

BEFORE THE UNITED STATES  
ATOMIC ENERGY COMMISSION

In the Matter of )  
 )  
Consolidated Edison Company ) Docket No. 50-247  
of New York, Inc. )  
(Indian Point Station, Unit No. 2) )

SUMMARY OF APPLICANT'S  
PROPOSED FINDINGS OF FACT AND  
CONCLUSIONS OF LAW IN THE FORM OF A  
PROPOSED INITIAL DECISION FOR A  
FULL-TERM, FULL-POWER OPERATING LICENSE

I. Radiological Health and Safety and the  
Common Defense and Security

Although Applicant's proposed findings of fact and conclusions of law filed on January 28, 1972 were prepared specifically to support authorization for a 50 percent testing license, those proposed findings of fact and conclusions of law which are part of the record for this Initial Decision and which relate to matters of radiological health and safety and the common defense and security support a full-term, full-power operating license and are adopted in support of the six ultimate radiological issues for determination by this Board.

Since the filing of Applicant's January 28 proposed findings and the issuance of the July 14 Initial Decision the record relating to radiological health and safety matters has been supplemented in certain respects. Therefore, supplemental evidentiary findings are made by the Board.

In response to an inquiry by the Staff, Applicant conducted and completed a program of inspection and evaluation in accordance with the criteria set forth by the Staff to verify the wall thickness of particular valves important to nuclear safety, i.e., those valves within the reactor coolant pressure boundary and over one-inch nominal pipe size in Indian Point 2. The inspection results and their subsequent evaluation provide additional assurance that the valves meet minimum wall thickness requirements and that the valves are acceptable for their intended service in Indian Point 2.

Applicant has made particular modifications to Indian Point 2. These modifications, including those to the high head safety injection system and to the main steam safety valves, have been completed and are acceptable. The modifications to the design of the fuel for Indian Point 2, including the increased fuel pellet density of Regions 2 and 3 fuel and

the prepressurization of all fuel rods, in order to minimize the effects of fuel densification, have been completed and safety analyses have been submitted for steady-state operation, operating transients and postulated accidents. The safety evaluation of the fuel densification phenomenon as it relates to Indian Point 2 by Applicant and the Staff adequately accounted for the effects of fuel densification. Operation of Indian Point 2 with the refabricated core at power levels up to full-power will not present an undue risk to the health and safety of the public.

## II. Environmental Matters

By a Supplementary Notice of Hearing issued November 29, 1971 the Commission made specific provision for consideration of environmental concerns and contentions. No party opposed the issuance of the requested operating license on non-radiological grounds. In fact, the record reflects the critical need for Indian Point 2. The controverted environmental matters in this proceeding relate to whether conditions should be placed on the operating license to protect environmental values and, if so, what those conditions should be.

The recommendations set forth by the parties underscore the basic issue in this proceeding, i.e., whether substantial or irreversible damage will be done to the Hudson River fishery during the period of Applicant's ecological study program and the subsequent period during which mitigating measures would be instituted if required after a review of the results of such program. In order to make this determination, extensive evidence was introduced in this proceeding relating to the extent of the potential damage to the Hudson River fishery by operation of the presently designed once-through cooling system during the next several years. During that period Applicant intends to conduct extensive studies to determine the actual environmental impact of the plant and the alternate measures (including a closed-cycle system) to mitigate that impact. Applicant also offered detailed testimony as to the costs and schedule for implementing a closed-cycle cooling system, including the necessary studies to determine its environmental impact.

The major issue relating to potential damage between now and 1981 to the Hudson River fishery involves the level of reduction of the striped bass population as a result of

entrainment of eggs, larvae and early juveniles through the cooling system and impingement of later juveniles on the screens of Indian Point Units 1 and 2. The evidence in this proceeding demonstrates that the effects of entrainment and impingement as a result of operating Indian Point 1 and 2 through September 1, 1981 with the presently designed once-through cooling system will not be substantial or irreversible.

The Applicant has presented the testimony of a leading expert on the life history of the striped bass, of a leading expert on the dynamics of fish populations, and of an eminent environmental engineer who has studied the Hudson River for ten years, that the operation of Indian Point Units 1 and 2 on a short-term basis will not produce an irreversible adverse effect on the fish populations in the Hudson River. These opinions were arrived at on the basis of the general knowledge and experience of Applicant's expert witnesses over many years relating to the Hudson River and elsewhere, including extensive field work and the research performed specifically at Indian Point. However, Applicant recognized that long-term operation of Indian Point Units 1

and 2 has the potential to affect adversely the Hudson River ecosystem. For this reason, an extensive seven-year study was initiated in 1969 to provide empirical data on the effects of entrainment, impingement, and chemical and thermal discharges on Hudson River biota. The approach taken in this study is a classical scientific before/after experimental procedure. Because it is based on empirical data, the conclusions reached at the end of this study will be more valid and better reflect the actual impact of plant operation than those of existing experimental mathematical models which are based on limited data.

### III. Entrainment

The Staff and HRFA used mathematical models in an attempt to make a preliminary evaluation of the effects of entrainment at Indian Point on the Hudson River striped bass population. Applicant also used a mathematical model to evaluate such effects pending completion of the ecological study program. Although the results of Applicant's ecological study program should be used to make a final determination whether an alternative to the present once-through cooling

system is required at Indian Point, Applicant's mathematical model is useful to place a variety of qualitative statements into a quantitative framework to estimate short-term effects. For the purpose of performing the benefit-cost analysis, Applicant's model estimates of population impact, with its present limitations, is best suited for the purpose and should be utilized, in preference to the Staff's or intervenor's models, with the knowledge that the effects of entrainment indeed may be substantially less than that computed by Applicant's transport model which estimates a 5-10 percent total striped bass population reduction over ten-year operation of Indian Point 2. Applicant's model built on the existing data base is more realistic than those of the Staff or HRFA since the Applicant's model utilizes compensatory processes, recognizes potential differences between plant intake concentrations and average river concentrations in the Indian Point vicinity and incorporates tidal effects and larval diurnal behavior through use of dispersion and "f" factors. Furthermore, the assumption of 100 percent mortality to entrained striped bass eggs and larvae as a result of exposure

to mechanical, chemical and thermal stress in passage through the plant, used by the Staff and HRFA to predict the impact from entrainment is based on conflicting results of studies at other plants inapposite to Indian Point 2 and cannot be justified at this time. The preliminary results of the first year of a multi-year site study have shown that mortality to entrained striped bass eggs and larvae is probably substantially less than 100 percent, perhaps as low as 7-39 percent.

#### IV. Multi-Plant Operation

Applicant has also demonstrated that the operation of Indian Point Units 1 and 2 with a once-through cooling system through September 1, 1981, together with the Bowline and Roseton plants on the Hudson River, will not have a substantial or an irreversible adverse impact on the Hudson River spawned population of striped bass. The limited evidence available also supports Applicant's model prediction that operation of Indian Point Units 1 and 2 with a once-through cooling system for ten years, together with the Bowline and Roseton plants, will not reduce the total striped bass population by more than 12-13 percent even assuming 100 percent mortality of entrained organisms during the first four weeks



of life.

V. Contribution of the Hudson River to the  
Mid-Atlantic Coast Striped Bass Fishery

Although the extent of the Hudson River contribution to the mid-Atlantic coast striped bass population cannot be determined definitively on the basis of the information currently available, the evidence demonstrates that the allegation that the Hudson River contributes about 80 percent of the striped bass population in the Middle Atlantic States of Delaware, New Jersey and New York is based on an inaccurate interpretation of the results of limited tagging studies performed by others - an interpretation contrary to that of the investigators themselves - and the invalid use of a regression analysis in an effort to show a close correlation between commercial striped bass landings in the Hudson and landings in the mid-Atlantic regions five years later. Based on the best evidence available at this time, the Hudson River appears to make a significant contribution to the striped bass population in the area of the Hudson River, northern New Jersey, western Long Island Sound and southwest Long Island but only a 10 percent maximum contribution to the Middle Atlantic population. Furthermore, the evidence

demonstrates that it is most probable that the Chesapeake Bay is the major source of the striped bass population of the mid-Atlantic coast. More information is needed, however, to confirm the consensus of a large number of investigators over at least 35 years that the Chesapeake is by far the largest contributor to the mid-Atlantic striped bass population. The results of Applicant's research program, together with the three-year cooperative Federal-State tagging study recently undertaken, should provide the necessary additional data.

VI. Estimation of Monetary Impact on Striped Bass Fishery

Applicant estimated the monetary value of the impact of once-through operation of Indian Point 2 on the Hudson-influenced portion of the Atlantic fishery to be \$740,000 annually, rather than \$13 million annually as estimated by HRFA. Applicant's estimate is based on the Federal Government's procedures for benefit-cost analysis for public investment in water resources development which use a simulated market price to evaluate recreational benefits. Applicant's calculational procedures more closely conform to Federal policy and are more appropriate than HRFA's. Applicant's

estimate of the monetary value of the impact of once-through operation of Indian Point 2 should be contrasted with Applicant's estimate of the annual levelized cost for implementation of a cooling tower system for Indian Point 2, which is approximately \$20 million. If the benefits and costs of a closed-cycle system are analyzed in monetary terms, there is no economic justification for closed-cycle cooling for Indian Point 2.

#### VII. Impingement

The impact of impingement on fish populations in the Hudson River is as yet an unresolved question. The population dynamics aspect of the current ecological study program is designed to answer this specific question. The weight of the evidence in this proceeding supports the conclusion that impingement of later juveniles on the screens at Indian Point Units 1 and 2 will not have a substantial or irreversible impact on the Hudson River fishery. Applicant's estimate of annual impingement (approximately 1,252,500 fish - mostly white perch 2-4 inches in length - with a total weight of 16,000 pounds) is the best estimate which can be made at this time and is based on the most recent available data which corresponds to the proposed modes

of operation, including reduced flow (84,000 gpm/pump from October 1 to March 31) and changes in plant configuration. Extensive data from Unit 1 indicate that the best estimate of the percentage of fish collected at Indian Point 1 and 2 which will be striped bass is 3.1 percent.

#### VIII. Other Fish Species

The estimates of plant impact on the Hudson River fishery have centered primarily on the striped bass population because the species is the object of a sport and commercial fishery, early life stages are known to be subject to entrainment and impingement and more information is available on its life stages and behavior than on any other Hudson River fish. The parties, however, have referred to the potential impact on other fish populations although no analysis of population changes for other species has been introduced nor has reliable evidence as to the monetary value of the losses of these other species been introduced. The record does not support the contention that operation of Indian Point 1 and 2 would have a serious adverse impact on the population of other fish species, or that any adverse impact will have a significant cost. Rather, the record supports the expert opinion that

operation of Indian Point 1 and 2 through September 1, 1981 will not have a substantial or irreversible adverse impact on such populations and that the public benefits of stocking these other species will not exceed the public costs. Applicant's research program is not limited to the striped bass and the program is designed to detect serious damage to other key species.

IX. Other Aquatic Biota

The results of extensive site specific studies conducted by New York University, as well as combined laboratory and field research programs conducted over a period of four years, demonstrate that entrainment, including mechanical, thermal and chemical stresses, will not have a substantial or irreversible effect on other aquatic biota such as bacteria, phytoplankton, microzooplankton and macrozooplankton populations in the Hudson River during the period of start-up of Indian Point 2 through September 1, 1981.

X. Chlorination, Thermal Discharges,  
Dissolved Oxygen

Chlorination for control of condenser slimes as it

is to be practiced at Indian Point 1 and 2 will result in releases of residual chlorine (and any chloramines formed through chemical reactions) which will not have a significant adverse impact on Hudson River biota. Thermal discharges from Indian Point 1 and 2 also will not cause substantial adverse changes in aquatic life of the Hudson River. Thermal effluents discharged from Indian Point 1 and 2 will comply with the present New York State thermal discharge criteria and the Applicant shall conduct a monitoring program to demonstrate compliance with these criteria. Moreover, migrating fish will not be prevented from movement by the thermal discharge from Indian Point 1 and 2 and fish will not be attracted to intakes by recirculation in view of the low temperature rise of recirculated water and the known behavior of fish. Furthermore, neither the reduction in dissolved oxygen content of the water in the thermal plume nor the increase in metabolic activity caused by the thermal plume released from Indian Point 1 and 2 will result in a substantial adverse impact on Hudson River biota.

XI. Alternative Closed-Cycle Cooling System

A. Cost and Schedule

In addition to the determination that the operation of Indian Point 1 and 2 will not have a substantial or

irreversible adverse impact on the Hudson River fishery during the first eight years of operation, the huge cost and required schedule for the implementation of a closed-cycle cooling system at Indian Point buttress the determination that a closed-cycle cooling system should not be required until after the results of Applicant's ecological study program have been analyzed and alternate mitigating measures studied and not before September 1, 1981. Applicant has presented detailed testimony relating to the costs of cooling towers which reflect the exigencies of the Indian Point site. These detailed costs not only include appropriate increments for such items as extensive excavation, piping and backfitting but also include the benefits of Applicant's optimization studies which have resulted in Applicant's presentation of a single tower natural draft system. The evidence demonstrates that the direct cost of construction of such system is estimated to be \$35,795,000. Including appropriate items such as indirect costs, escalation, contingencies and incremental generating costs, the total present worth revenue requirement is estimated to be \$143,823,000. The levelized annual costs for the installation of a single draft cooling tower for Indian Point 2 is estimated to be \$19,842,000.

B. Environmental and Design Studies

In order to determine the environmental impact of a closed-cycle cooling system in the vicinity of Indian Point appropriate environmental and design studies should be completed. These studies, which include studies of meteorology, salt deposition, acoustical emissions and blowdown, as well as consideration of the impact on land, air and the community, will be completed and the results analyzed by August 1, 1974. Subsequent actions, including review and approval by regulatory agencies and completion of construction of the alternative closed-cycle cooling system, including excavation, is estimated to take five and one-quarter years. Therefore, based on Applicant's evidence and experience, a closed-cycle cooling system could be implemented for Indian Point 2 by November 1, 1979. However, in order to allow time to complete Applicant's ecological program and to review the results prior to the construction of a closed-cycle cooling system, an alternative cooling system should not be required to be installed before September 1, 1981.

XII. Mitigation of Environmental Impact  
From Once-Through Cooling

A. Mitigating Measures Available

Applicant has demonstrated, by implementing already



particular measures at Indian Point 1 and 2 to mitigate possible detrimental effects from the operation of the plants on aquatic biota and by undertaking a further program to investigate a variety of long-term and short-term mitigating measures, that should severe adverse environmental effects be observed during operation of the once-through cooling system, steps can and will be taken to limit these effects consistent with economic and technical considerations. To this end, Applicant has commenced design of a natural draft closed-cycle cooling system based on preliminary data and will be prepared to commence construction of a closed-cycle cooling system expeditiously following receipt of governmental approvals in the event that such action is required.

B. Stocking

In addition to studying and considering such measures as reduced flow, fish repellent system, a lagoon system, a pervious dike system and possible modifications of the existing once-through cooling system, Applicant has commenced a program to study and determine the feasibility of artificial stocking of screenable striped bass. It is undisputed that further research needs to be done to demonstrate the feasibility of rearing and stocking striped bass in the Hudson River. However, Applicant's expert witnesses have

testified that it is reasonable to conclude that hatchery-reared striped bass fingerlings can be successfully introduced in the Hudson River and that hatchery-reared fish should be able to survive adulthood and reproduce themselves just as do the fish spawned in the River itself. Recent efforts to stock striped bass fingerlings in estuarine situations also support these conclusions. The evidence of solid improvements in hatchery techniques, such as total survival of approximately 10 percent from raw eggs to fingerlings as compared to survival of less than 1 percent from raw eggs to two-inch fingerlings in the Hudson River, supports the feasibility of the stocking program. Based on Applicant's more realistic model estimates and impact parameters, the number of female striped bass required annually would range from two to ten fish. The annual cost of raising 15,000,000 four-inch juvenile striped bass, without taking into account the economies of large-scale production, is \$7.5 million, which is to be contrasted with the annual levelized cost of a natural draft, closed-cycle cooling tower of about \$20 million.

In sum, if the Hudson River striped bass population were severely impacted due to entrainment and impingement of

larvae and juveniles by once-through cooling systems in power plants on the Hudson River prior to September 1, 1981, there is no biological or economic reason why the population could not be maintained or restored through stocking with fingerling fish. Moreover, the evidence strongly suggests that such stocking would be effective as a permanent mitigating measure in the event it were ultimately decided to retain a once-through cooling system for Indian Point 2.

C. Restricted Operation

The record demonstrates that restricted operation of Indian Point 2 during the periods between December 15 and March 1 and between June 1 and July 31, including the scheduling of all shutdowns and maintenance during such periods as suggested by HRFA, is technically infeasible and would reduce the flexibility and reliability of Applicant's system during periods of peak demand. Restricted operation would also impose economic and environmental penalties on the Applicant and its customers without providing a necessary or significant benefit to the ecology of the Hudson River. The technical infeasibility of such operation is related to the xenon buildup in the fuel as well as the

required heatup of large plant components, both of which would incapacitate Indian Point 2 for extended periods of time. Furthermore, cyclic operation would limit the life of large plant components.

XIII. Applicant's Research Program

The Applicant, with the assistance of an outstanding group of fishery biologists, has examined the existing information relevant to a determination whether the operation of Indian Point 1 and 2 will have a substantial or irreversible adverse impact on the Hudson River fishery, has identified significant gaps in the data, and has commenced in 1969 a major research effort, extending over a seven-year period and utilizing 40-80 biologists, designed to remedy significant data deficiencies. Applicant's research program, which is complemented by other Hudson River studies now underway and is supervised by the Inter-Utility Coordinating Committee, is adequate to detect an impending substantial or irreversible adverse impact upon the fish population in the Hudson River, specifically striped bass, which may be caused by Indian Point 1 and 2. The study program, which will evaluate the populations of key species before and after startup, will isolate the impact of Indian Point 1 and 2

from other environmental variables by the measurement of physical, chemical and biological parameters, the use of regression analyses and the use of population dynamics techniques. Furthermore, the study program will evaluate the contribution of the Hudson River to the mid-Atlantic striped bass fishery. The results of these various studies can then be compared with the baseline data which exist for the years 1969, 1970, 1972 and 1973. It is undisputed by the parties that there are means of permanently avoiding a substantial or irreversible impact on the Hudson River fishery should such impact be detected in time, and that effective means of avoiding destruction of large numbers of fish could be installed not later than September 1, 1981. The results of Applicant's biological studies, together with engineering studies of alternate mitigating measures which are being undertaken concurrently, will be available by January 1, 1977 (based on operation during 1973) and such results, together with the Applicant's criteria to assess the impact of Indian Point 1 and 2 on the population of striped bass and white perch, will permit a timely implementation of interim and/or permanent corrective measures at the Indian Point plants.

XIV. Conclusion

Upon the basis of the consideration of the entire record in this proceeding and in accordance with the requirements of the Atomic Energy Act of 1954, as amended, the rules and regulations of the Commission and other pertinent statutes, an amendment to Facility Operating License No. DPR-26 authorizing operation of Indian Point 2 in accordance with appropriate radiological and environmental technical specifications at power levels up to 2758 megawatts thermal for a period of 40 years may be issued subject to the condition for the protection of the environment recommended by the Applicant.

Dated: June 1, 1973