FIGURE 1

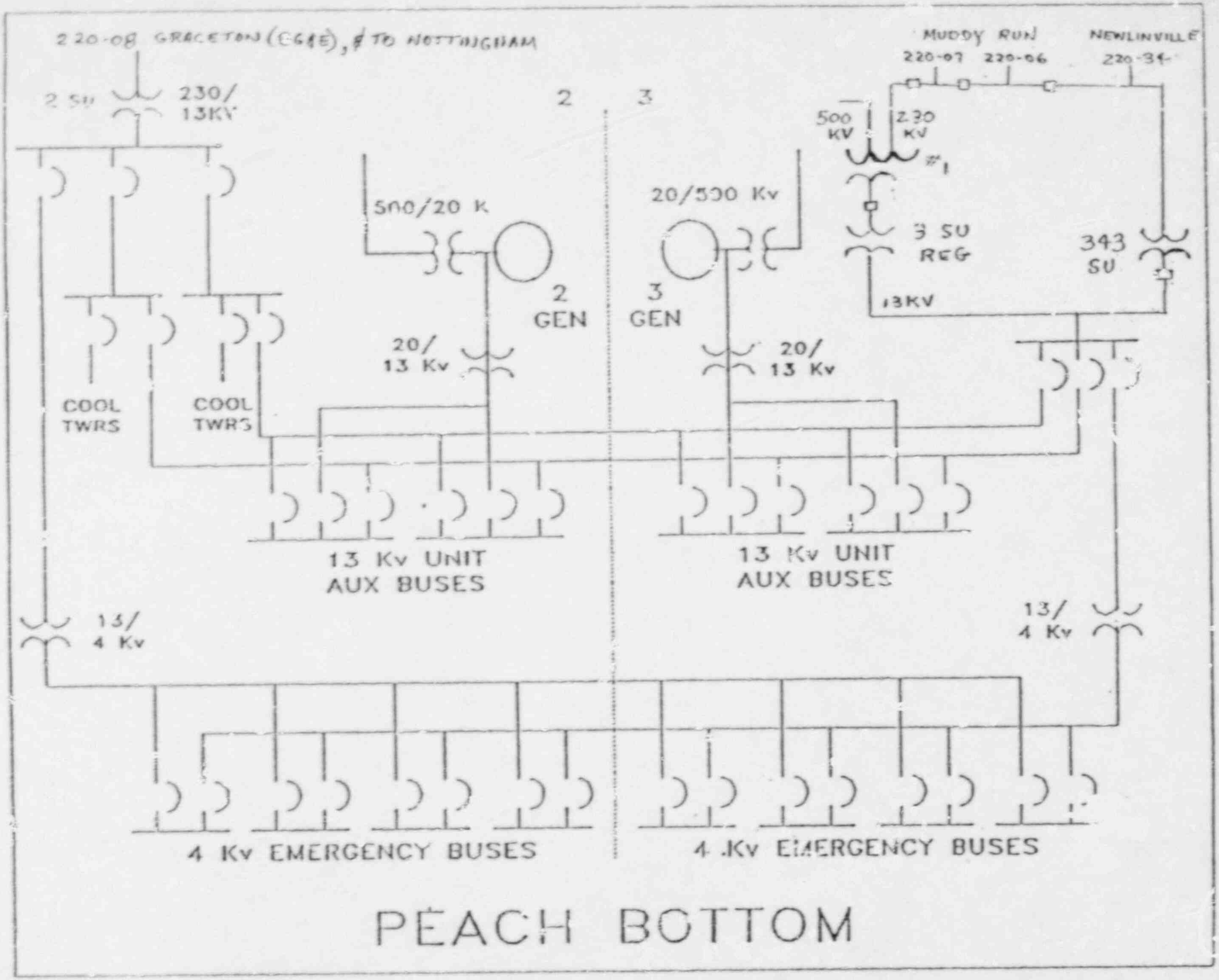
220-08 GRACETON (EG&E), Ø TO NOTTINGHAM
MUDDY RUN
NEWLINVILLE
220-07
220-06
220-34
2 SU
230/
13KV
2
3
500
KV
230
KV
#1
500/20 K
20/500 Kv
3 SU
REG
343
SU
13KV
2
GEN
3
GEN
20/
13 Kv
20/
13 Kv
COOL
TWRS
COOL
TWRS
13 Kv UNIT
AUX BUSES
13 Kv UNIT
AUX BUSES
13/
4 Kv
13/
4 Kv
4 Kv EMERGENCY BUSES
4 Kv EMERGENCY BUSES
PEACH BOTTOM

FIGURE 2

PEACH BOTTOM

TYPICAL 4 KV SAFEGUARD BUS

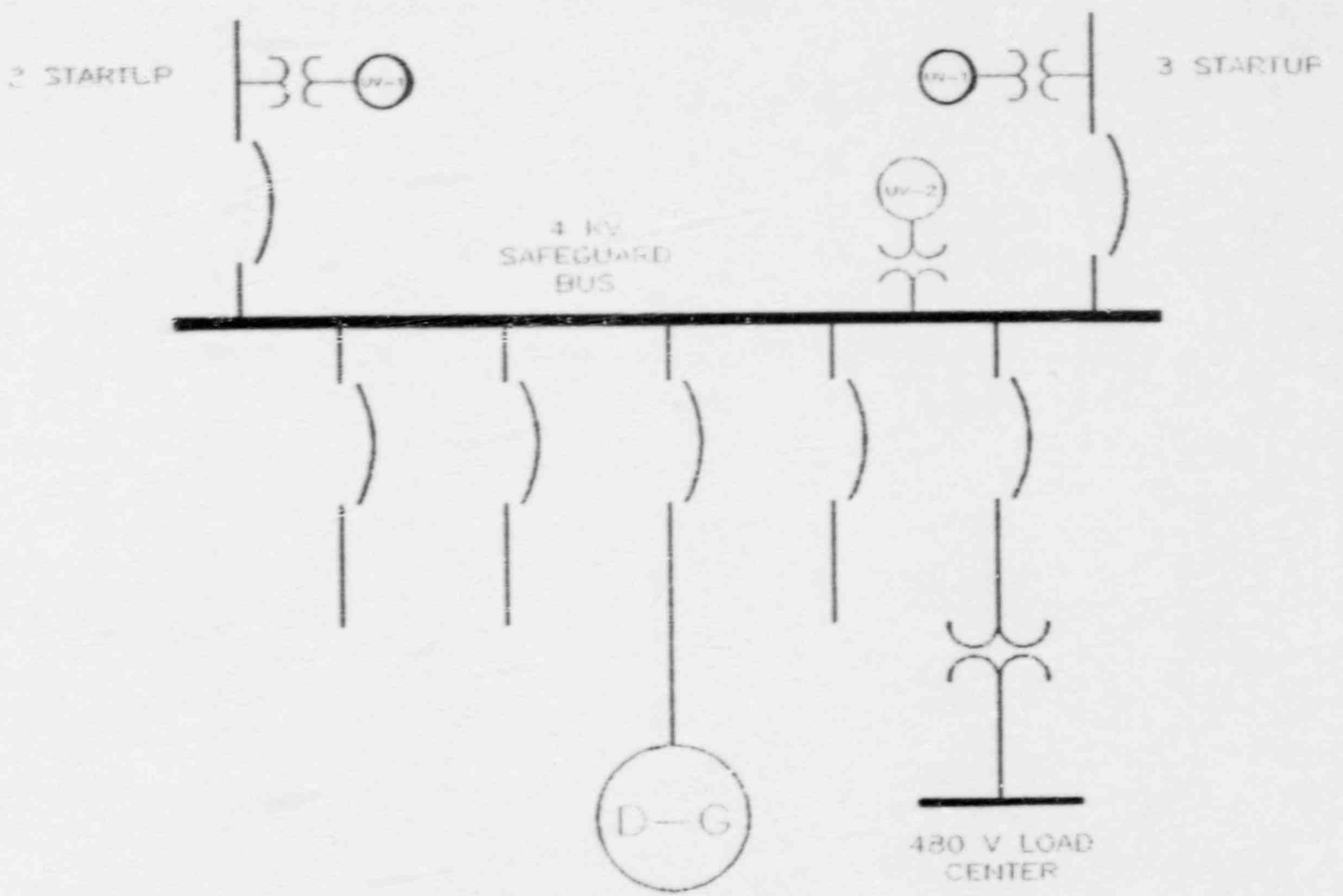

TABLE 3.2.B

INSTRUMENTATION THAT INITIATES OR CONTROLS THE CORE AND CONTAINMENT COOLING SYSTEMS

Minimum No. Of Operable Instrument Channels Per Trip System (1)	Trip Function	Trip Level Setting	Number of Instrument Channels Provided by Design	Remarks
2	Core Spray Pump Start Timer	6 +/- 1 sec. 13 sec. +/-7% of setting 23 sec. +/-7% of setting	4 timers 2 timers 2 timers	All pumps-loss of offsite power only A & C pumps-offsite power available B & D pumps-offsite power available
2	LPCI Pump Start Timer (Four pumps)	2 sec. +/-7% of setting 8 sec. +/-7% of setting	4 timers 4 timers	LPCI pumps A & B LPCI pumps C & D
1	ADS Actuation Timer	90 </= t </= 120 seconds	2 timers	In conjunction with Low Reactor Water Level, High Drywell Pressure and LPCI or Core Spray Pump running interlock, initiates ADS.
2	ADS Bypass Timer*	8 </= t </= 10 minutes	4 timers	In conjunction with low reactor water level, bypasses high drywell pressure initiation of ADS.
2	RHR (LPCI) Pump Discharge Pressure Interlock	50 +/- 10 psig	4 channels	Defers ADS actuation pending confirmation of Low Pressure Core Cooling system operation (LPCI Pump running interlock).
2	Core Spray Pump Discharge Pressure Interlock	185 +/- 10 psig	4 channels	Defers ADS actuation pending confirmation of Low Pressure Core cooling system operation (Core Spray Pump running interlock).

*Effective when modification associated with this amendment is complete.

TABLE 3.2.B

INSTRUMENTATION THAT INITIATES OR CONTROLS THE CORE AND CONTAINMENT COOLING SYSTEMS

Minimum No. Of Operable Instrument Channels Per Trip System (1)	Trip Function	Trip Level Setting	Number of Instrument Channels Provided by Design	Remarks
2	Core Spray Pump Start Timer	6 +/- 1 sec. 13 sec. +/-7% of setting 23 sec. +/-7% of setting	4 timers 2 timers 2 timers	All pumps-loss of offsite power only A & C pumps-offsite power available B & D pumps-offsite power available
2	LPCI Pump Start Timer (Four pumps)	2 sec. +/-7% of setting 8 sec. +/-7% of setting	4 timers 4 timers	LPCI pumps A & B LPCI pumps C & D
1	ADS Actuation Timer	90 </= t </= 120 seconds	2 timers	In conjunction with Low Reactor Water Level, High Drywell Pressure and LPCI or Core Spray Pump running interlock, initiates ADS.
2	ADS Bypass Timer	8 </= t </= 10 minutes	4 timers	In conjunction with low reactor water level, bypasses high drywell pressure initiation of ADS.
2	RHR (LPCI) Pump Discharge Pressure Interlock	50 +/- 10 psig	4 channels	Defers ADS actuation pending confirmation of Low Pressure Core Cooling system operation (LPCI Pump running interlock).
2	Core Spray Pump Discharge Pressure Interlock	185 +/- 10 psig	4 channels	Defers ADS actuation pending confirmation of Low Pressure Core cooling system operation (Core Spray Pump running interlock).

TABLE 3.2.B (CONTINUED)

INSTRUMENTATION THAT INITIATES OR CONTROLS THE CORE AND CONTAINMENT COOLING SYSTEMS

Minimum No. Of Operable Instrument Channels Per Trip System(1)	Trip Function	Trip Level Setting	Number of Instrument Channels Provided by Design	Remarks
2 per 4KV Bus	Emergency Transformer Undervoltage (IAV) (inverse time-voltage)	60%(+5%) of rated Voltage. Test at zero volts in 1.8 seconds (+10%).		1. Trips emergency transfer feed to 4kV emergency bus. 2. Fast transfer permissive.
2 per 4kV Bus	Emergency Transformer Degraded voltage (27N) (Instantaneous)	89% of rated voltage +0.30% of setting (3702 volts + 11 volts)		
		60 second (+5%) time delay.		1. Trips emergency transformer feed to 4kV emergency bus. 2. Fast transfer permissive.
		9 second (+7%) time delay		1. Trips emergency transformer feed to 4kV emergency bus. 2. Fast transfer permissive. 3. Safety injection signal required.

3.2 BASES (Cont'd.)

The recirculation pump trip has been added at the suggestion of ACRS as a means of limiting the consequences of the unlikely occurrence of a failure to scram during an anticipated transient. The response of the plant to this postulated event is within the envelope of study events given in General Electric Company Topical Report, NEDO-10439, dated March, 1971.

In the event of a loss of the reactor building ventilation system, radiant heating in the vicinity of the main steam lines raises the ambient temperature above 200 degrees F. Restoration of the main steam line tunnel ventilation flow momentarily exposes the temperature sensors to high gas temperatures. The momentary temperature increase can cause an unnecessary main steam line isolation and reactor scram. Permission is provided to increase the temperature trip setpoint to 250 degrees F for 30 minutes during restoration of ventilation system to avoid an unnecessary plant transient.

The Emergency Aux. Power Source Degraded Voltage trip function prevents damage to safety-related equipment in the event of a sustained period of low voltage. The voltage supply to each of the 4kV buses will be monitored by undervoltage relaying. With a degraded voltage condition on the off-site source, the undervoltage sensing relays operate to initiate a timing sequence.

The timing sequence provides constant and inverse time voltage characteristics. Degraded voltage protection includes: (1) An instantaneous relay (27N) initiated at 89% voltage which initiates a 60-second time delay relay and a 9 second time delay relay. The 9-second time delay relay requires the presence of a safety injection signal to initiate transfer; (2) An inverse time voltage relay (CV-6) initiated at 87% voltage with a maximum 60 second delay and operates at 70% voltage in 30 seconds; and (3) An inverse time voltage relay (IAV) initiated at approximately 60% voltage and operates at 1.8 seconds at zero volts.

When the timing sequence is completed, the corresponding 4kV emergency circuit breakers are tripped and the emergency buses are transferred to the alternate source. The 60-second timing sequences were selected to prevent unnecessary transfers during motor starts and to allow the automatic tapchanger on the startup transformer to respond to the voltage condition. The 9-second timing sequence is necessary to prevent separation of the emergency buses from the off-site source during motor starting transients, yet still be contained within the time envelope in FSAR Table 8.5.1.

Supplemental Information

On July 1, 1988, PECo representatives met with members of the NRC staff to discuss the results of the revised voltage regulation study and the proposed Technical Specification changes. The NRC staff identified items which required a PECo response. These items along with their responses are stated below.

Item 1: Model Validation

To verify the validity of the revised voltage regulation study, a model validation test will be performed in accordance with PSB-1. Actual measurements of auxiliary system parameters (volts, watts and vars) at selected system locations will be made and compared with the calculated values assumed in the study. The model validation test will cover two test sequences or sets of test cases, one with No. 2 startup source (#2 startup transformer) and the other with No. 3 startup source (#343 startup transformer) supplying power to the auxiliary system. The test will include the recording of transformer tap settings, recording of voltage and loading (watt and var) of selected buses, as well as equipment terminal voltages. The test will address both steady state and larger motor starting transient conditions. The approximate minimum loading on the startup transformer will be 15MVA.

Item 2: Operation below Emergency Rating:

The original voltage regulation study assumed an emergency rating of 0.95 pu. To address the NRC concern as to whether either of the two startup sources had ever reached this level, the operating history of the No. 2 startup source (#2 startup transformer) and the No. 3 startup source (#343 startup transformer) were researched.

The normal voltage range for the Peach Bottom tap (#2 startup) 220-08 line is 0.975 pu (224.3kV) to 1.043 pu (239.9kV) and the emergency voltage range is 0.941 pu (216.4kV) to 1.054 pu (242.4kV). The normal voltage range for Peach Bottom 230kV (#343 startup) is 0.975 pu (224.3kV) to 1.043 pu (239.9kV) and the emergency voltage range is 0.947 pu (217.8kV) to 1.054 pu (242.4 kV).

The latest voltage regulation study considered both maximum and minimum emergency voltage levels and used a lower value of 0.934 (214.8 kV) for the minimum emergency voltage level in the analysis assuming the modifications are completed.

The source supply for the #343 startup transformer is the 220-34 line, a 230kV transmission line at the Peach Bottom 230kV substation. To the best of our knowledge, the lowest voltage present on Peach Bottom #343 Startup Transformer occurred at 2:29 p.m. on June 1, 1987 when 0.947 pu or 218kV was present. The voltage was below 0.95 pu for one to two hours that day. This Peach Bottom 230kV voltage is a calculated value based on monitored voltage and power flows at Newlinville Substation.

Newlinville is at the other end of 220-34 line from Peach Bottom. Direct monitoring of voltages at Peach Bottom 230kV was out of service on June 1, due to the outage of Peach Bottom #1 500-230kV transformer.

Philadelphia Electric Co. does not retain complete documentation of system bus voltages. PECo does record conditions each Monday and retains information for unusual or interesting operating conditions. Also, PECo's energy control computer SAMAC alerts the system operators to low voltages. Based on these sources of information, the only known incident of voltage below 0.95 pu is that of June 1, 1987.

Normally, the Peach Bottom 230kV bus is connected to the 500kV system through Peach Bottom #1 500-230kV transformer. This provides a stiff supply, keeping voltages on Peach Bottom 230kV in line with voltages throughout that part of the 500kV system. Only a general system emergency would cause voltages to drop to emergency levels.

The low voltage on June 1, 1987 was a result of abnormal offsite operating conditions. From April 13, 1986 to October 14, 1987, Peach Bottom #1 transformer was out of service due to a fire and the subsequent replacement of the transformer. During this time, the Peach Bottom 230kV bus was connected to the system by only the 220-34 line, a 33 mile line to Newlinville Substation. Also connected to Peach Bottom 230kV bus are the 220-06 and 220-07 lines which are the only system connections for the Muddy Run Pumped Storage Hydroelectric Plant. Therefore, for the one and a half years that Peach Bottom #1 transformer was out of service, Peach Bottom 230kV voltage was dependent more on the operation of Muddy Run than on general system conditions.

During the transformer outage, Muddy Run operation was restricted because of low voltages. In the pumping mode, no more than 6 out of 8 units were operated concurrently. In the generating mode, all eight units could be operated under normal rated output of 880 MW. On June 1, 1987, a full pond permitted Muddy Run to generate 956MW or 9% over rated output. A full pond is only present on Monday as Muddy Run operates on a weekly basis. This is the special operating condition that caused reactive power losses in 220-06, 220-07 and 220-34 lines to increase beyond the reactive power operating state of Muddy Run causing the low voltage on Peach Bottom 230kV bus. Muddy Run has the flexibility of operation to control the Peach Bottom 230kV voltage. For example, if only seven units had been generating on June 1, 1987, the Peach Bottom 230kV voltage would have been greater than 0.95 pu.

The source supply for the #2 startup transformer is the 220-08 line, a 230kV tie line between Philadelphia Electric Company and Baltimore Gas and Electric Co. Unlike the #343 startup transformer, the #2 startup transformer is far from any source of voltage control. Any low voltage would represent a general system emergency with low voltages throughout the Philadelphia Electric and Baltimore Gas and Electric systems. There are no known incidents where the voltage on the Peach Bottom #2 startup transformer went below 0.95 pu.

Item 3: Assurance of Emergency Rating Assumption

As stated in Item 2, the original voltage regulation study assumed an emergency rating of the offsite power supplies to be 0.95 pu. Because of the long term loss of the Peach Bottom #1 transformer due to a fire in the transformer, the revised voltage regulation study conservatively assumed an emergency rating of 0.934 pu. It is not expected that this value will ever occur. While the PJM and PECo long term plans predict continued load growth, for the region and this growth will be offset by the completion of additional generating units, the plans do not project any need for additional substation tied to any of the lines that feed the Peach Bottom Area.

An agreement will be made between the Load Dispatcher and Peach Bottom management to alert the Operations staff in anticipation of any abnormal grid conditions which would indicate that the 0.934 pu emergency rating assumption is inadequate.

Item 4: Non-Technical Specification Modifications

The safety evaluations for the modifications involving the Emergency Service Water pumps, the Emergency Cooling Water pump, the RHR compartment coolers, the cooling towers and the diesel generator vent supply fans are attached.

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SAFETY EVALUATION FOR MOD 2564
PEACH BOTTOM ATOMIC POWER STATION
UNITS NO. 2 & 3
Revision 1

I. SUBJECT:

This modification changes the time settings to start the Residual Heat Removal (RHR) pumps, and the Core Spray (CS) pumps, for Units No. 2 and 3 and the station common Emergency Service Water (ESW) and Emergency Cooling Water (ECW) pumps upon receipt of a Loss of Coolant Accident (LOCA) signal, as described below in part III of this document.

Selection of the new time settings is based on the results of the voltage regulation study for the Peach Bottom Atomic Power Station (PBAPS), Units No. 2 & 3 performed by Bechtel Power Corporation under modification 2123.

II. CONCLUSION:

This modification:

a. does affect safety related equipment;
b. does not involve an unreviewed safety question;
c. does require a technical specification change;
d. does maintain the capability to safely shutdown the plant in the event of a fire;
e. does require a license amendment or prior NRC approval;
f. does not involve a significant hazards consideration.

III. DISCUSSION:

The present loading sequence for the RHR, CS, ESW, and ECW pumps in the event of a LOCA, with offsite power available, is as follows:

t = -3 seconds	Triple Low Level is reached
0 second	Initiation of LOCA signal
0 second	Start RHR pumps A & B
5 seconds	Start RHR pumps C & D
10 seconds	Start CS pumps A, B, C & D
22 seconds	Start ECW and ESW pumps A & B

In order to improve voltage regulation in the event of a LOCA while operating from either a single or both offsite sources that are at their emergency voltage ratings, new time settings are required for the loading sequence for the core standby cooling, emergency service water, and emergency cooling water systems. The new time settings will maintain voltages sufficient to ensure safe operation of the RHR, CS, ESW, and ECW pumps and associated loads.

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The modified loading sequence is as follows:

In the event of a LOCA with offsite power available, the following loading sequence takes place:

t = -3 seconds	Triple Low Level is reached
0 second	Initiation of LOCA signal
2 seconds +/- 7% of setting	Start RHR pumps A & B
8 seconds +/- 7% of setting	Start RHR pumps C & D
13 seconds +/- 7% of setting	Start CS pumps A & C
23 seconds +/- 7% of setting	Start CS pumps B & D
36 seconds +/- 7% of setting	Start ESW pumps A & B and ECW pump.

There are no changes to the existing RHR and CS pump initiation sequence in the event of a LOCA coincident with a Loss of Offsite Power. The existing diesel loading sequence for the RHR and CS pumps remains unchanged. The new initiation timer setting of 36 seconds for the ESW and ECW pumps will be in effect regardless of the power source.

The increased ESW and ECW time delays will not impact other diesel generator loads that are operating during ESW and ECW initiation. The loads that operate closest to the new ESW/ECW initiation at 49 seconds (LOCA concurrent with loss of offsite power requires an additional 13 seconds for the diesel generators to come up to speed and close their breakers), are the reactor recirculation discharge valves which begin closing at 27 seconds (design basis suction line break). These valves can operate as low as 80% of their rated voltage. Based on the diesel generator loading measurements performed at Peach Bottom and the design of the recirculation discharge valves, the transient effects caused by delayed ESW/ ECW initiation will not cause the discharge valve motor operator voltage to drop below an acceptable voltage level.

After implementation of this modification, the RHR, CS, ECW, and ESW pumps and associated loads will start and accelerate within the allowable motor terminal voltages without causing excessive voltage drop on the associated 4.16kV and 480V buses.

The General Electric Appendix K LOCA analysis and the Supplemental Reload Licensing Submittal were used to determine bounding allowable starting times for the RHR (LPCI) and CS pumps. The new timer values imposed by this modification fall within the limiting starting times analyzed by the Appendix K LOCA analysis, and thus, no accident analyses are affected.

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There are two elements that define success for the CS system; pump ready for rated flow and injection valve open to permit full flow. Pump ready for rated flow is defined as the pump being at design full speed (wet). Full flow through the injection valve requires the valve to be full open. There are two conditions required to support valve opening in a limiting case flow path; reactor pressure is at the low end of its low pressure permissive (400-500 psig) and power is available at the valve operator. In the limiting ECCS scenario for CS as analyzed by GE's Appendix K analysis (100% break in the reactor recirculation discharge line), the low pressure permissive occurs 47 seconds after reaching triple low level; power to the valves must be established prior to this time. Although design characteristics show that a gate valve at half stroke passes most of its rated flow, the Appendix K analysis does not assume Core Spray flow into the vessel until the CS injection valve is at its full open stroke, which requires 12 seconds to traverse from full close. Therefore, per the Appendix K analysis, the earliest that the CS injection valve can be opened is 59 seconds after triple low level, and the pumps must be ready for full flow prior to this time.

The series of events contributing to the establishment of the pumps ready for rated flow are the sensor times for detection of the LOCA (3 seconds), the time for power to be made available at the emergency bus (this time is zero if offsite power is available), the time for power to be made available to the pump motor (ECCS pump motor timing relay setting) and pump motor acceleration time (dependant upon motor terminal voltage) which, at worst case voltage, is 6.8 seconds for the A and C CS pumps and 8.1 seconds for the B and D CS pumps. Both times assume an open flow path, which is more limiting with respect to acceleration time than a closed flow path. Per the Appendix K analysis, the time available after triple low level to start and accelerate the CS pumps from the offsite sources is 59 seconds. Taking into account the above equipment delays, the resulting analyzed limit for the ECCS CS timer is 47.9 seconds. Thus, although the 13 and 23 second timer settings proposed by this modification reduce the existing design margin relative to pumps being ready for rated flow, they fall within the limit analyzed by GE.

Similarly, there are three elements that define success for the low pressure coolant injection (LPCI) mode of the RHR system; pump ready for rated flow, injection valve open to permit full flow (full stroke is required to admit flow) and full closure of the recirculation discharge valve. Per the Appendix K analysis, the limiting time for the limiting LPCI scenario (100% break in the reactor recirculation suction line) is 57 seconds which consists of the time to reach the low pressure permissive to close the reactor recirculation discharge valve (30 seconds after reaching triple low level to reach 200-250 psig) plus the full stroke closure time of the recirculation discharge valve (27 seconds). The series of events for the RHR pumps ready for rated flow are identical to the series of events for the CS pumps except

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that the acceleration time for the A&B RHR pumps is 2.8 seconds and the C&D pump acceleration time is 3.1 seconds at the worst case voltage level and pumping into an open flow path. Taking into account the sensor and acceleration delays, the resulting analyzed limit for the ECCS LPCI timer is 50.9 seconds. Thus, although the 2 and 8 second timer settings proposed by this modification reduce the existing design margin relative to pumps being ready for rated flow, they fall within the limit analyzed by GE.

The limiting design function for the Emergency Service Water System is the delivery of cooling water to the emergency diesel generators. The present ESW initiation delay is 22 seconds. After implementation of this mod, ESW will initiate in 36 seconds with offsite power available. ESW will initiate in 49 seconds when operating off of the diesel generators.

The diesel manufacturer has tested the PBAPS diesel design and has shown that the diesels can run without cooling water for up to three minutes, as identified in UFSAR Section 8.5.3. Also, Limerick Generating Station employs emergency diesel generators that are the same model as those used at PBAPS. The existing ESW pump delay at Limerick is nominally 55 seconds for a diesel start with offsite power available; 6 seconds longer than the PBAPS longest delay time of 49 seconds. No diesel failure has ever occurred at Limerick due to a lack of emergency service water. Based on the diesel design and the experience at Limerick, delaying the PBAPS ESW initiation an additional 14 seconds will not adversely affect diesel operation.

The ECW pump is designed as a backup to the ESW pumps and is initiated at the same time as the ESW pumps. Whenever the ESW pumps reach rated flow and pressure, the ECW pump is automatically tripped off. Since the ECW pump acts as a backup to the ESW system, delaying ECW initiation an additional 14 seconds will not have an adverse affect upon the plant.

The time settings have been selected to optimize the voltage regulation within the limits for core coolant delivery established by the Appendix K analysis while also minimizing the changes to the existing ECCS initiation sequence. The overall benefit of this modification is to ensure that adequate voltage is provided for starting and accelerating the ECCS pump motors and associated loads in the event of a design basis accident while operating with either a single or both offsite sources that are at their emergency voltage ratings.

All equipment supplied by this modification is safety related. The only equipment supplied is new and replacement time delay control relays that will be located in existing safety-related panels. The panels are located in a mild environment. The control relays provided will equal or exceed the ratings of the existing relays and meet the applicable design requirements for such relays, including, but not limited to environmental qualification, seismic qualification and quality assurance.

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No additional loads are placed on the station power system by this modification. The RHR pumps and CS pumps are presently equipped with either auxiliary or time delay control relays. The present time delay relays for the B and D CS pumps, and the A and B RHR pumps must be replaced to accomodate the new time settings. All control relays are 125 VDC. The power consumption of the replacement relays is the same as the existing relays, six (6) watts each.

This modification will maintain the capability to safely shut down the plant in the event of a fire, because no cables or conduits are added in any fire zones, therefore, this modification has no effect on fire protection capability.

This modification does not involve radwaste system. Therefore, the guidance provided in IE Circular 80-18 is not applicable.

The design of this modification has no impact on ALARA considerations.

UFSAR Sections 6.4.3, 6.4.4, 6.5.3.3, 6.5.3.4, 7.4.3.4, 7.4.3.5, 8.5.1, 8.5.2, 8.5.3, 8.5.4, 10.9, 10.24, 14.5, 14.6, and table 8.5.1 have been reviewed for this modification. Sections 7.4.3.4.2 and 7.4.3.5.2 as well as figures 7.4.5a, 7.4.7a, and 10.24.1 and Table 8.5.1 must be revised to show the new Core Spray, RHR, ESW and ECW pump delays.

PBAPS Technical Specification Sections 3.2.B, 3.5 and 3.9 have been reviewed. Page 67 of Table 3.2.B will be revised to indicate the new start times and tolerances for the RHR and CS pumps. ESW and ECW initiation times are not identified in the Technical Specifications.

IV. <u>10CFR50.59 CHANGES, TESTS, AND EXPERIMENTS</u>:

1. Implementation of this modification at Peach Bottom Atomic Power Station Units 2 & 3 will not;

   a. Increase the probability of occurrence or the consequence of an accident or malfunction of equipment important to safety as previously evaluated in the FSAR. This modification affects the start times for equipment provided to mitigate the consequences of a LOCA. The times assumed in the Appendix K LOCA analysis for availability of LPCI (57 seconds) and CS (59 seconds) are not affected by the new start times for the RHR (2 seconds A&B, 8 seconds C&D), CS (13 seconds A&C, 23 seconds B&D), ESW, and ECW pumps (36 seconds). The pump start timer changes have no affect on the probability of occurrence of an accident.

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The control relays being added and replaced are the same as those presently in service except for their available time delay. Thus the failure effects of these relays on the ECCS systems have not changed. Failure of a relay can only affect one redundant train of equipment. The current design tolerates failure of a redundant train.

There are no limiting transients identified in Chapter 14 of the UFSAR that involves the RHR or CS systems. Since the CS and RHR system response times fall within the limiting response times analyzed by the Appendix K analysis, the Design Basis Accident Analysis contained in Chapter 14 of the UFSAR is not impacted. Therefore, the consequences of an accident are not increased.

b. Create the possibility for an accident or malfunction of a different type than any previously evaluated in the FSAR. This modification adds or replaces time delay relays that control the start times for the RHR, CS, ESW, and ECW pumps. These relays are identical to the relays presently in service except for the time delay range, therefore, no new failure effects are introduced into the systems.

There are no limiting transients concerning RHR or CS systems in chapter 14 of the UFSAR. Since the CS and RHR system response times fall within the limiting response times analyzed by the Appendix K analysis, the Design Basis Accident Analysis contained in Chapter 14 of the UFSAR is not impacted. Therefore, the consequences of an accident are not increased. Failure of a relay can only affect one redundant train of equipment. The current design tolerates failure of a redundant train.

The relays do not impact the existing qualification of the panels in which they are located. The new CS, RHR, ESW and ECW start times will not impact LOCA environmental parameters used for environmental qualification purposes.

c. Reduce the margin of safety as defined in the basis of any Technical Specifications. The initiation times for the RHR and CS pumps will be increased from the values identified in the PBAPS Technical Specifications. The new timer values were chosen to minimize delay in the ECCS initiation sequence yet provide improved starting voltage for each pump motor. The new initiation times are enveloped by the ECCS response times assumed in the Appendix K LOCA analysis of record as referenced in the Supplemental Reload Licensing Submittal for PBAPS Units 2 and 3 for Reloads 7 and 8 respectively.

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Per 10CFR 50.46, the limiting safety parameters in the event of a Design Basis LOCA correspond to fuel integrity (i.e., peak cladding temperature, zirconium water hydrogen generation, cladding oxidation, and coolable geometry). Successful ECCS response prevents or limits degradation of these fuel parameters. The Appendix K LOCA analysis has utilized limiting design basis ECCS response times (57 seconds for LPCI, 59 seconds for CS) to demonstrate successful ECCS performance.

Successful ECCS performance is defined by injection of rated flow into the reactor vessel. In order for the Core Spray system to meet this goal, the CS pumps must be ready for rated flow and its injection valve must be open to pass rated flow. Opening of the injection valve is dependent on a low reactor pressure permissive which, according to the Appendix K analysis, takes place 47 seconds after reaching triple low level. An additional 12 seconds is required to allow the injection valve to open to full stroke to permit flow per the assumptions in GE's Appendix K analysis. This is a conservative assumption since the design characteristics of a gate valve, like the CS injection valve, permit passage of most of its rated flow at half stroke. With the new timer settings, the CS pumps will have accelerated to rated speed before the injection valves receive their permissives to open. Considering the times for detection of the LOCA and acceleration of the pump motors in an open system, the A and C CS pumps will be at rated speed in 22.8 seconds and the B and D CS pumps will be at rated speed by 34.1 seconds. Pump acceleration time for an open system is more limiting than the time achievable in a closed system. Therefore, although installing new CS initiation timer settings will reduce the existing design margin relative to pumps being ready for rated flow, they will not result in a reduction in the margin of safety for core coolant delivery.

In order for the RHR system to achieve its cooling objective, the RHR pumps must be ready for rated flow, the pump's injection valve must be open to pass rated flow (assumed to be full stroke), and the reactor recirculation discharge valve must fully close. Closure of the reactor recirculation discharge valve is dependent on a low pressure permissive which, according to the Appendix K analysis, takes place 30 seconds after reaching triple low level. An additional 27 seconds is required for the full stroke closure of the valve. Taking into consideration the new timer settings, and the times for the detection of the LOCA and acceleration of the pump motors into an open system, the A and B RHR

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pumps will be at full speed within 7.8 seconds and the C and D RHR pumps will be at rated speed by 14.1 seconds. Open system pump acceleration time is more limiting than a closed system. Thus, all four RHR pumps will be available for full flow 42.9 seconds before the reactor recirculation discharge valve closes. Therefore, although installing new RHR initiation timer settings will reduce the existing design margin relative to pumps being ready for rated flow, they will not result in a reduction in the margin of safety for core coolant delivery.

This modification does not affect any limiting safety system setpoints for level or pressure as identified in the Technical Specifications.

2. The applicable sections of the Technical Specifications are 3.2.B, 3.5, 3.9 and the associated bases. Page 67 of Table 3.2.B is affected by this modification, and needs to be revised to show the new pump relay timer settings as follows:

2 seconds +/- 7% of setting	Start A & B RHR pumps
8 seconds +/- 7% of setting	Start C & D RHR pumps
13 seconds +/- 7% of setting	Start A & C Core Spray pumps
23 seconds +/- 7% of setting	Start B & D Core Spray pumps

3. An amendment to the operating license is required to change the Technical Specification start times and tolerances for the RHR and CS pumps found on page 67, Table 3.2.B.

V. 10CFR50.92 SIGNIFICANT HAZARDS DETERMINATION:

This Technical Specification change does not involve any significant hazards considerations based on the guidance provided by the NRC in Generic Letter 86-03, and in the March 6, 1986, Federal Register (51 FR 7750). One of the examples (vi) found in 51 FR 7750 concerns actions involving no significant hazards considerations is: "A change which either may result in some increase to the probability or consequences of a previously analyzed accident or may reduce in some way a safety margin but where the results of the change are clearly within all acceptable criteria with respect to the system or component specified in the Standard Review Plan." Of all the examples identified in 51 FR 7750, example vi represents the closest correlation to this proposed Technical Specification change. This example, however, is not applicable for this modification since the proposed change in RHR and CS pump initiation times will not reduce a margin of safety or increase the probability or consequences of an accident. The new pump initiation times will have no affect on final coolant availability to the

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vessel in the event of a LOCA. As determined by the Appendix K LOCA analysis, final RHR and Core Spray injection into the vessel is dependent on low reactor pressure permissives which occur after the pumps have accelerated to their rated speed based on their new start times.

As a result of this modification, the operation of the plant:

1. does not involve a significant increase in the probability or consequences of an accident previously evaluated. This Technical Specification change affects the start times of equipment provided to mitigate the consequences of a LOCA. The times assumed in the General Electric Appendix K LOCA analysis for availability of LPCI (57 seconds) and CS (59 seconds) are not affected by the new start times of the RHR (2 seconds A&B, 8 seconds C&D), and CS (13 seconds A&C, 23 seconds B&D) pumps. The new and replacement relays are identical to those currently installed except for their available time delay, and therefore do not introduce any new failure effects into the systems. The changes in timing reduce the probability of equipment malfunction due to inadequate bus voltage. The pump start timer changes have no affect on the probability of occurrence of an accident.

   There are no limiting transients identified in chapter 14 of the UFSAR that involves the RHR or CS systems. Since the CS and RHR system response times fall within the limiting response times analyzed by the Appendix K analysis, the Design Basis Accident Analysis contained in chapter 14 of the UFSAR is not impacted.

2. does not create the possibility of a new or different kind of accident from any accident previously evaluated. This Technical Specification change affects the start times of equipment provided to mitigate the consequences of a LOCA. Relays that determine the start times for the RHR, and CS pumps will be added, adjusted or replaced. No new failure effects are introduced by the new and replacement relays since they are identical to those presently installed except for their available time delay. Failure of one of these relays can only affect one redundant train of equipment. The current design tolerates failure of one redundant train.

3. does not involve a significant reduction in a margin of safety. This modification only relates to the margin of safety for mitigation of a LOCA. The new CS and RHR initiation times introduced by this modification will reduce the probability of improper operation of the RHR and CS pumps and associated equipment due to low voltage, and will not impact ECCS availability as defined by GE's Appendix K LOCA analysis.

   The primary function of ECCS systems is to prevent or limit degradation of fuel parameters (i.e. peak cladding tempera-

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ture, cladding oxidation, coolable geometry, hydrogen generation) in the event of a LOCA. The Appendix K LOCA analysis has analyzed limiting ECCS response times (57 seconds for RHR, 59 seconds for CS) to ensure successful ECCS performance.

Successful ECCS performance is defined by injection of rated flow into the reactor vessel. In order for the CS system to meet this goal, the CS pumps must be ready for rated flow, and, per Appendix K assumptions, its injection valve must be full open. The CS system must receive a low reactor pressure permissive to open its injection valve, which, according to the Appendix K analysis, takes place 47 seconds after reaching triple low level. An additional 12 seconds is required to allow full stroke opening of the valve which, per Appendix K assumptions, is required to pass full flow. The Appendix K analysis assumes no CS flow into the vessel until the CS injection valve is full open. This is a conservative assumption since the design characteristics of a gate valve, such as the CS injection valve, allow passage of most of its rated flow at half stroke. Therefore, the Appendix K analyzed response time for Core Spray is 59 seconds.

Accounting for the new initiation timer settings, and the times for detecting the LOCA and accelerating the pump motors, the A and C CS pumps will be up to full speed within 22.8 seconds and the B and D CS pumps will be up to speed within 34.1 seconds, assuming worst case voltage conditions and an open flow path. Thus, all four CS pumps will be ready for rated flow 24.9 seconds before the system's injection valve opening at 59 seconds.

Before the RHR system can inject coolant into the vessel, it too must allow its injection valve to open to full stroke per Appendix K assumptions, and, in addition, allow the reactor recirculation discharge valve to fully close. Closure of the recirculation discharge valve is dependent on a low reactor pressure permissive which occurs 30 seconds after reaching triple low level as analyzed in Appendix K. An additional 27 seconds is required to fully close the valve, resulting in a required RHR response time of 57 seconds.

Accounting for the new initiation timer settings, and the times for detecting the LOCA and accelerating the pump motors, the A and B RHR will be up to speed within 7.8 seconds and the C and D RHR pumps will be up to speed within 14.1 seconds, assuming worst case voltage conditions and an open flow path. Thus all four RHR pumps will be ready for rated flow 42.9 seconds before the 57 second analyzed RHR response time

Therefore, it is concluded that this Technical Specification change does not involve any significant hazards considerations.

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VI. APPROVALS:

Prepared By M. G. Wiwel Date 8-18-88
Responsible Engineer

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SAFETY EVALUATION FOR MODIFICATION 2580

PEACH BOTTOM ATOMIC POWER STATION UNITS 2 & 3

File: ________

I. SUBJECT

The Voltage Regulation study of Peach Bottom Atomic Power Station Units 2 & 3, undertaken to address the concerns that surfaced from the Millstone study concluded that in the event of a LOCA at the plant, Cooling Tower loads be shed by the LOCA signal to improve voltages on 13.8 kV Unit Auxiliary buses as well as 4.16kV Emergency Auxiliary buses. The cooling tower loads are non-safety related and are fed from one of the two off-site power sources.

II. CONCLUSION

This modification:

a. does not affect safety related equipment;
b. does not involve an unreviewed safety question;
c. does not require a technical specification change;
d. does maintain the capability to safely shut down the plant in the event of a fire;
e. does not require a license amendment or prior approval of the Nuclear Regulatory Commission;
f. does not involve significant hazards consideration.

III. DISCUSSION

At Peach Bottom, there are five mechanical draft cooling towers (A, B, C, D and E) which maintain the temperature of the water discharged to the river within the environmental limits.

Cooling towers A, B and C each have one 5000HP pump and eleven 200HP cooling fans. Cooling towers D and E each have one 7000HP pump and fourteen 250HP cooling fans. All cooling tower pumps and fans are non-safety related and are fed from either of the two off-site power sources.

Presently, cooling tower pumps and fans are shed on a unit trip so that the unit auxiliary buses can be picked up by the off-site source without overburdening it. In this modification LOCA signals from either Unit 2 or Unit 3 are used to energize the cooling tower load shedding relays 386X3A and 386X3B located in Turbine-Generator relay control panel 20C22B.

The LOCA signals are taken from G.E. NSSS engineered safeguard system control panels. In Unit 2, control panel 20C32 provides Division A LOCA signal, and panel 20C33 provides Division B LOCA signal. In Unit 3 control panels 30C32 and 30C33 provides LOCA signals respectively.

A dry contact of each relay (14A-K11A and 14A-K11B) in both Units are wired in parallel and are connected to the cooling tower load shedding relays (386X3A and 386X3B) so that the relays are energized to drop the cooling tower loads in the event of a LOCA.

The dry contacts are considered to be isolating devices, which will adequately isolate the subject load shedding control circuit from the engineered safeguard system. This modification does not adversely impact the operation of safety related systems.

All control cables required in the modification are non-Q, therefore they are installed in non-Q cable trays. However, in the G.E. relay cabinet panels, the control cables are wrapped with thermoflex sleeving from the corresponding dry contact of each relay to the terminal block. Flex conduits are used from the terminal blocks to the non-safeguard cable tray to meet separation requirements in accordance with drawing E-1315 and E-1317.

This modification does not significantly affect the combustible loading of the plant and will maintain the capability of the plant to be safely shutdown in the event of a fire.

This modification does not involve any radwaste system. Therefore, the guidance provided in IE Circular 80-18 is not applicable.

UFSAR Sections 8.0 and 11.6 have been reviewed. These UFSAR Sections do not specifically address the cooling tower load shedding on LOCA. However, UFSAR Section 11.6 will be revised to add a statement that the cooling tower load will be shed in the event of LOCA on either unit. 1

PBAPS Technical Specification Section 3.9, "Auxiliary Electric System" was reviewed. The Technical Specification does not address cooling tower load shedding therefore, no change is required to the Technical Specifications.

PBAPS Technical Specification Appendix B, Sections 3.0 and 3.1 "Monitoring Requirements" were reviewed. In the event of a LOCA at the plant, the cooling towers would be shut down until the LOCA signal is cleared. Under this condition the warm water can be discharged to Conowingo Pond without going through the cooling towers.

The cooling tower operation is covered by NPDES permit No. PA 0009733 Rev. 9/1985. The temperature monitoring requirements to cooling tower operation are covered in PBAPS Technical Specification Appendix B, Section 3.1.

As indicated in the NPDES permit (paragraph 1C) the cooling tower operation is not required during various emergencies including a reactor emergency. Therefore, during a LOCA, the cooling tower operation would not be required regardless of plant operating conditions.

Appendix B of the Technical Specification mandates temperature monitoring of Conowingo Pond after seven days of daily calculated flow of less than 15,000 cfs if at that time less than three cooling towers are operating in support of one or both units.

Therefore, one unit in a LOCA condition would require Conowingo Pond thermal monitoring only after seven days and very possibly not at all.

IV. 10 CFR 50.59 CHANGES, TESTS AND EXPERIMENTS

1. An unreviewed safety question is not involved since this modification:

   a. does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety as previously evaluated in the Safety Analysis Report. This modification improves the voltage regulation of the electrical distribution system of the plant. Adequate separation between safety related channels is maintained because only non-Q cables are added through isolating devices. (UFSAR Sections 8.0 and 11.6 have been reviewed in making this determination.)

b. does not create a possibility for an accident or malfunction of a different type than any previously evaluated in the Safety Analysis Report. Since this modification improves the voltage regulation, maintains adequate channel separation, and does not introduce any new hazards, no accidents or malfunctions could occur in the modified system that could not have occurred in the present system design. (UFSAR Sections 8.0 and 11.6 have been reviewed in making this determination.)

c. does not reduce the margin of safety as defined in the basis for any Technical Specification. Technical Specifications for for the Peach Bottom Atomic Power Station do not address the cooling tower load shedding.

2. There is no change required to PBAPS Technical Specifications.

V. <u>10 CFR 50.92 SIGNIFICANT HAZARDS DETERMINATION</u>

This modification does not require a license amendment, thus a significant hazards determination is not required.

APPROVALS:

BECHTEL:

Prepared by Jay Lee Date 8-22-88
Responsible Engineer

Independent Reviewer Date 8-22-88

Interfacing Discipline Date 8/23/88

R. A. Mahony Date 8/23/88
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NUCLEAR ENGINEERING
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SAFETY EVALUATION FOR MOD 2579
DELAY START OF D-G VENT SUPPLY FANS

PEACH BOTTOM ATOMIC POWER STATION

I. SUBJECT:

Safety Evaluation to delay the start of the four diesel-generator room vent supply fans (OAV64, OBV64, OCV64, ODV64) and supplemental vent supply fans (OAV91, OBV91, OCV91, ODV91) by 40 seconds from their present starting sequence.

II. CONCLUSION:

This modification does:

a. Affect safety-related equipment
b. Not involve an unreviewed safety question
c. Not require a technical specification change
d. Maintain the capability to safely shutdown the plant in the event of a fire
e. Not require a license amendment or prior NRC approval
f. Not involve a significant hazards consideration

III. DISCUSSION

The Peach Bottom voltage regulation study identified the need to delay the start of the four D-G room vent supply fans and supplemental vent supply fans. Currently, each fan is started when its associated diesel generator voltage sensing relay closes (approximately 8 seconds after diesel-generator start). During a LOCA with offsite power available, the starting of these fans coincides with the starting of large ECCS motors. This may result in failure of fans to start due to depressed bus voltages.

This modification will add a time delay relay for each pair of vent supply and supplemental vent supply fans to delay their starting by 40 seconds. This will allow the bus voltages to recover and the fans to start. A time delay relay will be added in each of the diesel-generator voltage regulator panels (OAG13, OBG13, OCG13, ODG13). The new relays are seismically qualified for installation in the diesel- generator panels and are capable of operating in the environment present in diesel-generator rooms. All connections between the new relays and the existing fan control circuitry will be made internal to the voltage regulator panels.

Delaying the diesel-generator vent supply and supplemental vent supply fans will not cause a significant increase in the diesel-generator room temperatures. In leakage primarily through the outside air dampers for the diesel generator ventilation fans will provide sufficient combustion air to allow start and run of the diesels until the vent fans start and provide combustion and cooling air. This condition has been simulated during diesel generator testing in the winter when ambient temperatures are low enough initially to prevent outside air dampers from modulating.

The guidance provided in IE circular 80-18, although considered, is not applicable since this is not a radwaste system.

This modification does not change the plant as described in the UFSAR. Sections 8.5 and 10.14 were reviewed in making this determination.

IV. <u>10 CFR 50.59 CHANGES, TESTS AND EXPERIMENTS</u>:

1. An unreviewed safety question is not involved because of the following reasons:

   A. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report is not increased. This modification adds time delay relays to delay the start of the diesel-generator vent supply and supplemental vent supply fans by 40 seconds. The new relays will be mounted in the diesel-generator voltage regulator panels and are seismically qualified for this location and are capable of operating in the environment present in the diesel-generator room. Delaying the start of the vent fans for 40 seconds will not adversly affect the temperature profiles of the diesel-generator rooms. In leakage primarily through the outside air dampers for the diesel generator ventilation fans will provide sufficient combustion air to allow start and run of the diesels until the vent fans are started.

   B. The possibility for an accident or malfunction of a different than any evaluated previously in the safety analysis report is not created. This modification adds a time delay relay to delay the start of the diesel-generator room vent fans for 40 seconds. The design of the additional circuitry meets all the criteria of the original design and the relays are seismically qualified for installation in the diesel-generator panels and are capable of operating in the environment present in the diesel-generator room. Delaying the start of the vent fans will not adversely affect the temperature profile of the diesel-generator rooms. In leakage primarily through the outside air dampers for the diesel generator ventilation fans will provide sufficient combustion air to allow start and run of the diesels until the vent fans are started.

C. The margin of safety as defined in the basis for any technical specification is not reduced. No technical specifications address the starting times of the diesel-generator room vent supply fans. Sections 3.9, 4.9 and associated buses have been reviewed in making this determination.

2. A change to the technical specifications is not required since no technical specifications address the starting of the diesel-generator room vent fans.

V. 10 CFR 50.92 SIGNIFICANT HAZARDS DETERMINATION:

This determination is not applicable since a license amendment is not required.

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VI. APPROVALS:

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Responsible Engineer

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NUCLEAR ENGINEERING DEPARTMENT
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Safety Evaluation for Modification 2578
Peach Bottom Atomic Power Station, Units 2 and 3
Doctype 565
Revision 1

I. SUBJECT:

Safety evaluation for modifying the starting logic for the RHR compartment coolers.

II. CONCLUSION:

This modification:

a. affects safety-related equipment

b. does not involve an unreviewed safety question

c. does not require a technical specification change

d. maintains the ability to safely shutdown the plant in the event of a fire

e. does not require a license amendment or prior NRC approval

f. does not involve a significant hazards determination

III. DISCUSSION

Modification 2578 changes the starting logic for the Unit 2 and Unit 3 RHR compartment coolers. The coolers will start on either an RHR pump start signal (present design) or when the RHR system receives a LOCA signal (this modification). With the present design, the RHR compartment coolers may not start during a LOCA without a loss of offsite power (LOOP), in particular when only one offsite power source is available. This is a result of potential low bus voltage caused by attempting to start an RHR pump, the RHR compartment cooler fans, and other 460 volt loads at the same time. Starting the coolers at the beginning of a LOCA, and delaying the start of the RHR pump (objective of modification 2564), will eliminate this possibility. For non-accident conditions, an RHR compartment cooler will start when its RHR pump starts.

The following RHR compartment coolers are affected by this modification:

A CHANNEL	2AV25	2BV25	3AV25	3BV25
C CHANNEL	2CV25	2DV25	3CV25	3DV25
B CHANNEL	2EV25	2FV25	3EV25	3FV25
D CHANNEL	2GV25	2HV25	3GV25	3HV25

Start logic for the A and C channel RHR compartment coolers is modified by paralleling a HIGH DRYWELL PRESSURE OR REACTOR LOW LEVEL signal from RHR relay logic circuit "A" with the existing RHR PUMP 4KV CIRCUIT BREAKER CLOSED signal to start a cooler on either a LOCA or RHR pump start. The logic for the B and D channel RHR compartment coolers is likewise modified using RHR relay logic circuit "B". Safeguard channel separation is maintained by starting the A and C channel coolers with RHR "A" logic and starting the B and D channel coolers with RHR "B" logic.

This modification meets the design criteria of the RHR and secondary containment HVAC systems. A fire protection checklist and safe shutdown evaluation were completed to determine that this modification maintains the capability to safely shutdown the plant in the event of a fire.

There are no electrical loads added by this modification. This modification does not involve ran ite systems, therefore, the guidance provided in IE Circular 18 is not applicable.

No changes to the UFSAR are required. Sections 6.4.4, 4.8, and 5.3 were reviewed.

IV. 10CFR50.59 CHANGES, TESTS, AND EXPERIMENTS

1. An unreviewed safety question is not involved.

   a. The probability of occurrence or the consequences for an accident or malfunction of equipment important to safety previously evaluated in the UFSAR is not increased. This modification starts the RHR compartment coolers sooner than the previous design during a LOCA to prevent possible starting problems due to degraded bus voltage. Safeguard channel separation is maintained by this modification.

   b. This modification does not create a possibility of an accident or malfunction of equipment important to safety as previously evaluated in the UFSAR. The modification includes a LOCA as an additional initiation signal for starting RHR compartment coolers. The previous start conditions are maintained.

c. This modification will not reduce the margin of safety as defined in the bases of the Technical Specifications. The RHR system and secondary containment HVAC system as described in the Technical Specifications are unchanged. Sections 3.4.A, 4.4.A, 3.7.C, 4.7.C, and associated bases were reviewed.

2. A change to the Technical Specifications is not required based on a review of Sections 3.4.A, 4.4.A, 3.7.C, 4.7.C. The RHR and secondary containment HVAC systems are unchanged.

V. 10CFR50.92 SIGNIFICANT HAZARDS DETERMINATION:

This section is not applicable because an amendment to the license is not required.

VI. APPROVALS

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Responsible Engineer

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CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing Application were served on the following by deposit in the United States Mail, first class postage prepaid, on the 7th day of September, 1988

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