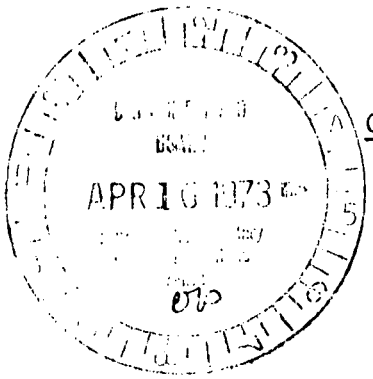

A RESPONSE TO DR. LAWLER'S ADDITIONAL TESTIMONY DATED MARCH 30, 1973 ON TEMPERATURE DISTRIBUTION CAUSED BY MULTIPLANT OPERATION ON THE HUDSON RIVER

by

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The Staff has reviewed the additional testimony of Dr. John P. Lawler, the Applicant's consultant, on the "Cumulative Effects of Bowline, Roseton and Indian Point Generating Stations on the Hudson River", dated March 30, 1973, and found it incomplete, unsupported, contradictory to previous testimonies, and misleading in its conclusions.

The principal argument of Dr. Lawler is that the Staff "did not even calibrate or verify the Staff's mathematical model with available field observations," (page III-3 of Lawler's testimony). The Staff agrees with Dr. Lawler on this point. The Staff further believes that such a calibration should indeed by made as also indicated in Section III.E.1 and XII.C.2 in the FES (Ref. 1). However, the Staff believes that:

(a) The available field data are insufficient to make such a calibration.

(b) The present calibration made by Dr. Lawler in his own model is useless, or more correctly, very misleading. Dr. Lawler's obtusive and highly flexible use of the little field data and

and measurements made is totally unacceptable and in my opinion not in accordance with sound scientific and engineering principles.

(c) The Staff expects that the Applicant shall prepare and carry out a complete and competent program for collecting sufficient observed data to make a reasonable calibration of the mathematical model. Such a program shall be fully documented, reported, evaluated and continually reviewed by the Staff. Adjustments to the program may be needed to meet new requirements to obtain the proper information.

(d) Since the models are used as predictive tools for various meteorological and river conditions and for heat loads much higher than presently operating on the Hudson River, the Staff believes that such a calibration cannot be made until the program mentioned in item (c) is carried out to the satisfaction of the Staff.

In the Staff's opinion, Dr. Lawler's testimony helps to show that the numerical values used for the various parameters involved in the mathematical model are of great importance. This is the main reason the Staff has carried out its parametric study (Ref. 2) and showed results based on a range of possible realistic assumptions.

As for the actual material presented by Dr. Lawler in his testimony, the Staff has found it incomplete and contradictory. In order to complete the review of this testimony the Staff is requesting the following additional information.

Request for Additional Information

Section I

1. In reference to Dr. John Lawler's testimony of March 30, 1973, provide a complete listing of the computer programs used to generate the curves shown in Fig. III-8.

2. Provide the original input and output data used for all the actual cases run as shown in Figs. III-3, III-7, III-8, III-9. Specifically the longitudinal dispersion coefficient $^{(E)}$ and the thermal stratification factor (TSF) used should be given as a function of distance, since they were not specified anywhere in Lawler's testimony.

3. Figures III-7, III-8, and III-9 should be completed to show the extent of the curves below Mile Point 30. Provide input and output data and computer runs for such information.

4. Provide a copy of the report, "Application of the M.I.T. Transient Salinity Intrusion Model to the Hudson River Estuary," Technical Report No. 153, Ralph M. Parsons, Laboratory for Water Resources and Hydrodynamics, Department of Civil Engineering, M.I.T., prepared under the support of Quirk, Lawler and Matusky Engineers, Tappan, New York, September 1972.

5. Provide all empirical correction factors which have been used in all computer runs to derive the curves in the above mentioned figures.

6. For any of the observed cases for the power plants in actual operation which Dr. Lawler has relied on for calibrating his mathematical models or used for comparison with Staff predictions, provide all the actual meteorological conditions (wind velocity, humidity, dry and wet bulb temperatures, cloudiness, rain, equilibrium temperatures), actual river conditions (ambient temperatures, salinities, fresh water flows, tidal ranges or water surface elevations, equilibrium temperatures), actual ocean conditions (temperatures, water levels, salinities) and actual power plant conditions (intake temperatures, discharge temperatures, condenser flows, discharge velocities, actual power plant operating loads). Those conditions should be specified for the period of monitoring and data collection as well as those conditions for the period of at least two months prior to that time.

7. For the power plants in operation, provide complete lists of the data collected and measurements taken to monitor the thermal plume. The number of thermocouples used, their locations, and the frequency of measurements taken should be specified.

8. Provide the calculations made to evaluate the longitudinal dispersion coefficient, the heat exchange coefficient and the thermal stratification factors which existed during the observation period when the power plants were in operation.

This information for the above requests is definitely necessary in order for the Staff to make an evaluation of the calibration of Dr. Lawler's mathematical models.

Section II

Based on the present material of Dr. Lawler's testimony, the Staff has the following additional questions:

1. The Staff has calculated the heat released into the atmosphere based on Fig. III-8 and found that this heat is about 20% of the total heat dumped into the river by all the 5 power stations. It seems from this, that Dr. Lawler has used on the average a thermal stratification factor (TSF) of about 5.

   If this is correct, should the same thermal stratification factors be used for evaluating the 4°F excess temperature for the river surface width? How does the thermal stratification factor value of 5 compare with the previous values used in your earlier predictions made in as for example, Lawler's testimony of April 5, 1972 entitled, "The Effect of Indian Point Units 1 and 2 Cooling Water Discharge on Hudson River Temperature Distribution."

2. When using such a TSF, one takes advantage of the assumption that the temperature increases are mainly concentrated on the surface and that the lower layers stay relatively cold. For such a case, it may be

assumed that only part of the river depth is actually participating in heat absorption and dispersion. Was such reduced effective depth considered in Lawler's model? If yes, what value was assumed? If not, why?

3. For Fig. III-8, the excess temperatures were indicated but no mention was made of the actual river ambient temperature. Is this because the excess temperature predictions are almost independent of the ambient temperature? If yes, could you explain again the comments on page III-5?

4. In Fig. III-8 it is shown that the average temperature rise at the Indian Point site for simultaneous operation of all five power stations is about 1.3°F. However, in Dr. Lawler's testimony of April 5, 1972, mentioned above, and in Table 4, page 209 of Vol II of the FES, it is indicated that the temperature rise will be 1.75°F at the Indian Point site with the Indian Point Units 1 and 2 and Lovett power plants alone in operation. Please explain this contradiction.

In connection with this comparison, explain how the values were obtained in Table 6 of Lawler's April 5, 1972 testimony (see also Table 3, page 207, Vol II of FES), based on the equation given on page 206, if "no empirical correction were employed" as claimed. The Staff has used this equation with no correction factor and with all the numerical values specified by the Applicant and finds for the

first case a ΔT of 1.14°F per 100 billion BTU/day instead of 0.84°F. This means a $\overline{\Delta T}$ of 2.24°F for the heat load of Indian Point Units Nos. 1 and 2 alone. Clarify this point in relation to the 1.3°F given in the present testimony for all five power stations operating simultaneously.

5. Dr. Lawler shows in his testimony that there will be no measurable Lovett-plant-induced temperature rises in the vicinity of Indian Point. The effect of Indian Point Unit No. 1 is evaluated by Dr. Lawler to be about 0.2°F area average temperature rise. In Section XII, pages 9-10 of the FES, there are tabulated temperatures which were observed by New York University Staff at the Indian Point site for two successive years. This observed data show an area average temperature of 80.4°F for August 1968 and 80.66°F for August 1969. In light of the Applicant's repeated position that the maximum ambient temperature of the river is 79°F, can one conclude that the area-average temperature rise observed by New York University is about 1.5°F as compared to 0.2°F claimed by Dr. Lawler, or should one conclude that the river ambient temperature was 80.3°F?

6. Based on the same observed data one can see that the thermal stratification factor (TSF) is very close to 1.0 (1.012 for August 1968 and 1.018 for August 1969). How do these values compare with the values Dr. Lawler has been using in his testimony of March 30, 1973 for the five power stations on the Hudson River?