

Improvements Resulting From Davis-Besse Incident

Background

On March 5, 2002, maintenance workers at the Davis-Besse nuclear power plant in Oak Harbor, Ohio, discovered a football-sized void in the reactor vessel head. The void, caused by corrosion, did not cause a reactor accident, and did not actually cause any problems while the reactor was operating. The near-failure of one of three barriers between the reactor fuel and the environment, however, is still considered a serious nuclear safety incident.

FirstEnergy Nuclear Operating Company committed to keep Davis-Besse shut down until the reactor vessel head had been replaced and the company implemented safety culture changes at the plant to maintain safety as the top priority. The NRC fined FirstEnergy more than \$5 million (the largest fine in NRC history) for the violations that led to the corrosion. FirstEnergy also paid \$28 million in fines under a settlement with the U.S. Department of Justice.

While the NRC confirmed the plant was ready to restart in 2004, the agency continued extra inspections through 2009. These included reviews of 20 independent assessments of Davis-Besse by third-party organizations. The NRC also inspected the reactor vessel and reviewed the results of FirstEnergy's inspections from early 2005. NRC inspectors paid particular attention to FirstEnergy's commitment to increase their focus on safety culture and encourage a safety conscious work environment. In 2009 the NRC was satisfied that FirstEnergy had addressed the organizational problems that had allowed such a serious incident to occur.

Davis-Besse Lessons Learned Task Force

All nuclear power plants operate at high temperatures and pressures. These conditions can cause cracking in some of the metal alloys used in reactor components. If the cracking is severe enough, cooling water can seep out of the reactor vessel head and evaporate. The evaporating cooling water leaves boric acid deposits behind (boric acid is added to the cooling water to help control the reactor). Under the right conditions, boric acid can corrode the reactor vessel head's metal. This corrosion caused the void in Davis-Besse's reactor vessel head.

An NRC task force examined agency actions prior to March 2002 to determine how to avoid similar events in the future. The task force included NRC experts and an observer from the state of Ohio. The task force concluded that the corrosion remained undetected for so long for several reasons, including:

- Davis-Besse failed to ensure plant safety issues received appropriate attention;
- Davis-Besse, the nuclear industry, and the NRC had not adequately reviewed relevant operating experience at other nuclear power plants; and
- The NRC’s assessment of Davis-Besse’s safety performance did not consider all available information.

The task force made 51 recommendations to prevent similar incidents in the future.

NRC Safety and Oversight Enhancements

The NRC addressed the corrosion that caused the issue at Davis-Besse by improving inspections for components susceptible to cracking. These included new requirements for what plant operators needed to look for, as well as improving procedures NRC inspectors use. The NRC inspections ensure licensees find and repair any cracks before they affect plant safety. After performing these new inspections, many nuclear power plants installed new reactor vessel heads with more crack-resistant alloys. The NRC also developed additional procedures for monitoring plants’ inspection programs and boric acid control programs. The NRC has also worked with the American Society of Mechanical Engineers to improve professional standards for inspecting reactor components.

The NRC reorganized its operating experience program so the agency better uses experience gained from events in order to prevent similar, more serious events from happening. This formal process reviews issues that could affect nuclear reactors and communicates any potential problems to the right people. The NRC has also made it easier for inspectors and technical reviewers to find information about areas under review. This allows them to see the impact from past similar problems and the actions that resolved the issue.

The NRC updated some of its own inspection and assessment processes to consider all appropriate information during the periodic assessments of licensee safety performance. This included:

- Additional inspector training for detecting corrosion and leakage;
- Changes to the NRC’s review of licensee safety culture to more quickly recognize when licensees were not maintaining safety as the highest priority; and
- Improvements to NRC engagement with reactor licensees at multiple levels.

Conclusion

The NRC ensured Davis-Besse met all applicable requirements before it restarted and maintained extra oversight until the underlying organizational issues had been addressed. The NRC conducted an in-depth review to identify how such a serious problem had gone undetected for so long, and continues to build on the insights from that review to ensure the health and safety of the public.

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