NOV 30 1964

Docket No. 50-220

Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse 2, New York

Attention: Mr. Minot H. Pratt
Vice President and Chief Engineer

Gentlemen:

Transmitted herewith for your information is a copy of a report by the United States Department of the Interior, Fish and Wildlife Service, outlining its comments and recommendations on the Preliminary Hazards Report, Nine Mile Point Nuclear Station, Niagara Mohawk Power Corporation.

Sincerely yours,

Original signed by
E. G. Case

Edson G. Case
Assistant Director
Division of Reactor Licensing

Enclosure:
As stated above

bcc: E. G. Case
OGC
N. D. Mason
C. Henderson

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cc: G. Cole
OGC
J. D. Kelley
C. Haughney (2)

Appendix D

COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
WASHINGTON 25, D. C.

November 17, 1964

Mr. Harold L. Price
Director of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Price:

In accordance with your request dated June 9, 1964, for our comments and recommendations on the Preliminary Hazards Report, Nine Mile Point Nuclear Station, Niagara Mohawk Power Corporation (Docket No. 50-220), we are transmitting copies of a report by Dr. Theodore R. Rice of the Bureau of Commercial Fisheries entitled, "A Preliminary Evaluation of Possible Effects on Fish and Shellfish of the Proposed Nine Mile Point Nuclear Station, Oswego County, New York."

We requested that Mr. William F. Carbine, Regional Director, Bureau of Commercial Fisheries, Ann Arbor, Michigan, discuss Dr. Rice's report and the Preliminary Hazards Report with local representatives of the Bureau of Sport Fisheries and Wildlife and the New York Conservation Department to obtain their comments in view of local knowledge.

On the basis of Dr. Rice's report and the comments received from other agencies, we believe that plans for control and disposal of radioactive wastes are adequate to protect fish and wildlife in the vicinity of the proposed plant. Recommendations in Dr. Rice's report dealing with radioactive hazards to fish and wildlife should be carried out by competent fish and wildlife experts to insure that no adverse effects occur. We request that local Fish and Wildlife Service and New York Conservation Department personnel be consulted in developing and reviewing the surveys needed to carry out these recommendations. Mr. Carbine, at the above address, would be happy to assist with the necessary coordination if desirable.

Fish and wildlife experts believe that thermal pollution may adversely affect aquatic resources in the area. We recommend that appropriate studies of the effect of the heated water be made and plant operation be modified to minimize any harmful thermal effect on aquatic life.

Although the Atomic Energy Commission feels that its regulatory authority over nuclear power plants includes only those hazards associated with radioactive materials, we urge that the hazards to fish and wildlife from

thermal effects be called to the attention of the Niagara Mohawk Power Corporation and that they be encouraged to discuss this matter with appropriate State officials and representatives of the Fish and Wildlife Service to develop measures to minimize this problem.

We are sending a copy of this letter and Dr. Rice's report to the New York Conservation Department for their information.

Sincerely yours,

/s/ Donald L. McKernan

Acting Commissioner

Enclosures

A PRELIMINARY EVALUATION OF POSSIBLE EFFECTS ON FISH AND SHELLFISH OF THE PROPOSED NINE MILE POINT NUCLEAR STATION, OSWEGO COUNTY, NEW YORK. (DOCKET # 50-220)

By

T. R. Rice, Director

and

J. P. Baptist, Fishery Biologist

Radiobiological Laboratory
Bureau of Commercial Fisheries
Beaufort, North Carolina

I. Introduction

The Niagara Mohawk Power Corporation has applied to the Atomic Energy Commission for a construction permit and license to operate a nuclear power reactor in Oswego County, New York. The nuclear plant site comprises approximately 1,500 acres on the southeast shore of Lake Ontario, 7 miles northeast of the city of Oswego, and 36 miles north northwest of Syracuse.

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 are not involved

in the pending AEC licensing proceeding, 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 and Wildlife Service review the proposal and evaluate the possible effects of the operation of the proposed reactor on the fisheries. The present evaluation is based in part on information presented in Exhibit D, Preliminary Hazards Summary Report, Nine Mile Point Nuclear Station, by the Niagara Mohawk Power Corporation, Syracuse, New York.

2. Description of the Station

The nuclear facility will employ a direct cycle boiling water reactor to produce steam for direct use in a steam-drive turbine generator. The reactor is designed for an output of 1,538 thermal megawatts. Electrical output is 525,000 kilowatts, with station equipment designed to accommodate future increases up to a maximum output of 620,000 kilowatts.

All major structures including the turbine building, waste disposal building, screen house stack and administration building will be founded on Oswego sandstone which exists on the site at an average of 11 feet below grade. The reactor building substructure will be founded in rock to a depth of approximately 60 feet. Reactor coolant will be passed through five recirculation loops, each one of which will include an adjustable pump to control the flow of circulating water and thus control reactor

power. During operation reactor heat is transferred to slightly subcooled water entering the bottom of the core. A steam-water mixture flows upward through the core to the steam separator assembly where centrifugal force drives the water to the outside walls of the separators and from where it passes back to the recirculation loops. Closed loop cooling water systems used in the reactor building and in the turbine building will be coupled to heat exchangers cooled by lake water.

3. Radioactive Waste Treatment Facilities

Equipment for processing and handling solid, liquid, and gaseous radioactive wastes will be basically the same as that utilized in other plants of similar design. Only the liquid wastes are pertinent to this evaluation report since solid wastes will be packaged for ultimate disposal in an approved manner and gaseous wastes stored, filtered, and discharged to the atmosphere at rates within limits designated by the operating license.

Liquid wastes of low radioactivity content after being processed will normally be discharged to the circulating water discharge system. Liquid wastes with relatively high radioactivity concentration will be pumped to the waste concentrator for treatment. Concentrate will then be collected in the concentrated waste storage tank and later mixed with cement to bind free water, packaged into steel drums and stored as solid waste for future shipment and offsite disposal. The estimated normal discharge of radioactivity to the lake will be less than 2×10^4 microcuries per day. These wastes will be diluted by the condenser cooling water system which has a normal flow rate of 240,000 gallons/minute, or

approximately 3.4×10^8 gallons/day. The intake for the coolant water is expected to be offshore in about 25 feet of water. After passing through the condensers the water will be discharged through an underwater tunnel located between the intake and the shore. Discharge of radioactive liquid waste to the lake will conform to limits established in the operating license. Data from extensive environmental surveys and consideration of lake diffusion characteristics will provide the basis for establishing the discharge limits. Niagara-Mohawk expects to cooperate with New York State health authorities on environmental and radiological matters.

4. Limnology of the Nine Mile Point Area

An extensive limnological study program was started in May 1963 by Dr. John F. Storrs, Consultant in Oceanography and Limnology. This program contained the following 4 specific objectives: (1) to define the offshore currents at Nine Mile Point, (2) to correlate these currents with various wind regimes which may then be used as current indicators, (3) to determine the dilution factors applicable to water leaving the Nine Mile Point site, and (4) to evaluate the effect of station effluent on aquatic life. An average of 13 cruises per month were made from May to December of 1963. The area from the mouth of the Oswego River to the eastern end of the lake was worked extensively with a concentration of the cruise time spent in the immediate vicinity of the promontory on which the nuclear power plant is to be located. The investigators were equipped to measure chlorides, water conductivity, water temperatures at the surface and in depths, water transparency, and current direction and flow at various depths.

The fortuitous presence of high chloride content found in the Oswego River water (at times over 300 ppm) above that found in the lake served as the indicator in tracking the water movement past the plant site and beyond. Chloride concentrations were also used in determining dilution rates under specific current flows and wind conditions. Over 1,000 drift cards in weighted cylindrical plastic containers were released from various positions in the lake. Over 50% of these were recovered.

Dilution rates were calculated by using the outflow of the Oswego River as a model. The river flow is about twice the volume of the plant effluent and the water is always at a higher temperature in the lake. At times it attained about half the 32° F rise planned for the condenser circulating water. Because of this close parallelism, estimates of dilution rates with plant effluent based upon the Oswego River as a model should be reasonably accurate. It was concluded that the dilution at the plant site and nearby locations is comparatively high and the overall effect on lake usage will be negligible.

5. The Fisheries of Lake Ontario

During the year 1961, a total of 2,460,000 pounds of fish were caught in Lake Ontario. Of this total, Canada landed 2,109,000 pounds and the United States, 351,000. In order of greatest quantity, dominant fish were: whitefish, 631,000 pounds; carp, 363,000 pounds; bullheads, 256,000 pounds; yellow perch, 241,000; smelt, 223,000 pounds; common eel, 155,000 pounds; sunfish, 138,000 pounds; and yellow pike, 126,000 pounds (Power, 1963). Types of gear used included gill nets, fyke and hoop nets, trap nets, and a few haul seines.

6. Fate of Radionuclides in 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.

7. Conclusions and Recommendations Concerning Radioactive Effluents

The proposed reactor has been designed to operate with a minimum of environmental contamination by radioactive materials. However, these radioactive liquids must be released at a rate which will not exceed the maximum permissible limits set forth in title 10, part 20 of the Code of Federal Regulations.

It is concluded that the proposed nuclear reactor can be operated without harmful effects to the fisheries provided that an intensive radiological monitoring program remains in effect during reactor operation, and the findings of this 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.

To insure that adequate safeguards are followed, which will protect the fisheries from harm, certain requirements must be met. Therefore, it is recommended:

a. That ecological surveys be conducted 2 years prior to plant operation and continued on a regular basis after the plant starts operation to determine the effects of reactor effluents on plant and animal communities.

b. That extensive radiological monitoring of the biota, water, and sediments of the proximal aquatic environment be initiated at least 1 year prior to reactor operation and that it be continued on a regular basis.

c. That the hydrologic studies in the vicinity of the plant such as already have been completed be continued during plant operation to determine the extent of any changes which may occur due to discharge of radioactive effluents.

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

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

8. 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.

Power, E. A. 1963. Fishery Statistics of the United States, 1961. U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Statistical Digest No. 54, p. 329-346.

APPENDIX E

REPORT ON THE SEISMICITY OF THE NINE MILE POINT AREA, OSWEGO COUNTY, NEW YORK

The Nine Mile Point nuclear station site is located approximately six miles northeast of Oswego, New York, on the southeast shore of Lake Ontario. The nearest area of seismic activity ever reported is approximately 50 miles from the nuclear reactor site. Historically, the known seismic activity within a radius of 200 miles of the site has resulted in a maximum Modified Mercalli intensity at the epicenter of VIII and an estimated intensity at the site of not greater than V. The closest known earthquake was a shock of maximum intensity VI near Lowville, New York, about 50 miles from the site, on March 12, 1853.

Earthquakes of note which have been felt at the site are: the St. Lawrence Valley earthquake of 1663 at a distance of 325 miles, maximum intensity XI-XII; the Baie St. Paul earthquake of 1870 at a distance of 300 miles, maximum intensity VIII; two earthquakes in northeastern New York in 1877 and 1897 at a distance of 175 miles, maximum intensities VII and VI; the Lanark, Ontario, earthquake of 1914 at a distance of 110 miles, maximum intensity VII; the St. Lawrence River earthquake of 1925 at a distance of 400 miles, maximum intensity IX; the Attica, New York, earthquake of 1929 at a distance of 100 miles, maximum intensity VIII; the Timiskaming, Quebec, earthquake of 1935 at a distance of 250 miles, maximum intensity VI; the Lake Ossipec, New Hampshire, earthquake of 1940 at a distance of 130 miles, maximum

intensity VII; and the Cornwall, Ontario, earthquake of 1944 at a distance of 150 miles, maximum intensity VIII.

In the Preliminary Safeguard Report, the applicant has stated correctly that no damage has been recorded in this area, and that the nearest earthquake occurred at a distance of approximately 50 miles from the site.

The statement by the applicant in the Preliminary Safeguard Report that". . . . if there is any trend at all in the seismic history of the region, it is of a lessening of larger magnitude earthquake activity" does not seem to be justified. However, the applicant's choice of a design earthquake with a maximum acceleration of 0.11 g at the site, assuming that the reactor is located directly on the Oswego sandstone, appears to be adequate for this site, since historically the highest accelerations experienced there were 0.07 g.

U. S. Coast and Geodetic Survey
Washington 25, D. C. 20230

October 21, 1964