DOCKET NUMBER
PROD. & UTIL. FAC. 50-247

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November 10, 1971



Angus Macbeth, Esq.
Natural Resources Defense
Council, Inc.
36 West 44th Street
New York, New York 10036

Re: Consolidated Edison Company
of New York, Inc.
Indian Point Unit No. 2
AEC Docket No. 50-247

Dear Mr. Macbeth:

Enclosed are answers to the questions (identified as "Set I") which you raised in your letter of October 22, 1971, concerning environmental aspects of Indian Point No. 2.

In supplying you with this information Applicant reserves the right to interpose such objections as it may have to cross-examination or the offer of any matter into evidence in the proceeding.

Sincerely yours,

Enclosure:
"Responses to Questions Supplied by
Hudson River Fishermen's Association
on October 22, 1971"

cc with enclosure:
Samuel W. Jensch, Esq.
Dr. John C. Geyer
Mr. R. B. Briggs
Myron Karman, Esq.



7/2

hearing

cc Anthony Z. Roisman, Esq.
J. Bruce MacDonald, Esq.
Honorable Louis J. Lefkowitz
Algie A. Wells, Esq.
Secretary, USAEC ✓

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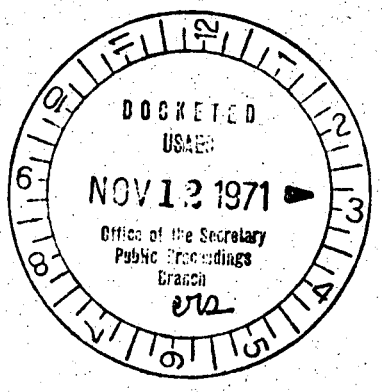



Consolidated Edison Company of New York, Inc.

Responses to Questions Supplied by Hudson River Fishermen's Association on October 22, 1971.

1. What was the peak summer power demand on the entire Consolidated Edison system on the day of greatest production in a) 1971, b) 1970, c) 1969?

a) 7719 MW July 1, 1971 - 2-3 P.M.

b) 7041 MW August 28, 1970 - 3-4 P.M.

c) 7266 MW July 17, 1969 - 4-5 P.M.

These figures represent the peak send out on the days in question. The extent to which demand was influenced by Con Edison's efforts to obtain voluntary load reduction cannot of course be measured.

The following load reduction measures were in effect on these days:

July 1, 1971 - 3% voltage reduction; "Save-A-Watt" campaign in effect.

August 28, 1970 - no voltage reduction

July 17, 1969 - 3-5% voltage reduction

2. What is the anticipated peak summer power demand in the entire Consolidated Edison system for the day of greatest production in a) 1972, b) 1973, c) 1974?

a) 8550 MW

b) 8950 MW

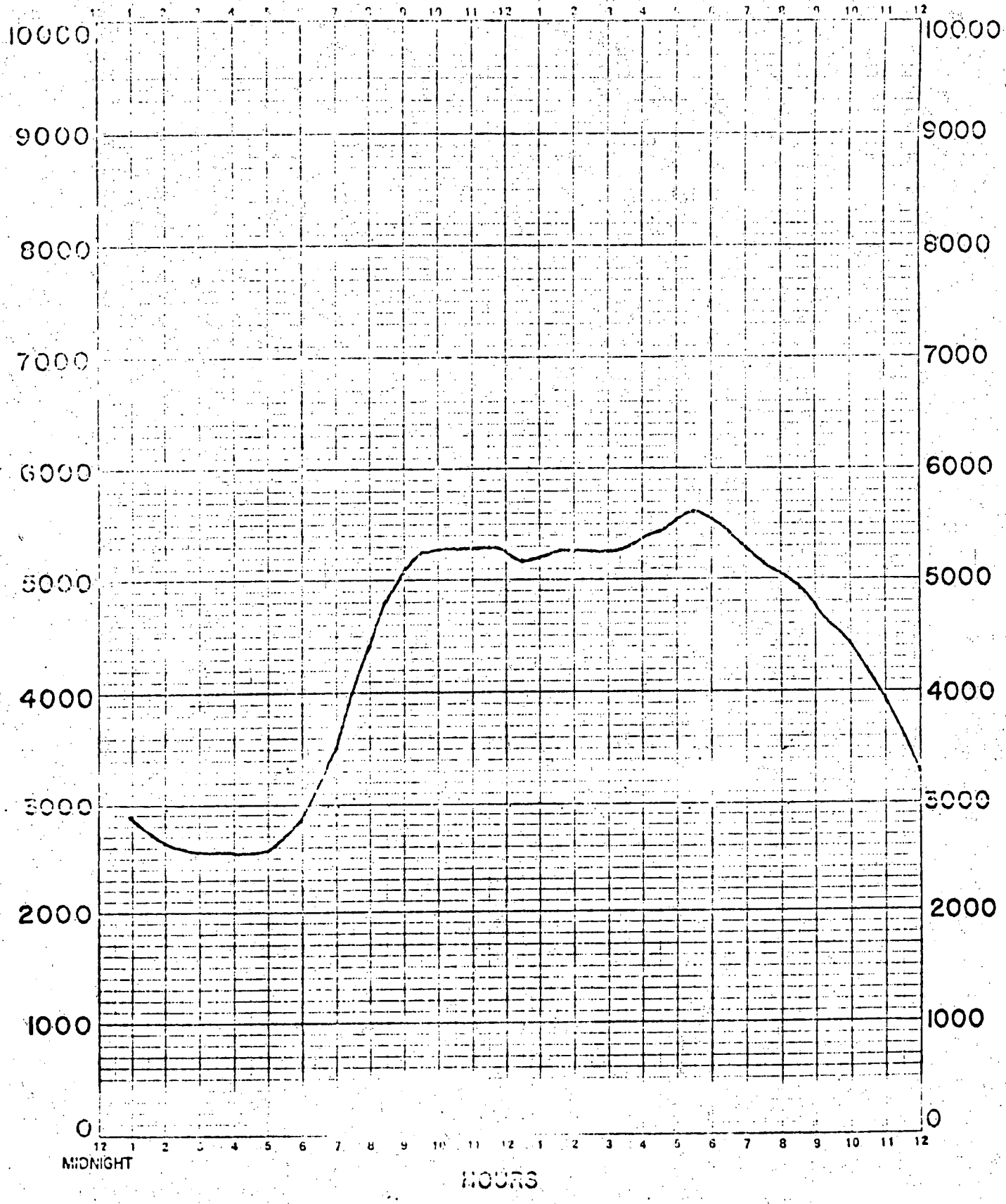
c) 9400 MW

Note: This is not necessarily the day of greatest production.

3. What are the present power demands in the entire Consolidated Edison system, on an hour by hour basis, during the course of an average day in a) January b) April c) August d) October? A graphical presentation of these data showing twenty-four (24) hour continuous demands would be most useful.

The attached graphs, Figures 3-1, 3-2, 3-3 and 3-4, indicate on an hour by hour basis the loads on an average day in October 1970, January, 1971, April, 1971 and August, 1971, respectively.

AVERAGE DAY — JANUARY 1971



AVERAGE DAY — APRIL 15TH

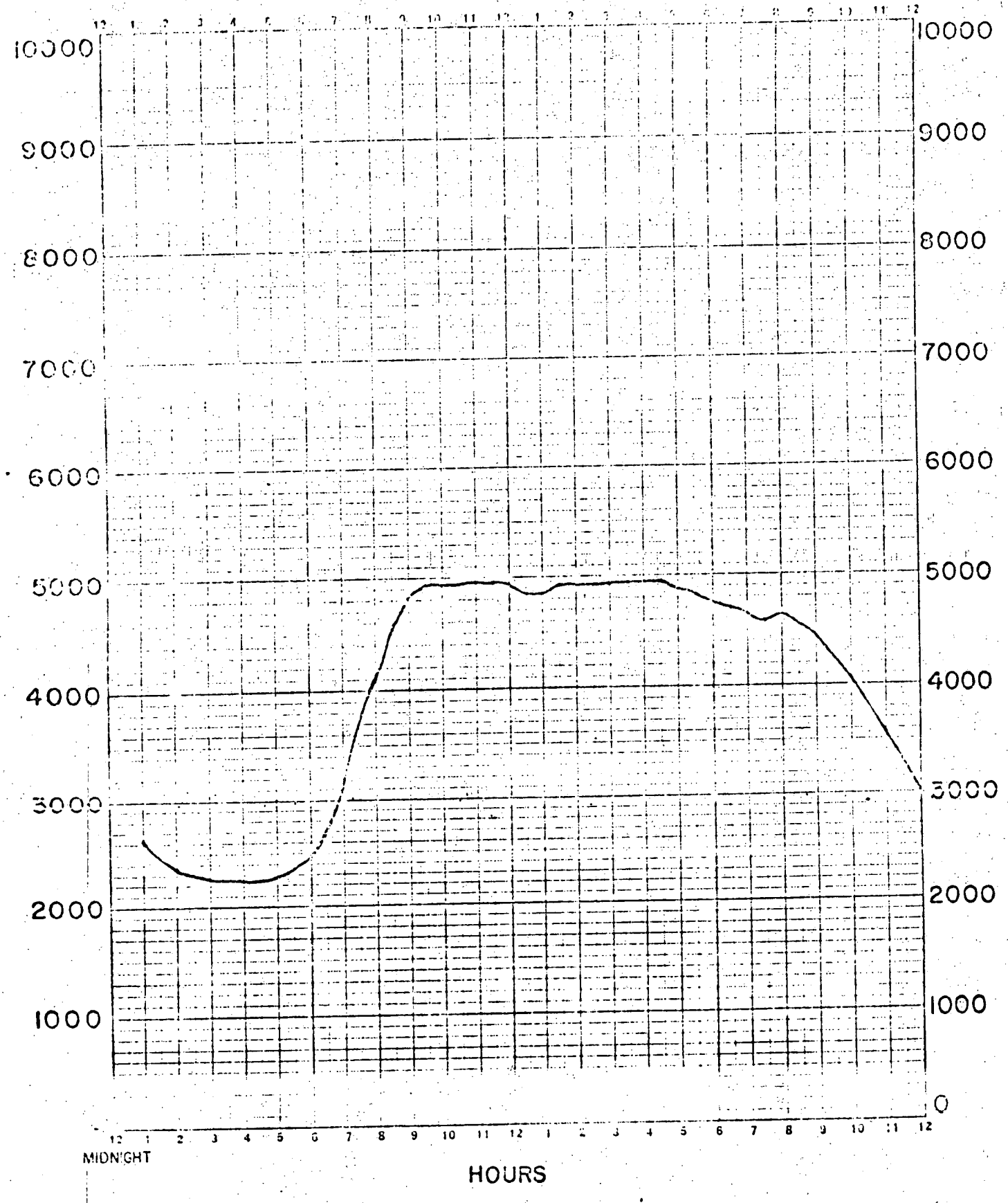
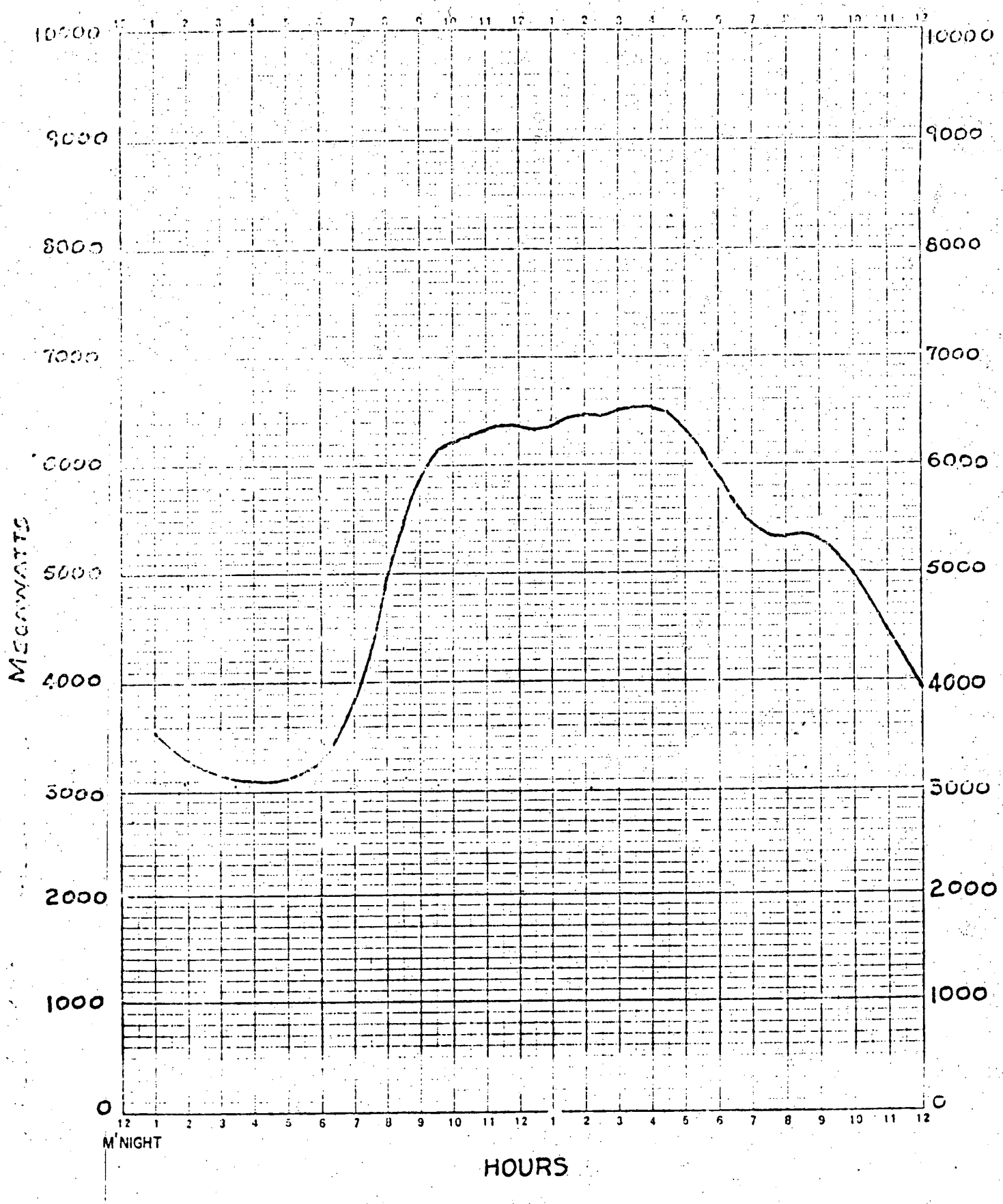
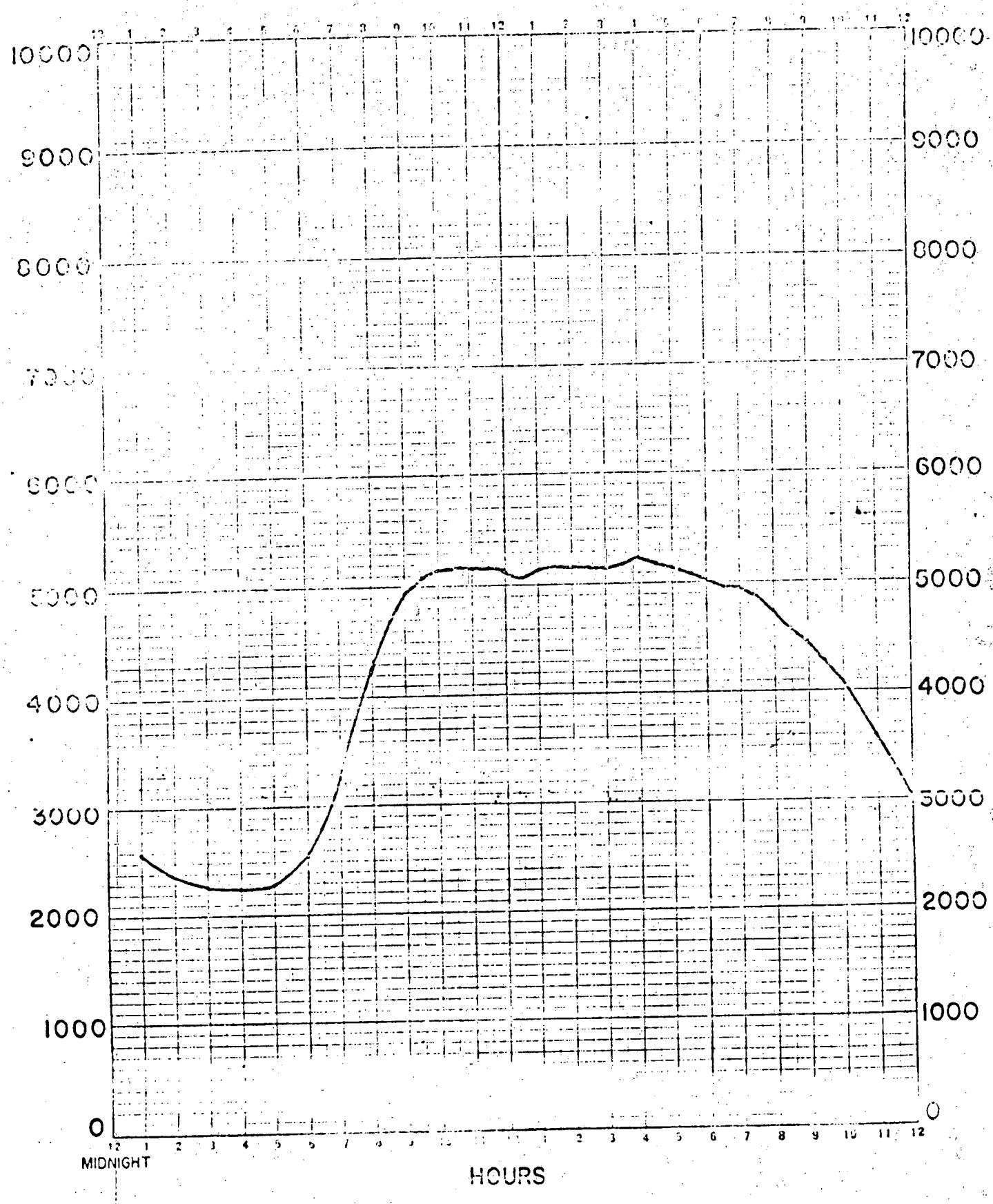


Figure [illegible]

AVERAGE DAY - AUGUST 17TH



AVERAGE DAY – OCTOBER 1970



4. How is the discharge of copper from Indian Point Unit No. 1 monitored?

A cupric ion ($Cu^{++}$) sensor is incorporated into the Automated Environmental Systems Unit (AES). The water from the discharge canal is pumped to the AES unit and the cupric ion concentration is recorded on a strip chart recorder continually and on a punch tape every 30 minutes.

5a. How will the discharge of copper and copper elements from Indian Point Unit No. 2 be monitored?

Since Units 1 and 2 have a common discharge canal, the AES unit will monitor the units together, as described above. The sampling point for all parameters is located at the first exposed opening in the discharge canal, Unit 2 is not monitored separately.

b. Will there by monitoring of $Cu^{++}$, $Cu^{+}$ and Cu metal?

There will be monitoring of $Cu^{++}$.

6. What is the sensitivity of the copper detection system in theory and practice?

The sensitivity of the cupric ion sensor is .006 ppm to 60,000 ppm in theory. However, this lower limit of sensitivity is for a pure solution under laboratory conditions. In discussions with the sensor manufacturer, it has been indicated that this system is subject to interference from chloride, bromide and iron and thus the effective sensitivity for copper for the Indian Point installation would be approximately 1.0 ppm.

7. Various reports of copper detection (0.1 mg/liter vs. 0.006 mg/liter). What is the source of this discrepancy?

A mistake was made in the Raytheon reports indicating the lower end of the sensitivity as .6 ppm. This was due to a mistake in the manufacturer's literature. As per this literature the sensor was not calibrated to read anything below .6 ppm. The mistake was not found until October 4, 1971. As stated previously, the actual effective lower limit sensitivity for copper is on the order of 1.0 ppm.

8. What amounts of copper over what periods of time have been discharged in the Hudson River from Indian Point Unit No. 1?

Indian Point Unit 1 went on line in 1962 and the cupric ion sensor was installed in 1969. Since the sensor was installed, no detectable $Cu^{++}$ concentration has been recorded.

9. What amounts of copper over what periods of time does Consolidated Edison anticipate discharging into the Hudson River from Indian Point Unit No. 2?

No detectable copper would be expected to be discharged from Indian Point Unit 2 based upon our experience on Indian Point Unit 1. Some trace amounts of copper would be expected from corrosion of condenser tubes, but we cannot accurately predict an amount.

10a. What is i) the maximum, ii) the minimum rate of flow of water through the water-box of Indian Point Unit No. 2?

i) The maximum rate of flow through each of three inlet water boxes is 280,000 GPM. Each of the three water-boxes is divided by a separation plate and the flow through each half section is 140,000 GPM.

ii) The minimum rate of flow through each of half sections of the water-boxes is 84,000 GPM. It is expected that at a minimum at least three half sections will be in operation.

b. What is the rate of flow of water through the water-box of Indian Point Unit No. 2 under normal operating conditions?

The rate of flow through each of three inlet water-boxes at normal conditions will vary between the above limits.

11a. What is i) the maximum, ii) the minimum rate of flow of water through outfall of Indian Point Unit No. 2?

i) If only Unit 2 is on the line the maximum rate of flow through the outfall of Indian Point No. 2 is 908,000 GPM. If Unit 1 is also operating the maximum flow rate through the combined outfall is 1,188,000 GPM.

ii) The minimum rate of flow through outfall of Unit No. 2 is 282,000 GPM with only Unit 2 in operation.

b. What is the rate of flow of water through outfall of Indian Point Unit No. 2 under normal operating conditions?

The rate of flow through outfall of Unit No. 2 under normal conditions will be between the limits described above.

12. What is the lowest practicable rate at which to operate the intake pumps to a a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The lowest practicable rate of flow at which to operate the intake pumps of Unit No. 1 is 84,000 GPM per pump.

b) The lowest practicable rate of flow at which to operate the pumps of Unit No. 2 is 140,000 GPM per pump; with recirculation (system to be installed prior to Winter 1972-3) the net flow to the condensers will be 84,000 GPM per pump.

13. When the intake pumps are being operated at the lowest practicable rate, what is the dwell time of non-screenable organisms in the condensors of a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The dwell time of non-screenable organisms under minimum flow conditions, in the condensers of Unit No. 1 is 13 seconds from water-box inlet to water-box outlet.

b) The dwell time of non-screenable organism under minimum flow conditions in the condensers of Unit No. 2 is 18 seconds from water-box inlet to water-box outlet.

14. When the intake pumps are being operated at normal rates, what is the dwell time of non-screenable organisms in the condensers of a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The dwell time of non-screenable organisms under maximum normal flow conditions, in the condensers of Unit No. 1 is 8 seconds, and under minimum normal flow conditions is 13 seconds from water-box inlet to water-box outlet.

b) The dwell time of non-screenable organisms under maximum flow conditions in the condensers of Unit No. 2 is 11 seconds and under minimum normal flow conditions is 18 seconds from water-box inlet to water-box outlet.

15. When the intake pumps are being operated at the lowest practicable rate, what is the dwell time of non-screenable organisms from the point of entrance to the water-box until exit from the discharge channels into the river for a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The dwell time of non-screenable organisms from point of entrance to water-box to river, for lowest flow rate of Unit No. 1 is 35 minutes with Unit No. 1 and No. 2 in service.

b) The dwell time of non-screenable organisms from point of entrance to water-box to river, for lowest flow rate of Unit No. 2 is 40 minutes with Unit No. 1 and No. 2 in service.

16. When the intake pumps are operating under normal conditions what is the dwell time of non-screenable organisms from the time of entrance to the water-box until exit from the discharge channel into the river for a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The dwell time of non-screenable organisms from point of entrance to water-box to river, for maximum normal flow rate of Unit No. 1 is 9.5 minutes for 280,000 GPM flow and 35 minutes for 84,000 GPM, with Unit No. 1 and No. 2 in service.

b) The dwell time of non-screenable organisms from point of entrance to water-box to river, for maximum normal flow rate of Unit No. 2 is 11 minutes for 840,000 GPM and 40 minutes for 252,000 GPM, with Unit No. 1 and No. 2 in service.

17. When the intake pumps are operating at the lowest practicable rate, what is the peak temperature rise of the water passing through the hottest of the condenser tubes in a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The peak temperature rise of water through the hottest of the condenser tubes, for lowest flow rate, on Unit No. 1 is 29.3°F. This includes mean temperature rise of 27.8°F and an additional 1.5° rise in the hottest tube.

b) The peak temperature rise of water through the hottest of the condenser tubes, for lowest flow rate, on Unit No. 2 is 34.0°F. This includes a mean temperature rise of 32.5°F and an additional rise of 1.5° in the hottest tube.

18. When the intake pumps are operating under normal conditions, what is the peak temperature rise of the water passing through the hottest of the condenser tubes in a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The peak temperature rise of water through the hottest of the condenser tubes, for maximum normal flow rate on Unit No. 1 is 13.9°F for 280,000 GPM. This includes a mean temperature rise of 12.4°F, and an additional 1.5°F rise in the hottest tube. The peak rise for 84,000 GPM is 29.3°F. This includes 27.8° mean temperature rise and 1.5° additional rise in the hottest tube.

b) The peak temperature rise of water through the hottest of the condenser tubes, for maximum normal flow rate on Unit No. 2 is 16.4°F for 840,000 GPM. This includes a mean temperature rise 14.9°F and an additional 1.5° rise in the hottest tube. The peak rise for 252,000 GPM is 34.0°F. This includes a mean temperature rise of 32.5°F and an additional rise of 1.5° in the hottest tube.

19. What is the temperature rise gradient through the water-box (i.e. the temperatures within the different tubes as one moves vertically and horizontally through the water-box) of a) Indian Point Unit No. 1, b) Indian Point Unit No. 2? A diagram of the tube array with indications $\Delta$ T at 1 degree F intervals would be most useful.

a & b) The temperature rise gradient in different tubes could be $1.5^{o}$ above the mean water outlet temperature and that the coolest water in the center tube of the tube array is $1.5^{o}$ below the mean water outlet temperature. No study has been made of $1^{o}F$ intervals.

20 & 21. In the course of the average winter how frequently are there frazzle ice formations at Indian Point? What is the a) geographic distribution, b) the quantity of frazzle ice at Indian Point during a typical frazzle ice formation?

Frazzle ice formations have rarely been observed to have occurred at Indian Point. The Plant is designed to preclude occurrence of frazzle ice when conditions approach those where frazzle ice might occur.

22. Does the use of heated water or exhaust steam to counteract frazzle ice buildup or formation seem to attract fish to the intake of Indian Point Unit No. 1 or Indian Point Unit No. 2?

No. It is doubtful that the "deicing loop" returning warm water directly into the forebays, not out into the river where the fishes are, would attract fishes to Unit No. 2.

23. If the answer to No. 22 is yes, what action does Consolidated Edison plan to take to reduce fish attraction?

Not applicable.

24a. Has mechanical agitation been used to counteract frazzle ice clogging of the intake structure of Indian Point Unit No. 1 or Indian Point Unit No. 2?

We have tested air bubbles over the fixed screens. Air curtains are used at other stations on the Hudson.

25. To what extent would relocation of the intake structure towards midstream partially or wholly avoid the frazzle ice problem?

Relocation of the intake structure towards midstream would of itself not avoid a frazzle ice problem. It would complicate the use of recirculating water to prevent frazzle ice formation.

26a. To what extent can Consolidated Edison control the timing of the injection or release of chemicals so that they are mixed and neutralized in the outfall?

The timing of chemical releases can only be controlled to a minor degree.

b. If it is not possible to control the timing of the injection or release of chemicals, why is that so?

Chemicals are used in the plant at many locations at different times and for different purposes. See pages 2.3.4.1 to 2.3.4.4 in Supplement One of the Environmental Impact Statement. Releases are dependent on operating and plant conditions the timing of which cannot be controlled in most circumstances.

27a. Is it possible to release alkali from one ion exchange column so as to coincide with the release of acid from another?

Yes, it is possible to release alkali (sodium hydroxide) and acid (sulfuric acid) so that neutralization occurs before discharge.

Sodium hydroxide and sulfuric acid are employed simultaneously for the regeneration of the mixed bed ion exchangers. In effect, these wastes neutralize one another before discharge.

29. Can the three hourly chlorination periods at Indian Point Unit No. 2 per week be reduced without substantial impairment of function?

No.

The determination that three hourly chlorination periods would be required as a minimum to prevent severe condenser fouling was arrived at by field testing at Indian Point 1. Originally, the chlorination schedule called for hypochlorite injection three times per day, seven days per week. Currently, chlorination activities are adjusted so that the outfall concentration is less than 0.5 ppm residual chlorine. However, due to the chlorine demand of the unchlorinated cooling water measured residuals are usually less than 0.1 ppm.

30a. Are the chlorination periods at Indian Point Unit No. 1, and Indian Point Units No. 2, staggered (i.e. a single pump being chlorinated at a time)?

The chlorination periods at Unit No. 1 and No. 2 are staggered.

One-half of the Unit No. 1 condenser is chlorinated at a time to a residual of 1.0 ppm. Dilution with water from the other half of the condenser insures a residual chlorine level at the tail pipe approximating 0.5 ppm and a chlorine demand results in a concentration of less than 0.1 ppm at the outfall. Condensers on Unit No. 2 will be chlorinated similarly. Chlorination activities <u>will not</u> be performed simultaneously.

31a. i) For Indian Point Unit No. 1, ii) For Indian Point Unit No. 2, in the passage of water from the intake to discharge into the river, are the most severe mechanical restrictions and turbulence encountered in the water-box?

There are no restrictions in water boxes.

b. For each unit where are there any other constrictions of flow?

There are restrictions of flow in the following locations:

A weir is located in the condenser discharge tunnel of Unit No. 2, to control the hydraulic head on the pump of Unit 2 regardless of tide.

There are outfall gates to regulate the velocity and direction of flow out of the twelve outlet ports in the combined outfall. Other constrictions include the fixed and travelling water screens, pumps, tube inlet and waterbox outlets.

32. Why did Consolidated Edison choose to employ 3/8 inch mesh screens at the point of intake rather than some other mesh?

The 3/8 inch mesh screens were and are a standard mesh size for screens used at power plant intakes. Operating experience has shown this to be the smallest practical mesh size to avoid excessive clogging. We have had testing done utilizing 1/4 inch mesh size. The 1/4 inch mesh was very fast to clog with the clogging resulting in increased intake velocities.

33a. Has Consolidated Edison made or does it know of any studies to determine the least harmful mesh size for the intake screens in terms of a) physical damage to the plant (e.g. abrasion) or b) environmental damage?

We have not performed studies to determine least harmful mesh sizes. However, the entrainment studies being performed by NYU will yield valuable data on what organisms and life stages can survive entrainment. Also, we have tested what size striped bass can be screened by a 3/8 inch mesh screen. (Hudson River Fishery Investigations 1965-68). Results of recent studies indicate that organisms can survive entrainment better than they may survive impingement on the screens. Therefore, a reduction in screen size may result in higher mortality than the present size or larger mesh sizes. Thus far, evidence supports the conclusion that the mortality of entrained organisms has had no detrimental effect on the biosystem of the Hudson.

34. Indicate all investigations made by Consolidated Edison of methods of removing fish impinged on intake screens.

See pages 2.3.6-22 to 2.3.6-30 of Supplement to Indian Point Unit No. 2 Environmental Report.

35. Within the power generating industry, what is the state of the art with regard to fish protection?

The state-of-the-art for fish protection is described in Bechtel Associates' report to Con Edison (Survey and Performance Review of Fish Screening Systems).

36a. To the knowledge of Consolidated Edison, what other power generating corporations or authorities have had problems of fish protection at specific generating stations?

b. To the knowledge of Consolidated Edison, indicate how the fish protection problems indicated in (a) above have been resolved.

Con Edison has been in contact with utility companies on the West Coast, Great Lakes area, throughout New York State and New England and in England. They all report that they collect fishes on their intake screens during certain times of the year, but do not classify it as an operational or biological problem.

37. What is the surface area of copper actually or potentially exposed to the flow of cooling water in a) Indian Point Unit No. 1, b) Indian Point Unit No. 2?

a) The surface area of condenser turbing exposed to the flow of cooling water for Unit No. 1 is 192,980 square feet.

b) The surface area of condenser tubing exposed to the flow of cooling water for Unit No. 2 is 833,460 square feet.

The condenser tube material used in the condensers of both units is admiralty metal. Admiralty metal contains 70% copper.

38. What is the effect (eg. oxidation) on the copper condensers of chlorination under the proposed program of chlorination?

Chlorination tends to reduce the formation of corrosion cells which tends to limit the amount of oxidation of copper.