

BROWNS FERRY UNIT 1

Athens, AL

Owner: Tennessee Valley Authority

Outage dates (duration): March 22, 1975 to September 24, 1976 (1.5 years)

Reactor type: Boiling water reactor

Reactor age when outage began: 0.6 years

Commercial operations began: August 1, 1974

Fleet status: Oldest of two reactors owned by the company

Synopsis

Larry Hargett, a 20-year old engineering aide, was using a lit candle to check the integrity of sealant around locations where electrical cables penetrated through concrete walls of the cable spreading room. He inadvertently ignited polyurethane material that had improperly been used to fill one location. The fire burned for nearly seven hours because the Tennessee Valley Authority (TVA) plant manager, ignoring advice from the local fire department, refused to allow water to be used on electrical fires. The fire damaged 1,611 cables and disabled the entire array of Unit 1 emergency core cooling systems. Operators in the control room, directly over the cable spreading room, manually shut down the reactor and jury-rigged some non-safety related equipment to keep the reactor cooled. After the fire, TVA off-loaded the nuclear fuel from the reactor core into the spent fuel pool to facilitate replacement of damaged cabling.

Process Changes

On February 10, 1971, the Atomic Energy Commission (AEC; the NRC's predecessor) adopted Appendix A to Title 10 of the Code of Federal Regulations (CFR), Part 50.¹ General Design Criterion (GDC) 3 specified fire protection requirements; for example, "Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room." The NRC's Special Review Group recommended that (a) the NRC develop guidance on implementation of GDC 3 and (b) the NRC should evaluate each plant's fire protection program for compliance with the guidance developed. The NRC issued Branch Technical Position (BTP) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," on May 1, 1976. Though the NRC and some plant owners disagreed on 17 issues of the BTP 9.5-1 guidance, the NRC codified the guidance with its fire protection rule (10 CFR 50.48) and Appendix R to 10 CFR Part 50 on November 19, 1980.²

Commentary

UCS examined the Browns Ferry fire and its lessons and concluded in a report issued June 10, 1976 (before the reactor restarted): "the Browns Ferry fire calls into question both the competence and integrity of the nation's nuclear regulatory personnel. Clearly the Browns Ferry operating license and construction permit,

official certifications of the safety of the facility, provided only the color and not the substance of independent safety regulation of the facility. Until this problem is corrected, and a trustworthy regulatory program is established to oversee the construction and operation of nuclear plants, the acceptability of nuclear power will remain in fundamental doubt.”³ Those doubts remain to this day. The current Hemyc fire barrier problem demonstrates that many operating reactors are still not in compliance with GDC 3, 10 CFR 50.48, and Appendix R, and the NRC is as incapable of addressing that non-compliance today as the AEC was then.

NRC Systematic Assessment of Licensee Performance (SALP) History

Not applicable—SALPs began about four years after Browns Ferry Unit 1 restarted from the fire.

Details

March 21, 1974: An internal AEC memo stated:

“The initial cable installations at Robinson 2, Browns Ferry 1, Oconee 1 and 2, ANO-1 and Turkey Point 3 and 4 did not meet the intent of their respective FSAR’s [Final Safety Analysis Reports] or what would be considered as good industry practices. I personally expended an enormous amount of time and effort in attempting to achieve acceptable levels in the installations with which I was associated and I am aware that Bower and others have also. We have not yet achieved our goals.”⁴

March 22, 1975: A worker using a lit candle to check for air leaks through sealant applied around penetrations in the walls of the cable spreading room ignited highly combustible sealant material. The ensuing fire burned for nearly seven hours. Operators manually shut down Unit 1. Emergency core cooling systems were disabled when the fire damaged power and/or control cabling. Operators used one relief valve along with the condensate and control rod drive pumps to cool the reactor.⁵

May 9, 1975: The NRC issued an amendment to the operating license for Unit 1 to ensure the reactor remained shut down in a safe configuration until the fire damage was repaired and the NRC authorized restart.⁶

September 16, 1975: The Joint Committee on Atomic Energy of the U.S. Congress conducted a hearing on the Browns Ferry fire.

February 21, 1976: The NRC Special Review Group chaired by Dr. Stephen H. Hanauer released its report on the cause and regulatory implications of the fire:

“The Review Group believes that the causes, course, and consequences of the Browns Ferry fire are evidence of substantial inadequacies in the Browns Ferry QA [Quality Assurance] program.... The Review Group notes that NRC (and formerly AEC) licensing review and inspection also failed to uncover these lapses in QA.”⁷

March 2, 1976: Congress conducted a hearing on the Browns Ferry fire.

July 2, 1976: The NRC issued an amendment to the operating license allowing fuel to be reloaded into the Unit 1 reactor core.

September 22, 1976: During initial start-up from the extended outage, the terms of the operating license were violated when the rate at which the reactor water was heated exceeded the limit of 100 degrees Fahrenheit per hour.

September 24, 1976: The unit was connected to the electrical grid to end the extended outage.

November 7, 1977: The NRC issued Regulatory Guide 1.120, “Fire Protection Guidelines for Nuclear Power Plants,” delineating acceptable measures for complying with GDC 3.

February 17, 1981: Paragraph 50.48(b) to 10 CFR Part 50 became effective requiring all nuclear power plants licensed before January 1, 1979, to comply with Appendix R Sections III.G, III.J, and III.O.⁸

Notes

- ¹ *Federal Register*. 1971. Vol. 36, no. 35. Washington, DC: U.S. Atomic Energy Commission, 3255–3260. February 20.
- ² Bajwa, C.S., and K.S. West. 1996. *Fire barrier penetrations seals in nuclear power plants*, NUREG-1552. Washington, DC: Nuclear Regulatory Commission. July.
- ³ Ford, D.F., H. Kendall, and L.S. Tye. 1976. *Browns Ferry: The regulatory failure*. Cambridge, MA: Union of Concerned Scientists. June 10.
- ⁴ Murphy, C.E. 1974. Development of guideline for installation of cables and cable support. Letter to John C. Davis, deputy director for field operations at the Atomic Energy Commission, March 21. C.E. Murphy was the system chief, facilities construction branch at the Atomic Energy Commission.
- ⁵ Nuclear Regulatory Commission (NRC). 1975. *Cable fire at Browns Ferry Nuclear Plant*, Bulletin No. 75-04A. Washington, DC. April 3.
- ⁶ Purple, R.A. 1975. Letter to James E. Watson, Tennessee Valley Authority, May 9. Robert A. Purple was with the NRC.
- ⁷ Hanauer, S.H. 1976. *Recommendations related to Browns Ferry fire*, NUREG-0050. Washington, DC: NRC. February.
- ⁸ NRC. 1981. *Fire protection rule*, Generic Letter No. 81-12. Washington, DC. February 20.