UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. and POWER AUTHORITY OF THE STATE OF NEW YORK (Indian Point Station, Unit No. 3)	)	Docket No. 50-286 (Selection of Preferred Alternative Closed-Cycle Cooling System)

COMMENTS OF POWER AUTHORITY OF THE STATE OF NEW YORK WITH RESPECT TO DRAFT ENVIRONMENTAL STATEMENT

Power Authority of the State of New York ("the Power Authority"), as owner of the Indian Point Station, Unit No. 3 ("Indian Point 3") facility and co-holder of Facility Operating License No. DPR-64 ("the License"), submits the following detailed comments on the Draft Environmental Statement ("the DES") prepared by the Regulatory Staff ("the Staff") of the Nuclear Regulatory Commission ("the Commission") in the above-captioned proceeding.

In summary, the Power Authority concurs in the Staff's assessment that the natural draft, wet cooling tower is the preferred closed-cycle cooling system, should such a system ultimately be installed at Indian Point 3. Nevertheless, there are some aspects of the Staff's analysis that require comment and/or qualification, as appears more fully below.

Summary and Conclusions

Paragraph 2, ¶ 2. Due to the failure of Indian Point 3 to operate at the levels required under ¶ 2.E(1)(e) of the License, the termination date for the period of interim operation with the installed once-through cooling system has been moved back to September 15, 1982. The Environmental Report in this proceeding (Consolidated Edison Co. of New York, Inc., Economic and Environmental Impacts of Alternative Closed-Cycle Cooling Systems for Indian Point Unit No. 3 (1976)) was filed on January 30, 1976.

Paragraph 3.e. The cost data summarized in this paragraph are under examination, and a detailed assessment with up-to-date Power Authority information will be provided by October 24, 1977.

Paragraph 3.g. Pursuant to State law, the Power Authority is not subject to taxation. Hence, there will be no increase in the tax base upon construction of a cooling tower system at Indian Point 3.

Paragraph 5. The Power Authority should have been listed as an interested entity.

Paragraph 8. This paragraph should refer to Part 51 of the Commission's regulations, rather than the former Appendix D to Part 50 of the regulations. The penultimate paragraph refers to a monitoring program for drift and salt deposition and the detection of botanical injury from cooling tower operation. See also § 5.2.2.5 (last paragraph). Any such

proposed program should be presented in advance of adjudicatory proceedings (if any are held) in this docket, in order that the Power Authority can know at an appropriate time the obligations the Staff seeks to impose upon it. In light of the Staff's conclusion that no permanent damage will occur with operation of a natural draft cooling tower, however, this monitoring program is unnecessary, and the Power Authority would object to any program that was essentially a matter of pure research that should be funded by the Federal Government. Once a cooling tower is built, the utility of such a program to the Power Authority would be nil, and hence, the Power Authority should not be compelled to pay for it. In any event, if there is to be a monitoring program, the details should not form part of the License, in order to afford a measure of flexibility.

It is understood that this paragraph lists the sole area in which the Staff intends to seek formal license or technical specification provisions conditioning the approval of a particular type of closed-cycle cooling system.

Chapter 1 Introduction

§ 1.2, ¶ 1. At present, Indian Point 3 operation is limited to 873 MWe, rather than 878 MWe. On April 20, 1977, an application was filed with the Commission to remove the limitation on Indian Point 3 operation to 91% of full power. That application would authorize operation at 3,025 MWt.

The Power Authority has also applied for a transfer of operating authority from the present operator, Consolidated Edison Company of New York, Inc. ("Con Edison"), to itself.

§ 1.3. The discussion of the status of the Indian Point 2 proceeding is not current. The Power Authority recommends that the Final Environmental Statement ("FES") reflect conditions in effect at the time that document is prepared. With respect to the penultimate paragraph of this section, it should be noted that the stipulation among the parties to the Indian Point 3 case has been incorporated into the License.

§ 1.5. The Power Authority recommends that the Staff provide a current report on the status of the Chalk Point study program as of the publication of the FES in this case.

§ 1.6, ¶4. The reference to "meteorological rockets" is incorrect and should be deleted.

Chapter 3 Design, Construction and Operating Characteristics of Alternative Closed-Cycle Cooling Systems

§ 3.4.3, ¶3. The drift rate used in the Environmental Report analysis of the natural draft cooling tower was 0.002% rather than 0.0025%.

§ 3.4.5, ¶2. As shown in Figure 3-1, the proposed natural draft cooling tower is located relatively close to the plant because of the proximity to the south property line which restricts the physical arrangement. Thus, the tower would be less than a tower height away from the Indian Point 3 containment,

the control room the primary auxiliary building and the emergency diesel generator. Nevertheless, we believe that the tower would be sufficiently removed from the safety-related structures and equipment and would not affect plant safety because collapse of the tower shell, based on past incidents, would be inward. In addition, we concur with the Staff that the Indian Point 2 and 3 structures are capable of withstanding tornado-generated missiles and, therefore that any missiles generated by a tower failure would not constitute an additional safety problem. See 1 Environmental Report at 3-15.

§ 3.6. In paragraph 2 of this section, the Staff states, without discussion, that "[s]maller sizes for the natural draft towers could be possible for the site." The basis for this assessment should be provided.

In the following paragraph, it is understood that formal license conditions will not be issued with the proposed license amendment requiring the use of particular construction materials or methods. The Power Authority intends, however, to install drift eliminators to meet the performance criterion referred to in line 2 of page 3-15.

Chapter 4 Schedule and Permits

§ 4.1. We understand from discussions with representatives of the Regulatory Staff that the schedules presented in this chapter are being revised. In view of this, we cannot offer detailed comments at this time. We do, however, agree

that the September 15, 1983 outage date shown as Item 12 on page 4-2 is proper as a reflection of the need to avoid simultaneous excavation or outage of Indian Point 2 and 3 as reflected in the License pursuant to the stipulation of the parties to the Indian Point 3 operating license proceeding in the event that it is necessary to construct these cooling towers. The establishment of a new date to reflect this requirement and licensing developments in the Indian Point 2 docket is a proper subject for the present proceeding, just as was the case with the proceeding to designate a preferred alternative closed-cycle cooling system for Indian Point 2.

The following is a corrected list of milestones, to which Figure 4-1 should conform:

Major Milestones	Event or Action Item
(1) January 30, 1976	Submittal of the economic and environmental evaluation report to the NRC;
(2) February 1, 1980	Receipt of regulatory reviews and approvals required for construction of the closed cycle cooling system;
(3) May 1, 1980	Commencement of gas line relocation;
(4) August 1, 1980	Commencement of excavation;
(5) August 1, 1980	Commencement of construction;
(6) September 15, 1983	Commencement of cutover to closed cycle cooling system;
(7) April 15, 1984	Completion of construction of closed cycle cooling system and commencement of operation.

These milestones represent the latest dates that must be met to complete the construction of the closed cycle cooling system to meet a shutdown date of September 15, 1983.

§ 4.2. With respect to the necessary permits and approvals listed in this section, the approval of the Federal Power Commission is not required for relocation of the Algonquin Gas Transmission Company pipeline (Item 8). Also, under New York law the Power Authority is not required to obtain a building permit or zoning variance from the Village of Buchanan (Item 9).

Chapter 5 Environmental Impacts of Feasible Alternative Closed-Cycle Cooling Systems

§ 5.1.3.2 (last ¶). The salt drift deposits for each type of cooling tower assessed at Indian Point 3 are the accumulated deposits resulting from hourly calculations including hourly variations in humidity. The Staff has incorrectly assumed that the accumulated deposits obtained were based on the highest humidity observed during the month.

§ 5.1.3.3.b.1 (¶2). The natural draft cooling tower drift analysis for Indian Point 2 is not materially altered if reduced salinity of the makeup water is not considered as has been done for Indian Point 3. The circulating water in each such tower is approximately 600,000 gpm. The salinity is about the same as the basin salinity. The 5% dilution effect of the addition of 30,000 gpm of makeup water with half the salinity of basin water is negligible.

§ 5.2.2.2. The Staff has incorrectly stated that the Boyce Thompson Institute ("BTI") estimated "threshold" rates of saline deposit, and in subsequent sections (5.2.2.3, 5.2.2.4, 5.2.2.5) it develops conclusions based on the threshold concept. The goal of the BTI study was not to determine the threshold for injury but to estimate the distribution of thresholds for a population of receptors

under certain environmental conditions. Thus the Environmental Report's analysis considers the risk of injury greater than or equal to a certain amount instead of a threshold for injury. In the case of hemlock, that analysis is based on a level of salt deposition which affected 100% of the plants, not on the threshold.

¶1. The Staff's comment is misleading with respect to the location of the parafilm-covered deposition plates. It would be more accurate to describe the position of the plates as at a height close to the tops of the trees rather than "near the bottom of the chambers". Furthermore, the deposition rate was expressed as $ug.min^{-1}.cm^{-2}$ and total dose as $ug.cm^{-2}$. It was not assumed that leaves intercepted the same deposit as the collectors but that leaves were exposed to the same flux across a horizontal plane as the collectors.

¶¶3, 5 and 6. The DES states that the background concentration of chloride in suspended particles during the exposures of plants to simulated drift was 1500 $ug\ m^{-3}$ of salt. This is erroneous. At dose rates of about 0.20 and 0.05 $ugCl\ cm^{-2}\ min^{-1}$, the concentrations of suspended particles were 10.1 and 4.8 $ugCl\ m^{-3}$, respectively, and no detectable Cl was found in the control chamber. Thus, the background was actually zero.

The levels upon which the predictive models were based all resulted from later experiments in which larger particles

ranging from 50-1500 ug generated by a different method were used. No direct measure of the atmospheric concentration of salt in the chamber could be made because of the mass and settling velocities of the particles and the BTI reports make no mention of aerosol concentrations in the tests in which dose-responses were determined. Therefore the Staff's statements regarding salt concentration in the chambers must be regarded as conjectural.

The incorrect assumption by the Staff of a high background aerosol concentration in the chamber (see paragraph 3) should not be used to cast doubt on the estimated deposition levels causing injury to the most susceptible species tested. The tests were conducted at BTI at the doses stated and injury occurred at the doses used, not at the dose plus some background amount.

¶7. Care must be exercised in extrapolating Cassidy's results with ambient xerosols to those anticipated with aerosols of cooling tower origin. In the case of ambient aerosols which Cassidy studied, the particle size was between 0.1 and 10 um and the submicron particles might diffuse into stomates by Brownian motion. In the case of cooling towers, the range of particle sizes is much larger. In the BTI study, nearly 95% of the particles ranged between 50-150 um (see BTI Report, Table 7, p. 40 (Sprayco pneumatic at 13 psi)), which is too large for Brownian diffusion. Leaves of

most of the vegetation tested by BTI have few no stomates on the upper surface of the leaf, and because of the downward flow of air in the chambers it would be unlikely that aerosols of 50-150 um would deposit into stomates on the lower leaf surface. Therefore the stomatal pathway which the Staff posits appears highly unlikely in the chambers. In the actual environment, where upward moving wind currents may carry salt particles upward, the stomatal pathway might be significant, but this has not been tested.

§ 5.2.2.3(a). The Staff has assumed that "salt effects may be at least a factor of two less than the maximum", and then based its own analysis on this assumption. Because Staff has not presented data to justify this assumption, it appears to be little more than conjecture.

§ 5.2.2.3(b). The probability of 14 rainless days has been documented as 0.42 each year. See Consolidated Edison Co. of New York, Inc., Economic and Environmental Impacts of Alternative Closed-Cycle Cooling Systems for Indian Point Unit No. 2, Supplement No. 2 (1975). Subsequent reviews of rainfall in the Dobbs Ferry area for 1973 and 1974 substantiate the assumption. It is not the "low probability" described by the Staff.

§ 5.3.1.a. The Environmental Report's ananlysis of cooling tower plumes was besed upon one year of data, from October 1, 1973 thorugh September 30, 1974.

§ 5.4.4. There are no fixed screens at Indian

Point 3. The Power Authority disagrees with the implication in the last sentence of this section that present entrainment and impingement levels are unacceptable, and objects to the entire sentence on the ground that it is irrelevant to the present proceeding. In the first paragraph of this section, the reference should be to Indian Point 3 rather than Indian Point 2.

§ 5.5.1. The discussion of anticipated liquid releases and their anticipated radiological impact from the Indian Point reactors is based on outdated models and calculational techniques. This section of the DES should be updated and revised to reflect the most recent models utilized. A detailed discussion of these models and the calculated results can be found in "An Evaluation to Demonstrate the Compliance of the Indian Point Reactors with the Design Objectives of 10 CFR Part 50, Appendix I", which was filed with the Commission on March 14, 1977.

Chapter 6 Socio-Economic Analysis of Closed-Cycle Cooling Systems

As indicated in our covering letter, the Power Authority will be submitting a detailed economic analysis reflecting cooling tower system cost data directly applicable to the Power Authority, since the Power Authority expects to succeed to the responsibility for operation of Indian Point 3 in the near future. We have, however,

attached to the present comments a copy of the cooling tower system cost data that were previously submitted to the Environmental Protection Agency in connection with that body's proceedings under the Federal Water Pollution Control Act. The report from which this material was drawn has already been provided to the Regulatory Staff. See Consolidated Edison Co. of New York, Inc. and Power Authority of the State of New York, Indian Point Unit Nos. 2 & 3 Engineering, Environmental (Nonbiological), and Economic Aspects of a Closed-Cycle Cooling System (July 1977).

As a preliminary matter, we shall note several of the areas in this chapter of the DES which the Staff may wish to be reconsidering pending receipt of our detailed comments.

§ 6.1(¶1). In the last sentence, the reference should be, we assume, to the FES for selection of a preferred alternative closed-cycle cooling system at Indian Point 2, rather than Indian Point 1.

§ 6.2.1 (last ¶). The Power Authority has previously noted the Staff's policy of using a conventional discount rate of 10% in environmental impact statements for investor-owned utilities. As the Power Authority is a political subdivision of the State of New York, the use of such a convention is inappropriate.

§ 6.2.2.2.a. Taxes should not be included in calculating Power Authority costs of cooling tower system construction, as the Authority is exempt from Federal, State and local taxation.

§ 6.2.2.2.d. This section's use of a five month "penalty" for the transitional outage assumes that that outage will overlap outages for some other purpose. We believe this to be an unduly optimistic assumption that may well not be borne out by events. In addition, this reduction to five months assumes that the cutover work could be performed simultaneously with other outage activities. Safety and other considerations may render simultaneous activities impracticable.

§ 6.3.1.8. (pp.6-28). We do not understand why it was not feasible for the Staff to consider plume visibility in assessing the impact of cooling tower designs on historic points of interest in the site area. Viewshed techniques such as those applied elsewhere in the DES to an assessment of towers themselves should be available for an assessment, under simulated conditions, of plume observability at these sites as well. With respect to the final paragraph of this section, we are concerned that the statement that the Indian Point site housed an amusement park for some years may be misconstrued. In fact, while there is development in the area, including industrial

activity, any suggestion that it is entirely given over to such would be misleading, for the site itself is, to a considerable degree, tree-covered and quite handsome. Cf. NUREG-0296, § 6.3.2.3.e.

§ 6.3.1.9 (pp. 6-29). The reference in the penultimate paragraph to "701" funding for the City of Peekskill is unclear; presumably this is some sort of shorthand reference to a law or regulation. The Staff should give a more precise reference if it considers it necessary to retain this sentence in the FES.

§ 6.3.2.3.c. This paragraph would be pertinent only to Con Edison. As indicated above, the Power Authority is not subject to taxation. See also § 6.3.3.3.d.

Chapter 7 Evaluation of Proposed Action

§ 7.1. With regard to the final paragraph in this section, the Power Authority considers it insufficient for the Staff to suggest, without more, that no additional land will be required for a cooling tower system at Indian Point 3. As stated in the Environmental Report submitted on January 30, 1976, "[a]ddition of the Unit No. 3 natural draft cooling tower system would expand the total area now utilized for the three-unit generating station (including auxiliary facilities and the Unit No. 2 cooling tower) from 51 to 67 acres -- or to about 28% of the total 239 acre

Indian Point site." See 1 Environmental Report § 6.5.4, at 6-67. The DES, then, tends to obscure and understate even the site-impact of the proposed action. The Power Authority also questions the basis for the Staff's conclusion concerning the impact on terrestrial biota.

§ 7.2. We have serious misgivings concerning this section of the DES. The "proposed action" in issue in the present proceeding is not the question of whether a closed-cycle system should be installed, but rather, which type of such system should be selected. The Staff's "Evaluation" tends to obscure this. Its conclusion that "the benefits to be derived from the closed-cycle cooling system outweigh the potential impacts on the environment" is therefore neither germane nor supported by the body of the DES.

The Power Authority recognizes that it is somewhat difficult to address the proposed action in this case using the standard matrix the Staff has developed for environmental impact statements under the National Environmental Policy Act. Despite this, we submit that this portion of the DES should at least attempt to assess the relationship between short-term uses and long-term productivity in terms of the options being addressed in this proceeding. If, based on this analysis, the choice seems to favor a particular

closed-cycle system, then that should be so indicated.

§ 7.3. This subsection should be both corrected, and expanded and refined, for, as written, it fails to address the subject its heading seems to advertise. First, it is false to state that the labor and money required for a cooling tower system are a "small fraction" of the present sunk costs of the facility. In fact, such a system would significantly increase the total capital cost of the facility as well as the cost of operation. Further, the "more of the same" phrase in the initial paragraph gives the sense that the Indian Point site is essentially a lost cause having no further environmental value. This is plainly not true, as the Staff's own viewshed materials attest. Moreover, merely because the types of materials are of the same general character as those that have previously been used on the site does not properly disclose the arrangement and use to be made of those materials and their effects on the surrounding environs. Simply because there are already tall structures on the site does not relieve the Staff of the obligation to state clearly and distinctly that the towers yet to be built would loom much larger on the horizon.

We have already addressed the assertion that no additional land needs to be taken. See Comment to § 7.1 supra. The fact that certain acreage is within a site boundary does not relieve the Commission of the obligation, when preparing an impact statement, to disclose that

additional portions of a site are to be dedicated to new and different uses.

Finally, with respect to the closing observation that the "irreversible and irretrievable commitments are appropriate for the benefits to be gained," the Staff should provide a comparative assessment of the choice among alternative closed-cycle cooling systems. The DES in no way supports such a conclusion, nor should it, since it misconceives the issue in the proceeding.

§ 7.4, ¶2. Based on noise evaluations, the ranking of the three alternatives considered viable by the Staff appears to be inconsistent with the relative noise evaluation found in paragraph 2 of § 5.2.5.3. This should be clarified or corrected.

The Power Authority appreciates the opportunity to submit the foregoing comments, and will provide its further economic analysis no later than October 24, 1977.

Respectfully submitted,

LeBOEUF, LAMB, LEIBY & MacRAE

By Eugene R. Fidell

Eugene R. Fidell
Partner

1757 N Street, N.W.
Washington, D.C. 20036

Attorneys for Power Authority
of the State of New York

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INDIAN POINT UNIT NOS. 2 and 3

ENGINEERING, ENVIRONMENTAL (NONBIOLOGICAL), AND ECONOMIC ASPECTS OF A CLOSED-CYCLE COOLING SYSTEM

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

and

THE POWER AUTHORITY OF THE STATE OF NEW YORK

JULY 1977

3.2 METHODOLOGY FOR QUANTIFYING COST OF CONSTRUCTION AND OPERATION OF THE COOLING SYSTEM AT INDIAN POINT UNIT NO. 3

3.2.1 CAPITAL COSTS

The total capital cost of the natural draft cooling tower consists of the direct capital cost, indirect capital costs, escalation from the time of the estimate of the costs (March, 1975) to the completion date of tower construction, and contingency.

3.2.1.1 DIRECT CAPITAL COST

Direct capital cost for the natural draft wet cooling tower system for Indian Point Unit No. 3 and other major cost components are set forth in Table 3-6 (March 1975 costs). The direct capital costs are based on construction cost estimates prepared by Con Edison for submission to the Nuclear Regulatory Commission.

TABLE 3-6

CAPITAL ESTIMATE SUMMARY

Indian Point Unit No. 3
Natural Draft Cooling Tower
Installed June, 1984

Total Direct Cost		$ 40,575,000
Design & Engineering Expense	(15%)	6,086,300
Construction Management	(8.5%)	3,448,900
Authority Administrative Cost	(3%)	1,503,300
Interest During Construction	(14.82%)	7,649,100
Total Project Cost (1975 Dollars)		$ 52,262,600
Escalation	(57.12%)	33,850,800
Contingency	(20%)	18,622,700
Total Estimated Cost		111,736,100
Finance Charge	(2%)	2,455,700
Bond Reserve	(7%)	8,595,100
TOTAL CAPITAL COST		$122,786,900
Say		123,000,000

3.2.1.2 INDIRECT CAPITAL COST

The estimated total project cost is made up of direct costs and those indirect or overhead costs which in keeping with standard utility practice, are capitalized as part of the project capital cost. The indirect or overhead cost is composed of the follcwing components:

A. Design and engineering expense (15% of total direct costs).

B. Construction management (8.5% of total direct costs).

C. Power Authority administrative costs (3% of the sum of total direct costs plus the costs in A and B above.)

D. Interest during construction (7% per year or 14.82% of the sum of total direct cost plus the costs in A, B, and C above.)

Design and Engineering Expense

In order to construct a cooling tower system, the Authority would employ the services of an engineering consulting firm to prepare preliminary engineering designs and bidding

documents. These engineering costs are estimated to be 15% of total direct construction costs.

Construction Management

The Authority would also employ the services of an engineering consulting firm to perform project supervision and management. The cost of such services is estimated to be 8.5% of total direct construction costs.

Authority Administrative Costs

Proper accounting practice requires the allocation to capital project costs a portion of the general administrative expenses of the Authority. This recognizes the fact that general administrative costs are in part attributable to capital projects.

The Power Authority uses a factor of 3% of the sum of direct project cost and engineering consultant expenses as an estimate of the allocatable portion of these expenses.

Interest During Construction

The cost allowance for interest during construction of 14.82% was calculated using a 7% rate of interest compounded annually, assuming an even cash flow for the four-year construction period.

Escalation

The Authority has adopted Con Edison's escalation rates for construction projects for this analysis. Con Edison has developed a New York City Construction Price Index which forms the basis fo the Company's projected escalation rates.

The average annual rate of escalation indicated by this index was (1) 1964-1971 at 6.3%, (2) 1964-1974 at 6.4%, and (3) 1973 at 7%. The period from 1974 to 1976 was estimated at a 9% average annual rate of change and for years after 1976 at 7.5%.

Contingency

The contingency allowance is based on experience and reflects the extent and certainty of the knowledge of project details. A contingency factor of 20% is appropriate

for this project in view of the fact that the detailed design of the project has not been completed.

3.2.2 INCREMENTAL GENERATING COSTS

The following section describes the method of computing the cost impact of installing a closed-cycle cooling system at Indian Point Unit No. 3. This cost impact is presented in the form of the cost of the tower for an economic analysis.

The economic life of the cooling tower used in this analysis is measured from the time it becomes operational to the end of the total economic life of the nuclear plant, taken herein to be forty years from initial commercial operation. Indian Point Unit No. 3 began commercial operation August 30, 1976, thus incremental generating costs are considered only for the economic life of the cooling tower from the beginning of June 1984 to the beginning of September 2016.

Indian Point Unit No. 3 is presently licensed to operate at 873 MWe (net electrical output). (See Section 2.3 above.) It is expected that the license will be amended to allow operation at 1033 MWe (net electrical output). For purposes of this analysis, the Authority has assumed that the unit

will be licensed to operate 1033 MWe in 1980 with the existing once-through cooling system.

The incremental generating costs, presented in Table 3-7, are the sum of the additional annual costs due to the cooling tower present-worthed to January 1, 1977 using a discount rate of 6.5%. The present worth of a revenue requirement in any year is the amount of money which if invested at the specific rate of return in 1977 would meet this revenue requirement in the later year.

Aside from the expected values of these incremental generating costs, Table 3-7 shows values for each line item corresponding to the Authority's best judgment of: 1) the low estimate such that the probability that the actual cost will be lower than this value is .05 and 2) the high estimate such that the probability that the actual will be higher than this value is .05.

3.2.2.1 MAINTENANCE AND OTHER OPERATING EXPENSES

Cooling tower operating and maintenance expenses were estimated based on industry experience. The estimate is

TABLE 3-7

INCREMENTAL GENERATING COSTS ABOVE BASE PLANT
FOR CLOSED-CYCLE COOLING AT INDIAN POINT UNIT NO. 3

	Description of Expenses	Present Worth of Revenue Requirements[1] $		
		Low Estimate	Best Estimate	High Estimate
a)	Maintenance and other operating expenses	3,500,000	3,880,000	4,300,000
b)	Carrying cost of capital for cooling tower	88,400,000	98,250,000	117,900,000
c)	Cost of replacing deficient energy (annual derating)	78,900,000	92,770,000	120,600,000
d)	Carrying cost of capital for replacement capacity (peak derating)	36,600,000	40,720,000	48,900,000
e)	Replacement energy for plant downtime to cut in cooling tower	34,300,000	48,920,000	68,500,000
f)	Firm purchase for replacement capacity for downtime to cut-in tower	11,100,000	15,790,000	22,100,000
	TOTAL:	-	300,330,000	-

[1] Base year 1977.

escalated by 5.5% per year compounded to reflect anticipated increases in the cost of labor and materials.

3.2.2.2 CARRYING CHARGES ON ADDITIONAL CAPITAL FOR THE COOLING TOWER SYSTEMS

The Authority's annual carrying charge is computed as the sum of the level debt payments on the bonds issued to finance the cooling tower plus insurance.

The level debt charge is calculated using the Authority's assumed cost of 7% for bonds having a 35 year maturity. This level debt charge of approximately 7.72% is increased by 20% as provided for under the terms of the Authority's Bond Resolutions to yield a total level debt charge of 9.27% per year.

An allowance for increased property insurance premium payments was also included in the annual charge rate. An amount equal to 0.25% has been included for this purpose.

3.2.2.3 COST OF REPLACING DEFICIENT ENERGY

The computation of the incremental revenue requirements includes the cost of replacing energy required because of the average annual derating (33.5 MWe) imposed on Indian Point Unit No. 3 by the installation of a cooling tower. The derating results from the additional energy required to operate circulating water pumps and other auxiliary equipment and high turbine back pressures associated with heat transfer characteristics of the cooling tower as compared to once-through cooling.

The cost of this derating is the cost to New York State of replacing the lost energy with alternative generation. In this analysis the alternate generating source has been assumed to be combined generation resources of the member companies of the New York Power Pool. It has been assumed that the lost Indian Point Unit No. 3 generation would be replaced by oil-fired generation for the period 1984 through 1994, by a mix of 25% coal-fired generation and 75% oil-fired generation for the period 1995 through 2004, and by a mix of 50% coal-fired generation and 50% oil-fired

generation from 2005 through the end of the analysis (2016). The cost of the oil-fired generation for the period 1984 through 1994 is based on a generation cost of $28.10 per megawatt-hour in 1982 and 5.5% escalation per year through 1994. The cost of the 25% coal-fired mix and the 75% oil-fired mix for the period 1995 through 2004 was calculated using a price of $52.31 per megawatt-hour in 1995 and 5.5% annual escalation through 2004. The cost of the replacement energy for the period 2004 through 2016 was based on a price of $82.42 per megawatt-hour for a mix of 50% coal and 50% oil generation in 2004 and 5.5% escalation per year through the end of the analysis.

3.2.2.4 CHARGES ON ADDITIONAL CAPITAL FOR REPLACEMENT GAS TURBINE CAPACITY

The installation of closed-cycle cooling at Indian Point Unit No. 3 will reduce its peak generating capability which would have been available to meet New York State's peak load by 77.5 MWe. The loss of this peak generating capacity would have to be replaced in order to maintain system reliability.

The economic value of the loss in system reliability is the cost to New York State of replacing Indian Point Unit No. 3's lost peak generating capability. For purposes of this analysis it was assumed that the capacity would be replaced by the cheapest source of such capacity through the installation of gas turbines at an estimated cost of $304 per installed kilowatt of capacity in 1984. This cost represents the most recent estimates used by the New York Power Pool for purposes of generation planning.

The cost of the replacement capacity in Table 3-2 is the carrying charge on the capital cost of the gas turbines, assumed to be 20.6 percent annually. The cost of any operation of the gas turbines is not included within this item because the cost of energy to replace lost Indian Point Unit No. 3 generation is included in the cost of replacing deficient energy.

The annual carrying charge on the capital cost of gas turbine replacement capacity (peak derating) includes a 7% property tax. For the low, best and high estimates of this incremental generating cost item the tax equals $12,400,000, $13,840,000 and $16,600,000 respectively.

3.2.2.5 REPLACING ENERGY FOR PLANT DOWNTIME

Indian Point Unit No. 3 would not operate during the seven month period required for the cut-in of the closed-cycle cooling system. It was assumed that a normal refueling outage of two months duration could be scheduled to coincide with the start of the cut-in period and that the additional cost associated with the replacement of energy during the cut-in period would be for the additional five month outage period.

The Authority, in conjunction with the other utilities participating in this proceeding, has attempted to develop a schedule for the construction and cut-in of cooling towers at the four lower Hudson River generating sites that will minimize the cost of replacement energy. This schedule minimizes the overlap of cut-in periods.

The cost of replacing the five months of Indian Point Unit No. 3 generation lost because of the cut-in of closed-cycle cooling is the cost of running alternative generation in New York State. This cost was calculated using a multi-area production simulation program which can economically dispatch the generating resources of the New York Power Pool observing power transfer limits between load-generation areas within the State. This program was run with the

assistance of the New York Power Pool staff and reflects the Pool's latest long range plan and its estimates of future economic parameters affecting generation costs.

3.2.2.6 RELIABILITY IMPACT OF INDIAN POINT UNIT NO. 3 OUTAGE

The outage for the cooling tower cut-in reduces the reliability of service to New York State consumers. In order to maintain equivalent reliability it would be necessary to purchase an equivalent amount of capacity.

While there is no assurance the neighboring utilities would have excess capacity available to sell on a firm basis, an assumption that gas turbine capacity would be purchased assigns a minimum value to the lost reliability.

The cost of replacement capacity for the outage shown in Table 3-2 represents five months carrying charges on the purchase of 1033 MWe of capacity assuming a cost of $304 per installed kilowatt for gas turbine capacity in 1984 and an annual carrying charge rate of 20.6%.

The annual carrying charge on the capital cost of gas turbine replacement capacity for downtime to cut-in the cooling tower includes a 7% property tax. For the low, best and high estimates of this incremental generating cost item the tax equals $3,800,000, $5,370,000 and $7,500,000 respectively.