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DESCRIPTION:
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PLANT NAMES: Kewaunee Nuclear Power Plant

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United States Department of the Interior

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ER-72/888

OCT 26 1972

Dear Mr. Muller:

This is in response to your letter of July 20, 1972, requesting our comments on the Atomic Energy Commission's draft statement, dated July 1972, on environmental considerations for Kewaunee Nuclear Power Plant, Kewaunee County, Wisconsin.

Historical Significance

The fourth paragraph on page II-18 infers that there were no impacts on archeological resources resulting from the construction of the plant since there are no documented archeological sites within the site boundaries. The statement does not refer to an archeological survey of the site as the basis for this conclusion. Archeological surveys of the project site and transmission line rights-of-way should have been conducted prior to construction and described in the environmental statement.

Geology

The Geological Survey, as a consultant to the Atomic Energy Commission, has previously reviewed the geology of the proposed site with respect to safety aspects of the operation. The statement adequately displays the expected geological effects of the plant operation.

Environmental Features

The effects of sedimentation and erosion on the plant and the measures to protect this area from these acts of nature are not discussed adequately. Pages II-32 and IV-6 refer to protection by a promontory extending into the lake and additional stabilization being provided by riprap. Figures III-1 and III-2 also give data as to the location of these

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features in respect to the plant. These small scattered portions of information should be pulled together and expanded in Chapter IV in order to present adequate coverage of this important feature.

Plankton

The second paragraph on page II-43 should be expanded to include the findings of other ecological studies of Lake Michigan. A report entitled "Physical and Ecological Effects of Waste Heat on Lake Michigan," published in September 1970 by this Department's Bureau of Sport Fisheries and Wildlife, indicated that nutrients in the inshore waters are approaching levels commonly found in the central basin of Lake Erie. Since Lake Michigan receives a substantial and increasing load of nutrients in the form of nitrogen, phosphorous, and other fertilizing agents from domestic effluents and agricultural runoff, it can be expected that the inshore waters of Lake Michigan, if nutrients are not controlled, will attain conditions of algae production similar to those in Lake Erie. If these conditions are reached, temperature will become a very important factor in determining the type of algae.

Stoermer and Yang (1969) reported that although the dominant phytoplankters in Lake Michigan are still diatoms, the numbers of taxa that are associated with degradation of water quality have increased and that a number of species which were able to thrive only in the naturally enriched areas near shore and in estuaries are now found in some areas of the open lake. The authors stated that "consideration of distribution and relative abundance of the major components of the plankton flora leads one to the conclusion that Lake Michigan is probably at the present time about at the breaking point between rather moderate and transient algae nuisances, largely confined to the inshore waters, and drastic and most likely irreversible changes in the entire ecosystem."

C. L. Schelshe and Stoermer, in a paper entitled "Depletion of Silicon and Accelerated Eutrophication in Lake Michigan," which was presented at the meetings of the American Society of Limnology and Oceanography in August 1970, stated that during the past 30 years the relative abundance of diatom species commonly associated with degradation of water quality

has increased. In the summer of 1969, the plankton diatoms comprised less than 10 percent of the phytoplankton in samples from the southern part of the lake, which was a significant deviation from previous years when the diatoms comprised at least 65 percent of the phytoplankton. The evidence, compared with data from Lake Erie and Lake Superior, suggests that accelerated eutrophication in Lake Michigan is rapidly approaching the point of a severe environmental change in which the diatom flora will be reduced or replaced by green and blue-green algae. The overall effect of heated discharges will be to reinforce and increase warmwater species to the detriment of more desirable coldwater species.

Benthos

This section, beginning on page II-45, describes extensive benthic surveys in the deeper offshore waters; however, data on benthos of the Kewaunee site in the nearshore waters where plant operations would have their greatest impact is not given. This data should be obtained and included in the final environmental statement.

Thermal Plume Dispersion

According to the cooling water effluent velocities given on page III-9, the travel time for the effluent to reach the end of the 530-foot discharge channel would vary from 3.7 to 1.3 minutes with 1.9 minutes required when the lake is at its normal water level of 577 feet (IGLD). These time periods appear to be in conflict with the second paragraph on page III-21 which states that the time involved would be approximately one minute. Therefore, organisms entrained in the cooling water would be exposed to maximum temperatures for approximately two minutes plus an additional minute in the effluent plume or a total of about three minutes at mean lake level.

We suggest that the apparent discrepancy between data on pages III-9 and III-21 be reconciled and the second paragraph on page III-21 be expanded to consider the time involved when strong lake currents will cause the plume to run along the shoreline and reduce the opportunity for the effluent to mix with the cooler receiving water. This will cause the duration of exposure of entrained organisms to

maximum temperatures in the effluent plume to be considerably longer than one minute.

We agree with AEC in the conclusion in the second paragraph on page III-9 that the mathematical model may not present an accurate indication of plume size. However, Figure III-7, showing the Point Beach plume on August 31, 1971, would appear to indicate that the applicant's data are reasonable. The Point Beach Unit 1, August 31, 1971, plume indicated distances in excess of a mile. The area enclosed by the 3°F isotherm is a significant area even though it may be less than 1,000 acres, as estimated by the applicant, or more than 254 acres, as estimated by AEC.

Of particular concern is that the statement does not adequately discuss the effects of sinking thermal plumes. It appears probable that the plumes of Kewaunee will sink below the surface at temperatures between 46°F and 32°F when the ambient temperature of the beach water is near freezing. The statement should evaluate this effect and the impact it may have on benthic organisms and on other aquatic life. We have special concern for the effects of biocides which may be carried to the bottom by sinking plumes.

Applicability to the Kewaunee Plant

This section, beginning on page III-13, contains a good discussion of the effluent plumes. We think that the intake temperatures and the plant load factors should also be included for the comparison with the Point Beach plant. Also, Figure III-11 indicates that the Point Beach plume has not completely separated from the lake bottom at about 1,000 feet from shore where the depth is 16 feet, while it is stated on page III-13 that the plume appears to separate from the bottom within a distance of 600 feet from the discharge. If both of these data are correct, there appears to be significant recirculation at Point Beach which could indicate that there will be significant, occasional recirculation of cooling water effluent at Kewaunee where the depth at the intake located 1,600 feet from shore is only 15 feet.

Water and Air Use

The first sentence, third paragraph of page V-4 should be corrected to recognize that the water usage will affect lower

levels of the lake in addition to surface waters. Chemicals will be distributed throughout the lake by vertical and horizontal mixing forces and heated water will sink to the bottom when lake waters are cooler than about 4°C.

Thermal Discharge

It does not appear that sufficient evidence has been presented to show that the biological environment in the vicinity of the discharge is relatively barren as stated on pages V-5 and V-15. Conversely, other sections of the statement indicate that an attractive sports fishery will result from the discharge of the heated effluent and that the area will become biologically bountiful in the future. We think that the effects on the aquatic life in Lake Michigan would be more adequately determined by assessing the impacts on the types and quantities of organisms that will be attracted to the area as a result of the plants' operation.

Recreational and Other Uses

Since the warmed effluent discharge from the plant is expected to attract fish to the area, we suggest that the applicant provide a public fishing pier with attendant sanitary facilities along the lake front. This feature and the applicant's plan to set aside four or five acres for proposed high school conservation classes should be included in an overall land use plan for the 908-acre site. The overall land use plan should be described in the final environmental statement.

Plankton

The rate of eutrophication is controlled primarily by nutrient supply and water temperature. Either can be a limiting factor to productivity. Nutrient control measures are being undertaken at municipal and industrial effluent outfalls on a lake-wide basis; however, many diffuse sources of nutrients such as agricultural and urban runoff and sediment erosion are not amenable to control. Conversely, waste heat inputs are essentially point sources and can be controlled much more efficiently than nutrients. Therefore, based on the importance of thermal effects, we think that the final environmental statement should show quantitatively

the net gain or loss of phytoplankton respiration at various times of the year resulting from the use of lake water to receive the cooling water effluent.

It should be recognized that although plant passage and entrainment of algae at the discharge point may cause a reduction in biomass, there is evidence that this may be followed by a compensatory overshoot in the plume when the temperature rise drops within a few degrees of ambient lake temperature. The area of heated effluent at 1 to 3°F rise is quite large and accelerated production in this area could result in a significant increase in biomass of thermophilic phytoplankters.

The classification of eggs and fry of Lake Michigan fishes, on page V-12, as meroplankton is not correct. The larvae of all Great Lakes fishes are relatively weak swimmers immediately after hatching but only one species, the drum, has a pelagic egg and a pelagic sac fry that is not free-swimming at the time of hatching.

The plant's estimated impact on the planktonic population is based on a ratio of the plant's cooling water intake and the entire volume of Lake Michigan. We suggest that a more accurate comparison would be with the shallow inshore waters of the lake where the water intakes and discharges of the generating plants are located.

Fish Eggs and Larvae

The last sentence on page V-13 states that no increase in mortality rate among the fish eggs and meroplankton is anticipated. This appears to be in error and also in conflict with page II-48 which states that alewives and smelt may spawn in the area.

The recent Point Beach Environmental Impact Statement stated that young fish generally frequent the close inshore areas and species such as smelt, alewives, and minnows may spawn in situations similar to Point Beach. The memorandum from J. R. Bell to F. H. Schranfnagel in Appendix C of the Point Beach statement showed that smelt eggs and fry passed through the cooling systems of the Point Beach and Oak Creek plants. These studies were terminated in late April and early May before the bulk of the eggs would have hatched.

Based on the environmental statements for Point Beach and Kewaunee and our understanding of the aquatic life in Lake Michigan, we suggest that this sentence be modified to indicate that some increase in mortality rate of fish eggs and larvae is anticipated.

Effects of Temperature Increases

We draw different conclusions than those presented in the second paragraph of page V-17 and the first paragraph of page V-18. A memorandum concerning the Point Beach studies and others at Oak Creek was presented at the 1971 Wisconsin hearings on thermal standards, which is apparently the same series of studies discussed in this section.

Plankton nets were used on 14 days during the period from March 3 to May 27, 1971, in the Point Beach cooling water effluent. Plankton, smelt eggs, and sculpins were caught. However, according to calculations based on data in the Wisconsin Department of Natural Resources report, about 31.3 billion gallons of water were passed through the plant cooling water system during the 86-day period covered by the sampling while only 0.001 percent of this flow was strained through the sampling net. Therefore, we must conclude that since the volume of water passed through the sampling net was relatively small, large numbers of eggs or fry of other species could have passed undetected through the plant.

The July 9, 1971, memorandum from Bell to Schranfnagel indicated that one sculpin was taken in each of the samples collected on eight successive sampling days from March 3 to April 29. The expansion of these sculpin catches proportionately on the basis of the total volume of water sampled and the total volume of water passed through the cooling system between the first and last of the eight samples yields an estimate of more than 4 million sculpins that theoretically passed through the Point Beach plant cooling system during the 42 days of operation from March 3 to April 29. The value of 4 million sculpins is difficult to assess; however, sculpins are generally recognized as an important item in the diet of lake trout and some other fishes. The heavy intake entrainment of sculpins during late winter and early spring is consistent with the data of Wells (1968), which shows that late winter and early spring is the time of greatest abundance of this species at the water depth at which the Point Beach plant water intake is located. While the Kewaunee intake velocity is reported as less than the Point Beach velocity, the opportunity for heavy entrainment at Kewaunee appears to be excellent in view of the intake design.

The number of smelt eggs entrained at the Point Beach plant between April 29 and May 19 can also be estimated on the basis of the amount of water filtered and the water passed through the plant. About 52 million gallons of water passed through the plant in the 150-minute sampling period on May 4, of which 0.023 percent or about 12,000 gallons were strained by the collecting net. If the "few" smelt eggs reported captured were actually 10 eggs, an expansion of the catch on the basis of the volume of water sampled yields about 4,000 smelt eggs that passed through the plant in 150 minutes and over 400,000 eggs in the 24 hours of the sampling period. On the same basis, the count would be more than 1 million smelt eggs for the 24 hours of the May 5 sampling.

We do not think that the data presented in the statement are a sufficient basis to conclude that the effects of the Kewaunee plant on fish are expected to be minimal.

Also, even if alewives and smelt are not being harvested because of market conditions they have value as the base of the food chain for salmonids in Lake Michigan. Their importance should also be recognized from this basis.

Effects of Temperature Decreases

This section recognizes the possible impacts on aquatic life due to temperature decreases. We suggest that the fourth paragraph on page V-20 be expanded to recognize that a sudden 28°F temperature drop to about 32°F would be fatal to most Great Lake fishes and benthic organisms. Consequently, sudden plant shutdowns should be avoided when possible, especially during the colder months.

Effluent Impact on Species Composition

The statement does not deal with probable increased uptake of toxic substances by fish in warmed waters. Available information suggests that the rate of uptake of certain harmful compounds (including mercury) from water by fish increases with water temperature. Thus, fish attracted to and residing in heated effluents could be expected to have higher concentrations of these compounds than fish in cooler waters. Therefore, even though the heated effluents may be good for fishing, it may not be good for the fish or for the consumers of the catch.

Environmental Impact of Accidents

This section contains an adequate evaluation of impacts resulting from plant accidents through Class 8 for airbourne emissions. However, the environmental effects of releases to water is lacking. Many of these postulated accidents listed in table VI-1 could result in releases to Lake Michigan and should be evaluated in detail.

We also think that Class 9 accidents resulting in both air and water releases should be described and the impacts on human life and the remaining environment discussed as long as there is any possibility of occurrence. The consequences of an accident of this severity could have far-reaching effects on land and in the lake which could persist for centuries affecting millions of people.

Once-Through Cooling System

The fifth paragraph on page XI-13 concludes that the primary impact of the once-through cooling system is its effect on Lake Michigan due to warming caused by return flow. The impact of organisms being entrained in the cooling water and passed through the plant may be equally important and very little research has been conducted to reliably establish the true importance of this aspect of the problem.

Cost-Benefit Analysis

Detailed data which would permit the reviewer to make an independent confirmation of the reported cost estimate for an alternative coal-fired plant are not presented on page XI-15. We agree that completion of the nuclear plant would probably have an economical advantage since a substantial amount of funds have already been committed; however, we recommend that the final environmental impact statement include data which will permit substantiation of the 13.46 mills per kilowatt hour as the cost of the coal-fired alternative.

Environmental Comparison of Alternatives

We agree that the analysis dealing with damage to biota is somewhat crude. They apparently do not take into account

the role of preadult fish in the food web economy of the lake and merely treat the preadult mortality as loss of pounds of adult fish. Also, the replacement value of $1.50 per pound is valid only for fish that can be reared in hatcheries and apparently does not include the cost of constructing the hatchery. If the value of adult sport fish to the sportsman is used in the analysis, we suggest a value of about $15.00 per pound.

Conclusions and Recommendations

Based on the physical and biological information presented, the apparent conclusion that the Kewaunee plant will not have significant impact on the biota of the lake appears to be somewhat unfounded. Most of the data used were taken from sites other than the Kewaunee site with much of it taken from Point Beach 4.5 miles away.

We believe that the thermal standards set by the Lake Michigan Enforcement in March 1971 and later approved by the Administrator of the Environmental Protection Agency are the minimum requirements which should be met in order to provide adequate protection for the aquatic environment of Lake Michigan. It does not appear that the Kewaunee plant, using the once-through cooling system, can operate at full load and comply with the thermal standards of the conference that there be no significant adverse effects on the aquatic biota.

Therefore, we recommend that the operating license for the Kewaunee Nuclear Power Station contain stipulations that the plant will operate within the limitations of the Lake Michigan Enforcement Conference Standards.

We hope these comments will be helpful to you in the preparation of the final environmental impact statement.

Sincerely yours,

Deputy Assistant Secretary of the Interior

Mr. Daniel R. Muller
Assistant Director for Environmental
Projects
Directorate of Licensing
Atomic Energy Commission
Washington, D. C. 20545

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