

# CALVERT CLIFFS UNIT 2

---

*Lusby, MD*

**Owner:** Baltimore Gas & Electric

**Outage dates (duration):** March 17, 1989 to May 4, 1991 (2.1 years)

**Reactor type:** Pressurized water reactor

**Reactor age when outage began:** 12.0 years

**Commercial operations began:** April 1, 1977

**Fleet status:** Youngest of two reactors owned by the company

---

## Synopsis

During a scheduled refueling outage, leaking pressurizer heater sleeves were discovered. During the ensuing outage, the pressurizer heater sleeves were repaired. In addition, there were extensive management changes at the plant and more than 100 people were added as permanent staff.

## Process Changes

No significant changes to industry and NRC processes attributable to the Calvert Cliffs outages were discerned.

## Commentary

The Calvert Cliffs extended outages illustrate a recurring regulatory problem. The NRC's oversight process had flagged declining performance at Calvert Cliffs for months prior to the commencement of the extended outages, but was unable to really induce substantive changes in behavior and attitude until there was irrefutable equipment degradation. The NRC can determine a plant to be heading down the wrong road, but doesn't force a change in direction until it arrives at a bad destination.

## 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 |
|---------|------------|-----------------------|----------------------------------|------------------------|------------------------|-----------------|----------------------------|-------------------|--|-----------|----------|
| 12/1980 | 3          | 2                     | 3                                | 2                      | 2                      | 2               | 3                          | 2                 | 3  | n/a       | n/a      |
| 02/1983 | 2          | 1                     | 2                                | 1                      | 1                      | 1               | 2                          | 1                 | n/a  | 2         | n/a      |
| 02/1984 | 2          | 2                     | 3                                | 3                      | 2                      | 1               | 1                          | 2                 | n/a  | 2         | n/a      |
| 01/1985 | 1          | 1                     | 2                                | 2                      | 1                      | 1               | 1                          | 1                 | n/a  | 1         | n/a      |
| 07/1986 | 2          | 1                     | 2                                | 1                      | 1                      | n/a             | 1                          | 2                 | 2  | 1         | 2        |
| 03/1988 | 2          | 1                     | 2                                | 2                      | 2                      | n/a             | 1                          | 1                 | 2  | 2         | 2        |
|         | Operations | Radiological Controls | Maintenance/Surveillance Testing | Emergency Preparedness |                        | Security        | Engineering and Technology |                   | Safety Assessment and Quality Verification |           |          |
| 05/1989 | 2          | 1                     | 2                                | 2                      |                        | 1               | 2                          |                   | 3  |           |          |
| 06/1990 | 3          | 2                     | 3                                | 2                      |                        | 1               | 2                          |                   | 3  |           |          |
|         | Operations |                       | Maintenance                      | Engineering            |                        |                 | Plant Support              |                   |  |           |          |
| 06/1991 | 2          |                       | 2                                | 2                      |                        |                 | 2/2/1                      |                   |  |           |          |
| 08/1992 | 1          |                       | 2                                | 2                      |                        |                 | 1/2/1                      |                   |  |           |          |
| 11/1993 | 1          |                       | 2                                | 1                      |                        |                 | 2                          |                   |  |           |          |
| 07/1995 | 1          |                       | 2                                | 1                      |                        |                 | 2                          |                   |  |           |          |
| 01/1996 | 1          |                       | 1                                | 1                      |                        |                 | 2                          |                   |  |           |          |

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

*November 24, 1987:* The NRC staff informed the NRC chairman and commissioners that the International Atomic Energy Agency (IAEA) conducted an Operational Safety Review Team (OSART) inspection at Calvert Cliffs August 10–28, 1987. It was the 20th OSART inspection conducted by the IAEA and the first conducted at a U.S. nuclear power plant. The OSART at Calvert Cliffs concluded:

*“The overall impression was that the plant is above average, in the upper range of the nuclear power plants visited by OSART missions. The operational safety status is satisfactory and no shortcomings in equipment, personnel or operating practices were found that would compromise safe operation and reliable electricity generation. The OSART was impressed with the managerial approach, with the comprehensive personnel training and in particular with the emergency response planning, which was found to be outstanding compared with some other plants.... Maintenance is the area where major improvements could be made, not for safety reasons but for increased effectiveness. The work control system contains all essential elements but is too complicated, even confusing, and needs major streamlining to serve its purpose of reliable scheduling, proper support and close following up of all maintenance work.”<sup>1</sup>*

*September 15, 1988:* A worker drowns in a tank of water at the plant site. He had entered the tank to rescue another worker who fell unconscious due to nitrogen gas within the tank.<sup>2</sup>

*September 20, 1988:* The NRC proposed a \$150,000 fine to Baltimore Gas & Electric (BG&E) for violations stemming from two recent incidents at Calvert Cliffs that gave the NRC concern about the ability of the company to recognize and resolve safety problems. One incident occurred in June 1988 when an emergency diesel generator was inadvertently disabled for 48 hours after a test because its voltage regulator was not restored to the proper position. The second incident occurred when workers incorrectly calibrated reactor core power level instruments on Unit 1 during startup, causing them to read inaccurately for 12 hours.<sup>3</sup>

*December 21, 1988:* A year after been praised by the IAEA OSART, the NRC added both reactors at Calvert Cliffs to its Watch List. NRC Region I Administrator William Russell said that the positive OSART report “may have contributed to the complacency and overconfidence” at Calvert Cliffs that he identified as factors in the declining performance. Thomas Murley, director of the NRC’s Office of Nuclear Reactor Regulation, stated “I don’t think we should leave the impression that OSART misses things,” but because OSART members only spend three weeks at a site, weaknesses can be covered up by good behavior over that short period.<sup>4</sup>

*May 3, 1989:* Workers discovered leaking pressurizer heater sleeves on Unit 2.<sup>5</sup>

*May 5, 1989:* BG&E voluntarily shuts down Unit 1 to determine if it had leakage in the pressurizer system as recently discovered on Unit 2 during its refueling outage.<sup>6</sup>

*May 11, 1989:* The NRC met with BG&E officials in the Region I offices to discuss four violations identified at Calvert Cliffs by NRC inspectors in February and March of that year. BG&E spokesperson Dan W. Latham stated, “We don’t believe the violations are indicative of declining performance, but more of the intense scrutiny we are coming under because of being on the watch list.”<sup>7</sup>

*May 12, 1989:* BG&E decided to delay the July 1989 scheduled restart of Unit 1 to take pressure off workers and ensure everything was done safely.<sup>8</sup>

*May 18, 1989:* The NRC issued a report containing two apparent violations from its inspection conducted April 17–27, 1989, at Calvert Cliffs. During Unit 2 refueling, valves were left open on two occasions that rendered the containment not leak-tight as required. And during the last refueling outage on Unit 1, workers made an unauthorized modification to the refueling machine that increased the probability of a fuel handling accident.<sup>9</sup>

*May 25, 1989:* The *Washington Post* reported that a recent special NRC inspection at Calvert Cliffs determined that management “placed primary emphasis on power production, with less attention to the safety” and “Management at all levels had been ineffective at incorporating safety and quality into their activities.” BG&E Manager of Quality Assurance Robert E. Denton responded, “We have become complacent with the superlative record we’ve had.”<sup>10</sup>

*June 19, 1989:* The *Washington Post* reported that BG&E ordered a major overhaul of top management at Calvert Cliffs and that Wall Street firms had downgraded the company’s credit rating.<sup>11</sup>

*June 1989:* In a filing with the Maryland Public Service Commission in support of a \$120 million rate increase request, BG&E proposed to increase spending at Calvert Cliffs by nearly 37 percent over 1988 levels. Part of the added funding was earmarked for hiring 143 more workers, including 50 engineers, 23 control room and equipment operators, and 12 training specialists.<sup>12</sup>

*August 16, 1989:* NRC staff and BG&E officials briefed the NRC commissioners on the status of Calvert Cliffs.<sup>13</sup>

*August 1989:* BG&E told regulators and financiers that efforts to correct leaking tubes inside the pressurizers at Calvert Cliffs will likely cause them to remain shut down until 1990.<sup>14</sup>

*February 23, 1990:* The NRC issued Information Notice 90-10 to pressurized water reactor owners to alert them about the stress corrosion cracking of pressurizer heater sleeves and instrument nozzles experienced at Calvert Cliffs. The Information Notice reported that the problems had been identified during a visual inspection during the Unit 2 refueling outage when boric acid was found at the pressurizer heater penetrations and on an instrument nozzle.<sup>15</sup>

*April 11, 1990:* The NRC approved the limited restart of Unit 1 to allow BG&E to perform testing that could not be performed with the reactor shut down. Unit 1 operated for about 10 days before shutting down for more repairs.<sup>16</sup>

*October 4, 1990:* Unit 1 was connected to the electrical grid to end its extended outage.<sup>17</sup>

*May 4, 1991:* Unit 2 was connected to the electrical grid to end its extended outage. A few days later, operators manually shut down the reactor due to high vibration of the main turbine. The unit was re-connected to the electrical grid on May 13.<sup>18</sup>

## Notes

---

- <sup>1</sup> Denton, H.R. 1987. IAEA OSART report on Calvert Cliffs. Memo to the chairman and commissioners of the Nuclear Regulatory Commission, November 24. Harold R. Denton was director, governmental and public affairs at the Nuclear Regulatory Commission (NRC).
- <sup>2</sup> Bruske, E. 1989. Top managers replaced at troubled nuclear plant; critical government report is latest bad news for operators of Calvert Cliffs. *Washington Post*, June 19.
- <sup>3</sup> Baker, G. 1988. NRC fines BG&E \$150,000, cites safety problems at Calvert Cliffs. *Inside NRC*, September 26.
- <sup>4</sup> Jordan, B. 1989. Calvert Cliffs, praised by OSART in '87, is problem plant in '88. *Nucleonics Week*, January 5.
- <sup>5</sup> Associated Press. 1989a. Scientist criticizes nuke plant officials. *Frederick Post*, May 20.
- <sup>6</sup> Ibid.
- <sup>7</sup> Associated Press. 1989b. NRC report shows other citations at nuke plant. *Frederick Post*, May 17.
- <sup>8</sup> Ibid.
- <sup>9</sup> Associated Press, 1989a.
- <sup>10</sup> Leff, L. 1989. Calvert Cliffs puts production over safety, NRC says. *Washington Post*, May 25.
- <sup>11</sup> Bruske, 1989.
- <sup>12</sup> Pierpoint, J.B. 1989. BG&E to pour millions into Calvert Cliffs' reactor woes. *Baltimore Business Journal*, June 26.
- <sup>13</sup> Chilk, S.J. 1989. Staff requirements – briefing on status of Calvert Cliffs, 10:00 a.m., Wednesday, August 16, 1989, Commissioners' conference room, One White Flint North, Rockville, Maryland (open to public attendance). Memo to James M. Taylor, executive director for operations at the NRC, August 25. Samuel J. Chilk was secretary at the NRC.
- <sup>14</sup> Pierpoint, J.B. 1989. Leaks to idle Calvert Cliffs well into 1990, BG&E says. *Baltimore Business Journal*, August 21.
- <sup>15</sup> NRC. 1990. Primary water stress corrosion cracking (PWSCC) of Inconel 600, Information Notice No. 90-10, February 23. Washington, DC. February 23.
- <sup>16</sup> Bruske, E. 1990. Calvert Cliffs allowed to start one reactor. *Washington Post*, April 12.
- <sup>17</sup> Associated Press. 1990. Calvert Cliffs restarts one of two units. *Frederick Post*, October 5.
- <sup>18</sup> Zuercher, R. 1991. NRC gives Calvert Cliffs good marks as Unit 2 returns to service. *Inside NRC*, May 20.