

The Ohio Nuclear Free Network (ONFN) www.onfn.org and Beyond Nuclear www.beyondnuclear.org are not-for-profit research and education organizations concerned with the health, safety, environmental and accident risks posed by commercial nuclear power plants including their routine and unplanned radioactive releases and contamination, and the production of radioactive waste for which there is no solution. Both advocate for the immediate transition from dangerous, unsustainable nuclear power and fossil fuels to renewables and energy efficiency.

On Tuesday November 28, 2003, these groups, representing three Lake County residents, filed with the Nuclear Regulatory Commission (NRC) to intervene and request an adjudicatory hearing in opposition to the 20-year license extension which would allow the aging, deteriorating 40 year old Perry Nuclear Power Plant (PNPP) to operate until 2046.
<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML23332A784>

Of many possible issues and concerns, the petitioners raised three contentions regarding the inadequacy of Energy Harbor's (EH) License Renewal Application (LRA) Environmental Report (ER) (Appendix E beginning on P. 1669):
<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML23184A081>

CONTENTION 1: Petitioners' expert, geologist Dr. Julie Weatherington-Rice, Ph.D., CPG, CPSS, has detailed the potential for serious plant structural accidents and concludes that the Severe Accident Mitigation Analysis and ER are inadequate because they:

- rely on outdated hydrogeological investigative techniques which fail to reflect current science published after the PNPP site was analyzed and the reactor constructed.
- ignore the impact of ground water movement on uninspectable, irremediable building foundations and other inaccessible structures.
- minimize area seismic activity and severe earthquake potential. The 1982 Safety Evaluation Report inaccurately concluded that there were no earthquake concerns near the plant.

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20054F514>

Four year later, on January 31, 1986, (just prior to plant operation) there was a magnitude 5 earthquake, the epicenter of which was 10 miles south of the Perry plant. The quake was felt in 10 states and Canada and produced at least 12 aftershocks. The earthquake was determined to be tectonic and naturally occurring. p. 139

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21361A214>

Certain high frequency data also demonstrated exceedance of the reactor's seismic design basis. p. 152 above and <https://www.nrc.gov/docs/ML1203/ML12037A027.pdf>

Given that the Perry area has experienced many subsequent (as recently as August 2023) and historical earthquakes of magnitude 4.2 or higher, Dr. Weatherington-Rice concludes that "(These earthquakes) are natural (and) tectonic and can(not) be stopped (which could be possible with man-made quakes) ... These are movements triggered by mid-continental plate shifts (which) are the hardest to predict and can be catastrophic when they occur."

- underestimate erosion and landslides which have caused area homes and a park to fall into Lake Erie. Dr. Weatherington-Rice states, "An estimate of shoreline failure, (erosion at the bottom or toe of the 45' high bluff on which the PNPP sits) at an average of 5 feet per year was given in the pre-built reports...Assuming a beginning date of 1980, the shoreline is expected to recede 330 feet by 2046. That puts the recession area within the built environment of the facility."

According to Dr. Weatherington-Rice, landslides can be activated by erosion cutting the toe of the bluff (i.e. wave action at the beach) and can also be activated by loading the top of the

bluff by, for example, building multi-ton dry storage casks for high-level radioactive waste (Perry has 25 so far).

Dr. Weatherington-Rice further warns that even if the toe of the bluff is reinforced with structural armoring, landslides can develop behind the armoring, dumping the armoring into the Lake and exposing new faces of the bluff, closer to the plant, to shoreline erosion.

Dr. Weatherington-Rice concludes, “[I]t is hubris on the part of the NRC...to continue to permit the operation of this plant at this location...The plant should be decommissioned and all radioactive materials (some of which are harmful for millions of years) should be moved offsite to a more structurally stable location.”

CONTENTION 2: Energy Harbor's Environmental Report presents a flawed description of the "No-Action, No-License-Renewal Alternative" by:

- ignoring NRC regulations, court decisions, and the National Environmental Policy Act (NEPA) which require Energy Harbor's Environmental Report to “rigorously explore and objectively evaluate all reasonable alternatives” and “discuss costs and benefits of the no-action alternative...at the license renewal state.”
- failing to provide any projections, pricing information, or assessment of incoming new generation resources to prove alleged “uncertainties” in the purchased power market.
- failing to provide statistical or factual analyses of electric overcapacity within Ohio, or of current and future electricity imported from multiple neighboring states including Michigan, Indiana, Pennsylvania, Kentucky, and West Virginia.

According to Petitioners' utility economics expert Ned Ford, "Pennsylvania has exported 25% of the electricity generated within its borders for more than 30 years and could easily replace all power lost from closing PNPP."

- falsely representing Perry's capacity as a more essential part of the competitive market in Ohio (and)... the PJM Interconnection (grid operator) region, according to Mr. Ford.

After FirstEnergy's 2018 announcement that it would close Perry and Davis-Besse, legislative hearings were convened in 2019 on H.B. 6, the proposed \$1.3 billion bailout of the two reactors and the largest corruption scandal in Ohio's history.

At one Ohio Senate committee hearing, Asim Haque, an Executive Director at PJM and former Chair of the PUCO testified, "PJM's analysis found that FirstEnergy's deactivation of those generating units is not expected to adversely impact the reliability of the PJM transmission system..." According to PJM, the two Ohio reactors were not needed to ensure reliable, affordable electric supply to Ohio and surrounding PJM states.

- neglecting to consider that Perry's generation is presently and will prospectively be too expensive. In 2019, according to Mr. Ford, the cost of operating Perry and Davis-Besse was \$42 per MWh, while the PJM market was experiencing costs between \$33.00 and \$35.00 per MWh.
- apparently deciding not to offer its customers voluntary energy efficiency programs which could further offset any need for Perry. HB6 eliminated Ohio's renewable energy and efficiency standards. Ohio is ideal for wind energy and was 13th in the country for wind power until a 2014 state law severely restricted wind turbine siting. Despite polling showing Ohioans' strong preference for wind and solar, the General Assembly has passed additional laws (often written by FirstEnergy) since 2014 decimating renewable energy to force reliance on fossil fuels and nuclear power.

https://www.cleveland.com/open/2015/01/ohio_renewable_energy_policies.html

https://www.cleveland.com/business/2017/05/ohio_wind_law_crippling_wind_d.html

<https://www.cleveland.com/open/2023/01/house-bill-6-left-ohio-with-least-stringent-clean-energy-program-in-us-study-shows.html>

CONTENTION 3: Perry's Tritium Problems

Tritium is radioactive hydrogen. It bonds easily with oxygen to form radioactive water. Once tritium becomes part of the water molecule, it cannot be removed. Therefore, tritium is consumed as potable water, and it bioaccumulates in the food chain. Tritium has a half-life of approximately 12 years which is the amount of time it takes for one-half of its radiation to decrease (decay). The hazardous life of a radioactive element is 10 to 20 half-lives or in the case of tritium 120 to 240 years.

In his recently published book Exploring Tritium Dangers, renowned nuclear engineer and radiation expert, Dr. Arjun Makhijani, Ph.D. states that tritium readily crosses the placental barrier and "can have significant biological consequences including damage to DNA, impaired physiology and development, reduced fertility and longevity, and can lead to elevated risks of diseases including cancer."

<https://ieer.org/wp/wp-content/uploads/2023/02/Exploring-Tritium-Dangers.pdf>

In its Environmental Report (ER) pp. 2020-2021, Energy Harbor concedes that: The issue [of inadvertent radionuclide release] is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites that involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater. The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

The Perry Updated Final Safety Analysis Report (UFSAR Chapter 11, p. 23) states, "Essentially, all tritium in the primary coolant is eventually released to the environs, either as water vapor and gas to the atmosphere, or as liquid effluent to the plant discharge or as solid waste...The study...estimated that approximately 90 percent of the tritium release was observed in liquid effluent, with the remaining 10 percent leaving as gaseous effluent."

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21307A187>

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21361A199>

The U.S. Supreme Court has interpreted the National Environmental Protection Act to require consideration of "cumulative or synergistic (where the effect of the whole is greater than the sum of its parts) environmental impact."

However, the Environmental Report (ER) underestimates and minimizes the environmental and health hazards of operating the aging, deteriorating PNPP for an additional 20 years while it is routinely releasing and accidentally leaking unpredictable amounts of tritium and other radionuclides including carbon-14, strontium-90, cesium-137, cobalt-60, iodine-131, chromium-51 etc. into air, soil, groundwater, and ultimately Lake Erie, the shallowest of the Great Lakes, with an average depth of 58 feet (LRA p. 1810).

The ER also fails to analyze the additive, synergistic, and cumulative effects of tritium and other radionuclides released into Lake Erie which already contains toxic chemicals including PCBs, heavy metals, pesticides, herbicides, and biocides which Energy Harbor (EH) uses to

kill mollusks and other invasive aquatic species around the plant's intake and discharge tunnels in the lake.

Notably with respect to mercury, PNPP's existing National Pollutant Discharge Elimination System (NPDES) permit provides a variance because the PNPP "cannot meet the 30-day average permit limit...and has also demonstrated...that there is no readily apparent means of complying with the Water Quality-Based Effluent Limits (WQBEL) without constructing prohibitively expensive end-of-pipe controls for mercury." (p. 11)

<https://epa.ohio.gov/static/Portals/35/permits/doc/31B00016.fs.pdf>

Furthermore, according to the ER (p. 1816) and the Updated Final Safety Analysis Chapter 2.5 (p. 112), the Perry site, like the surrounding offsite area, has a high groundwater table. "Observations made in the test borings at the site indicate groundwater levels usually ranging from three to five feet below ground surface in the main plant area..." (p. 1815)

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21361A214>

It was not until 2007, as the result of an Illinois lawsuit, that nuclear power plants began voluntarily reporting tritium levels above an arbitrary EPA drinking water standard of 20,000 picocuries/liter (pCi/L) which Dr. Makhijani says should be reduced to 400 pCi/L.

Illinois Attorney General lawsuit summary

<https://illinoisattorneygeneral.gov/News-Room/2006-2018-Press-Archive/200603-16%20GLASGOW%20FILE%20SUIT%20FOR%20RADIOACTIVE%20LEAKS%20AT%20BRAIDWOOD%20NUCLEAR%20PLANT.pdf>

EPA tritium drinking water standard

<https://semspub.epa.gov/work/HQ/175261.pdf>

Nuclear Energy Institute Voluntary Tritium Groundwater Protection Initiative

<https://www.nrc.gov/docs/ML0726/ML072600290.html>

The PNPP does monitor tritium in drains, manholes and wells. However, ten of twelve monitoring wells are tested two times per year, and the remaining two are tested every other year. Leakage beneath the plant and into groundwater onsite can go on for months, or years, before being discovered. Sometimes the cause of the tritium leak is found and remediated, but sometimes it is not.

Over the past decade, there have been a number of tritium spills and leaks of considerable concern at the PNPP: (see ER p. 1828 for 2020 & 2021 leaks)

- A January 20, 2014 sampling revealed a tritium concentration of 46,2000 pCi/L in the Auxiliary Building groundwater due to a feedwater leak.

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML14063A063>

- In July 2015, semi-annual sampling revealed a tritium concentration of 15,900 pCi/L

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML15223A440>

- On January 31, 2020, a leak developed in the reactor cooling system. Daily sampling throughout 2020, revealed residual tritium in March, April, May, June, July and December 2020. Cobalt-60 was detected in February and March 2020 and gross alpha activity was detected in November 2020. In March 2020, up to 13,200 pCi/L was detected in a manhole, and tritium was found in a different manhole in March, April, June, and November 2021.

- On December 16 -17, 2021 tritium was detected in a manhole, and indoor samples collected in December 2021 and January 2022...ranged from 10,100 to 14, 800 pCi/L

- On June 22, 2023, tritium activity was at a level of 40,000 pCi/L "and subsequent tests have confirmed continued elevated tritium levels." As of October 2023, the source of this significant tritium leak was unresolved.

<https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML23200A079>