

**A STATEMENT PRESENTED AT THE NRC HEARINGS IN
PLYMOUTH, MA, BY KENNETH Kelley, BIOLOGIST
[Undated, late 1970's]**

Recent studies have revealed the presence of plutonium in mussels sampled from four locations in Cape Cod Bay off of the Pilgrim Nuclear Plant in Plymouth. In addition, radioactive cobalt, manganese, and cesium have been detected in seaweeds and shellfish near the discharge canal of the plant. While the concentrations found were have been small, they do indicate that leakage is occurring and raise questions about just how much of its wastes Pilgrim I is letting out into the environment.

They also raise questions about future health problems around the plant, especially the growing number of studies linking low level radiation to increases in leukemia, cancer and birth defects. With these and other questions still remaining about Pilgrim I, some local residents are alarmed by the Department of Public Utilities speed up hearings on Boston Edison's plans for building a second nuclear power plant in Plymouth.

The plutonium was discovered in testing done by Dr. Vaughn Bowen of Woods Hole Oceanographic Institution. It is he who revealed the amount of Plutonium-238 in the world's oceans doubled after the burn up of the U.S. SNAP-9A satellite in 1964. While Dr. Bowen stressed the fact that their readings were low, he did feel that continued testing is needed to monitor levels in the future. Plutonium is one of the most deadly carcinogens known to man with as little as one-millionth of a gram able to cause cancer. This coupled with the fact that it has a half-life of 24,000 years is hardly reassuring to some.

Samples of shellfish and seaweed, Irish Moss, taken around the discharge canal have shown amounts of cobalt, manganese, and cesium which are ten times higher than sample sites which are five and ten miles away. During 1974 and 1975 Boston Edison illegally discharged cesium and manganese which was 1.5 curies above federal levels. When asked if there might be a relationship between these discharges and recent findings, Francis Wiedenmann, Manager of Nuclear Information for Edison said that Edison had never exceeded federal guidelines. When it was pointed out that these figures were contained in Edison's own "Marine Ecology Studies" in 1975, he replied, "Well, I've only been working here since 1976."

By trophic level magnification through the food chain marine organisms can concentrate radionuclides to an amazing degree. After leakage from a federal waste storage site in Hanford, Washington, fish in the Columbia River concentrated some elements up to 100,000 times their original levels. Transfer of radiation in the food chain results in further concentrations and wider dispersal from the project area, particularly by migratory fish, birds and mammals. People eating the fish and shellfish will take up the radionuclides because they are chemically similar to elements their bodies need. For example, cesium is similar to potassium and is deposited in muscles in the body where it can produce malignant changes.

Besides routinely releasing radiation into Cape Cod Bay, Pilgrim I daily emits 240 pounds of radioactive gases into the atmosphere. These include strontium which is ingested into our bodies in milk, and tritium which can mutate DNA molecules which in turn control cell reproduction and genetic coding. This airborne radiation is

deposited on gardens and accumulates in the numerous cranberry bogs which dot the South Shore and Cape Cod. Cranberries are better accumulators of radionuclides from the soil than other plants because of the mineral poor and wet substrate in which they grow.

In addition to their planned releases into the environment, the Pilgrim plant has been plagued by accidental releases of radiation since it began operation in 1972. Between 1972 and 1975 they reported over 70 "abnormal" occurrences. In 1975, technicians removed a neutron screen while refueling the reactor. Among other things it released radioactive iodine into the air which was detected in birds around the plant. Edison's reports of accidents and abnormal occurrences have been late and incomplete. They have admitted to falsifying safety reports and paid up to \$12,000 in fines for this. The fact that Edison has falsified reports casts doubts on the credibility of figures used in determining the environmental impact of the plant. A government inspector from the NRC who toured Pilgrim this fall found the plant "barely safe enough to continue operating" and gave them the lowest possible ratings in the area of radiation control and safeguards. A recent study by the Health Research Group, a Ralph Nader organization, showed that Pilgrim I had the worst record of 53 nuclear plants in the country of worker exposure to radiation in 1976 and 1977. The Union of Concerned Scientists included Pilgrim in its list of 16 nuclear plants it charged should be shutdown because their licenses were granted on the basis of safety standards contained in the Rasmussen Report. That report, on the chances of an accident occurring at a nuclear plant, the NRC has now concluded is based on inadequate data and employed "questionable" statistical procedures.

Along with radioactive wastes, certain chemical biocides such as chlorine are dumped into the water to control fouling organisms. During the first years of operation, Pilgrim's continuous discharge of chlorine far exceeded state standards. Numerous studies have shown that even low level chlorination could be detrimental to juvenile lobsters, flounder, and other species. It has also been discovered that large amounts of cadmium have been found in the waters surrounding the plant. This comes from metal loss in the condenser tubes of the reactor, and has been shown to upset metabolic rates of shellfish and other invertebrates.

The thermal discharge also had a deleterious effect on the marine ecology. The thermal plume which is released averages 27 degrees above the ambient water temperature. This has resulted in fish kills, plankton die-offs, changes in species composition and reproductive cycles. Besides eliminating most organisms in the area, it attracts fish like menhaden which are killed by nitrogen super-saturation in the heated water. In 1973, 50,000 died. In 1975, 16,000 herring dies due to thermal stress. The heated water has caused a drop of 200,000 pounds yearly in the local Irish moss harvest and a 15% loss to the juvenile lobster population. Further problems arise when the plant has to shut down and the water temperature drops. This has been a persistent problem at Pilgrim due to the numerous shutdowns at the plant which has operated at less than 50% of its capacity since beginning operations.

Each day Pilgrim consumes one square mile of plankton, which is the basis for the food chain in the ocean. Plankton sampling in the area has shown highly diversified phytoplankton and zooplankton populations. Of great concern to local fishermen is the fact that 24 species of fish eggs and larvae were found in the plankton tows. These include such commercially important species as cod, winter flounder, polluck, hake, tautog, cunner and mackerel. The Environmental Impact Statements (EIS) put out by Edison seems to ignore that a major spawning ground of winter flounder is

found north of the plant in Duxbury Harbor; or that a spawning ground of cod exists in Cape Cod bay, east and northeast of the plant. The counterclockwise along-shore currents in the Bay bring these waters right to the plant. These and other plankton are killed either by entrainment, entrapment or thermal shock. The spawning grounds of cod or pollock in the Bay are fully discussed by Bigelow and Schroeder's *Fishes of the Gulf of Maine*. A "marine Ecology Study" on the effects of Pilgrim I put out by Edison in 1973 even states, "These data continue to suggest that spawning activity of several species in waters adjacent to Pilgrim Station is ample to warrant concern regarding possible entrainment losses." Yet the final EIS for Pilgrim II dismisses any concerns with his ambiguous and contradictory statement that, "Nothing is known about the site of actual spawning, however concerning the combined thermal, mechanical, and chemical effects of passage on fish larvae: any impact due to the combined effects are judged acceptable by the staff."

According to Edison spokesmen, the levels of radioactivity found in the Bay are well within the government's "safe" exposure levels. However, some scientists have argued that there is no "safe" level of exposure, and that any increase in the amount of exposure will result in increasing rates of cancer, leukemia, and birth defects. Those most susceptible are younger children and fetuses still in their mother's womb. The NRC has recently proposed cutting the exposure level for nuclear plant workers by more than half, from 12 to 5 rems a year. The decision to propose the lower limit is the result of studies "which indicate that health effects at present does standards may be larger than previously thought." Some recently published studies have tended to support claims that the government's level has been arbitrarily set and may be too high.

According to a study by Dr. Thomas Najarian of Portsmouth Naval Shipyard workers on nuclear submarines, they have twice the cancer death rate of the population at large and 80% more cancer deaths than other workers at the same shipyard. Their leukemia death rate is four times the national average. Two members of a special watchdog committee set up by Congress to oversee a study of possible radiation dangers at the Portsmouth base have charged the study is being intentionally delayed by Federal agencies, and that essential information is being withheld. One of those who resigned in protest, Dr. Thomas Mancuso, of the University of Pittsburg did an earlier study of workers at the government nuclear facility in Hanford, Washington. This study showed, "cancers of the bone marrow, lungs, and pancreas...too numerous to be explained by chance." A long suppressed study done by the U.S. Public Health Service in 1965 cited excessive leukemia deaths occurring among Utah residents exposed to radioactive fallout from U.S. atomic bomb tests. Subsequent studies also revealed unusually high incidences of birth defects and thyroid cancer in surrounding areas. A ten-year study done by England's Medical Research Council of shipyard workers who worked on nuclear submarines in Scotland showed that they suffered chromosome damage at radiation levels which are considered "safe." They also found the greater the radiation dose, the greater amount of chromosome damage. These and other findings have prompted the Energy Department to undertake a massive study to determine the health effects of low-level radiation.

With the knowledge that some radionuclides will remain in Cape Cod Bay for up to 250,000 years, and that the levels are sure to grow with daily release of wastes from the plant; it is disconcerting to some that Boston Edison plans to build another plant even larger than Pilgrim I beside it. They are upset that Governor King and the DPU are trying to rush the hearings for Pilgrim II when Edison still has not submitted an

adequate evacuation, decommissioning, or waste disposal plan for Pilgrim I yet. Local fishermen are concerned about possible adverse effects on their livelihood, and point to the problems Pilgrim I has caused. And despite Edison's assurances that the levels of radioactivity found in the Bay are "safe", recent findings on the long term effects of low level radiation have failed to allay the fears of many who live around the plant.