



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NOS. 186 AND 191 TO FACILITY OPERATING

LICENSE NOS. DPR-44 and 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 NOS. 2 AND 3

DOCKET NOS. 50-277 AND 50-278

1.0 INTRODUCTION

By letter dated May 21, 1992, Philadelphia Electric Company (PECO), Public Service Electric and Gas Company, Delmarva Power and Light Company and Atlantic City Electric Company (the licensees) submitted a request for changes to the Peach Bottom Atomic Power Station (PBAPS), Unit Nos. 2 and 3, Operating Licenses (OL). The requested changes extend the Operating License expiration date for Unit 2 from January 31, 2008 to August 8, 2013, and for Unit 3 from January 31, 2008 to July 2, 2014. The original expiration date, January 31, 2008, is 40 years from the date of issuance of the Construction Permit for both units. The revised dates are 40 years from the date of issuance of the respective Operating License (August 8, 1973 for Unit 2 and July 2, 1974 for Unit 3).

2.0 DISCUSSION

Title 10 CFR Part 50.51 specifies that each license will be issued for a fixed period of time not to exceed 40 years from the date of issuance. In addition, 10 CFR Part 50.57 allows the issuance of an operating license, pursuant to 10 CFR Part 50.56, for the full term specified in 10 CFR Part 50.51 in conformity with the Construction Permit (CP), and when other provisions of 10 CFR Part 50.57 are met. The current term of the license for PBAPS Units 2 and 3, is 40 years commencing with the issuance of the CP on January 31, 1968. This results in an effective operating life of 34 years 6 months for Unit 2 and 33 years 7 months for Unit 3. Consistent with Section 50.51 of the Commission's regulations, the licensee has requested an extension of the OL term for PBAPS Units 2 and 3 such that the fixed period of the license would be 40 years from the issuance of the OL.

Current NRC policy is to issue operating licenses for a 40-year term, commencing with the date of issuance of the OL. For PBAPS Units 2 and 3, the dates of issuance of the OL were August 8, 1973 and July 2, 1974, respectively. Thus a 40 year term would change the expiration date from January 31, 2008, for Units 2 and 3, to August 8, 2013 for Unit 2 and July 2, 2014 for Unit 3.

The licensee's request for extension of the operating license is based, in part, on the fact that a 40-year service life was considered during the design and construction of the plants. Although this does not mean that some components will not wear out during the plant's lifetime, design features were incorporated which provide for the inspectability of structures, systems and equipment. Surveillance, inspectability and maintenance practices which were implemented in accordance with the American Society of Mechanical Engineers (ASME) Code for Inservice Inspection and Inservice Testing of Pumps and Valves and the facility Technical Specifications provide assurance that any unexpected degradation in plant equipment will be identified and corrected. The specific provisions and requirements for ASME Code testing are set forth in 10 CFR 50.55a.

### 3.0 EVALUATION

The NRC staff has evaluated the safety issues associated with the issuance of the proposed license amendment which would allow approximately 5½ years and 6½ years of additional plant operation respectively. The issues addressed during the staff's review include the radiological impact on the licensee's operating staff, impacts on the off-site population and the effect of general aging of plant structures and equipment.

The impact of additional radiation exposure to the facility's operating staff and the impact on the general population in the vicinity of the Peach Bottom Atomic Power Station are addressed in the NRC staff's Environmental Assessment dated January 24, 1994. The NRC concluded in the Environmental Assessment that the environmental impacts associated with extending the duration of the operating licenses by the amounts requested by the licensee are not significantly different from those previously assessed in the staff's April 1973 Final Environmental Statement and are acceptable. The impact of the aging of plant structures and equipment are addressed in the following paragraphs.

#### 3.1 Reactor Pressure Vessel

The Peach Bottom reactor pressure vessels have been designed and fabricated to meet the requirements of the ASME Boiler and Pressure Vessel Code, Section III, through the 1965 Winter Addendum for Unit 2 and the 1966 Summer Addendum for Unit 3.

The vessel is designed for a useful operational life of 40 years and is built to withstand expected operational and thermal transients. In addition, the design considered working space and access to allow for inspections based on the intent of Section XI of the ASME Boiler and Pressure Vessel Code.

The Updated Final Safety Analysis Report (UFSAR), Revision 11, for PBAPS, Units 2 and 3, dated June 29, 1993, states that the reactor vessel is designed for a 40-year life and will not be exposed to more than  $10^{19}$  nvt of neutrons with energies exceeding 1 Mev. This vessel design is conservative since the maximum calculated fluence at the end of 40 years at 100 percent power,

i.e., 40 effective full-power years (EFPY), will not exceed  $3.8 \times 10^{17}$  nvt. At the conclusion of cycle 8 (January 12, 1991 for Unit 2; September 13, 1991 for Unit 3) each unit had experienced less than 9 EFPY. Thus, projected operation of Units 2 and 3 through the additional years of the proposed construction recapture will result in a neutron flux which is considerably lower than that anticipated in the original design (which assumed 40 EFPY).

One of the principal obstacles for maintaining structural integrity of the reactor vessel and its internals is the problems associated with radiation-induced changes in vessel material properties. Over the operating life of a reactor vessel, ferric materials exposed to high neutron bombardment will undergo a decrease in fracture toughness. The decline in fracture toughness is of major importance as it diminishes a material's ability to resist brittle or ductile fracture. Licensees are required to both monitor the embrittlement of reactor vessel beltline materials and adjust the operational conditions in order to maintain a sufficient safety margin for the prevention of brittle failure of the reactor vessel and its internals.

Fracture toughness requirements for reactor vessel beltline materials are established in Appendix G of 10 CFR Part 50. Appendix H to Part 50 requires each licensee to have a program which can effectively monitor the radiation-induced changes in vessel material fracture toughness. The first of three surveillance capsules was removed from each unit at PBAPS at the end of cycle 7. These specimens from Units 2 and 3 were tested in 1988 and 1989, respectively, to assess the degree of embrittlement for materials in each reactor vessel. Utilizing the test data and the procedures of Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," reactor pressure-temperature operational limits were revised. The new pressure-temperature limits became effective October 25, 1989 and June 27, 1991 for Units 2 and 3, respectively, and are valid through 32 EFPY. Continued monitoring of reactor vessel material fracture toughness as required by Appendix H of 10 CFR Part 50 and the subsequent revision of plant operational limits will ensure that a safe margin is maintained for the prevention of problems associated with brittle fracture failure.

Additionally, the NRC staff is currently evaluating the licensee's July 10, 1992, submittal in response to Generic Letter 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)." The staff's review will address the licensee's adherence to 10 CFR Parts 50.60 and 50.61 (which are associated with the problem of radiation embrittlement of reactor vessel materials). In addition, the staff will also verify the licensee's commitments made in response to Generic Letter 88-01, "NRC Position on [Intergranular Stress Corrosion Cracking] IGSCC in BWR Austenitic Stainless Steel Piping." Any NRC findings indicating noncompliance with the above will be forwarded by the NRC staff to the licensee so appropriate corrective measures can be taken.

The reactor vessels used at PBAPS are designed to withstand a variety of transient and cyclic loads which occur throughout the operational life of the plant. The licensee is required by plant Technical Specification 6.10.2 to

record the transients listed in UFSAR, Section 4.0, Table 4.2.4 (these transients impose cyclic loads on the reactor vessel). NRC inspection reports 50-277/93-18 and 50-278/93-18 documented the licensee's program for tracking and analyzing cyclic transients. The staff found certain weaknesses in the licensee's program for maintaining a current accounting of the various transient cycles. These weaknesses had been first identified in inspection reports 50-277/90-14 and 50-278/90-14. The licensee responded to the 50-277/93-18 and 50-278/93-18 inspection reports in a December 3, 1993 letter. Region I staff accepted the licensee's response in a January 27, 1994 letter. Since the licensee has adequately addressed this issue, the corresponding unresoloved item number has been closed by the NRC's inspectors. Therefore, the staff concludes that the licensee will be able to adequately record the UFSAR Table 4.2.4 transients and thereby ensure that the number of transients do not exceed the design basis limits.

### 3.2 Reactor Containment Structure

The primary containment structures for PBAPS, Units 2 and 3 were designed, fabricated and tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Subsection B (1965), with applicable addenda effective as of April 1967. The licensee periodically performs integrated leakage testing (Type A testing) of the containment in accordance with Appendix J of 10 CFR Part 50, as required by plant Technical Specifications. Periodic surveillance testing by the licensee will allow for detection of degradation of the safety-related functions of the containment structure. The proposed construction recapture for the licenses for PBAPS Units 2 and 3 will not adversely affect the licensee's ability to detect and repair a degrading condition of the containment structure.

### 3.3 Mechanical Equipment

Surveillance, maintenance, and testing requirements for mechanical equipment are in place to verify operability or detect degradation and ensure that equipment that does degrade is replaced or corrective action is taken. In addition, subcomponents such as nonmetallics (gaskets, O-rings, etc.) are inspected and replaced, as necessary, as part of routine maintenance in order to ensure the design life of the equipment. Surveillance, inspection and testing requirements at PBAPS include the following:

1. ASME Code Section XI Equipment that is ASME Code Class 1, 2 or 3 is subject to the Inservice Inspection and Inservice Testing (IST) requirements of ASME Code Section XI and 10 CFR 50.55a (except for code requirements from which the licensee has received relief). This testing includes hydrostatic and leakage testing of the reactor coolant pressure boundary, inspections of a representative sample of pressure retaining welds, inservice performance testing of pumps and valves and inservice testing of certain supports. These requirements apply throughout the operating life of a facility and will provide reasonable assurance that mechanical components will be properly monitored throughout the operating life.

2. Technical Specifications Equipment covered by technical specifications is subject to the surveillance and testing requirements of the applicable technical specifications, with specified testing and surveillance intervals. These surveillance requirements include calibration and inspection of systems and components to ensure that operation of the plant will remain in accordance with the Limiting Conditions for Operation, as well as requirements for maintaining the structural integrity of reactor coolant system components.
3. 10 CFR Part 50, Appendix J Equipment and components associated with containment penetrations, including containment isolation valves, are subject to leak rate testing (Type B and C) of penetrations to verify containment integrity.

From our evaluation we conclude that compliance with the codes, standards, and regulatory requirements to which the mechanical equipment for PBAPS were originally analyzed, constructed, tested, and inspected provide adequate assurance that the structural integrity of components important to safety will be maintained during the additional periods authorized by this amendment. Any significant degradation by an active mechanism would be discovered and the mechanical equipment or component restored to an acceptable condition.

#### 3.4 Electrical Components

The licensee has a program for the environmental qualification (EQ) of safety-related electrical equipment in place. As noted in an October 18, 1984, Safety Evaluation and NRC Inspection Report Nos. 50-277/87-18 and 50-278/87-18 dated October 28, 1987, the staff has evaluated the licensee's EQ program. In these reports, the staff concluded that the licensee's EQ program is in compliance with 10 CFR 50.49. This rule requires that environmental qualification include a natural or artificial (i.e., accelerated) aging test. Therefore, the EQ program the licensee has in place should ensure that electrical equipment important to safety will perform its safety function regardless of the term of the license.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendments. The State official had no comments.

#### 5.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact have been prepared and published (59 FR 5213) in the FEDERAL REGISTER on February 3, 1994. Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of the amendments will not have a significant impact on the quality of the human environment.

## 6.0 CONCLUSION

The Commission has 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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