NRC approved CRDA analysis methods. Please note that in order to facilitate this analysis, it was conservatively assumed that all fuel rods in a bundle would fail if any fuel rod in that bundle reached the failure threshold.
2. 25% of Whole Body (WB) and Thyroid (THY) limits as specified in 10CFR100.11.



ATTACHMENT 2

- A. Relative Pin Local Peaking Factors
- B. Peak Deposited Enthalpy
- C. Relative Radial Haling Power Distribution (Approx. 40000 MWD/MTU)
- D. Haling Exposure Distribution (Approx. 40000 MWD/MTU)
- E. Relative Radial Haling Power Distribution (Approx. 44000 MWD/MTU)
- F. Haling Exposure Distribution (Approx. 44000 MWD/MTU)

ATTACHMENT 2A

RELATIVE PIN LOCAL PEAKING FACTORS AT 40 AND 45 GWD/MTU



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40.0 % Voids
Uncontrolled Case
40.000 GWD/MTU

.953								
.911	.916							
.959	.940	1.057						
1.021	1.065	1.061	1.053					
1.024	.930	1.057	1.054	.000				
1.022	1.065	1.062	1.057	1.056	.000			
.961	.941	1.054	1.066	1.071*	1.061	1.060		
.960	.981	.982	.935	1.064	.936	.975	.907	
.954	.959	.959	1.020	1.020	1.009	.953	.908	.950

* Peak Rod

ASSEMBLY TYPE 34
LATTICE TYPE 40 -- AVERAGE ENRICHMENT 3.85 WT% U-235
10 GADOLINIA RODS AT 5.0 WT % GD203
CPM-2 LOCAL PEAKING DISTRIBUTION - HOT UNCONTROLLED

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40.0 % Voids
Uncontrolled Case
45.000 GWD/MTU

.976								
.929	.916							
.962	.933	1.052						
1.011	1.053	1.064	1.064					
1.015	.932	1.062	1.065	.000				
1.012	1.054	1.064	1.066	1.062	.000			
.964	.935	1.050	1.066	1.072 *	1.058	1.051		
.964	.968	.976	.934	1.052	.933	.968	.909	
.977	.963	.962	1.010	1.011	1.001	.957	.927	.974

* Peak Rod

ASSEMBLY TYPE 34
LATTICE TYPE 40 -- AVERAGE ENRICHMENT 3.85 WT% U-235
10 GADOLINIA RODS AT 5.0 WT % GD203
CPM-2 LOCAL PEAKING DISTRIBUTION - HOT UNCONTROLLED

ATTACHMENT 2B

CONTROL ROD DROP ACCIDENT RESULTS

	<u>U2C7</u>	<u>U1C8</u>
Peak Deposited Enthalpy (cal/gm)	214 ¹	184 ²

¹ Peak enthalpy occurs on once burned fuel.

² Peak enthalpy occurs on fresh fuel.

ATTACHMENT 2C

RELATIVE RADIAL HALING POWER DISTRIBUTION

(Approx. 40,000 MWD/MTU Peak Assembly)

Power	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.9768	1.0475	1.3174	1.0491	1.1181	1.0644	1.3190	1.0549	.9991	.9981	.9325	.9546	1.1544	.8561	.5453
2	1.0483	1.3055	1.1718	1.3084	1.0482	1.3154	1.1014	1.3104	1.1515	1.2815	1.1199	1.2324	1.0318	.8502	.5364
3	1.3177	1.1728	1.0354	1.1437	1.3084	1.1687	1.3268	1.0900	1.3126	1.0501	1.3009	1.0342	1.1551	.8464	.5243
4	1.0512	1.3086	1.1432	1.0059	1.1347	1.0124	1.1679	1.0308	1.1406	1.3127	1.1667	1.2649	.9252	.8101	.4697
5	1.1192	1.0469	1.3083	1.1346	.9925	1.0993	1.3005	1.1407	1.0297	1.0364	1.3134	1.1233	1.1305	.8007	.4404
6	1.0644	1.3161	1.1683	1.0094	1.0984	.9903	1.1427	1.3009	1.1572	1.3032	1.1518	1.2290	.9441	.7313	.3904
7	1.3207	1.1060	1.3280	1.1683	1.3002	1.1422	1.0148	1.0374	1.2794	1.0327	1.2399	1.0208	.7445	.6052	.3217
8	1.0565	1.3125	1.0912	1.0333	1.1406	1.3002	1.0366	1.1168	1.0365	1.2122	1.0134	1.0218	.6943	.3978	
9	1.0011	1.1545	1.3132	1.1413	1.0270	1.1550	1.2769	1.0330	1.1712	.9841	.7837	.7060	.4204		
10	.9977	1.2809	1.0505	1.3114	1.0368	1.3006	1.0242	1.2093	.9830	.8320	.5798	.4008	.2814		
11	.9351	1.1145	1.2979	1.1621	1.3114	1.1505	1.2370	1.0109	.7786	.5776	.3752				
12	.9503	1.2288	1.0285	1.2616	1.1204	1.2272	1.0190	1.0198	.7041	.4022					
13	1.1527	1.0280	1.1519	.9232	1.1284	.9445	.7424	.6926	.4194	.2816					
14	.8602	.8462	.8443	.8118	.7976	.7289	.5979	.3944							
15	.5463	.5353	.5212	.4687	.4376	.3855	.3194								

Batch	Number of Assemblies	Average Power	Max Assembly Power		Min Assembly Power	
			Value	Location	Value	Location
05-24 (J)	18	.4234	1.0148	7 7	.2814	10 13
06-27 (K)	37	.9907	1.1060	7 2	.5776	11 10
06-28 (L)	22	.8581	1.0505	10 3	.5212	15 3
07-31 (M)	20	1.0009	1.1687	3 6	.5979	14 7
07-32 (N)	42	1.0066	1.1728	3 2	.6926	13 8
08-33 (P)	1	1.1712	1.1712	9 9	1.1712	9 9
08-34 (O)	51	1.2623	1.3280	7 3	1.0198	12 8

ATTACHMENT 2D

HALING EXPOSURE DISTRIBUTION

(Approx. 40,000 MWD/MTU Peak Assembly)

Expos

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	35.9905	35.4148	16.1949	38.6237	27.4907	36.6668	16.2441	35.6400	35.9910	33.8180	37.5670	36.9659	14.2291	24.5096	33.2800
2	35.4077	16.0468	27.9794	16.0950	38.9224	16.1977	36.9128	16.1374	27.5892	15.7765	27.5472	15.1779	26.2373	24.2158	33.4760
3	16.1988	27.9585	38.4686	27.4138	16.1084	27.9887	16.3390	35.3085	16.1593	39.9107	16.0127	36.6177	14.2303	23.9986	33.2681
4	38.2593	16.0976	27.7437	39.0961	24.2869	38.6100	25.1485	39.2039	28.0730	16.1549	28.9961	15.5723	36.8539	24.2381	38.1185
5	27.1780	39.3074	16.1061	24.2803	37.8464	27.4545	16.0169	27.6012	38.9857	39.3931	16.1642	27.5808	13.9259	23.2354	38.4640
6	36.7100	16.2055	28.2635	38.9028	27.5729	39.3073	25.9347	16.0192	27.7917	16.0412	28.1566	15.1352	25.1663	22.9014	38.3657
7	16.2638	36.6643	16.3544	25.1562	16.0137	25.9621	36.1051	36.5263	15.7539	39.3621	15.2707	24.8909	34.8215	20.8697	37.0098
8	35.4836	16.1622	35.3226	39.0333	27.5622	16.0106	36.1349	24.2334	34.3964	14.9337	25.8500	12.5960	21.4964	38.7127	
9	35.9173	27.6580	16.1655	28.0766	39.1511	27.8362	15.7237	34.7901	14.4294	25.0752	33.5396	22.7545	38.7930		
10	33.8247	15.7692	39.7786	16.1390	39.4421	16.0095	39.8041	14.8987	25.0450	24.3913	34.2199	38.7282	37.8609		
11	37.4567	27.6914	15.9754	29.1925	16.1381	28.1006	15.2344	25.7505	33.8029	34.2711	38.7452				
12	37.3055	15.1319	36.6726	15.5304	27.7503	15.1116	24.8627	12.5707	22.7529	38.6845					
13	14.2071	26.2193	14.1901	36.8389	13.8980	24.9802	35.1112	21.4603	39.0600	37.4014					
14	24.4277	24.6344	23.9435	23.8214	23.4885	22.8972	21.6637	39.0192							
15	32.8975	33.3833	33.5145	38.0178	38.7626	38.5149	37.0732								

Batch	Number of Assemblies	Average Expos	Max Assembly Expos		Min Assembly Expos	
			Value	Location	Value	Location
05-24 (J)	18	38.1909	39.0600	13 9	36.1051	7 7
06-27 (K)	37	36.3900	39.8041	10 7	33.5396	9 11
06-28 (L)	22	36.9891	39.9107	3 10	32.8975	15 1
07-31 (M)	20	25.8382	28.2635	6 3	20.8697	7 14
07-32 (N)	42	25.6729	29.1925	11 4	21.4603	13 8
08-33 (P)	1	14.4294	14.4294	9 9	14.4294	9 9
08-34 (O)	51	15.5420	16.3544	7 3	12.5707	12 8

ATTACHMENT 2E

RELATIVE RADIAL HALING POWER DISTRIBUTION

(Approx. 44,000 MWD/MTU Peak Assembly)

Power	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.9411	1.0185	1.2938	1.0301	1.1084	1.0604	1.3151	1.0534	.9962	1.0732	.9247	.9394	1.1309	.8378	.5156
2	1.0214	1.2812	1.1759	1.2982	1.0393	1.3165	1.1117	1.3206	1.1599	1.2788	1.1122	1.2098	1.0276	.8320	.5097
3	1.2942	1.1668	1.0227	1.1628	1.3327	1.1946	1.3644	1.1866	1.3185	1.0397	1.2793	1.0076	1.1278	.8318	.4989
4	1.0372	1.2976	1.1563	1.0362	1.3141	1.0554	1.3582	1.0502	1.1511	1.2978	1.1574	1.2359	.9015	.7891	.4444
5	1.1141	1.0399	1.3312	1.3125	1.0369	1.1543	1.3634	1.1755	1.0308	1.0218	1.2886	1.1024	1.0956	.7750	.4161
6	1.0616	1.3167	1.1919	1.0501	1.1478	1.0328	1.3455	1.3424	1.1717	1.2922	1.1382	1.1982	.9162	.6889	.3578
7	1.3175	1.1128	1.3622	1.3504	1.3431	1.2003	1.0574	1.0752	1.3046	1.0278	1.2212	1.0145	.6947	.4746	.2765
8	1.0569	1.3234	1.1863	1.0466	1.1641	1.3215	1.0696	1.3075	1.1499	1.2245	1.0092	.9815	.5575	.3361	
9	1.0115	1.1703	1.3205	1.1526	1.0256	1.1636	1.2989	1.1476	1.2349	.9990	.7668	.6821	.3807		
10	1.0774	1.2827	1.0417	1.2979	1.0203	1.2871	1.0163	1.2222	1.0060	.8328	.5566	.3796	.2585		
11	.9272	1.1133	1.2817	1.1583	1.2878	1.1361	1.2165	1.0080	.7651	.5565	.3607				
12	.9347	1.2103	1.0171	1.2383	1.1020	1.1972	1.0003	.9778	.6805	.3798					
13	1.1292	1.0214	1.1301	.9048	1.0985	.9292	.6922	.5554	.3786	.2581					
14	.8385	.8284	.8390	.7942	.7771	.6913	.4741	.3352							
15	.5171	.5090	.4986	.4464	.4132	.3568	.2800								

Batch	Number of Assemblies	Average Power	Max Assembly Power		Min Assembly Power	
			Value	Location	Value	Location
09-34 (Q)	17	.3564	.4464	15 4	.2581	13 10
10-34 (R)	58	.8974	1.1128	7 2	.4741	14 7
11-34 (S)	58	1.0271	1.2003	7 6	.6805	12 9
12-34 (T)	58	1.2641	1.3644	3 7	.9778	12 8

ATTACHMENT 2F

HALING EXPOSURE DISTRIBUTION

(Approx. 44,000 MWD/MTU Peak Assembly)

Expos

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	38.6177	37.7704	16.1527	40.4283	30.3351	38.3485	16.4226	37.7501	39.1344	30.1936	41.8511	38.5881	14.1166	26.8411	37.8776
2	37.4955	15.9953	28.7638	16.2093	43.4149	16.4385	38.7988	16.4873	30.4740	15.9637	30.0735	15.1012	26.9390	26.4486	38.0052
3	16.1571	29.7524	42.8124	29.7774	16.6396	31.4010	17.0331	31.8046	16.4581	43.7084	15.9655	39.0288	14.0773	25.3290	37.7076
4	39.8104	16.2007	30.4035	43.4603	16.4086	43.4139	16.9551	42.8968	30.8073	16.1989	31.2029	15.4262	38.4487	26.3197	41.7017
5	29.9291	43.4455	16.6206	16.3888	42.9061	30.5352	17.0188	30.6576	40.6594	43.3253	16.0816	30.0373	13.6744	25.1291	41.9361
6	38.4242	16.4406	31.4930	43.5865	30.5274	43.6487	16.7943	16.7551	30.7947	16.1291	30.7122	14.9533	26.8479	25.0092	42.1985
7	16.4501	38.9107	17.0059	16.8581	16.7653	27.1979	40.0781	39.5632	16.2852	41.5368	15.2428	24.9152	38.7480	36.7546	41.3312
8	37.7280	16.5224	31.8272	42.8309	30.4990	16.4952	39.5768	16.3213	31.3069	15.2848	27.8769	12.2551	37.7173	41.9465	
9	37.9468	29.8447	16.4826	30.4555	40.6957	30.6959	16.2128	31.3537	15.4143	27.5752	36.0067	24.7214	42.4431		
10	30.2970	16.0101	43.6019	16.2004	43.2642	16.0650	42.5314	15.2557	26.6769	26.8262	38.3098	42.3105	41.3813		
11	41.7830	30.2150	15.9971	31.2094	16.0730	30.6362	15.1828	27.6749	36.1285	38.2219	42.4447				
12	39.2261	15.1074	37.9803	15.4552	30.1838	14.9419	26.1595	12.2082	24.7095	42.2167					
13	14.0942	27.6982	14.1072	38.4505	13.7118	25.3254	38.9727	37.7632	42.3686	41.2337					
14	26.6794	26.9793	24.5547	25.9931	25.1272	25.0489	36.8122	42.1674							
15	37.6978	38.2171	38.0678	41.4680	42.9225	42.5909	40.2147								

Batch	Number of Assemblies	Average Expos	Max Assembly Expos		Min Assembly Expos	
			Value	Location	Value	Location
09-34 (Q)	17	41.9339	42.9225	15 5	40.2147	15 7
10-34 (R)	58	39.8360	43.7084	3 10	36.0067	9 11
11-34 (S)	58	28.6001	31.8272	8 3	24.5547	14 3
12-34 (T)	58	15.7805	17.0331	3 7	12.2082	12 8

SECRET