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DAVIS-BESSE NUCLEAR REACTOR

Ohio Sierra Club Nuclear Free Committee
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Pat Marida, chair marida@wideopenwest.com



FirstEnergy Nuclear Operating Company (FENOC) is attempting to get a 20-year license extension for its Davis-Besse nuclear reactor (power plant) located on Lake Erie in Oak Harbor, OH, 20 miles east of Toledo.

ACCIDENTS AND VIOLATIONS

The reactor has been plagued with accidents and violations, starting even before it began operations.

- In 1972 a strong wind caused lake water to flood the construction site for a month.
- Davis-Besse has had six “significant accident sequence precursors” out of 34 total in the U.S.
- In Oct. 1977 a pilot operated relief valve stuck open in an incident almost identical to the cause of the 1979 meltdown at Three Mile Island (TMI). Had the Nuclear Regulatory Commission (NRC) asked all similar pressurized water reactors to correct this problem, the TMI incident could have been avoided.
- In June 1985 a potentially catastrophic 12-minute loss-of-coolant event idled the plant for more than a year. The NRC referred to the accident as the worst since Three Mile Island.
- A direct hit by a tornado in 1998 caused complete loss of outside electric power and destroyed the alert, communication and emergency systems and threatened a meltdown.
- In 2002 a delayed inspection found that boric acid had eaten through 7 inches of the steel reactor lid, with only a bulging 3/16-inch steel liner preventing a radioactive catastrophe. A photo was found, taken earlier, that showed major corrosion on the outside of the vessel, but this was ignored. This “Hole-In-The-Head” fiasco resulted in the largest fine in NRC history – \$33.5 million. The plant was idled for 2 years, costing ratepayers \$600 million.
- In 2003 FENOC’s failure to trim trees along transmission lines caused the second largest power outage in our history, the Northeast Blackout that impacted 55 million Americans and Canadians.
- The reactor head was replaced twice due to cracking.



SHIELD BUILDING CRACKING AND VOIDS

Davis-Besse construction site floods in 1972.

A coalition of environmental groups has been challenging FENOC’s bid for a license renewal for Davis-Besse since 2010. Among the contentions were that renewables and efficiency could replace Davis-Besse’s power and that FENOC’s Severe Accident Mitigation Analysis was flawed. While those contentions were dismissed by the NRC (accident mitigation was not considered cost-beneficial), evidence in 2011 showed that the concrete shield building around the reactor is cracking.

- The shield building has been cut into 4 times to replace aging or seriously damaged parts. Each cut further weakened the building. The last 2 cuts were 25 x 39 feet. Cuts for replacing steam generators in 2011 and 2014 caused 26 sections of shield building rebar to be broken or cracked.
- Cracking in the shield building concrete was first reported in 2011. FENOC maintained that the cracks were “architectural, not structural”. NRC allowed the reactor to restart without knowing the cause.
- In early 2012 FENOC concluded that the cracks occurred because a failure to paint the building allowed the blizzard of 1978 to force water into the concrete which then froze. They maintained that cracks were not spreading. Inquiries later found that FENOC had evidence of cracking over a year before the blizzard.

- In a later report, FENOC noted that cracks are spreading. Causes? The new paint job had sealed in water, which was freezing and thawing. Use of the wrong type of cement and the plumb of the building being outside of tolerance are among numerous other speculated causes of instability and cracking.
- When the fourth cut was made into the building in 2014, a honeycomb void was found in the concrete, measuring 25 feet long and between 6 and 12 inches wide in a wall 2.5 feet thick. Records were later found showing voids in the previous patch of 2002 which were never made public.
- Two NRC engineers calculated that during a minor earthquake or a minor to moderate accident causing heat to permeate the interior wall, up to 90% of the 2.5-foot thick wall of the shield building could collapse into rubble on top of the reactor.¹
- The coalition has filed a challenge to the license renewal based on shield building instability.



Humpty Dumpty is cracked.

FLAWED REPLACEMENT STEAM GENERATORS

In 2013, the Sierra Club, Beyond Nuclear, and Don't Waste Michigan jointly legally challenged the engineering of two replacement steam generators. Although regulations require that replacement steam generators be "like-for-like" with the original, the new ones weighed 590 tons compared to 465 tons for the originals. A new alloy, Inconel 690, was used for the tubing. In San Onofre, CA, it was found that this new alloy could expand, which caused rubbing wear between tubes resulting in the escape of radioactive steam. After only two years of operation, these failed steam generators caused the permanent shutdown of San Onofre's two reactors. Despite these findings (or because the steam generators were already constructed), the NRC approved their use at Davis-Besse. They were installed in March of 2014.

HIGH BURNUP FUEL AND UNSAFE WASTE STORAGE

Davis-Besse is using "high burnup" nuclear fuel, which has been approved by the NRC for about 17 years. High burnup fuel is created when fuel is burned for a longer period of time. High burnup fuel has even more serious waste storage issues than traditional low burnup nuclear fuel.

- Radioactive nuclear waste from Davis-Besse will need to be shielded from the environment for hundreds of thousands of years.
- High-burnup waste is over twice as radioactive and over twice as thermally hot as traditional low burnup fuel waste, requiring 7 to 20 years of cooling in fuel pools, compared to 5 years for low burnup fuel.
- More space is required between high burnup fuel assemblies in the fuel pools, which already contain up to 5 times as many fuel assemblies as they were engineered to hold.
- The NRC is considering approval of dry cask systems for high burnup radioactive waste – to be used after the assemblies are taken out of the pools. The requirements for these casks are being challenged as having specifications based on assumptions that are proving to be incorrect.



This is what inspectors ignored.



Later, this football-sized hole was found in the head of the reactor.

¹ Intervenor's Fifth Motion to Amend and/or Supplement Proposed Contention No. 5 (Shield Building Cracking), Aug. 16, 2012 pp. 37-41