

PILGRIM

Plymouth, MA

Owner: Boston Edison

Outage dates (duration): December 10, 1983 to December 30, 1984 (1.1 years)

Reactor type: Boiling water reactor

Reactor age when outage began: 11.0 years

Commercial operations began: December 1, 1972

Fleet status: Only reactor owned by the company

Synopsis

Pilgrim was shut down in December 1983 for a planned 10-month outage to replace cracked recirculation system piping. The original estimate proved slightly optimistic and it took just over a year to complete the piping replacement and restart the reactor.

Process Changes

None.

Commentary

This outage represents as close to a “no-fault” extended outage as can probably be achieved. The need for and ultimate length of this extended outage were driven by lessons learned from experiences at similar reactors rather than unexpected performance problems.

Only one thing prevents the “no-fault” label in this case. The piping that was replaced had been intended to last for the entire 40-year life of the plant, but it lasted little more than one-quarter as long. Both safety and economics would have been better served had more homework been done to ensure the material being used for such vital piping was better suited to this application.

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
04/1981	2	3	2	2	3	2	2	3	3	n/a	n/a
10/1981	3	2	3	2	1	2	2	2	3	n/a	n/a
11/1982	3	2	2	2	1	3	2	2	n/a	2	n/a
01/1984	2	2	2	1	1	1	2	n/a	n/a	1	n/a
12/1984	2	3	1	1	3	2	2	1	n/a	1	n/a
02/1986	3	3	2	2	3	n/a	2	1	n/a	1	n/a
06/1987	2	3	2	3	2	3	3	1	3	2	2
12/1988	2	3	2	2	2	2	2	n/a	2	2	2
	Operations	Radiological Controls	Maintenance/Surveillance Testing	Emergency Preparedness	Security	Engineering and Technology	Safety Assessment and Quality Verification				
12/1989	2	2	2	2	1	1	2				
11/1990	2	1	2	2	1	1	2				
01/1992	2	1	2	1	1	2	2				
08/1993	1	1	2	1	1	2	2				
	Operations		Maintenance	Engineering	Plant Support						
11/1994	1		2	1	1						
05/1996	2		2	1	2						

NOTE: A rating of 1 designates a superior level of performance where NRC attention may be reduced. A 2 rating designates a good level of performance with NRC attention at normal levels. A rating of 3 designates an acceptable level of performance where increased NRC attention may be appropriate. A rating of n/a was given in those areas that were not assessed on that date.

Details

December 17, 1973: The Atomic Energy Commission issued an order requiring Pilgrim to be shut down until fuel channel box damage could be repaired and the cause of that damage corrected.¹

December 1980: The NRC expended 1,950 hours of inspection effort at Pilgrim between January and December 1980.²

August 1981: The NRC expended 2,328 hours of inspection effort at Pilgrim between September 1980 and August 1981.³

April 1982: Boston Edison conducted a 10-year hydrostatic pressure test of the Class I piping systems, including the recirculation system piping, at Pilgrim.⁴

October 14, 1982: The NRC issued Bulletin 82-03 to all owners of boiling water reactors that were shut down or scheduled to be shut down by January 31, 1983 (including Pilgrim), requiring them to conduct inspections of recirculation system piping. This NRC action was taken in response to recirculation system cracking detected at the Monticello (Minnesota), Edwin I. Hatch Unit 1 (Georgia), Browns Ferry Unit 2 (Alabama), and Nine Mile Point Unit 1 (New York) reactors.⁵

June 1982: The NRC expended 3,735 hours of inspection effort at Pilgrim between September 1981 and June 1982.⁶

March 4, 1983: The NRC issued Bulletin 83-02 to all owners of boiling water reactors (including Pilgrim), requiring their facilities to be shut down no later than January 1, 1984, and inspected for signs of intragranular stress corrosion cracking in recirculation system piping.⁷

June 1983: The NRC expended 3,234 hours of inspection effort at Pilgrim between July 1982 and June 1983.⁸

June 1983: Boston Edison voluntarily shut Pilgrim down—twice—to determine that the source of leakage inside the drywell was not cracked recirculation system piping and/or welds.⁹

July 11, 1983: The NRC received a report that workers at Peach Bottom Unit 2 in Pennsylvania had identified cracks up to 85 percent of the way through the walls of recirculation system piping.¹⁰

July 12, 1983: The NRC received a report that workers at Browns Ferry Unit 1 had identified cracking in 50 percent of the recirculation piping areas examined.¹¹

July 14, 1983: NRC Director of the Office of Nuclear Reactor Regulation Harold R. Denton and Director of Engineering Richard Vollmer met with NRC commissioners and recommended that five boiling water reactors (BWR) be shut down immediately for inspections of their recirculation system piping. Denton had invited the BWR Owners Group and General Electric to make a presentation to the commissioners defending their position that the shutdowns were not necessary, but both declined. Commissioners James Asselstine and Victor Gilinsky and Chairman Nunzio Palladino expressed disappointment that industry representatives opted to remain silent.¹² The commissioners voted 4-0 to concur with the staff recommendation.¹³

July 14, 1983: The NRC ordered the owners of Pilgrim, Browns Ferry Unit 3, Dresden Unit 3 (Illinois), Quad Cities Unit 2 (Illinois), and Brunswick Unit 2 (North Carolina) to shut down their reactors within 30 days for inspections of recirculation system piping.¹⁴

July 15, 1983: NRC commissioners met with representatives of the nuclear industry who protested that the shutdown of five boiling water reactors for recirculation system piping would be too costly and disruptive. The commissioners voted 4-0 to rescind the previous day's order.¹⁵

July 21, 1983: The NRC required Boston Edison to submit information pursuant to 10 CFR 50.54(f) explaining why Pilgrim should continue to operate until inspections of recirculation system piping for intragranular stress corrosion cracking required by Bulletin 83-02 could be performed.¹⁶

August 4, 1983: Boston Edison responded in writing to the NRC's July 21 letter. Boston Edison supplemented this response with letters dated August 10 and August 22.¹⁷

August 8, 1983: The NRC met with Boston Edison regarding inspections of recirculation system piping at Pilgrim.¹⁸

August 26, 1983: The NRC issued an order requiring Boston Edison to shut down Pilgrim for recirculation system piping inspection on or before December 10, 1983, and to:

- monitor unidentified leakage inside the drywell every four hours and shut down the reactor upon indication of a two-gallon-per-minute increase in leak rate in any 24-hour period;
- restore the leak monitoring system to service within 24 hours should it become inoperable or shut down the reactor (the original licensing basis permitted this monitoring system to be out of service for up to seven days);
- visually examine recirculation system piping during each plant outage lasting 48 hours or longer; and
- restore all emergency core cooling systems and subsystems within 72 hours should they become inoperable or shut down the reactor.¹⁹

December 10, 1983: Pilgrim was shut down for inspections of recirculation system piping in accordance with the NRC order issued August 26.²⁰

February 14, 1984: After piping inspections confirmed intragranular stress corrosion cracking was present, Boston Edison elected to replace the recirculation system piping. The original schedule called for the work to be completed within a 10-month refueling outage.²¹

September 1984: The NRC expended 4,960 hours of inspection effort at Pilgrim between July 1983 and September 1984.²²

December 30, 1984: The reactor was connected to the electrical grid, ending the extended outage.²³

October 1985: The NRC expended 3,792 hours of inspection effort at Pilgrim between October 1984 and October 1985.²⁴

January 1987: The NRC expended 6,762 hours of inspection effort at Pilgrim between November 1985 and January 1987.²⁵

May 1988: The NRC expended 9,698 hours of inspection effort at Pilgrim between February 1987 and May 1988.²⁶

Notes

- ¹ Moore, V.A. 1973. Letter to James M. Carroll, vice president and general counsel, Boston Edison Company, December 17. Voss A. Moore was assistant director, directorate of licensing, at the Atomic Energy Commission.
- ² Collins, S.J. 1988. Pilgrim restart assessment panel meeting minutes. Memorandum to William T. Russell, regional administrator, Nuclear Regulatory Commission, August 15. Samuel J. Collins was deputy director of reactor projects at the Nuclear Regulatory Commission.
- ³ Ibid.
- ⁴ Vassallo, D.B. 1983. IGSCC inspection order confirming shutdown. Letter to William D. Harrington, senior vice president, nuclear, Boston Edison Company, August 26. Domenic B. Vassallo was chief of operating reactors branch #2 at the Nuclear Regulatory Commission.
- ⁵ Nuclear Regulatory Commission (NRC). 1983. *Report to Congress on abnormal occurrences: January to March 1983*. NUREG-0090, Vol. 6, No. 1, September. Washington, DC.
- ⁶ Collins, 1988.
- ⁷ NRC, 1983.
- ⁸ Collins, 1988.
- ⁹ Vassallo, 1983.
- ¹⁰ *New York Times*. 1983. Fast reversal by the NRC, July 28.
- ¹¹ *New York Times*, 1983.
- ¹² Branscome, J., and C. Brown. 1983. Margin of safety cited in NRC BWR shutdown order. *Inside NRC*, July 18.
- ¹³ *New York Times*, 1983.
- ¹⁴ Associated Press. 1983. NRC orders endangered nuclear plants to close. *Gettysburg Times*, July 15.
- ¹⁵ *New York Times*, 1983.
- ¹⁶ Vassallo, 1983.
- ¹⁷ Ibid.
- ¹⁸ Ibid.
- ¹⁹ Markey, Edward. 1986. Letter to Gerry Studds, member, United States House of Representatives, June 26. Edward Markey is a member of the United States House of Representatives.
- ²⁰ Harrington, W.D. 1984. December 1983 monthly report. Letter to the Nuclear Regulatory Commission, January 12. William D. Harrington was senior vice president, nuclear, at the Boston Edison Company.
- ²¹ Associated Press. 1984. Fixing pipes is nightmare for nukes. *Chronicle-Telegram*, February 14.
- ²² Collins, 1988.
- ²³ Harrington, W.D. 1985. December 1984 monthly report. Letter to the Nuclear Regulatory Commission, January 14. William D. Harrington was senior vice president, nuclear, at the Boston Edison Company.
- ²⁴ Collins, 1988.
- ²⁵ Ibid.
- ²⁶ Ibid.