K. Morton, EG&G

MPR ASSOCIATES, INC.

June 28, 1982

Mr. Thomas Cheng
Systematic Evaluation Program Branch
U. S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20014

Subject: Oyster Creek Nuclear Generating Station,
Systematic Evaluation Program (SEP)

Dear Mr. Cheng:

At the request of GPU Nuclear (Mr. Y. Nagai), we are enclosing the results of our review and comparison of the control rod drive (CRD) pump discharge line as-built drawings with the analytical model used by EG&G in their analysis of this piping. Included in the enclosure is a marked-up copy of the GPU Nuclear Sketch (SK-F-M-0020) showing the CRD pump discharge as-built geometry and support locations with corresponding locations of node numbers used in the EG&G model (marked in red) and five sheets of CRD as-built support detail drawings (SK-F-5-0028 Sheets 1 through 5). Table 1 in the enclosure is a summary of as-built piping geometry and support locations compared to the modeled locations. The Table 1 summary references the node numbers that are marked on the enclosed sketch. Table 2 in the enclosure is a summary of the as-built support information (support type and direction) compared to modeled support input.

Results of the review and comparison are summarized as follows:

1. The piping system modeled by EG&G starts at the elbow of the CRD pump discharge line. Seven and one half inches of piping from the pump discharge nozzle to the elbow was left out. This can be seen by looking at nodes 5 and 1230 on the marked-up as-built support location sketch. The addition of this pipe section in the EG&G model could reduce stresses by adding local flexibility in the area of the socket weld-elbow.

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2. The piping system modeled by EG&G does not model the one inch recirculation lines coming out of the discharge line approximately 5-1/2 feet above the pump anchor points. This can be seen at nodes 45 and 1195 on the marked-up as-built support location sketch. The addition of the recirculation lines could provide both vertical and horizontal support which is not included in the EG&G model.

3. The U-bolt type supports modeled by EG&G do not take into account friction between the bolt and piping for the direction parallel to the pipe. An example is shown on the marked-up as-built support location sketch, for a U-bolt support at node 1105, where the system is assumed to be free to move in the X-direction. This very conservative assumption should be re-evaluated and some credit for friction in these supports considered.

4. Geometry variations from the as-built locations vary significantly from the modeled system starting at node location number 235. The as-built dimensions show the piping system turning through a 45 degree turn where the modeled system does not. The maximum geometry variations from as-built drawings, from Table 1, are as follows:

Maximum X-Direction Variation	Maximum Y-Direction Variation	Maximum Z-Direction Variation
5 ft at Node 1065	5 ft at Node 410	8 ft at Node 585

5. The piping system modeled by EG&G fails to model eight supports at various points along the piping system. Piping supports that were not modeled by EG&G are shown in the marked-up as-built support location sketch by red circled letters (B, D, E, F, G, H, I, and J).

At your request, copies of this letter and enclosure are being transmitted directly to EG&G, Idaho, Mr. Keith Morton.

Please contact us if you have any questions on the attached.

Sincerely,

Wm. R. Schmidt

Enclosure

cc: Y. Nagai, GPUN
K. Morton, EG&G

TABLE 1

SUMMARY OF AS-BUILT PIPING AND SUPPORT LOCATIONS
COMPARED TO MODELED LOCATIONS

NODE POINT	AS-BUILT LOCATIONS			MODELED LOCATIONS		
	X (ft)	Y (ft)	Z (ft)	X (ft)	Y (ft)	Z (ft)
*5	0.0	0.0	0.0	0.0	0.0	0.0
*1230	6.167	0.0	0.0	6.167	0.0	0.0
30	.167	5.208	0.0	.167	4.290	0.0
*35	.167	5.208	-	.167	4.290	-.75
1205	6.334	5.208	0.0	6.334	4.290	0.0
*1235	6.334	5.208	-	6.334	4.290	-.75
45	.167	6.333	0.0	.167	6.413	0.0
1195	6.334	6.333	0.0	6.334	6.413	0.0
*55	.167	6.5	-.458	.167	6.580	-1.0
*1185	6.334	6.5	-.458	6.334	6.580	-1.0
60	.167	6.5	-1.25	.167	6.580	-1.5
1175	6.334	6.5	-1.25	6.334	6.580	-1.5
*110	.167	6.5	-8.75	.167	6.580	-10.0
*1135	6.334	6.5	-8.583	6.334	6.580	-9.0
*1105	3.917	6.5	-10.833	3.334	6.580	-11.0
140	.167	6.5	-13.75	.167	6.580	-13.931
150	.417	6.5	-14.00	.264	6.580	-14.167
*170	.417	6.5	-18.125	.264	6.580	-18.098
175	.417	6.5	-18.583	.264	6.580	-18.931
*230	.417	16.208	-18.750	.264	16.580	-19.098
235	.417	17.417	-18.750	.264	17.413	-19.098
(A)	-3.119	17.583	-22.286	-	-	-
*(B)	-3.119	17.583	-29.786	-	-	-
*295	-3.119	17.583	-36.953	.264	17.580	-30.348
*(D)	-3.119	17.583	-40.286	-	-	-

port Location - Refer to Table 2 for support type_and direction.

TABLE 1 (CONTINUED)

DE POINT	AS-BUILT LOCATIONS			MODELED LOCATIONS		
	X (ft)	Y (ft)	Z (ft)	X (ft)	Y (ft)	Z (ft)
335	-3.119	17.583	-42.619	.264	17.580	-38.181
*360	-3.119	23.500	-42.786	.264	23.580	-38.348
*410	-3.119	42.458	-42.786	.264	37.580	-38.348
440	-3.119	46.042	-42.786	.264	46.413	-38.348
460	-1.354	46.208	-44.551	2.716	46.580	-40.800
*470	-1.104	46.208	-44.551	3.765	46.580	-40.849
*495	8.854	46.208	-44.551	10.765	46.580	-40.849
*(E)	15.438	46.208	-44.551	-	-	-
*510	15.813	46.208	-44.551	15.265	46.580	-40.849
*(F)	21.021	46.208	-45.009	-	-	-
*551	21.021	46.208	-45.551	25.765	46.580	-41.849
*(G)	21.021	46.208	-46.468	-	-	-
*580	21.021	46.208	-58.718	25.765	46.580	-50.015
*585	21.021	46.208	-59.593	25.765	46.580	-51.515
*635	21.021	46.208	-70.801	25.765	46.580	-66.515
650	21.021	46.208	-74.301	25.765	46.580	-70.946
*660	22.082	46.208	-75.528	26.826	46.580	-72.076
*(H)	27.974	46.208	-81.421	-	-	-
*(I)	31.333	46.208	-84.780	-	-	-
730	38.404	46.208	-91.851	41.680	46.580	-86.930
*755	46.473	46.208	-95.883	46.437	46.580	-89.522
*780	51.343	46.208	-97.900	53.367	46.580	-92.392
*805	56.334	46.208	-99.830	58.525	46.580	-94.114
*830	59.334	46.208	-99.830	63.525	46.580	-94.114
835	59.917	46.208	-99.830	64.359	46.580	-94.114
*845	60.084	45.208	-99.830	64.525	45.330	-94.114
870	60.084	39.208	-99.830	64.525	40.247	-94.114

pport Location - Refer to Table 2 for support type and direction.

TABLE 1 (CONTINUED)

DE POINT	AS-BUILT LOCATIONS			MODELED LOCATIONS		
	X (ft)	Y (ft)	Z (ft)	X (ft)	Y (ft)	Z (ft)
*900	61.141	39.041	-99.830	69.525	40.080	-94.114
*920	69.375	39.041	-99.830	73.525	40.080	-94.114
925	70.084	39.041	-99.830	74.359	40.080	-94.114
*945	70.250	37.499	-99.830	74.525	36.830	-94.114
960	70.250	34.791	-99.830	74.525	33.747	-94.114
971	70.250	34.624	-101.225	74.525	33.580	-94.864
*1245	70.250	34.624	-	74.692	33.580	-95.322
*(J)	70.250	30.666	-101.225	-	-	-
995	70.250	27.082	-101.225	74.525	27.747	-95.864
1010	70.250	26.916	-102.308	74.525	27.580	-95.864
*1250	69.417	26.916	-102.308	74.317	27.580	-95.864
1255	68.542	26.916	-102.308	73.817	27.580	-95.864
*1290	65.083	26.916	-102.308	69.025	27.580	-95.864
1020	70.250	26.916	-103.641	74.525	27.580	-97.198
*1025	69.417	26.916	-103.808	74.359	27.580	-97.364
1030	68.542	26.916	-103.808	73.775	27.580	-97.364
*1065	63.542	26.916	-103.808	68.525	27.580	-97.364
*1085	63.083	26.916	-102.308	66.525	27.580	-96.864

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;pport Location - Refer to Table 2 for support type and direction.

TABLE 2

SUMMARY OF AS-BUILT SUPPORT INFORMATION
COMPARED TO THE MODELED SUPPORT INFORMATION

NODE POINT	AS-BUILT SUPPORTS		MODELED SUPPORTS	
	DIRECTION OF SUPPORT	TYPE OF SUPPORT	DIRECTION OF SUPPORT	STIFFNESS OF SUPPORT (lb/in or lb-in/rad)
5	1,2,3,4,5,6*	Pump Anchor Pt.	1,2,3,4,5,6	Rigid
1230	1,2,3,4,5,6	Pump Anchor Pt.	1,2,3,4,5,6	Rigid
35	1,2,3	**	1,2,3	1 & 2 - $.333 \times 10^3$ 3 - $.7378 \times 10^6$
1235	1,2,3	**	1,2,3	1 & 2 - $.333 \times 10^3$ 3 - $.7378 \times 10^6$
55	2	Spring	2	50
1185	2	Spring	2	50
110	2	Hanger	2	10^5
1135	2	Hanger	2	10^5
1105	1,2,3	U-Bolt 1 = Pipe***	2,3	10^5
170	1,2,3	U-Bolt 3 = Pipe	1,2	10^5
230	1,2,3	U-Bolt 2 = Pipe	1,3	10^5
(B)	2	Hanger	None	-
295	1,2,3	U-Bolt 3 = Pipe	1,2	10^5
(D)	2	Hanger	None	-

TABLE 2 (CONTINUED)

NODE POINT	AS-BUILT SUPPORTS		MODELED SUPPORTS	
	DIRECTION OF SUPPORT	TYPE OF SUPPORT	DIRECTION OF SUPPORT	STIFFNESS OF SUPPORT (lb/in or lb-in/rad)
360	1,2,3	U-Bolt 2 = Pipe	1,3	10^5
410	1,2,3	U-Bolt 2 = Pipe	1,3	10^5
470	2	Spring	2	50
495	2	Hanger	2	10^5
(E)	2	Hanger	None	-
510	1,2,3	U-Bolt 1 = Pipe	2,3	10^5
(F)	2	Hanger	None	-
551	2	Hanger	2	10^5
(G)	1,2,3	U-Bolt 3 = Pipe	None	-
580	1,2,3	U-Bolt 3 = Pipe	1,2	10^5
585	2	Hanger	2	10^5
635	1,2,3	U-Bolt 3 = Pipe	1,2	10^5
660	2	Hanger	2	10^5
(H)	1,2,3	U-Bolt	None	-
(I)	1,2,3	U-Bolt	None	-
730	2	Dead Weight Support	2	10^5

TABLE 2 (CONTINUED)

NODE POINT	AS-BUILT SUPPORTS		MODELED SUPPORTS	
	DIRECTION OF SUPPORT	TYPE OF SUPPORT	DIRECTION OF SUPPORT	STIFFNESS OF SUPPORT (lb/in or lb-in/rad)
755	1,2,3,4,5,6	Concrete Wall	Angled Support	10^5
780	No Support		Angled Support	10^5
805	1,2,3	Pipe Clamp 1 = Pipe	2,3	10^5
830	No Support		2	10^5
845	1,2,3	U-Bolt 2 = Pipe	1,3	10^5
900	1,2,3	Pipe Clamp 1 = Pipe	2,3	10^5
920	2	Spring	2	50
945	1,2,3	U-Bolt 2 = Pipe	1,3	10^5
(J)	1,2,3	U-Bolt 2 = Pipe	None	10^5
1025	1,2,3	U-Bolt 1 = Pipe	2,3	10^5
1250	1,2,3	U-Bolt 1 = Pipe	2,3	10^5
1065	1,2,3	U-Bolt 1 = Pipe	2,3	10^5
1290	1,2,3,4,5,6	CRD Filter Pt.	1,2,3,4,5,6	Rigid
1085	1,2,3,4,5,6	CRD Filter Pt.	1,2,3,4,5,6	Rigid

TABLE 2 (CONTINUED)

NODE POINT	AS-BUILT SUPPORTS		MODELED SUPPORTS	
	DIRECTION OF SUPPORT	TYPE OF SUPPORT	DIRECTION OF SUPPORT	STIFFNESS OF SUPPORT (lb/in or lb-in/rad)
1245	1,2,3	**	1,2,3	1 & 2 - $.333 \times 10^3$ 3 - $.7378 \times 10^6$

* Support Direction

1	X	Trans	lb/in
2	Y	Trans	lb/in
3	Z	Trans	lb/in
4	X	Rot	lb-in/rad
5	Y	Rot	lb-in/rad
6	Z	Rot	lb-in/rad

** = Attached branch piping

*** = (Parallel to)

REVIEW OF THE MPR ASSOCIATES, INC. COMMENTS
ON THE ORIGINAL CRD RETURN LINE ANALYSIS

At the request of GPU Nuclear, MPR Associates, Inc. (MPR) reviewed and made comments on the original analysis of the CRD return line. The following is a review of the MPR comments and their utilization in the current analysis.

Comments 1, 2, and 4 deal with piping geometry variations in the original model. The system was accurately modeled based upon the information available. These geometry variations were not shown on the original isometric drawings. However, they have been incorporated into the current model based upon the as-built drawings.

The third comment indicates that the friction between U-bolts and the piping, parallel to the pipe, should be taken into account. Due to the lack of information concerning frictional values and their behavior during a seismic event, it was deemed appropriate to assume free movement in the axial direction of the pipe at U-bolt locations. This assumption was made for both the original and current analyses.

Comment 5 shows several supports that were not incorporated into the original model. Again, the support configuration was modeled accurately based upon the information available. With the exception of support "J", these supports were not shown on the isometric drawings. For the current analysis, all of these supports have been incorporated except for two. At each of the points designated "E" and "J" the piping is supported off of adjacent piping. The information provided is insufficient to determine the response of the adjacent piping during a seismic event, and its effects upon the CRD return line. As shown in the results, the stresses are very low at these points, thus leaving a margin of safety in the event the adjacent piping might cause adverse effects.