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REGION I

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LICENSEE: Philadelphia Electric Company
P. O. Box 195
Wayne, Pennsylvania 19087-0195

FACILITY NAME: Peach Bottom Atomic Power Station, Units 2 and 3

INSPECTION DATES: Dec '3-17, 1993

INSPECTOR: Richard A Skokowski 26 Jan 94
Richard A. Skokowski, Reactor Engineer Date
Electrical Section, EB, DRS

APPROVED BY: William H. Ruland 2/7/94
William H. Ruland, Chief Date
Electrical Section, EB, DRS

Area Inspected: This was an announced inspection to review the licensee's corrective actions of previously identified Electrical Distribution System Functional Inspection (EDSFI) findings.

Results: During this inspection, five open EDSFI-related issues were reviewed. Three unresolved items were closed, and two unresolved items were updated, requiring further NRC review.

The inspector considered the licensee's use of label plates located below each of the four EDG control room kW meters containing the EDG loading limit and the kW values of loads particular to each EDG noteworthy. However, an unresolved item was identified regarding the completion of the licensee-initiated action plan to ensure that EDG loading was maintained within the boundaries defined by the fuel consumption calculation. The inspector was also concerned that meter inaccuracies were not taken into consideration within the load management program.

The calculations for the tornado-generated missile protection of the EDG tank vents and the EDG fuel consumption were thorough and well organized with the assumptions well supported and documented.

DETAILS

1.0 PURPOSE

The purpose of this inspection was to review and verify the licensee's corrective actions for previously identified NRC findings of the Electrical Distribution System Functional Inspection (EDSFI) for Peach Bottom Atomic Power Station, Units 2 and 3.

2.0 FOLLOWUP OF PREVIOUS IDENTIFIED FINDINGS (2515/111)

2.1 (Closed) Unresolved Item (50-277;278/93-80-02) Lack of Tornado-Generated Missile Protection of the EDG Storage and Day Tank Vents

Section 8.5.2.4 of the Updated Final Safety Analysis Report (UFSAR) states that each diesel generator unit is housed in a seismic Class I structure, such that equipment is protected against other natural phenomena such as floods, tornado, rain, ice, snow, and lightning. During the EDSFI walkdown, the team noted that the fuel oil storage and day tank vents were exposed to tornado-generated missile hazards.

The inspector reviewed Non Conformance Report (NCR) PB 93-00086 000, regarding EDG fuel oil storage and day tank vent missile protection, and the associated 10 CFR 50.59 evaluation and found them acceptable. Portions of the supporting Calculation PM 849 were also reviewed. The purpose of this calculation was to determine if the diesel fuel oil storage tank and/or the diesel fuel oil day tank would be adequately vented if either or both of their respective vents were struck with a missile. It was noted in this calculation that the sizing of the vents is based on activities other than diesel operation. These activities include the filling and draining of the tanks. The assumptions used within this calculation were found to be appropriate and adequately supported. This calculation conservatively determined the worst-case opening available if the vent for either tank were damaged by a tornado-generated missile. The calculation used standard industry equations to verify that the worst-case vent opening was adequate to ensure that a vacuum would not be formed during normal EDG operation. In addition, the calculation verified that adequate net positive suction head would be available to the fuel transfer pump and the engine fuel pump during the worst-case conditions. The inspector also performed a walkdown of these vents to verify the assumptions used within the calculation. The inspector considered Calculation PM 849 to be thorough and well organized.

Also stated in the UFSAR, Appendix C.2.4 states that "Seismic Class I equipment...whose loss of function during a tornado would not violate the safety requirements of the plant, are not designed against tornado effects." Since Calculation PM 849 demonstrates that damage to the vents will not compromise the ability of the EDGs to their safety function, the absence of tornado missile protection is acceptable. To clarify this situation, the licensee plans to revise the UFSAR with respect to tornado-generated missile protection of the EDG fuel oil storage tank and day tank vents. According to the licensee, this clarifying statement should be included in the July 1994 revision of the UFSAR.

The inspector had no further concerns regarding this issue. This item is closed.

2.2 (Closed) Unresolved Item (50-277;278/93-80-09) Non-Conservative Fuel Oil Specific Gravity

The EDSFI team identified that Calculation PM 123, "Diesel Generator Fuel Oil Consumption for 7-day Operation with LOCA Time Dependent Loads," Revision 2, was based on a specific gravity of 0.887, while technical specification permits specific gravity to be as low as 0.83. The licensee's initial assessment of using the worst-case specific gravity indicated that, for seven-day operation of four EDGs with LOCA time-dependent load, the volume of fuel required would be 109,502 gallons. Furthermore, Calculation PM 046, "Diesel Generator Fuel Oil Storage Tank Volume Determinations," Revision 1, showed that the highest practical transferrable volume that could fit into each storage tank was 36,000 gallons. Therefore, with one fuel storage tank unavailable, the three remaining tanks could hold only 108,000 gallons of fuel.

The inspector reviewed Calculation PM 123, "Diesel Generator Fuel Oil Consumption for 7-day Operation with LOCA Time Dependent Loads," Revision 3. Enhancements to this latest revision of PM 123 include:

1) Inclusion of engine-specific fuel consumption curves;
2) Correction of the fuel consumption rates at a specific gravity of 0.83;
3) Correction of the generator efficiency to that which occur at 0.8 power factor; and
4) Introduction of a 24-hour to seven-day load block, which reflects the removal of certain loads from the EDGs that are not necessary following an accident.

The 24-hour to seven-day block was developed to more accurately reflect the loads that are running during this period. The licensee considered this conservative because it assumes that the EDG loads required 24 hours into the accident continue for the following six days. These loads are expected to decrease during the accident as the transient is stabilized.

Calculation PM 123 was based upon the standard industry methods as described by the Diesel Engine Manufacturer's Association (DEMA). The fuel consumption calculations were performed using a spreadsheet, and validated with hand calculations. The inspector compared the kW values of a number of loads from the EDG loading calculation to those used in the fuel consumption calculation and found them to be consistent. The inspector performed a walkdown of selected components, and compared the name-plate data to the data used in the calculation and also found them to be consistent. The results of the calculations revealed that the worst-case required onsite storage volume was 105,605 gallons for seven days of operation of four EDGs. The inspector considered Calculation PM 123 to be thorough and well organized, with the following exception.

The inspector reviewed loads that were removed at the 24-hour point, and identified that the loading of the eight station battery chargers was reduced from 30 kW to 1 kW each. The licensee changed the load since the batteries should be charged fully at this time, and that the only load supplied by the battery charger would be a trickle-charge to the battery. The inspector asked if there were any other continuously-energized loads that would be supplied by the chargers during this time. The licensee determined that there was a worst-case of 40 kW not considered. The licensee performed a preliminary calculation and determined that this additional load would, worst-case, increase the EDG fuel consumption to 105,972 gallons.

The current Peach Bottom Atomic Power Station (PBAPS) Technical Specification requires that four EDGs shall be operable and there shall be a minimum of 108,000 gallons of diesel fuel on site. In addition to the total on site requirement for diesel fuel, the technical specification also requires that each operable EDG have the following:

- A separate day tank containing a minimum of 200 gallons of fuel;
- A separate fuel storage tank with a minimum of 28,000 gallons of fuel; and
- A separate fuel transfer pump.

With all four EDGs and their associated storage tanks operable, there would be a minimum of 112,800 gallons of fuel on site, and with one EDG or its associate storage tank out of service, there would be 108,000 gallons available on site. In both cases, there would be sufficient fuel to envelope the needed diesel fuel as determined by Calculation PM 123.

To ensure that the loading of the EDGs was maintained within the boundaries defined by PM 123, the licensee developed Action Plan A0794338. The purpose of this action plan was to implement operator procedure changes so that EDG loading is maintained low enough to ensure an adequate diesel fuel supply is available. At the completion of the inspection, the action plan was not yet implemented. The need to implement this action plan and other findings related to EDG load management are described in Section 2.5 of this report.

On December 17, 1993, the inspector verified that the quantity of fuel in each of the EDG fuel storage tanks exceeded the required amount. Three of the tanks contained over 35,000 gallons of fuel and the remaining tank contained over 32,000 gallons of fuel. There was also a low level alarm set at 31,000 gallons for each of the tanks, and the operators' logs specify a minimum of 29,000 gallons required in each tank. The inspector also reviewed the results of sampling performed on a September 1993 delivery of fuel for the on-site storage tanks and found the specific gravity well with the required specification. The inspector had no further concerns regarding this issue, and considered the item closed.

2.3 (Closed) Unresolved Item (50-277;278/93-80-07) Additional EDG Loads from Pumps

During the review of the EDGs steady-state loading, the EDSFI team noted that the UFSAR and the loading calculation were not conservative and needed further review and revision to show maximum EDG loading. In particular the team noted that the core spray pump could be operating near runout conditions at a peak load of 637 brake horsepower (BHP). This corresponds to a motor power requirement of 511 kW at 93% efficiency, while the loading calculation only assumed 481 kW. The team also noted that the control rod drive pump could be operating at a maximum flow of 200 gallons per minute (GPM) with a peak load of 269.6 BHP. This corresponds to a motor power requirement of 219.8 kW, while the loading calculation only assumed 212 kW. Furthermore, there was the possibility for automatic starting of the motor-driven 250 HP fire pump. This showed that the EDG loading could be increased by 277 kW (30 kW for each core spray pump, 8 kW for control rod drive pump and 239 kW for the fire pump).

The licensee initiated NCR 93-00110 regarding the core spray pump loading. The need to update the UFSAR to indicate the core spray pump loading of 511 kW at worst-case flow conditions was noted in this NCR. In addition, the licensee performed a review of the 4 kV loading profile to ensure that all loads were correctly represented in the UFSAR EDG and emergency bus loading tables. As a result, the licensee identified that the loading for the RHR pumps was not proper for operating flow conditions. The licensee also included in this NCR the need to update the loading tables for changes completed to the EDG building supply fans. The inspector reviewed this NCR and the bases for the changes in the RHR and EDG supply fan loading and found them acceptable.

The inspector reviewed Calculation PE 166, regarding EDG loading for the cases defined by the UFSAR Tables 8.5.2c through 8.5.2l, and found it acceptable. The inspector also performed a walkdown of selected components, and compared the name-plate data to the data used in the calculation and found them to be consistent.

The impact of the fire pump on the loading of the EDG is covered in Section 2.4 of this report. Additionally, the inspector performed a review of the licensee's EDG load management program, which is covered in Section 2.5 of this report.

Based on the review of the EDG loading calculation and the administrative controls provided by the EDG load management program, the inspector had no further concerns regarding the steady-state loading of the EDGs, and considered this item closed.

2.4 (Update) Unresolved Item (50-277;278/93-80-05) Potential Overloading of the EDGs due to Possible Loading of Fire Pump

During the EDSFI team's review of automatic sequenced loads for EDGs, a potential for automatic starting of the motor-driven 250 HP fire pump was identified. This could happen on receipt of a signal from a nonsafety-related pressure switch that the pressure in the fire protection header was decreasing. This load was not considered by the licensee as a sequenced load. This pump is supplied from a load center energized from bus E2, the most heavily loaded EDG; the remaining EDGs are not affected. The postulated load ranged from 203 kW for pump shutoff to 239 kW for rated flow, and could possibly overload the EDG in either transient or steady-state conditions.

In the licensee's response letter to the EDSFI, dated July 8, 1993, they stated that the fire pump would start following a loss of off-site power (LOOP). Since the pressure in the fire system header is maintained by non-diesel powered sources, upon a LOOP, the pressure in the fire system would gradually decay. In response to this pressure decay the electric-driven fire pump would start. However, based on operating experience, the licensee stated that the fire pump would not start during the initial loss of coolant accident (LOCA) load sequencing of the EDG. But there is the possibility that the starting of the fire pump could cause the EDG to exceed its 200 hour rating.

The licensee generated NCR PB 93-00741 000, dated October 21, 1993, to address this issue. The proposed resolution is to modify the fire pump starting circuit to prevent automatic starting of the fire pump following a LOOP. This proposed modification would also allow for manual starting of the fire pump if needed, at which time the operators would control the loading of the EDG under the guidelines provided by the EDG load management program, which is covered in Section 2.5 of this report. The licensee's internally proposed completion date for the resolution of this NCR is February 1, 1994.

The inspector found the concept of the licensee's proposed resolution adequate to address the issue. Also, the current EDG load management program is adequate to prevent steady-state overloading of the EDG. However, since the details of the modification were not complete, and the modification has not yet been installed, this item remains unresolved pending the completion of the licensee's effort and subsequent NRC review.

2.5 (Open) Unresolved Item - EDG Load Management

The inspector reviewed the licensee's EDG load management program to determine its effectiveness as an administrative control to ensure that the EDGs are operated within their design limits.

The licensee has an administrative limit of 3,000 kW on each of the EDGs. This limit is stated in Procedure SE-11, "Loss of Off-site Power." In addition, this procedure provides generalized guidance on load management, including a list of approximate kW load values for selected components. Furthermore, below each of the four EDG kW meters located in the control room was a label plate stating the EDG loading limit and the approximate kW values of the major loads associated with each particular EDG. The inspector considered these label plates to be a strength within the licensee's load management program. Discussions with members of the licensee's operating staff indicated that it is their policy to always maintain EDG loading as low as possible. The inspector found the load management program to be acceptable with the following exceptions.

1) As described in Section 2.2 of this report, the licensee developed action A0794338 to ensure that the loading of the EDGs was maintained within the boundaries defined by the fuel consumption calculation. The purpose of this action plan was to implement operator procedure changes so that EDG loading is maintained low enough to ensure an adequate diesel fuel supply is available. At the completion of the inspection, the action plan was not completed.

2) The inaccuracies of EDG kW meters are not considered in the licensee's load management program. Worst-case, the control room EDG kW meter could indicate ± 141 kW. According to the present load management program, which maintains 3000 kW by control room meter indication, the actual worst-case EDG loading could be 3141 kW which would place the EDGs in the 200-hour limit.

The inspector's review of recent EDG kW meter calibrations indicated that the meters are functioning well within their specifications, and that there is no immediate concern with meter inaccuracies allowing the operators to overload the EDGs inadvertently. However, this item is considered unresolved pending the completion of the licensee's evaluation and subsequent NRC review of the impact of meter inaccuracies on the load management program and the completion of their action item to ensure that the load management program envelopes the EDG fuel consumption calculation (50-277;278/93-33-01).

2.6 (Update) Unresolved Item (50-277;278/93-80-04) Non-Seismic Steam Piping and Room Heaters Installed in the EDG Rooms

The original heating units (two per room) were seismically qualified. However, a walkdown performed by the EDSFI team revealed that certain heater units were replaced with unqualified units for unknown reasons (E1-two new units, E2-one new unit, E4-one new unit). On February 12, 1993, the valves supplying steam to all of the unqualified units except the unit in the E1 compartment were closed. This action eliminated the concern for the potential heater failures during a seismic event in EDG E2, E3, and E4 rooms until appropriate corrective actions could be implemented. In the event of a failure of a heater in the E1 compartment due to a seismic event, mitigating measures were available to take timely corrective action to restore or maintain diesel generator operability. The team noted

that an alarm was provided in the control room to alert the operator to a high temperature condition in the EDG rooms. In addition, routine operator rounds were performed on a periodic basis to verify the equipment operability. The licensee initiated NCR PB 93-00096 to resolve discrepancies between the design drawings and the installed conditions of the auxiliary steam piping, pipe supports and unit heaters.

To address the lack of a seismically-qualified heater in the E1 EDG room, the licensee replaced one of the non-seismically qualified heaters in that room with one of the qualified heaters from EDG room E3. Also the licensee verified that a single EDG room heater was sufficient to maintain the EDG room above 65°F; therefore, there is no concern regarding minimum EDG room temperature. The inspector performed a walkdown of the EDG rooms and verified the replacement of the heater in EDG room E1.

The inspector also reviewed Calculation PM-802, regarding the maximum temperature following the failure of a single heater while the EDG was running. This calculation concluded that both the maximum relative humidity and the maximum temperature following the worst-case heater steam pipe rupture would be maintained within the limits specified. The inspector's review of the calculation found it performed in accordance with standard industry methodology. The inspector had no further questions regarding this calculation. However, the long-term corrective actions for the non-seismically qualified steam piping and heaters were not reviewed. Additionally, further inspection effort is required to address the installation of these unqualified heaters. This item remains unresolved pending the completion of NRC review.

3.0 CONCLUSION - FOLLOWUP OF PREVIOUS IDENTIFIED FINDINGS

During this inspection, five open EDSFI-related issues were reviewed. Three unresolved items were closed, two unresolved items were updated and require further NRC review. Also during this review of EDSFI-related issues, the inspector identified an unresolved issue regarding EDG load management as described in Section 2.5 of this report.

The calculations for the tornado-generated missile protection of the EDG tank vents and the EDG fuel consumption were thorough and well organized with the assumptions well supported and documented.

4.0 UNRESOLVED ITEMS

Unresolved items are matters about which additional information is necessary to determine whether they are acceptable, a deviation, or a violation. Several unresolved items are discussed in detail under Section 2.0.

5.0 EXIT MEETING

The inspector met with the licensee's personnel denoted in Attachment 1 of this report at the conclusion of the inspection on December 17, 1993. The scope of the inspection and inspection results were summarized. During this meeting, the licensee acknowledged the inspection findings as detailed in this report and had no additional comments regarding the inspection results.

ATTACHMENT 1

Persons Contacted

Philadelphia Electric Company

*	H. Abendroth	Atlantic Electric Site Representative
*	J. Armstrong	Senior Manager, Plant Engineering
	G. Beckner	System Engineer
*	A. Blumm	System Engineer
*	W. Bowers	ISEG
*	W. Boyer	Manager, Electrical Engineering Branch
*	J. Carey	PSE&G Site Representative
*	F. Cook	Senior Manager, Design Engineering
	T. Gonzalez	Engineering Staff
*	J. Hart	System Engineer
	S. Hutchins	Engineer
	A. Jones	Engineer
	M. Kray	Manager, PBAPS Licensing
*	W. McFarland	Engineer
	M. McGill	System Engineer
	R. McKinley	System Engineer
	W. Mindick	Engineer
*	T. Niessen	Director, Site Engineering
*	W. Nolle	Lead Assessor, NQA
*	J. Rogenmuser	Training Supervisor
	C. Schwarz	Shift Manager
*	G. Siefret	Licensing Engineer
*	R. Smith	Regulatory Section
*	T. Wasong	Manager, Experience Assessment
*	J. Zardus	System Engineer

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*	C. Beardslee	Reactor Engineer, Region I
	A. Della Greca	Acting Section Chief, Electrical Section, Region I
*	W. Schmidt	Senior Resident, Peach Bottom Atomic Power Station

* Indicates those attending the exit meeting