

December 31, 1986

Docket No. 50-278

Mr. Edward G. Bauer, Jr.
Vice President and General Counsel
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

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Dear Mr. Bauer:

SUBJECT: PEACH BOTTOM UNIT 3 - MID-CYCLE EXAMINATION OF FIVE WELDS

By letter dated March 20, 1986, we issued Confirmatory Orders on actions you proposed to implement during the current Unit 3 fuel cycle as a result of several significant ultrasonic indications you found during inspection of the recirculation system piping. One of the items specified in the Orders requires a mid-cycle inspection of five welds.

The Confirmatory Order provides that the Director, Division of Boiling Water Reactor Licensing, may relax or terminate any of the provisions specified in the Order upon request from the licensee, if the request is timely and provides good cause for the requested action. By letter dated October 8, 1986, you requested that the Order be modified to allow continued operation until the end of the current fuel cycle (fall 1987) without a mid-cycle examination of the five welds. Your submittal, which was supplemented by letter dated December 22, 1986, described your programs for further improvements in water chemistry for Peach Bottom Units 2 and 3, committed to replace all IGSCC susceptible piping inside primary containment during the next Unit 3 refueling outage and provided other technical basis justifying continued operation without a mid-cycle inspection.

We have reviewed your request and have concluded that your request was timely and that you have provided good cause for not performing a mid-cycle inspection. Our Safety Evaluation supporting our evaluation is enclosed. Accordingly, I am terminating item 2 in the Confirmatory Order dated March 20, 1986 so as to not require a mid-cycle shutdown and inspection of the five welds. Item 1 of the Order, requiring more stringent leakage monitoring conditions

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than required in the BWR standard Technical Specifications remains in effect.
Your submittal of June 9, 1986 satisfactorily complied with item 3 in the Order.

Sincerely,

Original Signed By:
Robert M. Bernero

Robert M. Bernero, Director
Division of BWR Licensing

Enclosure:
as stated

cc w/enclosure:
See next page

*See Previous Concurrence

*DBL:PD#2
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DIR:DIV *RB*
RBernero
12/31/86

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Peach Bottom Atomic Power Station,
Units 2 and 3

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

ENCLOSURE 1

SAFETY EVALUATION PERTAINING TO
PECO'S RELIEF REQUEST REGARDING
THE MID-CYCLE INSPECTION AT PEACH BOTTOM UNIT 3

INTRODUCTION

During the Peach Bottom Unit 3 1986 refueling outage, crack-like ultrasonic indications were reported in 10 thermal sleeve attachment welds of recirculation inlet safe ends and 30 piping welds in recirculation (18) and RHR (12) systems. Twenty-two of those piping welds were reinforced by weld overlay. The others, including 10 recirculation inlet safe end welds and 8 piping welds were not repaired. PECO performed fracture mechanics analyses to justify continued service of those unrepaired welds. The staff has some concerns regarding PECO's fracture mechanics analyses, particularly regarding the crack growth evaluation where a plateau of crack growth rate was assumed in the calculation. To resolve the staff's concerns, Confirmatory Order was issued to PECO requesting the implementation of several actions during cycle 7 operation to ensure that cracks in those unrepaired welds were not growing excessively. One of the items specified in the Order required a mid-cycle inspection of three unrepaired piping welds (recirculation welds 2-AS-08 and 2-BD-12 and RHR welds 10-0-3) and two unrepaired recirculation PECO provided new field crack growth data in a submittal dated October 8, 1986, and requested a modification of the Confirmatory Orders to allow continued operation of Peach Bottom Unit 3 without performing a mid-cycle inspection. PECO's technical justification for not performing a mid-cycle examination was also presented to NRC staff in a meeting held on November 24, 1986 in Bethesda, Maryland. Subsequently, the staff requested additional information from PECO regarding their programs pertaining to the improvement of water chemistry, and their schedule to replace piping and safe-ends. PECO provided the additional information in a submittal dated December 22, 1986.

DISCUSSION

PECO recently introduced special programs in Peach Bottom Unit 3 to improve the plant water chemistry and also implemented the BWR Owners Group water chemistry guidelines. As a result, the water chemistry in Peach Bottom Unit 3 has been maintained most of the time in current cycle below 0.3 us/cm. PECO also indicated that further improvement in water chemistry in the remaining fuel cycle is possible because the sensitivity of the leak detection has recently been improved.

PECO indicated that all the piping and safe ends susceptible to intergranular stress corrosion cracking (IGSCC) are scheduled to be replaced during the upcoming refueling outage and, in addition, system for hydrogen water chemistry will also be installed to further improve the coolant water chemistry. The duration of the outage for such activity is expected to be about 48 weeks.

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The new field crack growth data provided by PECO was based on the test results from the crack arrest verification system (CAVS) installed in Peach Bottom Unit 3. General Electric Company developed the CAVS for on-site crack growth monitoring. The CAVS consists of three fracture mechanics specimens (two 316L and one sensitized 304 stainless steel pre-cracked specimens) enclosed in an autoclave that is attached to the plant recirculation system by a sample line. The crack growth rates measured from the CAVS specimens are significantly slower than that used by the staff in the crack growth calculation at least by a factor of five or more. PECO attributed the slow crack growth rate in the CAVS specimens to the improved water chemistry in the operation of Peach Bottom Unit 3 during the current cycle. PECO's fracture mechanics analysis utilized the slow crack growth rate derived from the CAVS specimens to justify the continued service of those unrepaired welds for a full 18-month cycle. However, we consider that PECO's analysis in taking the full credit of the limited CAVS test data for crack growth calculation is not conservative, because we have the following concerns regarding the CAVS test data: (1) because of heat to heat variations in the IGSCC resistance, the limited test results may not represent that of the materials used in the plant, and (2) the uncertainties in simulating the field geometry and environmental conditions in the IGSCC testing can not be accurately determined. Therefore, the staff normally relies on the use of a conservative bounding crack growth curve to envelope such uncertainties. In the staff's previous Safety Evaluation Report (SER), our conservative crack growth calculations had shown that the continued service of those unrepaired welds is acceptable for about nine months. However, by considering the improved water chemistry as demonstrated in the recent operation of Peach Bottom Unit 3, and PECO's commitments in further improving the water chemistry and replacing all the IGSCC susceptible piping and safe ends, we have determined that it is prudent to allow a factor of two credit in reducing the crack growth rate. Based on this limited reduction of the crack growth rate, our bounding crack growth calculations have shown that the final crack size at the end of the current fuel cycle (18 months) in those unrepaired welds would not exceed the ASME Code IWB-3640 limits and the staff acceptance criteria.

PECO also reported that an outage of 21-25 days may be required to perform the mid-cycle inspection of the five unrepaired welds. The replacement power costs for three weeks would be approximately seven million dollars, and the total personnel radiation exposure associated with the inspection is estimated to be about 34 man-rem. In view of PECO's commitment to replace all the IGSCC susceptible piping and safe ends during the upcoming refueling outage, we consider that the undue hardship as mentioned above resulting from the subject mid-cycle inspection is not justified, because there is no compensating increase in the level of safety.

CONCLUSION

Based on our review of PECO's submittals, we conclude that the operation of Peach Bottom Unit 3 throughout the current cycle without a mid-cycle inspection is acceptable, because we believe that excessive crack growth in those unrepaired welds beyond the Code allowable and staff acceptance criteria is not likely

to occur in the current fuel cycle if the improved water chemistry continues to be maintained. Furthermore, as PECO is committed to replace all the IGSCC susceptible piping and safe ends during the upcoming refueling outage, we consider the undue hardship in costs and the associated ALARA considerations as a result of performing the subject mid-cycle inspection is not warranted.

Principal Contributor: W. Koo