BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

In the Matter of	:	
	:	Docket Nos. 50-277
PHILADELPHIA ELECTRIC COMPANY	:	50-278

APPLICATION FOR AMENDMENT

OF

FACILITY OPERATING LICENSES

DPR-44
DPR-56

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Philadelphia Electric Company, Licensee under Facility Operating Licenses DPR-44 and DPR-56, for the Peach Bottom Atomic Power Station (PBAPS) Unit No. 2 and Unit No. 3, respectively, hereby requests that the Technical Specifications contained in Appendix A to the Operating Licenses be amended. Proposed changes to the Technical Specifications are indicated by the vertical bars in the margins of the attached pages 67, 71a, and 93a.

Introduction

The original voltage regulation study for Peach Bottom was performed prior to licensing of Unit 2 in 1974. The study was based on a combination of manual and time-shared computer calculations. Voltage transients were considered only down to the 4.16kV level in that study, which was consistent with industry practice at that time. In 1979, in response to an NRC request concerning the adequacy of station electric distribution voltages for Peach Bottom, additional voltage studies were performed. These studies were performed assuming steady state conditions at all voltage levels but did not address the effects of motor starting transients since they were expected to last only a few seconds. Modifications were designed and implemented based on that assumption. Because of industry experience gained in the area of voltage regulation which was disseminated by NRC Information Notices, and the availability of more sophisticated calculation techniques, Licensee elected to perform a revised voltage regulation study for Peach Bottom which considers transients down to the 480V level. As a result of the revised study, deficiencies in the degraded voltage protection scheme were identified. The purpose of this Application is to propose changes to the Technical Specifications to correct the deficiencies.

The proposed changes in this Application are grouped into two categories. The Category A changes address the degraded grid protective relays, and involve increasing the time delay for the 4.16kV bus or the emergency power system to transfer to an

alternate power supply and decreasing the voltage setpoint on the instantaneous undervoltage relays on the 4.16kV buses (Modification 5002). Category B changes address the Emergency Core Cooling System (ECCS) loading sequence (Modification 2564). Each category of changes includes a System Discussion, Description of Changes, Safety Discussion and a No Significant Hazards Consideration. The Application concludes with a common Environmental Impact Assessment. Attached to this Application are the following: Figures 1 and 2, proposed Technical Specification pages and Supplemental Information.

System Discussion - Category A

A simplified single line diagram of the Peach Bottom electrical distribution system is shown on the attached Figure 1. The two independent offsite power sources are referred to as the No. 2 and No. 3 start-up sources. The 4.16kV bus feeder breakers provide the interface between the two offsite power sources and the plant safety-related AC power distribution system. Each of the four 4.16kV buses, identified as the 4kV emergency buses at the bottom of Figure 1, in each unit can be powered by either of the two offsite power supplies. Normally, each of the two offsite power sources supplies two 4.16kV buses in each unit. Each of the 4.16kV buses can also be powered from a safety-related diesel generator.

Each startup source to each 4.16kV bus is equipped with an instantaneous undervoltage protective relay. Each relay is presently set to initiate at 90% of nominal voltage on the 4.16kV

bus. The purpose of these relays is to ensure that adequate levels of voltage are provided to the motors and control components which are powered from the 480V motor control centers (MCCs) which are fed from the 4.16kV buses. Certain control components are specified to operate at +/-10% of nominal voltage to preclude damage from low voltage. A simplified diagram of the 4.16kV bus which includes its 480V load center is shown on the attached Figure 2.

The degraded grid protective relays shown on Figure 2 as UV-1 initiate time delay relays which transfer the 4.16kV bus to an alternate supply source if the normal supply source does not recover to the instantaneous relay reset value (currently 93%) in a set period of time. Each of the four 4.16kV buses on each unit has two instantaneous relays, one associated with each of the two offsite power sources. The control circuit logic to the time delay relays distinguishes between an undervoltage condition without a safety injection signal and one concurrent with a safety injection signal. Without a safety injection signal, a time delay relay will initiate the transfer 60 seconds after initiation of the instantaneous relay if the voltage does not recover. The 60 seconds allows time for the tap changers on the offsite source transformers to adjust the voltage or for the operator to take manual actions (i.e. shed loads) to improve the voltage. With a safety injection signal, another time delay relay will initiate the transfer bus 6 seconds after initiation of the instantaneous relay if the voltage does not recover. The purpose of the 6 second delay is to minimize the time that

safety-related equipment is exposed to the undervoltage condition, yet allow the voltage to recover from the dips caused by acceleration of the large safety-related motors. In either case, if the voltage of the normal supply has not recovered before the time delay relays initiate the transfer, the associated source breaker is tripped and the bus is loaded onto an alternate power supply. The alternate supply for any 4.16kV bus is, in order of preference, the remaining offsite power source, then the emergency diesel generator. The revised voltage regulation study identified that under the scenario of a safety injection signal on one unit while operating with only one of two offsite power sources (permitted for 7 days by Limiting Condition for Operation 3.9.B.1), the existing 6 second time delay setting is inadequate. The existing 6 seconds would not allow sufficient acceleration time for the core spray pump motors. Therefore, even after a 6 second delay, the core spray pump motors, which are currently started simultaneously, will not be at rated speed (based on design acceleration versus voltage values) thereby not allowing voltage recovery on the 4.16kV buses, and all four 4.16kV bus feeder breakers will trip, thus loading each bus onto its associated diesel generator.

Description of Changes - Category A

Licensee proposes the following changes:

(1) Revise Table 3.2.B on page 71a to designate the trip level setting for the instantaneous relays as "89% of rated voltage ± 0.30% of setting (3702 volts ± 11 volts)" instead of "90% (+/-2%) of rated

voltage", and replace the "(ITE)" in the trip function column with "(27N)".

(2) Revise Table 3.2.B on page 71a to designate the trip level setting for the time delay relays as "9 second (+/-7%) time delay" instead of "6 second (+/-5%) time delay".

(3) Revises BASES section 3.2 on page 93a to reflect the 89% setting of the instantaneous relay.

(4) Revise BASES section 3.2 on page 93a to reflect the 9 second time delay.

Safety Discussion - Category A

Change Request (1) is proposed to improve the protection provided by the undervoltage protective relays which sense the voltage level on the offsite power sources to the 4.16kV buses. This Change Request involves replacing the existing instantaneous relay (ITE) with one with improved setpoint accuracy (27N). The proposed trip level setting is 89% of rated voltage ±0.30% of setting. The present setting of the existing relays is 90% ±2% of rated voltage. Although this is a decrease in the setpoint value, the protection to the 480V control components powered from the MCCs is improved due to improved operational tolerances of the new relays. The setpoint of the existing relay was selected to assure adequate voltage to loads and control components on the 480V system. Although the proposed setpoint is below the ±10% manufacturers' design tolerance, field tests have been performed

to determine actual pick-up voltage values for sizes 1, 2, 3 and 4 motor contactors and other safety-related control components that could experience this voltage. This range covers the contactor sizes used in the 480V powered MCCs at Peach Bottom. The field measured pick-up voltage for this range of starters is less than 75% of nominal voltage. Licensee concludes that the proposed setting with improved tolerance will provide sufficient voltage protection to all loads powered from the 480V MCCs.

Change Request (2) is proposed to prevent a spurious transfer of the 4.16kV buses to the diesel generators under the design basis condition of a safety injection signal on one unit with only one offsite power source available. A safety injection is the automatic plant response to a loss of coolant accident (LOCA), and requires the starting of the ECCS pumps. Because of large demands on the 4.16kV buses incurred from pump motor acceleration, a LOCA load sequence on a single offsite power source is the most limiting design basis accident for the emergency system. Licensee proposes to increase the time delay on the 4.16kV bus from 6 seconds to 9 seconds to allow sufficient time for the 4.16kV bus to recover from the normal motor acceleration transient of the core spray pumps. Under single offsite source operating conditions and the existing load sequencing scheme, the core spray pump motor voltage is 81.4 percent (0.814 pu) resulting in a design value core spray acceleration time in excess of 17 seconds. This long acceleration time exceeds the existing 6 second delay and, therefore, would result in the 4.16kV bus being separated from

the available offsite source and loaded onto the associated diesel generator. Under the proposed revised load sequencing scheme discussed in the Category B changes, the minimum core spray motor terminal voltage is such that the worst case core spray pump acceleration time is within 9 seconds. Therefore, the proposed 9 second setting of the instantaneous degraded voltage relay (27N) is adequate to ensure that the core spray motors will accelerate under a degraded voltage condition and the undervoltage relays will reset prior to causing the feed breakers to trip. The time delay meets the intent of NRC Branch Technical Position PSB-1 which states that the time delay should be sufficient duration for "something longer than that of a motor starting transient"

Change Requests (3) and (4) revise the Bases to accurately reflect Change Requests (1) and (2), respectively. Consistency between the Bases and their corresponding specifications is necessary to avoid misinterpretations and to enhance the understanding of the intent of the requirements.

No Significant Hazards Consideration - Category A

(1) The proposed Category A changes do not involve a significant increase in the probability or consequences of any accident previously evaluated.

The Category A changes are proposed to improve the protection provided by the undervoltage protective relays. Although the proposed setpoint is lower than

the existing setpoint, protection to the 480V control components powered from the MCC s is improved due to improved operational tolerances of the proposed replacement relays. Increasing the setting on the time delay relay from 6 seconds to 9 seconds will ensure that the 4.16.kV buses will not be spuriously transferred tc the diesel generators in the event of a design basis accident with only one offsite power source available. These proposed changes do not affect the probability or consequences of any accidents previously evaluated, but ensure that the 4.16kV buses will not be spuriously transferred to the diesel generators thereby ensuring the validity of the existing accident analysis; specifically, a loss of coolant accident with off-site power available.

(2) The proposed Category A changes do not create the possibility of a new or different kind of accident from any previously evaluated.

The proposed changes to the relay settings do not involve a redistribution of loads on safety-related buses or affect the electrical separation or redundancy of any safety-related trains or components. The proposed changes improve the undervoltage protective scheme and allow the 4.16kV buses to sustain a normal motor acceleration transient without a spurious transfer to an alternate power source. The Category A changes do

not alter the intent of the relays, and do not create the possibility of a new or different kind of accident from any previously evaluated.

(3) The proposed Category A changes do not result in a significant reduction in a margin of safety.

The Category A changes are proposed to enhance safety. Although the proposed 89% setting does not assure 90% voltage at the MCC contactors as suggested by manufacturers' design tolerances (±10%), field tests have been performed which indicate that the actual pick-up voltage is less than 75% of nominal voltage. Increasing the time delay settings allows pump motors to accelerate without an unnecessary transfer to an alternate power supply. The changes do not involve a significant reduction in any margin of safety.

System Discussion - Category B

The Peach Bottom Emergency Core Cooling System is designed to meet the acceptance criteria defined in 10 CFR 50.46 to ensure fuel integrity for the entire spectrum of postulated LOCAs. The ECCS is actuated by either of two diverse indications of a LOCA: reactor vessel low water level or primary containment (drywell) high pressure. The ECCS consists of the High Pressure Coolant Injection (HPCI) System, the Automatic Depressurization System (ADS), the Core Spray (CS) System and the Low Pressure

Coolant Injection (LPCI) mode of the Residual Heat Removal (RHR) System. The four CS pumps and the four RHR pumps are powered from the 4.16kV buses. (The HPCI pump is turbine-driven and there are no pumps in the ADS). In the event of a LOCA with off-site power available, the RHR and CS pumps are loaded sequentially onto the 4.16kV buses to preclude severe voltage transients from the simultaneous starting of the pumps. The present loading sequence for the RHR and CS pumps in the event of a safety injection signal with offsite power available is as follows:

time =	0 seconds	Initiation of safety injection signal
		Start various 480V safety-related loads
		Start RHR pumps A and B
	5 seconds	Start RHR pumps C and D
	10 seconds	Start CS pumps A, B, C, and D

As described previously, this loading sequence results in voltage dips on the 4.16kV and 480V buses which are unacceptable in consideration of the degraded grid protective relay settings due to core spray pump motor acceleration time. Therefore, Licensee proposes the following loading sequence for a safety injection signal with offsite power available:

time =	0 seconds	Initiation of safety injection signal
		Start various 480V safety-related loads
	2 seconds	Start RHR pumps A and B
	8 seconds	Start RHR pumps C and D
	13 seconds	Start CS pumps A and C
	23 seconds	Start CS pumps B and D

These times were selected to minimize voltage transient effects on the plant electrical distribution system and connected loads. The timer change from 0 to 2 seconds for the A and B RHR pumps is introduced to allow 480V control and connected load accelerations prior to the RHR pump motor starts. The timer change from 5 to 8 seconds for the C and D RHR pumps is introduced to allow 2 seconds for the 480V control and connected load accelerations plus an additional second to provide the 480V loads with a slightly longer time available for acceleration. The CS starting sequence is modified most significantly to split the four motor starts into two segments of two pumps each, which minimizes transient voltage effects and improves CS acceleration time. The time between and following CS motor starts is introduced in recognition of the acceleration requirements of these particular motors.

In addition to the proposed ECCS loading sequence, Licensee will further improve the voltage regulation of the 480V load centers during a motor starting transient by a combination of plant modifications which revise the load shedding or sequencing of the Emergency Service Water pumps, the Emergency

Cooling Water pump, the RHR compartment coolers, the cooling towers and the diesel generator vent supply fans. Licensee plans to perform these changes pursuant to 10 CFR 50.59 since none involves an unreviewed safety question or a change to the Technical Specifications.

Description of Changes - Category B:

Licensee proposes the following changes:

(1) Revise Table 3.2.B on page 67 to designate the initiation setpoint for the A and C core spray pumps to be "13 sec. +/-7% of setting" and the initiation setpoint for the B and D core spray pumps to be "23 sec. +/-7% of setting".

(2) Revise Table 3.2.B on page 67 to designate the initiation setpoint for the A and B LPCI pumps to be "2 sec. +/-7% of setting" and the initiation setpoint for the C and D LPCI pumps to be "8 sec. +/-7% of setting".

(3) Revise Table 3.2.B on page 67 of the Unit 3 Technical Specifications only to delete the asterisk next to the ADS Bypass Timer and the footnote which reads "Effective when modification associated with this amendment is complete."

Safety Discussion - Category B:

Licensee proposes Change Requests (1) and (2) to improve the degraded grid voltage protection on to the 480V buses and to accommodate CS motor start transients in the event of a design basis accident while operating with only one offsite power source available. The proposed Category B changes to the RHR and CS loading sequence do not affect the loading sequence of the diesel generators in the event of a LOCA coincident with a loss of offsite power. The Appendix K (ECCS Evaluation Models) analysis was used to determine bounding allowable starting times for the RHR and CS pumps. The proposed timer settings are within the limiting starting times assumed in the Appendix K analysis.

For Change Request (1), Licensee concluded that the proposed increases in the core spray timer settings are within the Appendix K analysis. Success of the core spray system requires two factors: 1) pump ready for rated flow and 2) injection valve open to permit full flow. Pump ready for rated flow is defined as the pump being at design full speed. Full flow through the injection valve is defined as valve full open. There are two conditions required to support worst case valve opening; reactor pressure is at the low end of its low pressure permissive (400-500 psig) and power is available to the valve operator. The limiting Appendix K scenario for CS is a 100% break in the reactor recirculation discharge line. Under this scenario, the low pressure permissive occurs 47 seconds following occurrence of the LOCA. Power to the valves must be established prior to this time. (Power to these valves is not interrupted in

this scenario.) The valve stroke time is 12 seconds. The earliest that the injection valve can be opened, therefore, is 59 seconds, 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 available at the emergency bus (this time is zero since offsite power is available for this scenario), the time for power to be available to the pump motor (pump timer relay setting) and pump motor acceleration time (dependent upon motor terminal voltage) which is less than 9 seconds at the voltage level resulting after the plant modifications previously described are completed. As stated previously, the Appendix K analysis assumes the time available to start and accelerate the CS pumps from the offsite sources is 59 seconds. Taking into account the above equipment operational time requirements, the CS timer setting must be less than 47 seconds (59 seconds minus 3 seconds for detection and a maximum of 9 seconds for acceleration). Thus, the 13 and 23 second timer settings proposed by this Application are within the analyzed condition.

For Change Request (2), Licensee has similarly concluded that the proposed increases in RHR pump timer settings are in accordance with the Appendix K analysis. Success of the low pressure coolant injection (LPCI) mode of the RHR system requires three factors: 1) pump ready for rated flow, 2) injection valve open to permit full flow a' , 3) full closure of the recirculation discharge valve. The limiting Appendix K scenario for LPCI is a

100% break in the reactor recirculation suction line. Under this scenario, 57 seconds are available for the RHR pumps to start and accelerate to rated speed. The 57 seconds are derived from the time to reach the low pressure permissive to close the reactor recirculation discharge valve (30 seconds to 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 that the RHR pump acceleration time is 3.1 seconds at the worst case voltage level pumping into an operating system. Taking into account the sensor and acceleration delays, the RHR timer setting must be less than 50.9 seconds (57 seconds minus 3 seconds for detection and 3.1 seconds for acceleration). Thus, the 2 and 8 second timer settings proposed by this Application are within the analyzed condition.

Neither Change Request involves additional loading onto the DC system. The RHR pumps and CS pumps are presently equipped with either auxiliary or time delay relays. The existing relays for the B and D CS pumps and the A and B RHR pumps must be replaced to accommodate the proposed setting of 23 seconds and 2 seconds respectively. The power consumption of both the existing and replacement relays is 6 watts each. Therefore, no additional load is incurred by these relays.

All replacement and additional relays resulting from Change Requests (1) and (2) 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 environmental and seismic qualification.

Change Request (3) is proposed to the Unit 3 Technical Specifications only to delete a footnote which is no longer required since the modification associated with the ADS bypass timer (Modification 633) was completed for Unit 3 on February 24, 1986. Removing the footnote will eliminate the need to check the status of the modification to determine the applicability of the specification. Licensee proposes this administrative change to enhance safety by reducing the effort required to interpret the specification.

Licensee concludes that the proposed revised loading sequence will ensure adequate voltage for motor acceleration during a design basis accident with only one offsite power source available, and the proposed changes do not adversely affect the existing Appendix K analysis or DC power system reliability.

No Significant Hazards Consideration - Category B:

(1) The proposed Category B changes do not involve a significant increase in the probability or consequences of any accident previously evaluated.

The Category B changes are proposed to ensure the validity of the existing accident analyses; specifically, a design basis LOCA with offsite power available. Revising the timer settings for the RHR and CS pumps will improve the voltage at the 480V levels

during a motor acceleration transient and also prevents spurious transfer of the 4.16kV buses to the diesel generators in the event of a safety injection while operating with only one off-site power source available. Therefore, the proposed changes do not increase the probability or consequences of an accident previously evaluated.

(2) The proposed Category B changes do not create the possibility of a new or different kind of accident from any previously evaluated.

The proposed changes to the CS and RHR systems only involve changes to load sequencing when offsite power is available. The proposed changes do not involve the CS or RHR system piping configurations, pumps, valves or system redundancies. The replacement timers required for the proposed load sequencing equal or exceed the ratings for the existing timers, and do not affect the environmental or seismic qualification of the panels in which they will be installed. Failure of any timer can only affect one redundant train of equipment. Therefore, the possibility of a new or different kind of accident is not created.

(3) The proposed Category B changes do not result in a significant reduction in a margin of safety.

The proposed changes do not adversely affect the safety margin assumed in the 10 CFR Appendix K analysis for ensuring fuel integrity for the entire spectrum of postulated LOCA s. The limiting Appendix K scenario for core spray requires the CS pumps to be at rated flow 59 seconds after a LOCA to ensure the existing margin of safety. Under the proposed changes, the latest that the CS pumps will achieve rated flow is 35 seconds (3 seconds for detection of the LOCA plus 23 seconds for the longer of the CS timer delays plus a maximum of 9 seconds for motor acceleration). The limiting Appendix K scenario for the low pressure coolant injection mode of residual heat removal requires the RHR pumps to be at rated flow 57 seconds after a LOCA to ensure the existing margin of safety. Under the proposed changes, the latest that the RHR pumps will achieve rated flow is 14.1 seconds (3 seconds for detection of the LOCA plus 8 seconds for the longer of the RHR timer delays plus 3.1 seconds for motor acceleration). Therefore, although the Category B changes delay the availability of the CS and RHR pumps at rated flow, they do not result in a significant reduction in the margin of safety for core coolant delivery.

Environmental Impact Assessment

These proposed amendments revise the settings on the 4.16kV bus relays and revise the loading sequence for a safety

injection signal with offsite power available. The Licensee has determined that these amendments involve no increase in the amounts and no change in the types of any effluents that may be released offsite, and has also determined that there is no increase in the individual or cumulative occupational exposure. Therefore, there is no environmental consideration involved and consequently an environmental report is not submitted.

Conclusion:

The proposed changes were analyzed to determine how they would affect the accident analyses contained in Section 14 of the PBAPS Updated Final Safety Analysis Report. In addition, a determination of No Significant Hazards Consideration was completed.

The Plant Operations Review Committee and the Nuclear Review Board have reviewed these proposed changes to the Technical Specifications and have concluded that they do not involve significant hazards considerations or an environmental consideration and will not endanger the health and safety of the public.

Licensee requests that the proposed changes be effective upon completion of Modifications 2564 and 5002.

Respectfully submitted,
PHILADELPHIA ELECTRIC COMPANY

J. W. Gallagher
Vice President

COMMONWEALTH OF PENNSYLVANIA :

: ss.

COUNTY OF PHILADELPHIA :

J. W. Gallagher, being first duly sworn, deposes and says:

That he is Vice President of Philadelphia Electric Company, the Applicant herein; that he has read the foregoing Application for Amendment of Facility Operating Licenses, and knows the contents thereof; and that the statements and matters set forth therein are true and correct to the best of his knowledge, information and belief.

J. W. Gallagher

Vice President

Subscribed and sworn to
before me this 30TH day
of August, 1988

Judith Y. Franklin

Notary Public

JUDITH Y. FRANKLIN
Notary Public, Phila., Phila. Co.
My Commission Expires July 28, 1991