

THREE MILE ISLAND UNIT 1

Middletown, PA

Owner: Metropolitan Edison (General Public Utilities) **Outage dates (duration):** February 17, 1979 to October 8, 1985 (6.6 years)

Reactor type: Pressurized water reactor **Reactor age when outage began:** 4.5 years

Commercial operations began: September 2, 1974 **Fleet status:** Second oldest of three reactors owned by the company

Synopsis

Unit 1 was nearing the end of a refueling outage when the Unit 2 accident occurred. As a result, General Public Utilities (GPU) was required to fully implement all of the short-term and long-term lessons learned from the Unit 2 accident prior to being allowed to restart Unit 1. In addition, GPU made extensive repairs to steam generator tubes at Unit 1 in order to remedy corrosion and cracking. In parallel, there were considerable legal challenges—rising clear to the U.S. Supreme Court—that had to be resolved prior to restart.

Process Changes

The Unit 1 outage did not result in tangible process changes by either the NRC or the nuclear power industry, but the Unit 2 accident that caused the extended Unit 1 outage changed more NRC and industry processes than any other event in the past 40 years.

The NRC reorganized and revamped its reactor oversight processes. Among the many process changes: introduction of the Systematic Assessment of Licensee Performance (SALP) process to formally evaluate integrated safety performance at each plant, expansion of the resident inspector program, creation of the Office for the Analysis and Evaluation of Operational Data (AEOD), expansion of the generic communications process, and increased civil penalties for regulatory violations.

The industry also undertook numerous process changes. Perhaps the most significant of these was the creation of the Institute for Nuclear Power Operations (INPO). Among other functions, INPO accredits operator training programs and periodically assesses performance at each nuclear plant.

Commentary

The Three Mile Island (TMI) Unit 1 extended outage may be the quintessential example of the NRC's arbitrary and capricious regulatory nature. The NRC required all of the short-term and long-term lessons learned from the TMI-2 accident to be implemented prior to allowing Unit 1 to restart. Yet, the NRC allowed all other nuclear power plants—including the Babcock & Wilcox (B&W) reactors that were sister plants to TMI-1 and TMI-2—to continue operating and implement the TMI-2 fixes when convenient during scheduled outages. If such disparate treatment were justified based on GPU's incompetence, than it doesn't explain why Oyster Creek, another reactor managed by GPU, was allowed to operate.

The TMI-2 accident prompted the NRC to develop its Systematic Assessment of Licensee Performance (SALP). Unit 1 was shut down when the NRC began using SALP and remained shut down throughout the entire duration of the first four SALP periods. For some unexplained reason, the NRC's SALPs for TMI-1 during this period of extended outage rated performance in the "operations" area, but did not rate performance in the "outage" area. It would have made more sense for the NRC to have evaluated outage performance than it did to evaluate operations, since an outage was in progress and operations were not.

What would it take for the NRC to revoke the operating license of a nuclear power reactor? The NRC allowed TMI-1 to restart despite the facts that its owner allowed a meltdown of its sister reactor, allowed extensive cheating on operator examinations administered after the meltdown, and made material false statements about TMI-1 equipment status to the NRC after the meltdown. When culpability for the worst nuclear plant accident in U.S. history combined with subsequent deliberate wrongdoing on the path to restarting that plant does not prompt the NRC to even consider revoking an operating license from a wayward owner, there's little reason for hope that the agency will be able to act on warning signs to prevent a similar—or larger—accident.

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
6/1/1981	2	2	2	2	n/a	2	2	n/a	2	n/a	n/a
1/1/1983	1	2	2	1	1	1	1	n/a	1	1	n/a
7/1/1984	2	1	1	1	1	1	1	n/a	1	2	n/a
4/1/1985	1	1	1	1	1	1	1	n/a	n/a	2	n/a
3/1/1986	2	1	2	1	n/a	n/a	n/a	n/a	1	n/a	n/a

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

January 8, 1979: NRC inspector J.C. Creswell wrote a memo to his management that stated:

*"There are some indications that other B&W plants may have problems maintaining level indication during transients. In addition, under certain conditions, such as loss of feedwater at 100 percent power... the pressurizer may void completely."*¹

February 17, 1979: Unit 1 was shut down for a scheduled refueling outage.²

March 28, 1979: Unit 2 experienced a partial meltdown of the reactor core.³ The reactor experienced a loss of feedwater from nearly 100 percent power and, unknown to the operators, the pressurizer completely voided.

April 27, 1979: NRC staff responded to an agency query about inspections conducted at TMI before the accident:

*“Our inspection approach has been aimed at assuring that the licensee has a functioning quality assurance—or management control—program that achieves a desired level of performance.”*⁴

June 11, 1979: GPU representatives met with NRC staff and estimated Unit 1 would be ready to restart on September 1, 1979.⁵

June 22, 1979: Pennsylvania Governor Richard Thornburgh wrote to NRC Chairman Joseph Hendrie opposing restart of Unit 1 until serious issues could be resolved.⁶

June 26, 1979: GPU Chairman William Kuhns wrote to Governor Richard Thornburgh in response to his June 22 letter to the NRC chairman and explained that restarting Unit 1 would save residential customers about six dollars a month on their electrical bills.⁷

July 2, 1979: The NRC ordered Metropolitan Edison to keep Unit 1 shut down until it could provide “reasonable assurance” that the reactor could be operated safely.⁸

July 20, 1979: The NRC suspended the operating license for Unit 2 and ordered GPU to maintain the reactor in a shut-down condition.⁹

August 9, 1979: The NRC established an Atomic Safety and Licensing Board (ASLB) to hold hearings to determine whether Unit 1 could be operated without endangering public health and safety.¹⁰

August 9, 1979: The NRC ordered GPU to maintain Unit 1 shut down until the ASLB proceeding and commission deliberations could be completed.¹¹

August 24, 1979: Kemeny Commission member Theodore Taylor questioned the NRC’s Harold Denton about nuclear safety and regulatory oversight:

Taylor: *“Do you think TMI-2 was safe in the weeks prior to the accident?”*

Denton: *“It was an unsafe operation.”*

Taylor: *“Was TMI-1 safe?”*

Denton: *“There’s no reason to suspect TMI-1 was safer than TMI-2.”*

Taylor: *“Were all Babcock & Wilcox plants being operated unsafe?”*

Denton: *“For short-term operations they are not unsafe.”*

Taylor: *“Is the present method of operating reactors unsafe? Are they unsafe today?”*

Denton: *“Not in my judgment. I don’t consider the plants unsafe. If I did, I’d have to force them to cease operating.”*¹²

September 5, 1979: Congressmen John D. Dingell, Jr. and Clarence J. Brown, Jr. wrote to NRC Chairman Joseph M. Hendrie protesting extension of the licensing moratorium because of concerns by the presidential commission appointed to investigate the Unit 2 accident.¹³

September 13, 1979: The NRC issued Generic Letter 79-04 to all plant owners detailing measures to be taken in the short term based on lessons learned from the TMI-2 accident.¹⁴

October 25, 1979: The NRC fined Metropolitan Edison \$155,000 for violations related to the TMI-2 accident.¹⁵

December 5, 1979: Metropolitan Edison denied all the violations listed in the NRC's October 25 enforcement action, but paid the \$155,000 fine.¹⁶

January 1980: The task force chartered by the NRC to investigate the TMI-2 accident issued its final report, commonly referred to as the Rogovin report.¹⁷

March 28, 1980: GPU issued a brochure about the accident one year later and expressed its intention to restart Unit 1 by the end of 1980. GPU stated the Unit 1 outage was costing ratepayers about \$14 million a month for replacement power.¹⁸

May 7, 1980: The NRC issued Generic Letter 80-37 to all plant owners detailing five additional measures to be taken based on the lessons learned from the TMI-2 accident.¹⁹

October 15, 1980: The ASLB hearings began. The NRC determined that psychological stress suffered by residents living near TMI had no role in the proceedings. Persons Against Nuclear Energy (PANE), an intervener in the proceeding, appealed to the U.S. Court of Appeals for the District of Columbia Circuit.²⁰

December 8, 1980: GPU filed a \$4.01 billion lawsuit against the NRC for failing to warn the company about "defects in equipment, analyses, procedures and training affecting the operation of TMI-2 of which the NRC was or should have been aware."²¹

July 9, 1981: The ASLB hearings ended.²²

August 27, 1981: The ASLB issued a ruling supporting the restart of Unit 1.

October 2, 1981: The ASLB re-opened hearings to consider allegations of widespread cheating by TMI control room operators on NRC requalification examinations.²³

November 1981: Steam generator tubes are discovered to be corroded and cracked, prompting GPU to repair 31,000 tubes at a cost of about \$50 million.²⁴

December 10, 1981: The ASLB hearings on operator cheating ended.²⁵

December 14, 1981: The ASLB issued a ruling supporting the restart of Unit 1.²⁶

January 7, 1982: The Court of Appeals in the District of Columbia ruled that the NRC need not consider psychological stress in the restart hearings but it must be considered under the National Environmental Protection Act. The court ordered the NRC to conduct a study on psychological stress. The NRC appealed to the U.S. Supreme Court.²⁷

February 1, 1982: NRC senior manager Harold Denton said the steam generator damage to Unit 1 was the worst in the nuclear industry.²⁸

March 29, 1982: The U.S. House of Representatives Subcommittee on Energy and the Environment (within the Committee on Insular and Interior Affairs) conducted a hearing in Middletown, PA, about the restart of Unit 1.²⁹

April 28, 1982: ASLB Judge Gary Milhollin, who presided over the hearing about operator cheating, issued a written opinion that some TMI supervisors and control room operators engaged in cheating and that the company's training program was inadequate.³⁰

July 27, 1982: The ASLB issued a ruling reversing many of Judge Milhollin's findings and supporting the restart of Unit 1.³¹

November 9, 1982: Before a public meeting with 1,200 people in attendance, the NRC's commissioners announced that a decision on restarting Unit 1 would be made by December 10, 1982.³²

December 10, 1982: Apparently, the commission's decision was to defer the decision.³³

March 22, 1983: Richard Parks, a senior startup engineer, charges that GPU and Bechtel harassed him and other workers for raising safety concerns.³⁴

April 19, 1983: The U.S. Supreme Court reversed the District of Columbia Circuit Court opinion that the NRC did not have to conduct a study on the psychological stress of residents living near TMI.³⁵

May 19, 1983: The NRC staff withdrew its endorsement of GPU's management due to unresolved criminal and civil investigations.³⁶

May 24, 1983: The NRC staff informed the full commission that its investigations concluded that TMI employees falsified safety records in the months leading up to the TMI-2 accident.³⁷

July 22, 1983: The NRC fined GPU \$140,000 for operator cheating incidents.³⁸

November 7, 1983: A federal grand jury indicted Metropolitan Edison on 11 counts related to falsification of safety records at TMI-2.³⁹

December 5, 1983: The NRC staff recommended to the commission that Unit 1 be allowed to restart and operate at up to 25 percent power.⁴⁰

January 27, 1984: The commission voted to separate the GPU management integrity issue from the decision regarding the restart of Unit 1.⁴¹

February 9, 1984: The Federal Emergency Management Agency (FEMA) reported that local and state plans for the emergency evacuation of Dauphin and Lancaster counties were inadequate.⁴²

February 28, 1984: Metropolitan Edison pled guilty to one count and no contest to six of the 11 counts filed against it.⁴³ It paid a \$45,000 fine in a plea bargain arrangement.⁴⁴

July 25, 1984: The NRC staff endorsed current GPU management and said it was former TMI managers who had lied, cheated, and falsified records.⁴⁵

September 11, 1984: The commission voted to postpone a restart decision for at least three to five months.⁴⁶

October 31, 1984: The ASLB ruled that the repairs to the Unit 1 steam generators ensured little likelihood of an accident.⁴⁷

November 8, 1984: The NRC informed Congress that a federal grand jury was investigating alleged criminal acts by NRC employees related to the agency's investigations of the Unit 2 accident.⁴⁸

November 16, 1984: A federal jury convicted James Floyd, a former supervisor of operations at Unit 2, on two counts of cheating on NRC operator licensing examinations.⁴⁹

January 9, 1985: Pennsylvania Governor Richard Thornburgh called for the resignation of Judge Ivan Smith from the ASLB, contending he was “incapable of fair and impartial decision-making.”⁵⁰

January 30, 1985: NRC staff echoed Governor Thornburgh’s call for the removal of Judge Smith, contending that he “clearly created an appearance of bias” in favor of GPU.⁵¹

February 13, 1985: The commission voted 3-2 that no additional hearings were required before the Unit 1 restart decision.⁵²

March 26, 1985: The commission voted not to disqualify Judge Smith.⁵³

April 25, 1985: The Commonwealth of Pennsylvania asked the Third U.S. Circuit Court of Appeals in Philadelphia to block the NRC from making a Unit 1 restart decision until after more public hearings could be held.⁵⁴

May 29, 1985: The commission voted 4-1 to allow Unit 1 to restart.⁵⁵

August 27, 1985: A Third U.S. Circuit Court of Appeals panel voted 2-1 in favor of the NRC.⁵⁶

September 19, 1985: The Third U.S. Circuit Court of Appeals voted 10-2 not to review the 2-1 ruling by its panel.⁵⁷

September 26, 1985: The NRC’s Office of Investigations (OI) concluded that GPU made material false statements to the NRC on May 20, 1983, and February 10, 1984, regarding the environmental qualification (EQ) of electrical equipment on Unit 1. OI further concluded that the individual responsible for the material false statements—the EQ supervisor—did not deliberately lie but rather did not know what he was doing and refused to listen to others.⁵⁸

October 8, 1985: Unit 1 was connected to the electrical grid.

November 22, 1985: Unit 1 exceeded the maximum power output allowed by the NRC when a technician leaned over a control room panel and accidentally flipped a switch with his belt buckle.⁵⁹

December 12, 1985: The U.S. Department of Justice (DOJ) finished its investigation into allegations that the NRC covered up issues raised by former TMI operator Harold Hartman and concealed information about these issues from the ASLB. The DOJ concluded:

“Questions remain about why the NRC did not act at certain times throughout the TMI investigation, and the facts now known certainly place the NRC in a sorry light. However, as disturbing as the whole saga of NRC’s handling of the Hartman allegations is, in light of the fact that NRC is supposed to be the “watchdog” over the nuclear industry, there is insufficient probable cause to believe there was a criminal cover-up in this matter or that further investigation will show a criminal cover-up. The serious issues concerning staff management’s philosophical orientation, competence and judgment disclosed by this investigation appear to fall within the jurisdiction of the Commission and the Congress.”⁶⁰

Notes

- ¹ LaBelle, G.G. 1979. Topic: Reactors share problems? Associated Press, April 6.
- ² *Philadelphia Inquirer*. 1985. The events that led to restart, May 30.
- ³ Ibid.
- ⁴ Davis, J.G. 1979. Draft information on Three Mile Island inspection. Memorandum to chairman and commissioners, Nuclear Regulatory Commission, April 27. John G. Davis was acting director, inspection and enforcement, at the Nuclear Regulatory Commission.
- ⁵ Denton, H.R. 1979. Status of shutdown plants. Memorandum to John Ahearne, commissioner, Nuclear Regulatory Commission, June 25. H.R. Denton was director, nuclear reactor regulation, at the Nuclear Regulatory Commission.
- ⁶ Thornburg, R. 1979. Letter to Joseph M. Hendrie, chairman, Nuclear Regulatory Commission, June 22. Richard Thornburg was governor of the Commonwealth of Pennsylvania.
- ⁷ Kuhns, W.G. 1979. Letter to Richard Thornburgh, Governor of the Commonwealth of Pennsylvania, June 26. William G. Kuhns was chairman of the General Public Utilities.
- ⁸ *Philadelphia Inquirer*, 1985.
- ⁹ Nuclear Regulatory Commission (NRC). 1979. Order for modification of license for the Three Mile Island Nuclear Station Unit 2, SECY-79-447, July 20.
- ¹⁰ *Philadelphia Inquirer*, 1985.
- ¹¹ Union of Concerned Scientists (UCS). 1984. Key Three Mile Island dates. Fact sheet, March 2.
- ¹² *Inside NRC*. 1979. Angry Kemeny Commission promises to recommend major changes at NRC, August 24.
- ¹³ Dingell, J.D., and C.J. Brown. 1979. Letter to Joseph M. Hendrie, chairman, Nuclear Regulatory Commission, September 5. John D. Dingell, Jr. is and Clarence J. Brown, Jr. was a member of the U.S. House of Representatives.
- ¹⁴ NRC. 1979. Followup actions resulting from the NRC staff reviews regarding the Three Mile Island Unit 2 accident. Generic Letter 79-04, September 13.
- ¹⁵ UCS, 1984.
- ¹⁶ Ibid.
- ¹⁷ Ibid.
- ¹⁸ General Public Utilities. 1980. Three Mile Island: One year later. March 28.
- ¹⁹ NRC. 1980. Five additional TMI-2 related requirements to operating reactors. Generic Letter 80-37, May 7.
- ²⁰ *Philadelphia Inquirer*, 1985.
- ²¹ General Public Utilities Corporation. 1980. Claim for damage, injury, or death submitted to general counsel, Nuclear Regulatory Commission, December 8.
- ²² *Philadelphia Inquirer*, 1985.
- ²³ Ibid.
- ²⁴ Ibid.
- ²⁵ Ibid.
- ²⁶ Ibid.
- ²⁷ Ibid.

- ²⁸ Ibid.
- ²⁹ Pollard, R.D. 1982. Testimony to the Subcommittee on Energy and the Environment of the Committee on Insular and Interior Affairs, U.S. Congress, March 29. Robert D. Pollard was senior nuclear safety engineer at the Union of Concerned Scientists.
- ³⁰ *Philadelphia Inquirer*, 1985.
- ³¹ Ibid.
- ³² Ibid.
- ³³ Ibid.
- ³⁴ Ibid.
- ³⁵ Ibid.
- ³⁶ Ibid.
- ³⁷ Ibid.
- ³⁸ Ibid.
- ³⁹ Ibid.
- ⁴⁰ Ibid.
- ⁴¹ Ibid.
- ⁴² UCS, 1984.
- ⁴³ *Philadelphia Inquirer*, 1985.
- ⁴⁴ UCS, 1984.
- ⁴⁵ *Philadelphia Inquirer*, 1985.
- ⁴⁶ Ibid.
- ⁴⁷ Ibid.
- ⁴⁸ Ibid.
- ⁴⁹ Ibid.
- ⁵⁰ Ibid.
- ⁵¹ Ibid.
- ⁵² Ibid.
- ⁵³ Ibid.
- ⁵⁴ Ibid.
- ⁵⁵ Ibid.
- ⁵⁶ United Press International. 1985. Supreme court accepts TMI case, September 30.
- ⁵⁷ Ibid.
- ⁵⁸ NRC. 1985. Office of Investigations case no. 1-84-021, Three Mile Island Unit 1 : Two material false statements relating to the TMI-1 environmental qualification program, September 26.
- ⁵⁹ Associated Press. 1985. Belt buckle causes power surge at TMI, November 23.
- ⁶⁰ Fields, R.C. 1985. Three Mile Island (TMI). Memorandum to Stephen R. Spivack, chief, special prosecutions, U.S. Department of Justice, December 12. Rhonda C. Fields was assistant U.S. attorney at the Department of Justice.