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A PRELIMINARY EVALUATION OF POSSIBLE EFFECTS ON FISH AND SHELLFISH OF THE OPERATION OF THE PROPOSED INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 BUCHANAN, NEW YORK (DOCKET NO. 50-247)

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1. Introduction

The Consolidated Edison Company of New York, Inc., has applied to the Atomic Energy Commission for licenses to construct and operate a nuclear reactor in Westchester County, New York. The proposed reactor will be the second nuclear facility at the Indian Point site, the first having been in operation for over 3 years. The site comprises approximately 250 acres of land on the east bank of the Hudson River at Indian Point, Village of Buchanan in upper Westchester County, New York. The site is 2.5 miles southwest of Peekskill and about 24 miles north of New York City boundary line.

We understand that the jurisdiction of the AEC in the licensing and regulation of nuclear power reactors is limited to matters pertaining to radiological safety. For that reason, our comments in this report are divided into two categories. The first category pertains to radiological

safety considerations which are involved in the pending licensing proceeding. The second category contains our comments on the possible effects of increased water temperature on fishery organisms. Although these considerations are not within the jurisdiction of the AEC and not involved in the pending AEC licensing proceedings, they may be of interest to appropriate state and local agencies and to the applicant.

The entry of radioactive materials into the aquatic environment, either by design or by accident, might conceivably result in adverse effects on the fisheries of the area. It was deemed advisable, therefore, that the Bureau of Commercial Fisheries of the U. S. Fish & Wildlife Service evaluate the possible effects of the operation of the reactor on the fisheries of the area. The present evaluation is based in part on information presented in the Preliminary Safety Analysis Report, Volumes 1 and 2, by the Consolidated Edison Company of New York, Inc.

2. Description of the Facility

Generating Unit No. 2 will be constructed adjacent to Unit No. 1 and will consist of a reactor containment building, auxiliary building, control room, and turbine building as the major structures.

The reactor will be a pressurized water-type cooled by ordinary water which is kept under sufficient pressure to prevent bulk boiling. This is the type used in Indian Point Unit No. 1, Brookwood, New York, and the Yankee Power Facility, Massachusetts. The water, after leaving the reactor vessel, passes through a heat exchanger where it yields its heat to another separate stream of water which is thereby converted into

steam. The reactor coolant system will be arranged as four closed reactor coolant loops connected in parallel to the reactor vessel, each containing a reactor coolant pump and a steam generator. An electrically heated pressurizer will be connected to one of the loops. The reactor design calls for a thermal output of 2,758 megawatts and a net electrical capacity of approximately 873 megawatts.

Condenser circulating water will be drawn from the Hudson River through a floating debris skimmer wall and eight separate screen wells at a flow rate of 840,000 gpm. The circulating water will be discharged back into the river far enough away from the intake to minimize recirculation.

3. Radioactive Waste Disposal Facilities

The waste disposal system is designed to collect, monitor, and process for safe disposal all solid, gaseous, and liquid wastes.

The maximum rate of solid waste accumulation will occur during refueling periods and the minimum during normal operation. Solid wastes, such as sampling paper, cardboard, wood, paper, broken or contaminated glassware, filter cartridges, etc., will be compressed by a hydraulic bailer into 55-gallon drums. These drums will be stored prior to shipment offsite. Spent ion-exchanger resins will be stored in a resin storage tank until a sufficient quantity has accumulated for packaging with concrete. Normally a minimum of 6 months will be allowed for decay.

Gaseous wastes will be stored in tanks until sample analysis indicates sufficient decay to warrant release to the environment. Three

tanks will be provided for normal operation with one tank filling, one in decay, and the third discharging. A fourth tank will be provided to accommodate gaseous wastes resulting from unexpected plant operations, such as cold or hot shutdowns. As the gases leave the waste disposal system, they will be monitored continuously, and if an unexpected increase in radioactivity is detected, one of the discharge valves will be closed automatically on signal from the monitor.

The concentration of radioactivity in liquid wastes determines the process to be used for safe disposal. Wastes may be discharged to the waste hold-up tanks if additional delay time is warranted for radioactive decay, to the gas stripper if the purity is low and the radioactivity level is suitable for processing through the evaporator train, or to the condenser cooling waters discharge if wastes can be released within the tolerances established by Title 10, Part 20 of the Code of Federal Regulations. The gas space in the waste hold-up tanks will be filled with nitrogen of a low positive pressure to prevent accumulation of a potentially explosive mixture of hydrogen and oxygen. Liquids from the evaporators may be discharged to the evaporator concentrates processing train for filtration, removal of cations in demineralizers, and then storage in the steam jacketed concentrates holding tank. From this tank the solutions will be either transferred to the boric acid tanks, or returned to the concentrates processing train or waste hold-up tanks for reprocessing by the evaporator train. Concentrated solutions from the evaporator will be placed in 55-gallon

5. Hydrology

The Hudson River in the vicinity of Indian Point ranges from 4,500 to 5,000 feet in width with maximum depths of 55 to 75 feet. Cross sectional areas in the vicinity are in the order of 165,000 to 170,000 square feet. The Hudson River is tidal as far as Troy, some 100 miles upstream from Indian Point. The elevation of the water surface in the vicinity of the plant is so responsive to the tidal cycle that average rate of flow has little effect on depth or velocity of flow.

The hazards of contamination of water supplies by radioactive effluent wastes from the Indian Point plant are considered minimal. In the reach of the Hudson River that could be effected, river water is used only for industrial cooling. However, the city of New York is now in the process of constructing a river water pumping station at Chelsea in Putnam County to pump Hudson River water into the County system.

6. Fisheries of the Hudson River

There are extensive commercial and sport fisheries in the Hudson River. Sport fishing is concentrated mainly on striped bass and white perch. The predominant commercial fishery is the shad fishery. During 1964, 181,865 pounds of shad were caught in the Hudson River. Approximately 149,000 pounds of this catch was caught by stake gill nets south of the Peekskill area. Less extensive commercial fisheries include herring, striped bass, American eel, sturgeon, white perch, tomcod, and American

drums, mixed with cement and ultimately shipped offsite for disposal. All liquid effluent releases will be monitored prior to release into and dilution with the condenser discharge.

4. Environmental Radioactivity

All radioactive effluents released into the Hudson River will be under controlled conditions at concentrations below the limits set by Title 10, Part 20 of the Code of Federal Regulations. Environmental radiological surveys have been in operation in the vicinity of Indian Point Station since 1958, about 4 years before Unit No. 1 began operation. These results are reported semiannually to the AEC, Docket #50-3. Monthly samples are taken of Hudson River water near the site, vegetation on the site, marine life from the river, and water from the Indian Point well. Surveys have shown that operation of Indian Point Unit No. 1 for over 3 years has had no detectable effect on the environment.

Similar results have been obtained in a 2 year post-operational survey conducted by members of the Bureau of Radiological Health Services in New York State Health Department, the Middletown District Health Office, and the Rockland and Westchester Health Department, and by biologists from the Bureau of Marine Fisheries in the New York State Conservation Department. Similar results also have been obtained in independent studies by Dr. Merrill Eisenbud, Director of Environmental Radiation Laboratory, Institute of Industrial Medicine, New York University.

smelt. Although there are no commercial fisheries for shellfish, some oyster setting grounds exist from the New Jersey boundary north for a distance of 9 miles.

7. Fate of Radionuclides in the Aquatic Environment

When radionuclides are released into the aquatic environment various factors tend to dilute and disperse them while other factors tend to concentrate them. If the rate of dilution were the only consideration, undoubtedly the maximum permissible concentrations of radionuclides which can be disposed of as wastes would be adequate criteria in determining the maximum safe rate of discharge. However, radioactive isotopes are adsorbed onto sediments and are concentrated by organisms which require many of the stable forms of these elements for their normal metabolic activities. In addition, some organisms concentrate radioisotopes not normally required but which are chemically similar to elements essential for metabolism . Furthermore, distribution of radionuclides can occur by their transmission from one organism to another through various trophic levels of the food web and by the migration of organisms from the area.

8. Conclusions and Recommendations Concerning Radioactive Effluents

The Indian Point Pressurized Water Reactor No. 2 has been designed to operate with a minimum of environmental contamination by radioactive effluents. Radioactive materials that are released to the

environment, however, must be released at a rate which will not exceed the maximum permissible limits defined in Title 10, Part 20 of the Code of Federal Regulations.

It is concluded that the Indian Point Nuclear Generating Unit No. 2 can be operated without harmful effects to the fisheries provided that the findings of the radiological monitoring program are used to govern the discharge of radioactive material.

Although it is well established that certain levels of radioactive wastes can be discharged into the aquatic environment without adverse effects on the fisheries, it is essential to determine whether such discharge adversely affects the organisms in each specific area. In view of the extensive fisheries in the Hudson River it is imperative that every effort possible be made to safeguard these fisheries. Therefore, it is recommended:

(a) That ecological surveys be initiated as soon as possible and continued on a regular basis to determine the effects of reactor effluents on plant and animal communities.

(b) That the radiological monitoring program be conducted on a quarterly basis and include representatives of the ecologically important groups of aquatic organisms and sediments.

(c) That hydrology studies in the vicinity of the plant be continued on a regular basis to provide necessary data on water flow for use in calculating dilution and dispersion of radioactive materials.

(d) That consideration be given to the combined effects of effluent discharge from all existing and planned reactors along the shores of the Hudson River.

(e) And that the Radiobiological Laboratory be placed on the distribution list to receive copies of the survey and monitoring reports for review in determining whether or not unsafe levels of radioactivity have been found in the water, sediments, or biota.

Possible Effects of Increased Water Temperature on Fishery Organisms

Large volumes of heated water discharged into an aquatic environment from a nuclear steam generating plant can result in a significant increase in the temperature of the environment near the plant. The temperature rise may or may not be sufficient to cause mortality among the organisms present, but subtle biological changes could occur causing long-term changes in the fisheries.

The thermal requirements of a fishery organism cannot be stated with any degree of accuracy. By "thermal requirements" here is meant the temperature limits which will permit survival at a level which allows for

continuity of the species. These limits are influenced by season, age, size, and other factors so that the thermal requirements would be quite variable and difficult to ascertain. As a controlling factor, the thermal requirement of a particular species becomes a level which will permit sufficient difference between resting and active metabolism to provide for essential activities (Brett 1960). The increased energy demand of resting metabolism during elevated temperatures may rob an organism of the agility needed to capture its food. It has been proposed that the upper limit of required temperature for any species of fish should not exceed that which would curtail activity below 3/4 of the optimum, i.e., 3/4 of the maximum difference between active and resting metabolism (Brett 1960).

Although a temperature rise in the aquatic environment may result in a change in species composition, increases in total productivity near warm water outlets from conventional power plants have been observed. Therefore, it will be necessary to follow carefully any changes in total productivity in order to properly evaluate the effects on fishery organisms from discharged heated water.

Literature Cited

Brett, J. R. 1960. Thermal requirements of fish--3 decades of study, 1940-1970. In: Biological Problems in Water Pollution. U. S. Public Health Service, Robert A. Taft Sanitary Engineering Center, Technical Report W60-3, p. 110-117.