UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

6/23/77

In the Matter of   )
)
CONSOLIDATED EDISON COMPANY   )   Docket No. 50-247
   OF NEW YORK, INC.   )
(Indian Point Station,   )
   Unit No. 2)   )

AFFIDAVIT OF KENNETH L. MARCELLUS

KENNETH L. MARCELLUS, being duly sworn, deposes and

says that:

1. My name is Kenneth L. Marcellus. I am the Chief

Biologist of the Consolidated Edison Company of New York, Inc.

("Con Edison") with offices at 4 Irving Place, New York, New

York, 10003.

2. Con Edison has been advised by its consultant,

Texas Instruments Incorporated, that a misinterpretation has

occurred in the application of an exploitation factor in the

development of an equilibrium reduction equation method for

impact assessment derived from the Ricker (1958, 1975) stock-

recruitment relationship.* That method was discussed in the

joint testimony of Drs. Campbell, Lawler, Marcellus, May and

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* Ricker, W.E. 1958. Handbook of computations for biological
  statistics of fish populations. Fish. Res. Bd. Can. 119,
  300 p.; Ricker, W.E. 1975. Computation and interpretation of
  biological statistics of fish and fish populations. Fish.
  Res. Bd. Can. Bull. 191:1-382.

McFadden, dated December 7, 1976, which was presented as evidence in the proceeding on Con Edison's June 6, 1975 application to amend License No. DPR-26 to extend the period of interim operation of Indian Point Unit No. 2 with its installed once-through cooling system (Tr. 255). This matter also affects the Final Research Report* filed with the Commission on February 18, 1977, which was referenced as an exhibit to Con Edison's March 15, 1977 application to eliminate the requirement for termination of operation of Indian Point 2 with the once-through cooling system. A supplement to the Final Research Report is being prepared for submission to the Commission and to the U.S. Environmental Protection Agency in July 1977 which will contain a detailed discussion of this matter and a revision of the calculations of impacts pursuant to the equilibrium reduction equation and the life cycle model.

3. Con Edison has been advised that the need for the change has been occasioned by recognition of the fact that the exploitation factor u_E in the Ricker stock-recruitment analyses was intended to be used in a situation where the

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* "Influence of Indian Point Unit 2 and Other Steam Electric Generating Plants on the Hudson River Estuary with Emphasis on Striped Bass and Other Fish Populations" dated January 1977.

removal of fish (by fishing) occurs during a relatively short
period of time, during which period the losses attributable
to natural mortality are insignificant and can be disregarded.
In applying the Ricker concept to the assessment of the power
plant impact upon Hudson River fish populations, however, the
extended period of time during which the "fishing" (in this
case, entrainment and impingement) takes place makes it in-
appropriate to disregard the natural mortality which occurs
concurrently. When natural mortality is taken into account
throughout the "fishing" interval, the fish population is
decreasing at a somewhat greater rate than would be the case
if the reduction were occurring solely as a result of the
fishing operation. Accordingly, the fish removed by fishing
represent a larger fraction of the surviving population than
would be the case if natural mortality were not operative.

Under these circumstances, the appropriate exploitation
rate to use in the calculation of impact is the conditional
fishing mortality rate (m), which represents, at any time during
the fishing interval, the proportion of the surviving fish
population which is removed by "fishing."

4. The principal changes from the previous descriptions
of the equilibrium reduction equation method of impact assess-
ment are as follows:

(A) The elimination of the determination of the exploitation rate for entrainment impact estimation (see Step 2, pp. 17, 20, December 7, 1976 testimony).

(B) The addition of a step: Determination of the conditional impingement mortality rate for the impingement impact estimation (see p. 21 of December 7, 1976 testimony).

(C) Changes in the levels of impact as presented on pp. 22 & 23 of the December 7, 1976 testimony.

5. The change is indicated by the substitution of factor m for u_E in the equation given on page 21 of the December 7, 1976 testimony, which should read as follows:

$$\% \text{ impact} = \left\{ 1 - \frac{\log_e[\alpha(1-m)]}{\log_e \alpha} \right\} \cdot 100 \qquad (4)$$

where

m = conditional mortality from entrainment, impingement, or entrainment and impingement combined.

α = Parameter of the Ricker stock-recruitment curve
$R = \alpha P e^{-BP}$

6. Based on an alpha (α) value of 5, and using all other factors as indicated in the December 7, 1976 testimony, the impact estimates for Indian Point Unit 2 on striped bass are 4.13% based on 1974 data and 4.62% based on 1975 data. The multiplant impact (Indian Point 2, Bowline Point, and Roseton) is 7.87% based on 1974 data and 9.27% based on 1975 data. This means that if the same plant operating and natural ecological conditions as actually occurred in these two years were to persist through the operational lives of the plants, the striped bass population would be reduced by the above given percentages below the average level which characterized the stock before the new power generating units were activated. Indian Point 2, which went into operation in October 1973, operated at levels mostly above 80% of full flow during the 1974 and 1975 entrainment seasons; Bowline Point (at which Unit 1 was activated in September 1972 and Unit 2 in May 1974) operated about half the time in 1974 at levels greater than 70% of full flow and most of the time in 1975 at greater than 67% of full flow; Roseton (at which Unit 2 was activated in September and Unit 1 in December of 1974) operated at greater than 75% of full flow during most of the 1975 entrainment season. The multiplant impact estimates apply to these cooling water flows.

7. Impact estimates previously reported for the equilibrium reduction equation method have been revised. For Indian Point 2 alone, the entrainment impact on striped bass was about the same in both years, but the impingement impact on striped bass was higher in 1975 than in 1974. These impacts are summarized as follows:

	1974	1975
Entrainment	3.63%	3.75%
Impingement	0.49%	0.86%
Combined	4.13%	4.62%

The estimated combined reductions in the striped bass population of 4 to 5% are small and are of no significance from either an ecological or an economic point of view.

For the multiplant case, the entrainment impact was higher in 1975 than in 1974, but the impingement impact was higher in 1974 than in 1975. These impacts are summarized as follows:
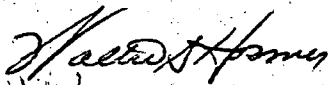
	1974	1975
Entrainment	5.26%	7.86%
Impingement	2.67%	1.41%
Combined	7.87%	9.27%

The combined multiplant impact of about 8-9% is not large enough to impair the ecological well being of the striped bass population, nor to cause significant economic loss.

8. The foregoing does not affect the assessment of impact of interim operation presented in the Extension Proceeding referred to in paragraph 2 above. The impact assessment in Con Edison's Environmental Report of June 1975 (Con Edison Exhibit OT-1 in that case) was based on the striped bass transport model of Lawler, Matusky & Skelly Engineers ("LM&S"), which included assumed levels of compensation rather than levels derived from the Ricker stock-recruitment relationship. The supplements to that report did not include any use of the equilibrium reduction equation method for impact assessment. Also, Con Edison's cost-benefit testimony of Dr. Gueron, Mr. Szeligowski, and Dr. Englert, dated January 18, 1977, was based on the LM&S transport model, and did not involve any use of the equilibrium reduction equation method for impact assessment.

Kenneth L. Marcellus

Subscribed and sworn to before

me this 23rd day of June, 1977

Notary Public