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PHILADELPHIA ELECTRIC COMPANY

NUCLEAR GROUP HEADQUARTERS

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July 12, 1989

Docket No. 50-171

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Peach Bottom Atomic Power Station, Unit 1
NRC Request for Information

REFERENCE: 1) Correspondence dated September 7, 1988
P. B. Erickson, NRC, to W. M. Alden, PECo

2) Correspondence dated November 15, 1988
J. W. Gallagher, PECo, to P. B. Erickson, NRC

3) Peach Bottom Atomic Power Station, Unit 1
License Amendment Application filed March 4, 1987

4) Correspondence dated December 16, 1988,
J. W. Gallagher, PECo to NRC

Dear Sirs:

This letter provides a response to a request for information received from the NRC in reference correspondence (1) regarding the March 4, 1987 License Amendment Application (reference 3). The Application proposes a 40 year extension of the expiration date for the Peach Bottom Unit 1 possession only license. Referenced correspondence (4) responded to requests for information except for the second part of request 1 in the NRC's letter. This request and our response are stated below.

Request

With respect to water entry, the licensee should provide an analysis of the below ground structures with respect to a loss of

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integrity through metal corrosion or other mechanisms. Is a cathodic protection system needed and is one maintained to reduce the likelihood of corrosion? If so, specify the operating and maintenance requirements for the system.

Response

The Peach Bottom Unit 1 containment vessel represents the only exclusion area below ground structure subject to possible corrosion.

During the original construction of Unit 1, excavation was made to clean sound rock. Ground water levels were controlled to below the level of excavation and lean concrete was placed on top of the sound rock. The steel containment shell was set and concrete was placed to support the liner. The minimum depth of concrete between the liner and the rock is 1 foot with the depth in most places being approximately 3 feet. Water stops are located at concrete construction joints above elevation 110' - 6", to prevent water instrusion. Concrete was also placed inside the curved liner bottom to create a bottom floor. A drainage sump is located in the floor and is inspected on a regular basis.

As an additional measure, a ground level interceptor moat surrounds the containment liner to trap and remove surface water runoff trying to seep between the liner and the concrete foundation. This moat is covered to minimize the amount of water accumulated from rain and snow.

When Peach Bottom Unit 1 was designed and constructed in the early 1960s the mechanisms of corrosion were not as widely understood as they are today. The corrosion rate of steel in contact with concrete was generally assumed to be the same as for steel in contact with soil. Present day information shows that steel embedded in concrete corrodes at a much slower rate than steel in contact with soil. Because of the lack of information on the corrosion rates of steel in the 1960s, a cathodic protection system was installed for the Peach Bottom Unit 1 containment.

The existing cathodic protection system provides protective current to the containment liner as well as nearby underground piping. The effect of this system is measured by three zinc reference electrodes. The existing cathodic protection system is presently tested every six months. PECo plans to continue operating the rectifier to supply the currents, and the testing every six months to verify operation, as long as the system remains operational. However, if the system should fail, PECo does not plan to effect any major repairs to return the system to operation.

Cathodic protection of embedded steel (whether it is reinforcement bars or containment liners) in properly designed and

constructed structures is normally not required because of the protective properties of the concrete. In the akaline concrete environment, the steel quickly develops a passivating iron oxide film that prevents corrosion and makes additional protection unnecessary. High concentration of chloride or sulfates in the presence of oxygen and moisture may destroy the passivating film and initiate corrosion of the steel. However, the integrity of the protective film is assured by completely encasing the steel in good quality concrete that is dense, impermeable and of sufficient cover to resist intrusion of harmful corrosive elements. As long as the integrity of the concrete is maintained, corrosion of the embedded steel is generally prevented.

During initial plant construction in 1962, soil and water resistivity measurements were taken at various locations in the area of Unit 1. The resistivity of both the water and soil are relatively high indicating that aggressively corrosive soil conditions are not present at the site. Additional testing also shows that chloride and sulfate levels are relatively low indicating that the soil is not aggressively corrosive. This testing confirms that the two most harmful constituents to steel in concrete are present only in very low levels. If Unit 1 was built today, a cathodic protection system would not likely be supplied.

There are no other mechanisms for failure of the containment structure that would allow for water instrusion. The containment penetrations are located above ground except for three 2 inch pipe penetrations that exit at the 112 foot elevation, 4 feet below ground elevation. These pipes exit into a concrete enclosed cavity that isolates the pipes from the underground environment. The pipes were cut and capped several feet from the containment vessel during the decommissioning program. There are no degradable materials between the pipe cap and the containment vessel.

Conclusions

1. The design of Unit 1 makes it very difficult for ground water to even reach the exterior of the containment liner to start the corrosion process. The concrete layer between the rock and the containment liner serves as a barrier to prevent water migration to the liner shell.

2. The Cathodic protection system, installed in 1964, continues to provide cathodic protection current to the concrete reinforcing bars and containment liner shell. Zinc reference electrodes encased in the concrete during construction continue to indicate that cathodic protection potentials have been realized.

3. Based on the present understandings of various corrosion mechanisms, the steel containment liner at Peach Bottom

should not corrode under the present environmental conditions or any anticipated future conditions even without an operating cathodic protection system. Should the existing cathodic protection system fail, PECo does not plan to effect any major repairs to return it to operation.

4. Inspections of the containment drain sump will detect any collection of water, whether from ground water intrusion or other sources.

Very truly yours,

D. R. Helwig
Vice President
Nuclear Services Department

cc: W. T. Russell, Administrator, Region I, USNRC
P. B. Erickson, USNRC
T. P. Johnson, USNRC Senior Resident Inspector