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December 1, 2000
L-00-138

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Response to Request for Additional Information
Pertaining to License Amendment Request Nos. 280 and 151

This letter provides the Beaver Valley Power Station (BVPS) response to the November 22, 2000, NRC request for additional information concerning Unit No. 1 License Amendment Request (LAR) No. 280 and Unit No. 2 LAR No. 151 submitted to the NRC by letter L-00-008 dated May 12, 2000. The subject LARs proposed changes to the Updated Final Safety Analysis Reports (UFSARs) addressing revised design basis accident dose analyses as a result of the complete reevaluation of all BVPS dose calculations. This information supplements the BVPS response previously transmitted by letter L-00-127, dated November 2, 2000.

If there are any questions concerning this matter, please contact Mr. Thomas S. Cosgrove, Manager, Licensing at 724-682-5203.

Sincerely,

Lew W. Myers

Lew W. Myers

c: Mr. L. J. Burkhart, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

A001

Subject: **Beaver Valley Power Station, Unit No. 1 and No. 2**
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Response to Second Request for Additional Information
Pertaining to License Amendment Request Nos. 280 and 151

I, Lew W. Myers, being duly sworn, state that I am Senior Vice President of FirstEnergy Nuclear Operating Company (FENOC), that I am authorized to sign and file this submittal with the Nuclear Regulatory Commission on behalf of FENOC, and that the statements made and the matters set forth herein pertaining to FENOC are true and correct to the best of my knowledge and belief.

FirstEnergy Nuclear Operating Company

Lew W. Myers
Senior Vice President - FENOC

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF BEAVER

Subscribed and sworn to me, a Notary Public, in and for the County and State above named, this 1 th day of December, 2000.

Sheila M. Fattore
My Commission Expires:

Notarial Seal
Sheila M. Fattore, Notary Public
Shippingport Boro, Beaver County
My Commission Expires Sept. 30, 2002
Member, Pennsylvania Association of Notaries

Attachment to Letter L-00-138
Response to Request for Additional Information
Regarding Revisions to UFSAR Design Bases Dose Analyses
Beaver Valley Power Station Unit Nos. 1 and 2
Docket Nos. 50-334 and 50-412

Unit 1:

1) Please provide brief justification/explanation for changes to the following items in Tables 14.1-3, 14.2-4b, 14.2-9, 14.2-10, 14.2-12, 14.3-10, 14.3-14a, and 14B-5.

a) Power level
b) RCS and Steam Generator fluid content
c) Primary to secondary leak rates
d) Post-accident steam release from steam generators
e) RCS density

RESPONSE:

Item No.	Parameter Name	Current Value	Revised Value	Reason for the change
a)	BVPS-1 Power level (MWt)			This change was made so that the current licensed maximum reactor power level is used in the analyses. BVPS Unit 1 is limited to 2652 MWt by Technical Specification (analyses are done assuming 102% of full power operation, hence 2705 MWt).
	Table 14.1-3 Loss of AC Power (LACP)	2766	2705	
	Table 14.2-4b Locked Rotor Accident (LRA)	2766	2705	
	Table 14.2-9 Steam Generator Tube Rupture (SGTR)	2766	2705	
	Table 14.2-10 Main Steam Line Break (MSLB)	2766	2705	
	Table 14.2-12 Rod Ejection Accident (REA)	2766	2705	
	Table 14.3-10 Small Line Break Accident (SLB)	2766	2705	
	Table 14.3-14a Loss of Coolant Accident (LOCA)	2766	2705	
	Table 14B-5 RCS Design Activity	2,766	2,705	

b)	BVPS-1 RCS and steam generator fluid content Note – the % power and % steam generator tube plugging values specifically bounding for each accident are noted.			The values for these parameters utilized for the individual dose analyses is based on the selection of the most conservative input into the radiological analyses. The values are derived from WCAP 13707-1 for the 30% steam generator tube plugging limits. Within the WCAP, Westinghouse evaluated that the parameter changes are consistent with the requirements for the safety analyses such as LOCA, DNB, Steam Generator Tube Rupture, ECCS acceptance criteria, etc. Input parameters associated with the Containment analysis have been verified by FirstEnergy to be consistent with the present analysis. The revised values for the RCS are actual values considering the pressurizer vapor space and the approved upper and lower limits for steam generator tube plugging. Previously used values did not fully consider the reduced volume because of these factors. The value used for the MSLB corresponds to 0% power operation because, through a series of sensitivity analyses, this condition resulted in the bounding analyzed doses. Similar sensitivity analyses were performed for the other accidents listed and the conditions used are bounding for each. For accidents where a coincident iodine spike is part of the source term, mixing in the pressurizer liquid volume is conservatively not assumed, and a lower liquid volume is used for this portion of the calculation. The revised values for steam generator liquid and steam masses include consideration of power level, steam generator tube plugging and uncertainty as provided by Westinghouse. A series of sensitivity analyses were performed using various combinations of operating conditions for each accident, and those conditions that resulted in the highest analyzed doses are provided. The exception is for the LRA, where the revised steam generator liquid mass is higher. This occurred because the current value is based on the old value with – 10% uncertainty, whereas the revised value is an updated, actual value that was recently calculated and provided by Westinghouse. *These are rounded values as provided in the calculation package input list. Higher precision was actually used in the calculations. See additional information on RCS and steam generator fluid content at the end of this Table.
	Table 14.1.3 (LACP) (100% / 30%)			
	RCS fluid content (lbm)	390,000	345,800	
	S/G liquid content (lbm)	97,900	103,868-10%	
	S/G steam content (lbm)	6,460	5,807+10%	
	Table 14.2-4b (LRA) (100% / 30%)			
	RCS fluid content (lbm)	351,000	345,800	
	S/G liquid content (lbm)	88,100	103,868-10%	
	S/G steam content (lbm)	6,980	5,807+10%	
	Table 14.2-9 (SGTR) (100% / 30%)			
	RCS fluid content (lbm)	390,000	345,800	
	RCS fluid content, less PZR (lbm)	n/a	314,500	
	S/G liquid content (lbm)	97,900	103,868-10%	
	S/G steam content (lbm)	6,460	5,807+10%	
	Table 14.2-10 (MSLB) (0% / 30%)			
	RCS fluid content (lbm)	351,000	329,500	
	RCS fluid content, less PZR (lbm)	n/a	314,500	
	S/G liquid content (lbm)	164,000	148,104+10%	
	S/G steam content (lbm)	6,100	5,781+10%	
	Table 14.2-12 (REA) (100% / 30%)			
	RCS fluid content (lbm)	390,000	345,800	
	S/G liquid content (lbm)	97,900	103,868-10%	
	S/G steam content (lbm)	6,460	5,807+10%	
	Table 14.3-10 (SLB) (100% / 30%)			
	RCS fluid content (lbm)	351,000	*3.46E+05	
	RCS fluid content, less PZR (lbm)	N/A	*3.15E+05	
	S/G steam content (Not listed in this Table)	N/A	N/A	
	Table 14.3-14a (LOCA)			
	Parameters not listed in this Table	N/A	N/A	
	Table 14B-5 (RCS design activity)			
	RCS fluid content (ft^3)	9,387	7,835	
	S/G steam content (Not listed in this Table)	N/A	N/A	

c)	BVPS-1 Primary–to-secondary leak rates			The revised values reflect the allowable current leak rates provided in Technical Specifications. The previous values of 500 gpd and 1 gpm were changed by an amendment to the Technical Specifications. Table 14.2-10 also provided a change to accident induced leakage from 8 gpm to 3 gpm. The lower value represents the highest leak rate that will result in acceptable analyzed accident doses, considering bounding plant operating conditions. The major reason for this decrease was a change to the RCS letdown system flow rate assumed in the dose analysis. This is further described in LER 1-99-002, Docket No. 50-334.
	Table 14.1-3 (LACP)			
	Any one S/G (gpd)	500 gpd	150 gpd ea.	
	All three S/Gs (gpm or gpd)	1.0 gpm	450 gpd all	
	Table 14.2-4b (LRA)			
	150 gpd each S/G listed remains unchanged	N/A	N/A	
	Table 14.2-9 (SGTR)			
	Any one S/G (gpd)	500 gpd	150 gpd ea.	
	All three S/Gs (gpm or gpd)	1.0 gpm	450 gpd all	
	Table 14.2-10 (MSLB)			
	150 gpd each S/G listed remains unchanged	N/A	N/A	
	Accident induced leak rate	8 gpm	3 gpm	
	Table 14.2-12 (REA)			
	Any one S/G (gpd)	500 gpd	150 gpd ea.	
	All three S/Gs (gpm or gpd)	1.0 gpm	450 gpd all	
	Table 14.3-10 (SLB)			
	Parameter not listed in this Table	N/A	N/A	
	Table 14.3-14a (LOCA)			
	Parameter listed in this Table	N/A	N/A	
	Table 14B-5 (RCS Design Activity)			
	Parameter not listed in this Table	N/A	N/A	

d)	BVPS-1 Post –accident steam release from S/Gs			The change to Table 14.2-4b corrects an error made in the original calculation. This small change has no affect on analyzed accident doses. The changes to Table 14.2-10 for 0-30 minutes reflects the changes in 1) initial team generator volume as described above, 2) the Technical Specification leak rate as described above, and 3) the reduced accident induced leak rate as described above. The revised value for 30 minutes to 8 hours is a duplicated parameter, as it is another way of stating the primary-to-secondary leakage in the affected steam generator (previously discussed). This considers that all of the initial fluid was previously released, and is based on the integrated accident induced plus Technical Specification allowable leakage for the duration specified. The current value does not reflect the value specifically used in the analysis (the analysis uses steam release based on primary-to-secondary leak rate, which is appropriate).
	Table 14.1-3 (LACP)			
	Steam release values remain unchanged	N/A	N/A	
	Table 14.2-4b (LRA)			
	0-2 hr steam release remains unchanged	N/A	N/A	
	2-8 hr steam release (lbm)	793,644	793,664	
	Table 14.2-9 (SGTR)			
	Steam release values remain unchanged	N/A	N/A	
	Table 14.2-10 (MSLB)			
	Steam release from intact S/Gs unchanged	N/A	N/A	
	0-30 min steam release, affected S/G	150,000	170,050	
	30 min-8 hrs steam release, affected S/G	1300	1397	
	Table 14.2-12 (REA)			
	Steam release values remain unchanged	N/A	N/A	
	Table 14.3-10 (SLB)			
	Parameter not listed in this Table	N/A	N/A	
	Table 14.3-14a (LOCA)			
	Parameter not listed in this Table	N/A	N/A	
	Table 14B-5 (RCS Design Activity)			
	Parameter not listed in this Table	N/A	N/A	

e)	BVPS-1 RCS density			Although density is not listed in the Tables, it is used to derive the RCS mass used in each Table.
	Table 14.1-3 (LACP) Parameter not listed in this Table	N/A	N/A	Table 14B-3 listed only the RCS temperature of 577°F, and no value for density. The RCS liquid density utilized in the new analysis and listed in the table corresponds to the 576.6°F nominal maximum Tavg (100% power).
	Table 14.2-4b (LRA) Parameter not listed in this Table	N/A	N/A	
	Table 14.2-9 (SGTR) Parameter not listed in this Table	N/A	N/A	
	Table 14.2-10 (MSLB) Parameter not listed in this Table	N/A	N/A	
	Table 14.2-12 (REA) Parameter not listed in this Table	N/A	N/A	
	Table 14.3-10 (SLB) Parameter not listed in this Table	N/A	N/A	
	Table 14.3-14a (LOCA) Parameter not listed in this Table	N/A	N/A	
	Table 14B-5 (RCS Design Activity) RCS liquid density (LBM/ft^3)	N/A	44.13	

Unit 2:

1) Please provide brief justification/explanation for changes to the following items in Tables 15.1-3, 15.2-2, 15.3-3, 15.4-3, 15.6-2 and 15.6-5b.

a) Power level
b) RCS and Steam Generator fluid content
c) Primary to secondary leak rate before and after the accident

RESPONSE:

Item No.	Parameter Name	Current Value	Revised Value	Reason for the change
a)	BVPS-2 Power level (MWt)			This change was made so that the current licensed maximum reactor power level is used in the analyses. BVPS Unit 2 is limited to 2652 MWt by Technical Specification (analyses are done assuming 102% of full power operation, hence 2705 MWt).
	Table 15.1-3 (MSLB) Parameter not listed in this Table	N/A	N/A	
	Table 15.2-2 (LACP)	2766	2705	
	Table 15.3-3 (LRA)	2766	2705	
	Table 15.4-3 (REA)	2766	2705	
	Table 15.6-2 (SLB)	2766	2705	
	Table 15.6-5b (SGTR)	2766	2705	

b)	BVPS-2 RCS and steam generator fluid content Note – the % power and % steam generator tube plugging values specifically bounding for each accident are noted. Table 15.1-3 (MSLB) RCS mass is not listed in this table Steam generator masses unchanged Table 15.2-2 (LACP) (100% / 0%) RCS mass is not listed in this table S/G liquid content (lbm) S/G steam content (lbm) Table 15.3-3 (LRA) (100% / 20%) RCS mass is not listed in this table S/G liquid content remains unchanged S/G steam content (lbm) Table 15.4-3 (REA) (100% / 20%) RCS mass is not listed in this table S/G liquid content (lbm) S/G steam content (lbm) Table 15.6-2 (SLB) Parameters not listed in this Table Table 15.6-5B (SGTR) (100% / 0%) RCS fluid content S/G liquid content S/G steam content (lbm)	 n/a n/a N/A 99,300 8,700 n/a n/a 7,190 n/a 99,300 8,700 n/a 1.91E+08 g 4.5E+07 g (not listed)	 N/A N/A N/A 103,172-10% 6,534+10% n/a n/a 6,152+10% N/A 102,230-10% 6,152+10% n/a 3.887E+05 lbm 103,172-10% lbm 6,534+10%	The values for these parameters utilized for the individual dose analyses is based on the selection of the most conservative input into the radiological analyses. The values are derived from WCAP 13798-0 for the steam generator tube plugging limits. Within the WCAP, Westinghouse evaluated that the parameter changes are consistent with the existing safety analyses such as LOCA, DNB, Steam Generator Tube Rupture, ECCS acceptance criteria, etc. Input parameters associated with the Containment analysis have been verified by FirstEnergy to be consistent with the present analysis. The revised values for steam generator liquid and steam masses include consideration of power level, steam generator tube plugging and uncertainty as provided by Westinghouse. A series for sensitivity analyses were performed using various combinations of operating conditions for each accident, and those conditions that resulted in the highest analyzed doses are provided. An exception is the steam mass decrease for the locked rotor accident. In Table 15.6-5B, the revised values for the RCS are actual values considering the pressurizer vapor space and the approved upper and lower limits for steam generator tube plugging. Previously used values did not fully consider the reduced volume because of these factors. The revised mass used in the radiological calculation corresponds to 100% power and 0% steam generator tube plugging conditions. See additional information on RCS and steam generator fluid content at the end of this Table.

c)	BVPS-2 Primary-to-secondary leak rate pre- and post-accident			The revised value reflect the current allowable leak rate provided in Technical Specifications. The previous value of 1 gpm was changed by an amendment to the Technical Specifications.
	Table 15.1-3 (MSLB)			
	Pre-accident primary-to-secondary leak rate remains unchanged	n/a	n/a	
	Post-accident primary-to-secondary leak rate is not listed in this Table	n/a	n/a	
	Table 15.2-2 (LACP)			
	Pre-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Post-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Table 15.3-3 (LRA)			
	Pre-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Post-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Table 15.4-3 (REA)			
	Pre-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Post-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Table 15.6-2 (SLB)			
	Parameters not listed in this Table	n/a	n/a	
	Table 15.6-5B (SGTR)			
	Pre-accident primary-to-secondary leak rate	1 gpm	450 gpd	
	Post-accident primary-to-secondary leak rate for unaffected steam generators	1 gpm	150 gpd each	
	Post-accident primary-to-secondary leak rate for ruptured steam generator remains unchanged	n/a	n/a	

Additional Information on RCS/Steam Generator Parameters

In all of the cases above, the parameter changes associated with the range of RCS and steam generator fluid masses that were considered in the analyses made relatively small changes to the accident doses. However, in the interest of conservatism, now and in the future, the conditions that produced the highest analyzed doses (even if the difference was only a fraction of a millirem) were used.

Unit 1:

The conditions (100% reactor power and 30% steam generator tubes plugged) used to determine the RCS and steam generator mass values that were changed in the Unit 1 UFSAR Tables are the same for all but the Main Steam Line Break Accident (MSLB). The conditions used for the MSLB accident correspond to 0% reactor power and 30% steam generator tubes plugged.

Characteristic of the MSLB accident, the total liquid mass in the faulted steam generator and all of the activity contained therein, is assumed to be released shortly after the accident occurs. The activity release is directly proportional to the mass release. We found that the influence of the activity released from the faulted steam generator changes enough over the expected range of values, to significantly influence the analysis results. The highest mass release results in the highest analyzed dose. This corresponds to the 0% power condition which is different than that used in the other accidents. This was confirmed by performing a series of sensitivity analyses using the conditions corresponding to the possible combinations of 0% and 100% reactor power, and 0% and 30% steam generator tubes plugged.

Additionally, the RCS liquid mass (less pressurizer liquid mass) is added to supplement the RCS mass values provided in Tables 14.2-9 and 14.2-10. This is added because, unlike previous analyses, the associated revised analyses do not use the liquid contained in the pressurizer to dilute the activity released as a consequence of the concurrent iodine spike that is characteristic to these accidents. This is a conservative assumption. The total RCS mass values are retained in the Tables because they are still used to determine the pre-release iodine escape rates from fuel. For this portion of the analyses, the larger values are conservative.

Unit 2:

Because RCS liquid volume is listed in only one (Steam Generator Tube Rupture) Table, there are no differences among the Tables to discuss.

Changes made to steam generator fluid content were limited to four of the UFSAR Tables. The Loss of AC Power (LACP) and the Steam Generator Tube Rupture (SGTR) accidents both use conditions corresponding to 100% reactor power and 0% steam generator tube plugging.

For the LACP, the combination of high initial steam generator steam mass (activity content) and lower liquid mass available to dilute primary-to-secondary leakage that are associated with these conditions provide the bounding (highest thyroid CDE) accident conditions.

For the SGTR, the relatively lower steam generator liquid mass associated with these conditions provide the bounding (highest thyroid CDE for the pre-accident spike case) accident conditions. The lower liquid mass provides for less pre-release dilution of the activity released from the primary to the secondary system prior to release to the environment. This was confirmed by performing a series of sensitivity analyses using the conditions corresponding to the possible combinations of 0% and 100% reactor power, and 0% and 20% steam generator tubes plugged.

The Locked Rotor Accident (LRA) and the Rod Ejection Accident (REA) both use conditions corresponding to 100% reactor power and 20% steam generator tube plugging. Because significant activity is assumed to be released from the fuel and then to the secondary system via primary-to-secondary leakage, the lower steam generator liquid mass associated with 100% reactor power and 20% steam generator tube plugging conditions provides for minimum dilution prior to release to the environment. This maximizes thyroid CDE, the bounding doses for both of these accidents. This was confirmed by performing a series of sensitivity analyses for both accidents using the conditions corresponding to the possible combinations of 0% and 100% reactor power, and 0% and 20% steam generator tubes plugged.