



## Summary: The Health Risks of Decommissioning the Pilgrim Nuclear Reactor

Decommissioning nuclear power plants has long been known to pose multiple health risks to workers and to residents of nearby communities; radioactive isotopes and nuclear waste are prominent among these risks.<sup>1</sup> Radioactive isotopes and nuclear waste are *proven causes of human cancer*.<sup>2</sup> While high-dose exposures to these materials are the most highly carcinogenic, any exposure to radiation carries some risk of cancer; infants in the womb and young children are especially vulnerable to even low doses of radiation.<sup>3</sup>

### Cancer risks both from aerosol and water releases of radionuclides

Both the proposed (and now temporarily stayed) plan to dump more than a million gallons of radioactive water into Cape Cod Bay during the decommissioning of the Pilgrim Nuclear Reactor and the recent known release of airborne radionuclide-containing vapor from the reactor by forced evaporation have led already and will continue to lead to certain human exposure to radioactive materials via ingestion of contaminated seafoods and via inhalation.

While the radioactive water that was planned to have been dumped into Cape Cod Bay was to have been pretreated by filtration to remove most (but not all) radionuclides before release, the radioactive vapor released via forced evaporation was not pretreated. This vapor contained measurable quantities of the radioactive isotope tritium and likely other radionuclides.

### Known elevated levels of health harming radionuclides in untreated plant cooling water

Dr. Barry Potvin, Chairman of the Plymouth Board of Health, calculated that the estimated 100,000 gallons of untreated radioactive water known to have been released from the reactor would have contained 1297 curies of tritium, 323 curies of Cobalt-60, and 3823 curies of Cesium-137.<sup>4</sup> Dr. Petros Koutrakis, Professor of Environmental Epidemiology in the Harvard T.H. Chan School of Public Health, notes that any radioactive isotope released into the atmosphere eventually falls to the ground, where it can contaminate oceans, surface water, soil, flora and fauna, including humans.

According to Woods Hole Oceanographic Institute expert Dr. Ken Buesseler, levels of the radioactive isotope, Tritium, in the cooling water inside the Pilgrim Nuclear Reactor water are

---

<sup>1</sup> Dodic-Fikfak M, Clapp R, Kriebel D. The health risks of decommissioning nuclear facilities. *New Solut.* 1999;9(2):153-61.. <https://pubmed.ncbi.nlm.nih.gov/17208791/>

<sup>2</sup> Gilbert ES. *Ionising radiation and cancer risks: what have we learned from epidemiology?* *Int J Radiat Biol.* 2009 Jun;85(6):467-82. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2859619/>

<sup>3</sup> Harris E. *Risk of Death From Low-Dose Radiation Might Be Higher Than Thought.* *JAMA.* 2023;330(12):1128. <https://jamanetwork.com/journals/jama/fullarticle/2809400>

<sup>4</sup> <https://www.mass.gov/doc/dph-split-sample-report-with-holtec-results-may-19-2023/download>; and Analysis of non-radioactive contaminants; <https://www.mass.gov/doc/dep-pilgrim-split-sampling-report-may-19-2023/download>



one million times higher than background levels of Tritium in seawater; likewise, levels of the radioactive isotope Cesium-137 in the reactor water are 200 million times higher than seawater levels. He notes that even if 99 percent of the Cesium-137 from the Pilgrim water were to be removed prior to discharge, the discharged water would still contain Cesium-137 at levels 2 million times higher than background levels in Cape Cod Bay.<sup>5</sup> In the same report, Dr. Buesseler notes that when Cesium-137 levels are elevated, the radioactive isotope, Strontium-90 will likely also be present in the discharged water, along with other radioactive and carcinogenic elements in the transuranic group, including Plutonium, Uranium, and Americium.

Dr. Buesseler also observes that the reported concentrations of these radioisotopes are 1,000-100,000 times greater in the Pilgrim reactor water than in the radioactive water recently dumped from the Japanese Fukushima reactor, an action that has engendered international concern.

### **Carcinogenicity of radionuclides; cumulative risk of radiation exposure**

All of the radioactive elements known and suspected to be released from the Pilgrim Nuclear Power Station located in Plymouth, MA can cause cancers in humans, including lung cancer, bone cancer, thyroid cancer, adult leukemia, and childhood leukemia.<sup>6</sup> The scientific consensus is that every additional exposure to radiation adds to the total risk for genetic damage and thus increases risk for blood cancers like leukemia; increased radiation exposure results in increased incidence of these diseases in exposed populations; for solid cancers, such as lung cancer, bone cancer, and thyroid cancer, the risk for cancer from radiation is directly proportional to cumulative exposure.<sup>7</sup>

### **Increased infant mortality, leukemia and thyroid cancer associated with Pilgrim**

Pilgrim Nuclear Power Station has specifically been associated with increased leukemia incidence in the local community. Dr. Richard Clapp, former Massachusetts state cancer epidemiologist and Professor Emeritus of the Boston University School of Public Health, found a fourfold excess of leukemia cases among persons who lived or worked near the Pilgrim nuclear power plant; in Dr. Clapp's study, leukemia risk was highest in persons with greatest exposure, a positive dose-response relationship.<sup>8</sup> Dr. Clapp's peer-reviewed case control study also showed increased infant mortality and elevated incidence of thyroid cancer.<sup>9</sup>

<sup>5</sup><https://cafethorium.who.edu/wp-content/uploads/sites/9/2023/06/Notes-on-Radiation-Control-Report-RE-PNPS-from-Ken-Buesseler.pdf>

<sup>6</sup> Gilbert ES. Ionising radiation and cancer risks: what have we learned from epidemiology? *Int J Radiat Biol.* 2009 Jun;85(6):467-82. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2859619/>

<sup>7</sup> Harris E. Risk of Death From Low-Dose Radiation Might Be Higher Than Thought. *JAMA.* 2023;330(12):1128. <https://jamanetwork.com/journals/jama/fullarticle/2809400>

<sup>8</sup> Clapp RW, Cobb S. Leukemia and other health outcomes in the vicinity of the Pilgrim Nuclear Power Station, Plymouth, MA. United States. *Archives of Environmental Health. Journal Volume: 45:5; Conference: 1. Annual meeting of the International Society for Environmental Epidemiology, Upton, NY (USA), 13–15 Sep 1989.* <https://www.osti.gov/biblio/5735008>

<sup>9</sup> Clapp RW, Cobb S. Leukemia and other health outcomes in the vicinity of the Pilgrim Nuclear Power Station, Plymouth, MA. United States. *Archives of Environmental Health. Journal Volume: 45:5;*



## Vulnerable populations at risk even from low dose ionizing radiation

While more exposure is always worse, even low-dose exposures to radiation increase cancer risk, according to the National Academy of Sciences BEIR VII report,<sup>10</sup> especially among vulnerable populations such as pregnant women, infants in the womb, and young children; moreover, exposure to ionizing radiation in early life can cause lifelong damage and increase risk of cancer across the lifespan.<sup>11</sup> The risks of radiation to children are much greater than those to adults because induced mutations usually occur during the DNA replicative process that accompanies cell division, and cells in the embryo, fetus, and children are dividing at much more rapid rate than in adults. Infants, children, and pregnant women are therefore particularly vulnerable to any radiation emitted from the Pilgrim Nuclear Power Station.

Given the tremendous increase in incidence of dementia in the US, it is particularly concerning that recent studies suggest that proximity to ionizing radiation sources is also associated with an increased risk of dementia.<sup>12</sup>

Radiation from nuclear power plants and the radioactive waste it generates pose disproportionate challenges to low-income and minority communities; some of the highest levels of radiation found across the country from these energy sources exist in these communities.<sup>13</sup> In Massachusetts, Superfund sites and hazardous waste are more likely to be located in close proximity to these populations.<sup>14</sup>

*In summary, there is cause for grave concern regarding potential future serious risk of cancer and other health effects among local communities due to radionuclide exposure from the decommissioning of the nuclear power plant in Plymouth and other ageing nuclear power plants across the United States. There is an urgent need, therefore, to develop standardized processes for decommissioning these facilities that are protective of health and minimize radiation exposure in Massachusetts and in other states.*

---

Conference: 1. Annual meeting of the International Society for Environmental Epidemiology, Upton, NY (USA), 13–15 Sep 1989. <https://www.osti.gov/biblio/5735008>

<sup>10</sup> [Health Risks from Exposure to Low Levels of Ionizing Radiation. BEIR VII. Phase 2](#)

<sup>11</sup> <https://www.epa.gov/radiation/radiation-health-effects>

<sup>12</sup> Srivastava T, Chirikova E, Birk S, Xiong F, Benzouak T, Liu JY, Villeneuve PJ, Zablotska LB. Exposure to Ionizing Radiation and Risk of Dementia: A Systematic Review and Meta-Analysis. *Radiat Res.* 2023 May;199(5):490–505. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10249679/>

<sup>13</sup> Kyne D, Bolin B. Emerging Environmental Justice Issues in Nuclear Power and Radioactive Contamination. *Int J Environ Res Public Health.* 2016 Jul 12;13(7):700. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4962241/>

<sup>14</sup> Faber DR, Krieg EJ. Unequal Exposure to Ecological Hazards: Environmental Injustices in 57 the Commonwealth of Massachusetts. *Environ Health Perspect.* 2002 Apr;110(Suppl 2): 277–288.