UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION SUPPORTING

AMENDMENT NO. 107 TO FACILITY OPERATING LICENSE NO. DPR-56

PHILADELPHIA ELECTRIC COMPANY
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
DELMARVA POWER AND LIGHT COMPANY
ATLANTIC CITY ELECTRIC COMPANY

PEACH BOTTOM ATOMIC POWER STATION, UNIT NO. 3

DOCKET NO. 50-278

1. INTRODUCTION

By Reference 1, Philadelphia Electric Company, et al. (the licensee) proposed Technical Specification changes for Peach Bottom Unit No. 3, Cycle 6 operation. The submittal proposes a revision to the Technical Specifications to allow operation in the region of the operating map bounded by the constant recirculation pump speed line between 100% power, 105% core flow and 70% power, 110% core flow with or without the last-stage feedwater heater valves out of service. The purpose of the Technical Specification changes is to improve operating flexibility during Cycle 6 operation. The evaluation of the related safety analysis in Reference 2 is discussed below.

In the core-related areas of fuel design and safety analysis, thermal-hydraulic design and safety analysis, nuclear design including power distributions and reactivity analyses as well as safety analyses of postulated BWR accidents and transients, the licensee has relied on the results presented in the approved General Electric (GE) topical report NEDE-24011, "General Electric Standard Application for Reactor Fuel", or GESTAR-II (Ref. 3).

In addition, the licensee submitted a supplemental licensing document (Ref. 2) which provides results of analyses necessary to justify Cycle 6 operation but not included in GESTAR-II.

2. DISCUSSION AND EVALUATION

THERMAL-HYDRAULIC DESIGN

The objective of the review is to confirm that the thermal-hydraulic design of the reactor core has been accomplished using acceptable methods, to provide an acceptable margin of safety from conditions which could lead to fuel damage during normal operation and anticipated transients, and to confirm that the core is not susceptible to thermal-hydraulic instability.

The review included the following subjects: (1) safety limit minimum critical power ratio (MCPR), (2) operating limit minimum critical power ratio (OLMCPR) and (3) thermal-hydraulic stability.

2.1. Safety Limit MCPR

A safety limit MCPR has been imposed to assure that 99.9% of the fuel rods in the core will not experience boiling transition during normal operation and anticipated operational transients. As stated in Reference 3, the approved safety limit MCPR is 1.07. We have confirmed that a safety limit of 1.07 was used for the Cycle 6 analyses.

2.2. Operating Limit MCPR (OLMCPR)

To assure that the fuel cladding integrity safety limit MCPR will not be violated during any abnormal transient, the most limiting events have been reanalyzed for this cycle (Ref. 2) by the licensee in order to determine which event results in the largest reduction in the minimum critical power ratio. The operating limits were then determined by adding the largest reduction and uncertainties associated with the calculational methods in the minimum critical power ratio to the safety limit MCPR.

We find that since approved methods (Ref. 3) were used and the results show an acceptable margin of safety from conditions which could lead to fuel damage during any anticipated operational transient, the thermal-hydraulic design is acceptable for operation with increased core flows and decreased feedwater temperature during the remainder of Cycle 6. The Technical Specification changes in Table 3.5.K.2 and Figure 3.5.K.2 for the operating MCPR limits are also acceptable since they are consistent with the results of the safety analysis in Reference 2.

2.3 Thermal-Hydraulic Stability

GE recently presented the NRC staff with stability test data which demonstrated the occurrence of limit cycle neutron flux oscillations at natural circulation and several percent above the rated rod line.

The oscillations were observable on the average power range monitors (APRMs) and were suppressed with control rod insertion. It was predicted that limit cycle oscillations would occur at the operating condition tested; however, the characteristics of the observed oscillations were different than those previously observed during other stability tests. Namely, the test data show that some local power range monitor (LPRM) indications oscillated out of phase with the APRM signal and at an amplitude as great as six times the core average. GE has prepared and released a service information letter, SIL-380, to alert the BWR owners of these new data and to recommend actions to avoid and control abnormal neutron flux oscillations.

The licensee submitted the results of the thermal-hydraulic stability analysis (Ref. 2) and showed that the maximum calculated decay ratio is 0.95 for Cycle 6 operation with increased core flow and decreased feedwater temperatures, as compared to 0.87 for the

present operating core conditions. The increase of decay ratio shows that the proposed mode of operation has a less thermal-hydraulically stable core, which is due to the increase of inlet subcooling caused by increasing core flow and decreasing feedwater temperature. As a result of our review, we requested the licensee to change the proposed Technical Specifications to be consistent with GE's recommendations in SIL-380 for protection against the potential for thermal-hydraulic instability, including a Technical Specification which will restrict operation in regions of potential instability and/or provide for surveillance and corrective action under conditions of marginal stability.

In response, the licensee has proposed changes (Ref. 4 and 5) to Peach Bottom Unit No. 3 Technical Specification 3/4.6.F. The principal changes to the Technical Specifications are the following:

1. The surveillance requirements and corrective action for the neutron flux noise

   When in two loop operation at total core flow less than 45% of rated core flow and thermal power greater than a specific limit, or in single loop operation at thermal power greater than a specific limit or at total flow less than 45% of rated core flow with thermal power greater than 35% of rated thermal power, the APRM and LPRM noise levels will be determined at specific intervals. If the APRM or LPRM neutron flux noise levels are greater than three times their established baseline levels, restore the noise level to within the required limits within 2 hours, or reduce thermal power to bring the reactor to the hot shutdown condition within 12 hours.

2. The surveillance requirements and corrective action for the core plate differential pressure noise

   When in single loop operation at total core flow rate greater than 45% of rated core flow, the core plate differential pressure noise level will be determined at a specific frequency. If the noise level is greater than 1 psi and 1.5 times the established baseline level, the noise level must be restored to within the required limits within 2 hours or core flow must be reduced to less than 45% of rated core flow.

3. The restrictions for the operation with no recirculation pumps operable

   When no recirculation pumps are in operation, the operator immediately initiates action to reduce thermal power to less than or equal to a specific limit. If a recirculation loop cannot be returned to service, the licensee will initiate measures to put the unit in Hot Shutdown within 12 hours. We have reviewed these proposed Technical Specifications and have found that they adequately restrict operation in regions of potential instability and provide for surveillance and corrective action under conditions of marginal stability. We therefore have concluded that the proposed Technical Specifications acceptably resolve the thermal-hydraulic stability concern for Peach Bottom Unit No. 3.

The basis for our review is described above. We conclude that the proposed changes to OLMCPR are acceptable for operation with increased core flows and increased feedwater temperatures during the remainder of Cycle 6 without undue risk to the health and safety of the public. This conclusion is based on the fact that acceptable methods and procedures were used to establish the operating MCPR limits for the remainder of Cycle 6 operation and that the Technical Specifications regarding OLMCPR have been correctly based on the results of that analysis. We also conclude that the Technical Specifications regarding stability are acceptable since they are prudent and adequately resolve our thermal-hydraulic stability concerns.

3. ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. We have determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4. CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Dated: December 3, 1984

The following NRC personnel have contributed to this Safety Evaluation: S. Sun and G. Schwenk

REFERENCES

1. A letter from E. Bradley (Philadephia Electric Company) to H. Denton (NRC), dated May 30, 1984.

2. NEDC-30519, "Safety Review of Peach Bottom Atomic Power Station, Unit No. 3, at Core Flow Conditions above Rated Flow Throughout Cycle 6", dated March 1984.

3. NEDE-24011-P-A-6, "General Electric Boiling Water Reactor Generic Reload Fuel Applications", dated April 1983.

4. A letter from E. Bradley (Philadelphia Electric Company) to H. Denton (NRC), dated August 24, 1984.

4. A letter from E. Bradley (Philadelphia Electric Company) to H. Denton (NRC), dated September 27, 1984.