

PEACH BOTTOM UNIT 2

Delta, PA

Owner: Philadelphia Electric Company

Outage dates (duration): April 28, 1984 to July 13, 1985 (1.2 years)

Reactor type: Boiling water reactor

Reactor age when outage began: 9.8 years

Commercial operations began: July 5, 1974

Fleet status: Second oldest of four reactors owned by the company

Synopsis

Workers shut down Peach Bottom Unit 2 in April 1984 for a scheduled extended outage to replace recirculation system piping. Similar problems had already necessitated extended outages at Nine Mile Point in New York, Browns Ferry in Alabama, and Pilgrim in Massachusetts. As operators attempted to restart the reactor in early July, other equipment problems surfaced that further extended the outage.

Process Changes

None.

Commentary

This extended outage exemplified the narrow focus of the nuclear power industry and NRC on hardware problems, overlooking the human elements of nuclear safety. In December 1984, during the middle of an outage intended to address a hardware problem, the Institute of Nuclear Power Operations (INPO) confronted Philadelphia Electric Company's (PECo) senior management with concerns about declining performance trends at Peach Bottom caused by poor safety culture. But as soon as the hardware problems were resolved to the NRC's satisfaction, PECO restarted the reactor without heeding INPO's warning about safety culture.

The merits of INPO's warning were demonstrated in March 1987 when the NRC ordered that both Peach Bottom reactors be shut down because operators were sleeping in the control room. Had the earlier extended outage on Unit 2 addressed both hardware and culture problems known to exist, the subsequent dual-unit extended outage would probably have been avoided.

NRC Systematic Assessment of Licensee Performance (SALP) History

Date	Operations	Radiological Controls	Maintenance	Surveillance Testing	Emergency Preparedness	Fire Protection	Security	Outage Management	Quality Assurance	Licensing	Training
07/1980	2	n/a	3	2	2	2	3	2	3	n/a	n/a
09/1981	2	2	2	1	2	3	2	1	2	n/a	n/a
10/1982	2	3	2	2	2	3	2	2	n/a	1	n/a
09/1983	2	3	2	3	1	3	1	2	n/a	2	n/a
05/1984	2	2	2	2	2	2	1	2	n/a	1	n/a
06/1985	2	3	1	2	2	2	3	1	n/a	1	n/a
06/1986	2	2	2	2	2	2	3	1	3	2	2
12/1987	n/a	2	2	2	2	3	2	n/a	n/a	2	n/a
	Operations	Radiological Controls	Maintenance/Surveillance Testing	Emergency Preparedness	Security	Engineering and Technology	Safety Assessment and Quality Verification				
12/1988	2	2	2	2	3	1	2				
02/1990	2	2	2	1	2	2	2				
10/1990	2	2	2	1	1	2	2				
	Operations	Maintenance	Engineering	Plant Support							
12/1991	2	2	2	2/1/1							
03/1993	2	2	2	2/1/1							
06/1994	1	2	2	2							
12/1995	1	1	2	1							

NOTE: A rating of 1 designated a superior level of performance where NRC attention may be reduced. A 2 rating designated a good level of performance with NRC attention at normal levels. A rating of 3 designated an acceptable level of performance where increased NRC attention may be appropriate.

Details

April 28, 1984: Operators manually shut down the reactor for a scheduled outage to replace recirculation system piping.¹

December 1984: INPO found clear evidence of declining performance at Peach Bottom and expressed concerns about corporate support, supervision, standards, and “culture” to PECO’s chief executive officer and chief operating officer.²

July 6, 1985: Following a year-plus outage to replace recirculation system piping, operators withdrew control rods and achieved reactor criticality. Shortly thereafter, two intermediate range monitors (IRMs) were found to be inoperable and operators shut down the reactor.³

July 7, 1985: Operators restarted the reactor and conducted startup testing.⁴

July 13, 1985: Unit 2 was connected to the electrical grid, ending the year-plus outage.⁵

July 18, 1985: Operators shut down the reactor due to high vibration of the main turbine. During this maintenance outage, workers also repaired the B reactor feedwater pump.⁶

July 19, 1985: Operators restarted the reactor.⁷

July 22, 1985: Operators shut down the reactor after identifying a leak from an instrument line on the C reactor feedwater pump.⁸

July 24, 1985: Operators restarted the reactor.⁹

July 30, 1985: Operators reduced the power level of the reactor after main steam line radiation levels increased following an injection of condensate system resin into the reactor vessel.¹⁰

July 31, 1985: Operators reduced the power level of the reactor so the A reactor feedwater pump could be removed from service for repairs to its turbine exhaust rupture disc.¹¹

August 2, 1985: The reactor achieved 100 percent power for the first time since the year-plus outage for recirculation system piping replacement.¹²

August 5, 1985: The reactor automatically scrammed during turbine control valve testing.¹³

August 7, 1985: Operators restarted the reactor, which automatically scrammed on an IRM reading of high flux.¹⁴

August 8, 1985: Operators restarted the reactor.¹⁵

August 12, 1985: Operators shut down the reactor when one emergency diesel generator and one loop of the residual heat removal system were determined to be inoperable at the same time.¹⁶

August 13-18, 1985: Operators restarted the reactor.¹⁷

August 19, 1985: Operators shut down the reactor when one emergency diesel generator and one loop of the residual heat removal system were again determined to be inoperable at the same time.¹⁸

August 20-25, 1985: Operators restarted the reactor.¹⁹

August 26, 1985: The reactor automatically scrammed when a worker returned a reactor pressure transmitter to service, generating a false high-pressure signal.²⁰

August 26-29, 1985: Operators restarted the reactor.²¹

Notes

- ¹ Ullrich, W.T. 1984. Peach Bottom Atomic Power Station monthly operating report. Letter to Nuclear Regulatory Commission, May 11. W.T. Ullrich was superintendent, nuclear generation division, at Philadelphia Electric Company.
- ² Pate, Z.T. 1988. Letter to Robert D. Harrison, chairman, special committee, Philadelphia Electric Company, January 11. Zack T. Pate was president of the Institute of Nuclear Power Operations. [Note: INPO reports are typically unavailable to the public, but PECO publicly submitted this report to the NRC by letter dated January 29, 1988, from John H. Austin to William T. Russell.]
- ³ Murley, T.E. 1986. Systematic assessment of licensee performance (SALP). Letter to S.L. Daltroff, vice president, electric production, Philadelphia Electric Company, June 6. Thomas E. Murley was a regional administrator at the Nuclear Regulatory Commission.
- ⁴ Ibid.
- ⁵ Ibid.
- ⁶ Ibid.
- ⁷ Ibid.
- ⁸ Ibid.
- ⁹ Ibid.
- ¹⁰ Ibid.
- ¹¹ Ibid.
- ¹² Ibid.
- ¹³ Ibid.
- ¹⁴ Ibid.
- ¹⁵ Ibid.
- ¹⁶ Ibid.
- ¹⁷ Ibid.
- ¹⁸ Ibid.
- ¹⁹ Ibid.
- ²⁰ Ibid.
- ²¹ Ibid.