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NUCLEAR ENGINEERING & SERVICES

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

SUBJECT: Peach Bottom Atomic Power Station, Units 2 and 3  
Response to March 12, 1991 Meeting on Emergency  
Diesel Generators


REFERENCE: Meeting Summary issued by G. Y. Suh (NRC) dated  
March 25, 1991

Dear Sir:

The purpose of this letter is to provide the information requested by the NRC at a meeting between the NRC and Philadelphia Electric Company (PECo) held on March 12, 1991. The subject of the meeting was the Emergency Diesel Generator (EDG) loading for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The NRC issued a summary of the meeting in the above referenced document. This summary included the Action Items to which PECO agreed at the meeting. PECO responses to these Action Items are provided as an Enclosure to this letter.

If you require any additional information, please contact us.

Very truly yours,

 DAVID R. HELWIG

Enclosure

cc: T. T. Martin, Administrator, Region I, USNRC  
J. J. Lyash, USNRC Senior Resident Inspector, PB

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Peach Bottom Atomic Power Station, Units 2 and 3  
Response to March 12, 1991 Meeting on  
Emergency Diesel Generators

The Action Items agreed to by Philadelphia Electric Company (PECo) at the March 12, 1991 meeting are enumerated below in order of their appearance in the NRC Meeting Summary.

- (1) Document the current continuous and 2000-hr Emergency Diesel Generator (EDG) ratings
- (2) Commit to the design basis loading profiles denoted as "actual loads" in the meeting handouts
- (3) Incorporate the "actual loads" into the next Updated Final Safety Analysis Report (UFSAR)
- (4) Commit to maintain design basis loading profiles within the 2000-hr EDG ratings with one exception of the first 10 minutes for the E-2 EDG
- (5) Confirm that the EDG ratings are based on an appropriate consideration of plant specific installation parameters such as ambient room temperature, combustion air temperature and cooling water temperatures
- (6) Confirm with the EDG manufacturer that the EDG ratings are valid given plant specific installation parameters
- (7) Provide tabulations of loading profiles
- (8) Complete an ongoing reevaluation of EDG testing practices and requirements, with the submittal of an associated Technical Specifications Change Request
- (9) Provide additional information on turbocharger effectiveness
- (10) Provide additional information on which component loads were based on test data and which were based on calculated values

The PECO responses to these items are provided below. In some instances, the Action Items have been reordered and closely related items have been grouped together.

**Response to Action Item (1):**

The complete spectrum of ratings for each of the four EDGs is as follows:

continuous	=	2600kW
2000-hr	=	3000kW
200-hr	=	3100kW
30-min	=	3250kW

Revision 8 of the Peach Bottom UFSAR (1/89) Chapter 8.5 states that the 2000-hr rating of the EDGs is 2840kW. The response to question 8.6-2c, included in Supplement 1 of the Peach Bottom Final Safety Analysis Report (FSAR) stated that the 2000-hr rating of the EDGs is 3000kW. Apparently, a transcription error occurred during the incorporation of the FSAR Supplement information into the UFSAR that resulted in the 2840kW value being given as the 2000-hr rating. The actual 2000-hr rating of the EDGs is 3000kW. This value has been reconfirmed by letter from the EDG manufacturer, and will be reflected in the UFSAR.

In addition to providing the complete spectrum of ratings, we are providing PECO's interpretation of how the ratings were intended to be used. This interpretation has been verified by the EDG manufacturer. The above ratings are considered to be maximum values for the particular time duration specified. This means that operation above 2600kW will place the unit within the 2000-hr range; operation above 3000kW will place the unit within the 200-hr range, and operation above 3100kW will place the unit into the 30-minute range. The 2000-hr rating, the 200-hr rating and the 30-minute rating are considered to be cumulative values. The running times in the higher ratings must be deducted from each of the total running times in the lower ratings. The expiration of the 2000-hr, 200-hr or 30-minute running durations will require that a preventive-maintenance inspection be performed in accordance with the manufacturer's recommendations. Expiration of the running durations does not imply a potential failure of the EDG.

#### Response to Action Items (5) and (6):

Information associated with the plant specific EDG installation parameters will be provided in a separate submittal by May 31, 1991. We are unable to generate a detailed comparative tabulation of these parameters at this time because the cognizant personnel are currently required to resolve the recent E-4 EDG emergent issue. The E-4 issue is the subject of ongoing communications with the NRC.

#### Response to Action Item (4):

The Peach Bottom FSAR and UFSAR made no commitment to control loads on the EDGs to a specific rating. Loads were controlled under the spectrum of diesel generator ratings for the three specific time intervals identified in the accident sequence analysis and as listed in Tables 8.5.2a through 8.5.2l of the UFSAR. These intervals are 0-10 minutes, 10-60 minutes and greater than 60 minutes. These intervals represent conservative design points. The 10 minute point is significant because no operator action is credited prior to this point. The 60 minute point is significant because it is the earliest anticipated point when shutdown cooling in the non-accident unit would be required. In addition to controlling to a spectrum of ratings, it was assumed that the 30-minute and 200-hr ratings could be used any time during the accident mitigation sequence, provided the duration times were not exceeded (i.e., use of the 30-minute

rating was not limited to the first 30 minutes following the accident).

As discussed in the meeting, the Revision 8 UFSAR tables do not represent a minimum set of essential, Design Basis Accident (DBA) (Loss of Coolant Accident (LOCA) with coincident Loss of Offsite Power (LOOP)) loads, but do include some discretionary loads. Discretionary loads are those loads which may be manually disconnected from the EDGs since no credit is taken for this equipment to mitigate the consequences of the DBA. Since prior load control was to a spectrum of ratings, and not a specific value, the load profiles given in Tables 8.5.2c through 8.5.2i of Revision 8 of the UFSAR permitted these loads as long as the spectrum of ratings was not exceeded. Additionally, no credit was taken for attempting to equalize the loads among the EDGs. In the 10-60 minute interval, Residual Heat Removal (RHR) pumps are secured and a High Pressure Service Water Pump (HPSW) pump is started in the accident unit. The pump selection reflected in the UFSAR Revision 8 loading tables was arbitrary; more judicious selection would result in an equalization of loads among the EDGs and reduction of the maximum load on the EDGs for that case and interval.

The results of a preliminary design analysis were presented at the March 12, 1991 meeting which incorporated recent physical plant modifications, recent operating procedure changes, and targeted the corrected 2000-hr rating as a load control value. The analysis demonstrated that with the exception of the 0-10 minute interval for the E-2 EDG, the design load profiles could be demonstrated to be within the 2000-hr rating of the EDGs. Therefore, as agreed upon in the March 12, 1990 meeting, PECO commits to controlling the essential DBA loads for the E-1, E-3 and E-4 EDGs to less than or equal to the 2000-hr rating of the EDGs (3000kW) for all load profile intervals, and to less than or equal to the 200-hr rating of the EDGs (3100kW) for the E-2 EDG for the 0-10 minute interval and to less than or equal to the 2000-hr rating for the E-2 diesel generator for beyond 10 minutes.

#### Response to Action Item (2):

PECO interprets this Action Item to mean that we formally submit the load profiles presented at the March 12, 1991 meeting. Attachment 1 provides the composite worst-case load profile for each of the four EDGs. These profiles were generated by considering each of the ten possible permutations of a LOCA on either unit coincident with any one EDG unavailable or coincident with all four EDGs available. A simultaneous LOOP was also assumed for all ten permutations. These profiles are referred to as "composite" profiles because they represent the highest loading of each EDG for each of the three time intervals indicated for any of the ten permutations. The profiles in Attachment 1 are a result of a final design analysis. Please note that the worst-case loading for the E-3 EDG in the 10-60 minute interval increased from 2116kW, which was presented at the March 12 meeting, to 2125kW. This 9kW difference is a result of the refinement which occurred when the preliminary design

analysis was converted to the final design analysis. Also, the graphically presented information for time periods beyond one hour which was referred to at the March 12 meeting has not been included in Attachment 1 since the design basis is only for the three intervals provided in the UFSAR. This information was discussed at the meeting to show that the load demands on the EDGs decrease with time due to diminishing system demands such as decay heat removal and battery charging.

As indicated in the legend at the bottom of Attachment 1, the dashed line refers to the EDG loading presented in Revision 8 to the UFSAR and the solid line reflects the sum of the connected essential DBA loads. As stated previously in response to Action Item (4), the actual DBA loadings differ from the Revision 8 UFSAR loadings because they incorporate modifications made after Revision 8, reflect current operating procedures and are targeted to the revised 2000-hr rating of 3000kW.

Attachment 2 presents the same information as Attachment 1, but in tabular form. The table numbers in the left column correspond to UFSAR table numbers. Attachment 3 is a mark-up of existing UFSAR Revision 8 Table 8.5.2. This mark-up reflects the sum of the connected essential DBA loads, and still includes some discretionary loads.

#### Response to Action Item (10):

The values used in the September 1989 "Diesel Generator Load Profiles and System Voltage Regulation Study" (EDG Load Study) and, therefore, UFSAR Tables 8.5.2a through 8.5.2l were obtained from the design drawings and motor test data sheets, when available. All loads with the exception of the RHR pumps are nameplate values. On a composite basis, this provides a conservatism since motors are applied with a horsepower capability greater than that required by the driven loads. The RHR values were calculated using flow rates and the pump curves to derive the kW values.

#### Response to Action Item (3):

Revision 9 to the Peach Bottom UFSAR is presently scheduled to be submitted to the NRC on July 22, 1991. To support this effort, a final review of the revision is already in progress. Incorporation of the essential DBA loads, as discussed at the meeting, into the UFSAR requires extensive changes to the text and tables of Section 8.5, as well as a review and potential changes to other sections. Accordingly, the necessary clarifications and commitments will be included in Revision 10. As stated in response to Action Item (2), a mark-up of UFSAR Table 8.5.2 which reflects information presented at the meeting has been included as Attachment 3. Revision 10 will include all changes made to the plant up to six months prior to its issuance. Because of this, the load profiles to be submitted in Revision 10 may differ from those provided by this letter and from those which will be included in Revision 9.



**Response to Action Item (7):**

In addition to the load tabulations provided in Attachment 2, which are in response to Action Item (2), the NRC also requested that PECO submit an excerpted summary sheet from the September 1989 EDG Study. This summary sheet is entitled "Diesel Generator Load Summary Base and Adjusted Loads," and is included as Attachment 4.

When reviewing the attached summary sheet, it is important to consider it within the context of the study of which it is a part. The EDG Load Study summarized the results of a calculation which was subsequently revised. The revised calculation was used to generate Tables 8.5.2 and 8.5.2c through 8.5.2l in Revision 8 of the UFSAR. This calculation, along with our load control program, provide the as-built configuration of plant loads. Both the EDG Load Study and the tables in the UFSAR were developed in accordance with the success criterion of staying within the spectrum of EDG ratings as discussed in response to Action Item (4). Differences exist between the numbers in the attached summary sheet and the Revision 8 UFSAR tables because the UFSAR tables are a refinement of the EDG Load Study, and include modifications made subsequent to the EDG Load Study.

It is also important to recognize that Attachment 4 is only a "snapshot" of the EDG loadings at the time that it was generated. As such, PECO does not commit to providing updates to this summary sheet. As with other calculations, a current calculation of EDG loading will be available at our Nuclear Group headquarters for NRC inspection. The attached summary sheet is provided solely for historical purposes, as requested by the NRC.

**Response to Action Item (8):**

The current EDG testing and associated Technical Specifications are being reviewed. At this time, we cannot project the submittal date of a resultant Technical Specifications Change Request (TSCR). A commitment to a submittal date of a TSCR will be provided by May 31, 1991.

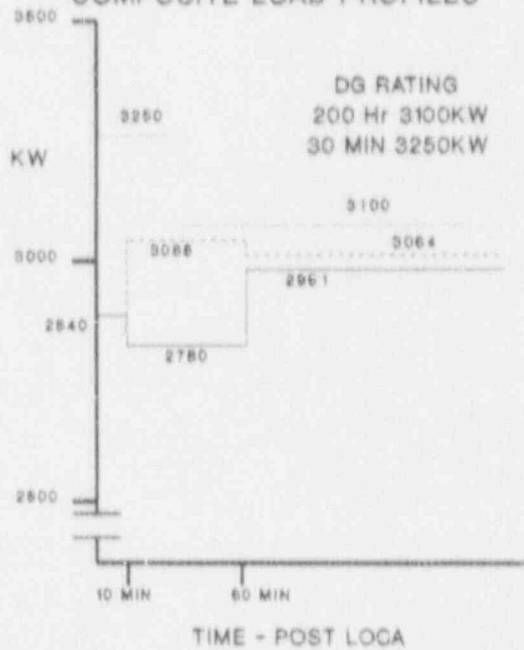
**Response to Action Item (9):**

The issue of the EDG turbocharger was discussed in a conference call conducted on March 20, 1991. Representatives from NRC Region I, PECO and Fairbanks-Morse (EDG manufacturer) participated in the call. The NRC expressed concern that DBA load profiles of the EDGs require them to pick up relatively large loads during the first few seconds of operation, and the turbocharger may not be up to speed, thereby resulting in the EDGs being unable to pick up the required load. PECO responded that the effects of the turbocharger were considered when developing the load profiles. The loads are added onto the EDG incrementally such that they actually stimulate the turbochargers ability to attain rated speed. Further, the effects of the turbocharger were incorporated into the computer model which was used in the EDG Load Study. This assessment was confirmed by the

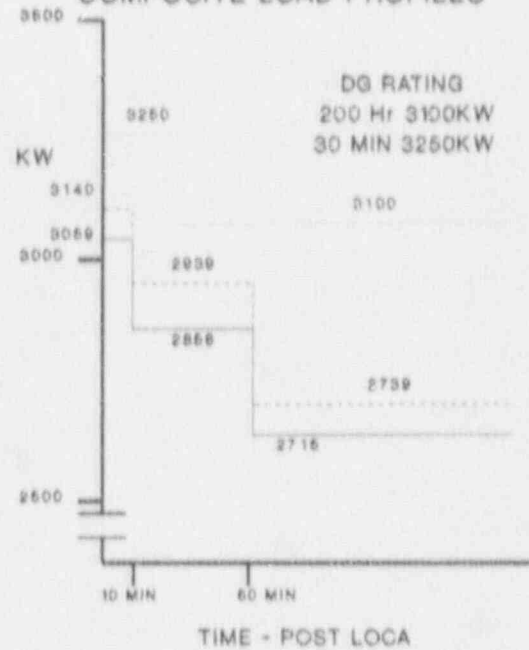
Fairbanks-Morse representative who participated in the conference call. Following this clarification, the NRC had no further questions, and no actions were required.

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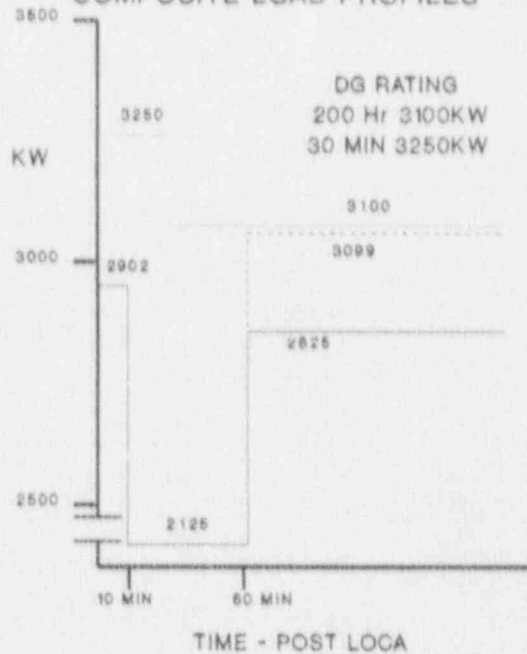
### E1 DIESEL GENERATOR COMPOSITE LOAD PROFILES



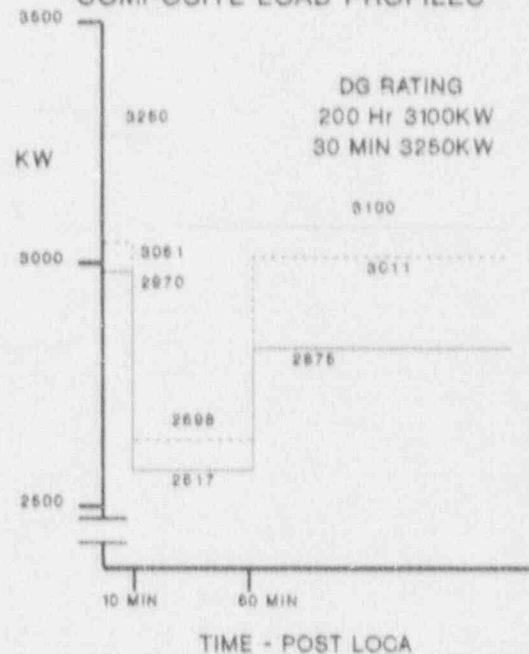
### E2 DIESEL GENERATOR COMPOSITE LOAD PROFILES



### E3 DIESEL GENERATOR COMPOSITE LOAD PROFILES



### E4 DIESEL GENERATOR COMPOSITE LOAD PROFILES



RATING

UFSAR REV.8

ACTUAL LOADS



## Diesel Generator Loadings (kW)

Interval	0 - 10 Min				10 Min - 1 Hr				1 Hr Plus			
	E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4
Diesel												
Table 8.5.2c	2840	3053	2902	2967	2279	1442	1634	1207	2109	2101	1412	2549
Table 8.5.2d		2952	2901	2867		2244	832	2617		2305	2617	2549
Table 8.5.2e	2740		2801	2967	2780		2115	726	2610		1893	2870
Table 8.5.2f	2840	2952		2867	919	2449		2617	2961	2305		2560
Table 8.5.2g	2740	3052	2801		2760	991	2125		2590	2257	2706	
Table 8.5.2h	2837	3059	2902	2970	2236	1449	1635	1211	2066	2107	1394	2554
Table 8.5.2i		2959	2902	2870		2858	833	2013		2715	2825	1946
Table 8.5.2j	2737		2802	2970	2737		2116	730	2567		1896	2875
Table 8.5.2k	2837	2959		2870	2286	2455		1211	2918	2312		2565
Table 8.5.2l	2737	3059	2802		2109	2407	1314		2741	2264	2504	

	0 - 10 Min				10 Min - 1 Hr				1 Hr Plus			
	E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4
Max Per EDG												
"Solid-line"	2840	3059	2902	2970	2780	2858	2125	2617	2961	2715	2825	2875

## FRAPS

TABLE 8.5.2

## SUMMARY OF LOADING

## DIESEL-GENERATORS AND EMERGENCY BUSES

## SAFEGUARD AND SELECTED NON-SAFEGUARD LOADS

Table No.	Table Title	0-10 Min	Maximum Loading of Any One Diesel-Generator (KW)	
			10 Min-1 Hr	Beyond 1 Hr
8.5.2b	Assignment of Safeguard & Selected Non-Safeguard Loads to Diesel-Generators & Emergency Buses	-	-	-
1 8.5.2cEh	Diesel-Generator & Emergency Bus Loading, & Diesel-Generators in Service	<del>3,340</del> 3059	2,279	<del>3,445</del> 2554
1 8.5.2dEi	Diesel-Generator & Emergency Bus Loading, E1 Diesel-Generator Out of Service	<del>3,340</del> 2959	<del>2,279</del> 2858	<del>3,445</del> 2825
1 8.5.2eEj	Diesel-Generator & Emergency Bus Loading, E2 Diesel-Generator Out of Service	<del>3,340</del> 2970	2,780	<del>3,445</del> 2875
1 8.5.2fEk	Diesel-Generator & Emergency Bus Loading, E3 Diesel-Generator Out of Service	<del>3,340</del> 2959	<del>3,288</del> 2617	<del>3,445</del> 2961
1 8.5.2gEl	Diesel-Generator & Emergency Bus Loading, E4 Diesel-Generator Out of Service	<del>3,340</del> 3059	2,760	<del>3,445</del> 2741

## NOTES:

1. The loadings are based on minimum engineered safeguard and selected non-safeguard loads for the situation of a design basis accident on one unit and an emergency shutdown of the other.
2. All loads in the period 0-10 min are automatically applied. Beyond 10 min the major loads are manually switched.
3. Additional non-safeguard loads may be manually applied as permitted by the available capacity of the diesel-generators.

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## DIESEL GENERATOR LOAD SUMMARY BASE AND ADJUSTED LOADS

DIESEL-GEN'S AVAILABLE	DIESEL GEN NO.		KW LOADING (TIME AS INDICATED)					
			UNIT #2 LOCA & UNIT #3 SHUTDOWN			UNIT #2 SHUTDOWN & UNIT #3 LOCA		
			0 - 10MIN	>10MIN-1HR	>1 HOUR	0 - 10MIN	>10MIN-1HR	>1 HOUR
ALL DGS AVAILABLE	E1	BASE	2889	2294	2216	2846	2241	2385
		ADJUSTED	2844	2284	2216	2800	2241	2385
	E2	BASE	3178	1531	2542	3189	1537	2336
		ADJUSTED	3140	1531	2542	3147	1537	2336
	E3	BASE	2903	1634	1604	2906	1634	1607
		ADJUSTED	2901	1634	1604	2905	1634	1607
	E4	BASE	3055	1290	2692	3050	1291	2693
		ADJUSTED	3050	1290	2692	3045	1291	2693
DG E1 UNAVAILABLE	E2	BASE	3078	2332	2747	3089	2946	2944
		ADJUSTED	3040	2332	2747	3047	2946	2944
	E3	BASE	2902	832	2809	2906	832	2812
		ADJUSTED	2901	832	2809	2905	832	2812
	E4	BASE	2955	2700	2692	2950	2092	2502
		ADJUSTED	2950	2700	2692	2945	2092	2502
DG E2 UNAVAILABLE	E1	BASE	2789	2765	2697	2746	2722	2866
		ADJUSTED	2744	2785	2717	2700	2742	2866
	E3	BASE	2802	2115	2297	2806	2115	2088
		ADJUSTED	2801	2115	2297	2801	2115	2088
	E4	BASE	3055	809	3013	3050	809	3014
		ADJUSTED	3050	809	3013	3049	809	3014
DG E3 UNAVAILABLE	E1	BASE	2889	874	3018	2846	3043	2975
		ADJUSTED	2844	924	3068	2800	3093	3025
	E2	BASE	3078	2537	2747	3089	1741	2541
		ADJUSTED	3040	2537	2747	3047	1741	2541
	E4	BASE	2955	2700	2692	2950	1290	2905
		ADJUSTED	2990	2700	2794	2949	1290	3007
DG E4 UNAVAILABLE	E1	BASE	2789	2765	2697	2746	2114	3060
		ADJUSTED	2744	2765	2697	2700	2114	3060
	E2	BASE	3178	1049	2457	3189	2465	2463
		ADJUSTED	3140	1079	2487	3147	2495	2493
	E3	BASE	2802	2115	3099	2806	1313	2696
		ADJUSTED	2801	2115	3099	2801	1313	2696