

## PEACH BOTTOM ATOMIC POWER STATION RECIRC PIPE DOSE RATES WITH ZINC INJECTION AND CONDENSER REPLACEMENT

6-3

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### SUMMARY

Peach Bottom Atomic Power Station (PBAPS) is located near the town of Delta, Pennsylvania, on the west bank of the Susquehanna River. It is situated approximately 20 miles south of Lancaster, Pennsylvania. The site contains two (2) boiling water reactors of General Electric design and each rated at 3,293 megawatts thermal. The units are BWR 4s and went commercial in 1977. There is also a decommissioned high temperature gas-cooled reactor on site, Unit 1.

PBAPS Unit 2 recirc pipe was replaced in 1985 and Unit 3 recirc pipes replaced in 1988 with 316 NGSS. The Unit 2 replacement pipe was electropolished, and the Unit 3 pipe was electropolished and passivated. The Unit 2 brass condenser was replaced with a Titanium condenser in the first quarter of 1991, and the Unit 3 condenser was replaced in the fourth quarter of 1991. The admiralty brass condensers were the source of natural zinc in both units. Zinc injection was initiated in Unit 2 in May 1991, and in Unit 3 in May 1992.

Contact dose rate measurements were made in standard locations on the 28-inch recirc suction and discharge lines to determine the effectiveness of zinc injection and to monitor radiation build-up in the pipe. Additionally, HPGe gamma scans were performed to determine the isotopic composition of the oxide layer inside the pipe. In particular, the specific activity ( $\mu\text{Ci}/\text{cm}^2$ ) of Co-60 and Zn-65 were analyzed.<sup>1</sup>

The results of the Unit 3 measurements after 2.8 effective full power years (EFPY) of operation on the new recirc pipe show dose rates higher than expected for zinc plants (164 mR/hr vs. 120 mR/hr projected). The latest measurement was made after running 1 cycle with a new Titanium condenser and zinc injection. On Unit 2 the latest dose rate measurements were made with 2.4 and 3.5 EFPY of operation with the 3.5 EFPY measurements post condenser replacement and zinc injection. Dose rates on the Unit 2 pipe continue to be in the typical zinc plant range (114 mR/hr average).

The Zn-65 and Co-60 specific activities on reactor recirc piping and concentrations in RWCU influent water are used to monitor zinc injection system impact on dose rates. Zinc is currently being injected at a rate of .15 ppb in feedwater (which is approximately 180-220 grams per week) to achieve 2-5 ppb in reactor water. This injection rate is based on the stable zinc concentrations present in feedwater prior to condenser replacement. GE recommends injecting zinc up to 0.6 ppb in feedwater for non-zinc plants (which correlates to around 5-10 ppb stable zinc in reactor water). PECO is investigating the optimum zinc injection rate in both Peach Bottom units to address the upward trend in dose rates on Unit 3.

<sup>1</sup> Data collection and analysis provided by Radiological & Chemical Technology, Inc., 1700 Wyatt Drive, Suite 16, Santa Clara, CA 95054.

## Authors' Biographies

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**Todd J. Jackson** is an Engineer in the Technical Services Branch of PECO Energy's Nuclear Generation group. He is responsible for coordinating radiation buildup and zinc injection effectiveness monitoring for Peach Bottom and Limerick stations. He was formerly the Chemistry Manager at Limerick station from 1988-93. Prior to joining PECO, he was Radiological Engineering Manager for Westinghouse Radiological Services and Hydro Nuclear Services. He began his career as a Radiation Specialist with the USNRC in Region I. He earned BS and MS degrees from Rensselaer Polytechnic Institute in biology and environmental engineering/radiological health.