Beyond Nuclear Fact Sheet

Epidemic of Radioactivity Leaks from U.S. Nuclear Plants Includes Irradiated Fuel Pools

INTRODUCTION

Beyond Nuclear's April 2010 report *Leak First, Fix Later*[1] documents radioactivity leaks at over 100 nuclear power plants in the U.S. since the early 1960s. The frequency and size of leaks is growing worse as reactors, and their underground piping systems, degrade with age. But in addition to controversial leaking pipes, as at Vermont Yankee beginning in January 2010, the U.S. has suffered a growing number of leaking irradiated nuclear fuel storage pools, as first highlighted in early 2006 by Dave Lochbaum, Union of Concerned Scientists' Nuclear Safety Project Director.[2]

Indian Point Nuclear Power Plant, Hudson River, Buchanan, New York

Perhaps the most controversial leaking pool is located just 25 miles upstream from New York City. In 2005, cracks in the Unit 2 pool wall were discovered to be leaking radioactive tritium[3] – which can cause cancer, genetic damage, and birth defects[4] – into groundwater, which then flows into the Hudson River. In 2006, strontium-90 – a bone seeker that can cause bone and soft tissue cancer, as well as leukemia -- was discovered leaking from the long-closed Unit 1 pool. Other radioactive isotopes, including cesium, cobalt, and nickel, have also been documented as leaking. The leakage could have begun in the early 1990s, and, despite attempts at repairs, "Water likely remains between the Unit 2 SFP [spent fuel pool] stainless steel liner and the concrete walls, and thus additional active leaks cannot be completely ruled out."[5] So much radioactively contaminated water has leaked that underground radioactive "lakes" are present in the groundwater under Indian Point's fuel pools.[6] Entergy Nuclear's controversial plan appears to be to leave the contamination in place, at least until decommissioning decades from now, in hopes that "Monitored Natural Attenuation" – allowing the radioactive contamination to flow into the Hudson River – will supposedly dilute away the problem.[7] But dilution is not the solution to such pollution, as radioactivity can bio-accumulate in the food chain: in 2007, fish contaminated with Sr-90 were detected in the Hudson River.[8] And, the U.S. National Academy of Sciences has affirmed for decades that any exposure to radioactivity, no matter how small, still carries a health risk.[9] Delusion is also not the solution. The U.S. Nuclear Regulatory Commission (NRC) and the nuclear power industry itself tend to dismiss the health risks of tritium leaks. When the Indian Point pool leaks were first discovered, for example, NRC issued a press release stating that "The leakage…is minimal and does not pose any immediate health or safety concern for members of the public or plant workers."[10] But "no immediate danger" does not mean safety in the longer term.[11] Tritium has a 12.3 year long half-life, thus representing 120-240 years of biological hazard.[12] New York State's U.S. Congressional delegation has loudly protested the leaks. Hudson Riverkeeper, led by Robert Kennedy, Jr., has filed a Resource Conservation and Recovery Act lawsuit, has challenged Indian Point's proposed license extension,[13] and is even challenging Indian Point's right to generate any more highly radioactive waste.[14]

Salem 1 Nuclear Reactor, Delaware River, Artificial Island, New Jersey

Radioactively contaminated water has also leaked from the Salem Unit 1 irradiated nuclear fuel storage pool. On September 18, 2002, workers inside the Auxiliary Building had radioactivity detected on their shoes. Investigation into the source found water on the floor of a room inside the Auxiliary Building. Chemical analysis of this water pinpointed the spent fuel pool as its likely source. The Unit 1 spent fuel pool has a reinforced concrete floor and walls that are lined with stainless steel. Leakage of groundwater in through the concrete and leakage of spent fuel pool water out through the liner was routed through drainage piping to a system that collected and processed contaminated liquids. On January 31, 2003, workers conducted a fiber optic examination of the drainage piping and discovered that it was blocked with precipitates, allowing water to accumulate in the space between the concrete and the liner. When the blockage was removed, the measured flow through the drainage piping was 100

gallons per day. During the period that the drainage piping was blocked, spent fuel pool water leaked through the concrete into the ground surrounding the plant. Workers confirmed this fact with eight monitoring wells installed adjacent to the Unit 1 Fuel Handling Building in January and February 2003. The groundwater contained tritium concentrations "above the New Jersey Groundwater Quality Criterion of 20,000 pCi/L [picocuries per liter]." A consultant retained to investigate the matter concluded: "*The testing results indicate that buildup of SFP [spent fuel pool] water behind the liner has been ongoing for at least five years."* The plant owner undertook an extensive groundwater remediation effort to reduce tritium concentrations below the New Jersey criterion.[15]

Connecticut Yankee Nuclear Power Plant, Connecticut River, Haddam, Connecticut

A third commercial reactor to suffer a leaking irradiated nuclear fuel storage pool is Connecticut Yankee. As with the Indian Point Unit 1 pool above, this leak was not discovered until long after the reactor was permanently shut down in 1996. On October 31, 2005, the NRC was informed that workers detected evidence that the spent fuel pool was leaking into the ground. The rate of leakage was unknown, but estimated to be on the order of a few gallons per day. Also, the quantity of water leaked was unknown, as the company did not know how long the leak had been occurring. Monitoring wells down gradient from the leakage site did not indicate the groundwater plume had traveled past the plant site.[16] However, serious weaknesses in groundwater monitoring have been documented across the nuclear power industry and its governmental agency regulators. For example, false assurances of no leakage have been reported based on monitoring wells located improperly that could not detect radioactive leakage that was, in fact, underway.

High-Flux Beam Reactor, Brookhaven National Lab, Long Island, New York

A case of such false assurance that radioactive leakage was not occurring from an irradiated nuclear fuel storage pool happened at Brookhaven, a U.S. Department of Energy (DOE) national lab devoted to so-called "peaceful uses of atomic energy" founded in 1947, due to improperly located monitoring wells. Ultimately, however, in January 1997, workers detected tritium levels in groundwater samples at twice the Environmental Protection Agency (EPA) safe drinking water standard. Subsequent investigations found samples reading 32 times higher than the EPA standard and that "*The tritium was found to be leaking from the laboratory's High Flux Beam Reactor's spent-fuel pool into the aquifer that provides drinking water for nearby Suffolk County residents."* In fact, over a million Long Island residents depend on the underlying aquifer as their sole source for drinking water. The concrete pool, built in the early 1960s, had not been lined with steel, making such leakage all the more likely over time. DOE's investigation concluded that the leak, estimated at 6 to 9 gallons per day, had been occurring for as long as ***12 years***. Due to the resulting public outcry, on May 16, 1997, DOE terminated the contract held by Associated Universities, Inc. (a consortium of seven Northeastern colleges), that had managed Brookhaven for half a century, due to performance problems associated with the long-standing tritium leak, including incompetence at groundwater monitoring. Brookhaven had agreed with the county government to install monitoring wells, but then took over two years to do so because it regarded them as a low priority. In response to the Lab's attempt to downplay the health risks of this drinking water supply contamination, the U.S. Government Accountability Office, Congress's investigative arm, warned that "EPA officials have advised us that while the tritium contamination poses little or no threat today, its long-term consequences are not certain."[17]

BWX Technologies, Inc., James River, Lynchburg, Virginia

Yet another leak of radioactively contaminated water from a radioactive waste cask handling area pool was discovered on September 19, 2000. Workers at the BWX Technologies facility in Lynchburg, Virginia determined that the cask handling area pool was leaking approximately ***250 gallons per day*** into the ground. The pool was approximately 528 yards from the James River. The pool contained irradiated reactor hardware and several spent fuel rods. The radionuclide concentrations of the water in this pool were significantly above the concentrations allowed by 10 CFR [Code of Federal Regulations] Part 20, the NRC regulations for releases to unrestricted areas. Boroscopic examination identified cracks across the transfer cavity region of the pool.[18] Although the company and NRC downplayed the risk, by citing that the estimated radiation dose to a member of the public drinking water from the James River was calculated to be less than one millirem per year, the issues of ongoing, chronic exposure and the added risks of organically bound tritium have gone unaddressed.[19]

CONCLUSION

The litany of pool leaks above is not exhaustive. As stated by the State of New York's Attorney General, Eric T. Schneiderman, *et al.,* "Radioactive water also leaked from pools at the Hatch nuclear plant in Georgia in 1986, the Turkey Point plant near Miami in 1988, the Seabrook plant in New Hampshire in 1999, the Watts Bar plant in Tennessee in 2002, and the Palo Verde plant in Arizona in 2005."[20] Such leaks are not a thing of the past, but now seem to be an aspect of age-related degradation at old reactors. As but one example, environmental coalition interveners opposing the 20-year license extension at the Davis-Besse atomic reactor recently un-earthed, via a Freedom of Information Act request, documentation of pool (as well as cask loading pit and fuel transfer canal) water leakage, such as from cracks on the underside of the spent fuel pool into the ground, as well as through the ceiling of an adjacent room, causing concrete and rebar degradation, as well as corrosion to the inner steel radiological containment vessel around the reactor pressure vessel itself.[21] Leakage from pools is but one of many risks, including the potential for pool boil or drain downs leading to high-level radioactive waste fires unleashing catastrophic amounts of radioactivity, outside of any radiological containment and directly into the environment. This bolsters the case that pools should be emptied into Hardened On-Site Storage (HOSS) as soon as possible, as a vital measure to protect public health, safety, security, and the environment.[22]

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[1] http://www.beyondnuclear.org/reports/
[2] Jan. 2006 public health emergency enforcement petition based on NRC regulations limiting radiation doses to members of the public, as well as requirement for control and monitoring of radioactive releases to the environment, environmental coalition 10 CFR 2.206 petition signed by a dozen organizations.
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[3] NRC news release, September 20, 2005, "NRC Performing Special Inspection at Indian Point 2 Nuclear Plant; Small Amount of Leakage from Spent Fuel Pool Area Under Review," and letter dated October 26, 2005, from Nils J. Diaz, Chairman, Nuclear Regulatory Commission, to Sue Kelly, United States House of Representatives.
[4] "Tritium: a universal health threat released by every nuclear reactor," Beyond Nuclear fact sheet, March 2010, http://www.beyondnuclear.org/storage/documents/Tritiumbasicinfofinal.pdf
[5] GZA GeoEnvironmental, Inc., "Hydrogeologic Site Investigation Report, Indian Point Energy Center, Buchanan, New York," January 7, 2008.
[6] *Leak First, Fix Later*, Beyond Nuclear, April 2010, http://www.beyondnuclear.org/reports/
[7] GZA GeoEnvironmental, above.
[8] Riverkeeper, "Radioactive Waste and Pollution," http://www.riverkeeper.org/campaigns/stop-polluters/indian-point/radioactive-waste/
[9] "All levels of radiation confirmed to cause cancer," June 30, 2005, NIRS, http://www.nirs.org/press/06-30-2005/1
[10] NRC news release, Sept. 20, 2005, above.
[11] Dr. Rosalie Bertell, No *Immediate Danger? Prognosis for a Radioactive Earth*, The Women's Press, London, 1985.
[12] "Tritium," Beyond Nuclear, above.
[13] Riverkeeper, above.
[14] NRC Commissioners Memorandum and Order, In the Matter of ENTERGY NUCLEAR OPERATIONS, INC., Indian Point Nuclear Generating, Units 2 and 3, Docket Nos. 50-247-LR and 50-286-LR, CLI-10-19, July 8, 2010.
[15] Letter dated June 30, 2004, from Jeffrey J. Pantazes, Manager – Permitting & Technical Services, PSEG Services Corporation, to Dr. Jill Lipoti, Assistant Director – Radiation Protection and Release Prevention Element, New Jersey Department of Environmental Protection, Division of Environmental Safety and Health, "Remedial

Action Workplan, Salem Unit 1, PSEG Nuclear LLC, Salem Generating Station, Lower Alloway Creek Township, Salem County, New Jersey"; Final Summary Report dated February 23, 2004, PSEG Nuclear LLC Radiation Protection/Chemistry Support, "Investigations of Salem Unit 1 Fuel Pool Leakage."

[16] Daily Event Report, Even Number 42099, November 1, 2005, reported by Connecticut Yankee during its decommissioning to the U.S. Nuclear Regulatory Commission.

[17] Report GAO/RCED-98-26, November 1997, U.S. General Accounting Office (now Government Accountability Office), "Department of Energy: Information on the Tritium Leak and Contractor Dismissal at the Brookhaven National Laboratory."

[18] Morning Report 2-00-0023, October 2, 2000, by the Nuclear Regulatory Commission, "Water Leak in Cask Handling Area Pool at the Lynchburg Technology Center."

[19] Beyond Nuclear's *Leak First, Fix* Later and "Tritium," cited above.

[20] Final Brief for States of New York, Vermont, Connecticut, and New Jersey, and the Prairie Island Indian Community, USCA Case #11-1051, Document #1357135, before the U.S. Court of Appeals for the D.C. Circuit, regarding the U.S. Nuclear Regulatory Commission's Nuclear Waste Confidence Decision, February 7, 2012.

[21] FOIA/PA 2012-0121, Response 1, Appendix A, Document A/1, 10/12/11, ML11294A349, Email from S. CuadradoDeJesus, NRR to S. Dorts, FirstEnergy on Davis-Besse Commitment List through LRA Amendment 19 (60 pages), specifically p.19 Commitment Item #30; p.20 Commitment Item #33; p.24-26; Item #37; p.25, Item #38; p.25, Item #39. See: http://pbadupws.nrc.gov/docs/ML1129/ML11294A349.pdf.

[22] Principles for Safeguarding Nuclear Waste at Reactors, signed by nearly 200 groups representing all 50 States, August 2009, posted online at http://ieer.org/wp/wp-content/uploads/2010/03/HOSS_PRINCIPLES_3-23-10x.pdf.