Annotated List of Documents
Related to the 316(a) and (b) Demonstrations
for the Oyster Creek Generating Station

REGULATORY AGENCY DOCUMENTS/SUBMITTALS

Jersey Central Power & Light Company. 1978. Oyster Creek & Forked River Nuclear Generating Stations, 316(a) & (b) Demonstration. Jersey Central Power & Light Company, Morristown, NJ. An abbreviated version of the Table of Contents is provided below.

Volume: Text

Chapter 1 – Background and Rationale

- Summary description of the Oyster Creek and Forked River Generating Stations and the surrounding environment.
- Biological Summary of the 316(a) and (b) Demonstrations
  - Thermal Discharge Effects – Representative Important Species Demonstration
  - Thermal Discharge Effects – Absence of Prior Appreciable Harm Demonstration
  - Impingement and Entrainment Effects

Chapter 2 – Hydrothermal Considerations

- Temperature distribution in Oyster Creek and Barnegat Bay
- Thermal plume measurements/modeling
- Recirculation Analysis

Chapter 3 – Environmental Effects of the Station's Discharges

- Representative Important Species Demonstration
- Absence of Prior Appreciable Harm Test

Chapter 4 – Environmental Effect/Impact of Cooling Water Intake Structures

- Decision criteria and overall rationale
- Impingement and entrainment effects

Chapter 5 – Alternative Systems

- Discharge/cooling system alternatives
- Intake structure alternatives

Chapter 6 – Economic Analysis

- Cost/benefit analysis of discharge/cooling system and intake system alternatives

Volume: Appendices A1-C1

Appendix A1 – The Environment of Barnegat Bay, Oyster Creek, and Forked River.

Appendix A2 – Description of the Oyster Creek Nuclear Generating Station

Appendix A3 – Description of the Forked River Nuclear Generating Station

Appendices B1-B12 – Descriptions of hydrographic and thermal plume studies performed by government and utility scientists; analysis of the plume relative to the NJ Surface Water Quality Standards.

Addendum B1-B5 – Copies of hydrographic and thermal plume related reports

Appendix C1 – Effects of thermal discharges on plankton, macroinvertebrates, and fish

- Distribution of organisms in Barnegat Bay and contiguous waters
- Temperature shock studies
- Dilution pump passage
- Delayed mortality studies
- Life history studies

Volume: Appendices C2-C6

Appendix C2 – Effects of Thermal Discharges on Mortality of Mercenaria mercenaria in Barnegat Bay.

Appendix C3 – The Marine Boring and Fouling Invertebrate Community.

Appendix C4 – Woodborer Study Associated with the Oyster Creek Generating Station – Annual Report for June 1, 1975 – May 31, 1976.

Appendix C5 - Woodborer Study Associated with the Oyster Creek Generating Station – Annual Report for June 1, 1976 – November 30, 1977.

Appendix C6 – A Seasonal Plankton Cycle in Barnegat Bay, New Jersey.

Volume: Appendices C7-D1

Appendix C7 – Composition and Periodicity of Phytoplankton and Zooplankton from Barnegat Bay.

Appendix C8 – Effects of Thermal Discharges on the Structure of Periphytic Diatom Communities.

Appendix C9 – Benthic Macroinvertebrates

Appendix C10 – Fishes of Barnegat Bay, New Jersey, with Particular Reference to Seasonal Influences and the Possible Effects of Thermal Discharges.

Appendix D1 – Effects of Impingement and Entrainment at the OCNGS on Plankton, Macroinvertebrates, and Fish.

Volume: Appendices E1-F1

Appendix E1 – OCNGS Alternative Cooling Water System Study.

Appendix E2 – Alternative Discharge Cooling Systems for the Forked River Nuclear Generating Station.

Appendix F1 – An Evaluation of the Economic Benefits and Costs of Alternative Cooling Systems at OCNGS.

Volume: Addendum 1 to Appendix C1 & Addendum 1 to Appendix D1

Addendum 1 to Appendix C1 – Effects of Thermal Discharges on Plankton, Macroinvertebrates, and Fish.

Addendum 1 to Appendix D1 – Effects of Impingement and Entrainment at the Oyster Creek Nuclear Generating Station on Plankton, Macroinvertebrates, and Fish.

Volume: Working Papers Volume 1

Working Papers A:

Final Environmental Statement for the Oyster Creek Nuclear Generating Station (JCP&L, December 1974).

Final Environmental Statement for the Forked River Nuclear Generating Station (JCP&L, February 1973).

NPDES Data Monthly Summaries – June 1975 to December 1977.

Working Papers B:

Simulation of the Effluent Plumes from the Oyster Creek Nuclear Generating Station (Lawler et al., March 1978).

Simulation of the Effluent Plumes from the Forked River Nuclear Generating Station (Lawler et al., February 1978).

Working Papers C:

Responses of Some Estuarine Fishes to Increasing Thermal Gradients (Gift and Westman, June 1971).

Volume: Working Papers Volume 2

Working Papers C (Continued):

The Qualitative and Quantitative Analysis of the Benthic Flora and fauna of Barnegat Bay Before and After the Onset of Thermal Addition (nine progress reports on studies conducted by Rutgers University).

The Ecology of the Benthic Macroinvertebrates of Barnegat Bay, New Jersey (Phillips, June 1972).

Zooplankton of Barnegat Bay: The Effect of the Oyster Creek Nuclear Power Plant (Sandine, October 1973).

Supportive Experimental Data on Representative Important Species.

Volume: Working Papers Volume 3

Working Papers C (Continued)

Progress Reports of Ecological Studies on Fin- and Shellfish and Plankton for the Oyster Creek Nuclear Generating Station - September 1975 - April 1976 (Ichthyological Associates, Inc.).

Volume: Working Papers Volume 4

Working Papers C (Continued)

Preliminary Final Report of Ecological Studies on Fin- Shellfish and Plankton for the Oyster Creek Nuclear Generating Station – September 1975 – August 1976 (Ichthyological Associates, Inc.).

Volume: Working Papers Volume 5

Working Papers C (Continued)

Preliminary Final Report of Ecological Studies for the Oyster Creek Nuclear Generating Station – (Continued):

September 1975 to August 1976 – Volume 2; Part 2; Plankton (Ichthyological Associates, Inc., May 1977).

Report on Data Collected for Ecological Studies for the Oyster Creek Nuclear Generating Station:

September 1976 to February 1977 – Part One; Finfish, Shellfish, and Plankton (Ichthyological Associates, Inc., June 1977).

September 1976 t0 February 1977 – Part Two; Appendix Tables (Ichthyological Associates, Inc. June 1977).

Working Papers D: BLANK

Working Papers E: BLANK

Working Papers F:

General Analysis of the Impact of an Alternative Discharge/Cooling System on the Rate Payer (JCP&L, 1978).

Estimation of Annual Stock Weight Gains of Aquatic Species From Substitution of Alternative Closed-Cycle Cooling Systems for the Existing Once-Through System at the Oyster Creek Nuclear Generating Station (Fitzgerald, 1978).

Working Papers F: Continued –

Valuation of Economic Costs of Fogging and Icing (Fitzgerald, 1978).

Evaluation of Costs of Damages to Materials from Increases in Salt Deposition Rates (Fitzgerald, 1978).

Evaluation of the Economic Costs of Cooling Tower Noise (Fitzgerald, 1978).

GPU Nuclear. 1988. GPU Nuclear comments on Versar's draft final report titled "Technical review and evaluation of thermal effects studies and cooling water intake structure demonstration of impact for the Oyster Creek Nuclear Generating Station, volumes I and II.

Summers, J. K., A. F. Holland, S. B. Weisberg, L. C. Wendling, C. F. Stroup, R. L. Dwyer, M. A. Turner, and W. Burton. 1989. Technical review and evaluation of thermal effects studies and cooling water intake structure demonstration of impact for the Oyster Creek Nuclear Generating Station, revised final report, volume I – text. Prepared for New Jersey Department of Environmental Protection Division of Water Resources. Versar, Inc., ESM Operations, Columbia, MD.

Summers, J. K., A. F. Holland, S. B. Weisberg, L. C. Wendling, C. F. Stroup, R. L. Dwyer, M. A. Turner, and W. Burton. 1989. Technical review and evaluation of thermal effects studies and cooling water intake structure demonstration of impact for the Oyster Creek Nuclear Generating Station, revised final report, volume II – appendices. Prepared for New Jersey Department of Environmental Protection Division of Water Resources. Versar, Inc., ESM Operations, Columbia, MD.

New Jersey Department of Environmental Protection. 1994. New Jersey Pollutant Discharge Elimination System, Discharge to Surface Water Permit Number NJ0005550. ***Fact Sheet/Basis section provides the scientific and regulatory basis for the NJDEP's determination that the existing cooling water intake structure, in conjunction with dilution pump optimization studies, should be designated Best Technology Available under section 316(b).***

IMPINGEMENT & ENTRAINMENT/FIN- & SHELLFISH POPULATION STUDIES

Ichthyological Associates, Inc. 1979a. Report of data collected for ecological studies for the Oyster Creek Generating Station, September 1977-March 1978, part one. Ichthyological Associates, Inc., Ithaca, NY, 93 pp.

Ichthyological Associates, Inc. 1979b. Report of data collected for ecological studies for the Oyster Creek Generating Station, September 1977-March 1978, part two. Ichthyological Associates, Inc., Ithaca, NY, 290 pp.

Danila, D. J., C. B. Milstein and Associates. 1979. Ecological studies for the Oyster Creek Generating Station, progress report for the period September 1977-August 1978, (finfish, shellfish, and plankton). Ichthyological Associates, Inc., Ithaca, NY, 391 pp.

Ichthyological Associates, Inc. 1979c. Report of data collected for ecological studies for the Oyster Creek Generating Station, September 1978-March 1979, part one, finfish, shellfish, and plankton. Ichthyological Associates, Inc., Ithaca, NY, 135 pp.

Ichthyological Associates, Inc. 1979d. Report of data collected for ecological studies for the Oyster Creek Generating Station, September 1978-March 1979, part two (appendix tables). Ichthyological Associates, Inc., Ithaca, NY, 223 pp.

Danila, D. J. and D. M. Byrne. 1979. Tagging study of winter flounder taken in Barnegat Bay. Progress report for the period December 1978 through July 1979. Ichthyological Associates, Inc., Ithaca, NY, 29 pp.

Ecological Analysts, Inc. 1980. Progress report of ecological studies at the Oyster Creek Nuclear Generating Station, April-August 1979, part one. Ecological Analysts, Inc., Towson, MD.

Danila, D. J. 1980. Tagging study of winter flounder taken in Barnegat Bay. Progress report for the period August 1979 through June 1980. Ichthyological Associates, Inc., Ithaca, NY, 24 pp.

Ecological Analysts, Inc. 1981a. Ecological studies at the Oyster Creek Nuclear Generating Station, progress report, September 1979-August 1980. Ecological Analysts, Inc., Sparks, MD.

Ecological Analysts, Inc. 1981b. Ecological studies at the Oyster Creek Nuclear Generating Station, progress report, September 1980-February 1981. Ecological Analysts, Inc., Towson, MD.

Ecological Analysts, Inc. 1982. Ecological studies at the Oyster Creek Nuclear Generating Station, progress report, September 1980-August 1981. Ecological Analysts, Inc., Sparks, MD.Ecological Analysts, Inc. 1983. Ecological studies at the Oyster Creek Nuclear Generating Station, progress report, September 1981-August 1982. Ecological Analysts, Inc., Sparks, MD.

Ecological Analysts, Inc. 1984. Ecological studies at the Oyster Creek Nuclear Generating Station, progress report, September 1982-August 1983. Ecological Analysts, Inc., Sparks, MD.

EA Engineering, Science, and Technology, Inc. 1986. Entrainment and impingement studies at the Oyster Creek Nuclear Generating Station 1984-1985. EA Engineering, Science, and Technology, Inc., Sparks, MD.

PEER REVIEWED PUBLICATIONS

Kennish, M. J. and R. A. Lutz, editors. 1984. Ecology of Barnegat Bay, New Jersey. Springer-Verlag, New York, NY. ***Collaboration of scientists from the utility, academia, and consulting industry to develop a collection of peer reviewed articles on various aspects of the ecology of Barnegat Bay. The 316(a) & (b) studies for the Oyster Creek Generating Station served as the basis for most of the articles.***

Vouglitois, J. J., K. W. Able, R. J. Kurtz, and K. A. Tighe, 1987. Life history and population dynamics of the bay anchovy in New Jersey. Transactions of the American Fisheries Society, Vol. 116, No. 2, pp 141-153. ***Collaboration of scientists from the utility, academia, and the Federal Government to synthesize the available biological/ecological data on the bay anchovy in New Jersey. Among other things, demonstrated that widely fluctuating population levels in Barnegat Bay were associated with mortality during the overwintering period on the inner continental shelf or changes in migratory patterns, rather than survival of the early life stages in the estuary.***

THERMAL PLUME AND HYDROGRAPHIC STUDIES

Jersey Central Power & Light Company. 1980. Oyster Creek Nuclear Generating Station, 1979 annual environmental operating report for the Oyster Creek environmental technical specifications, appendix B to license number DPR-16, docket number 50-219, section 4.2, thermal plume measurement program, and section 4.3, hydrographic study. ***Thermal plume measurements and intake/discharge canal soundings required by the US Nuclear Regulatory Commission.***

Jersey Central Power & Light Company. 1981. Oyster Creek Nuclear Generating Station, 1980 annual environmental operating report for the Oyster Creek environmental technical specifications, appendix B to license number DPR-16, docket number 50-219, section 4.2, thermal plume measurement program, and section 4.3, hydrographic study. ***Thermal plume measurements and intake/discharge canal soundings required by the US Nuclear Regulatory Commission.***

Starosta, T. P., M. B. Roche, D. W. Ballengee and V. L. Ohori. 1981. Hydrographic study of Barnegat Bay, New Jersey 1979. GPU Nuclear Corporation, Parsippany, NJ.

GPU Nuclear Corporation. 1982. Oyster Creek Nuclear Generating Station, 1981 annual environmental operating report for the Oyster Creek environmental technical specifications, appendix B to license number DPR-16, docket number 50-219, section 4.2, thermal plume measurement program, and section 4.3, hydrographic study. ***Thermal plume measurements and intake/discharge canal soundings required by the US Nuclear Regulatory Commission.***

GPU Nuclear Corporation. 1983. Oyster Creek Nuclear Generating Station, 1982 annual environmental operating report for the Oyster Creek environmental technical specifications, appendix B to license number DPR-16, docket number 50-219, section 4.2, thermal plume measurement program, and section 4.3, hydrographic study. ***Thermal plume measurements and intake/discharge canal soundings required by the US Nuclear Regulatory Commission.***

ALTERNATIVE COOLING SYSTEM STUDIES/ECONOMIC EVALUATIONS

Ebasco Services Incorporated. 1977. Jersey Central Power & Light Company, Oyster Creek Nuclear Generating Station, alternative cooling water system study, volume 1, executive summary. Ebasco Services Incorporated, New York, NY. Submitted as part of the 316(a) & (b) Demonstration for the Oyster Creek and Forked River Nuclear Generating Stations.

Ebasco Services Incorporated. 1977. Jersey Central Power & Light Company, Oyster Creek Nuclear Generating Station, alternative cooling water system study, volume 2, study text. Ebasco Services Incorporated, New York, NY. (Submitted as part of the 316(a) & (b) Demonstration for the Oyster Creek and Forked River Nuclear Generating Stations).

Ebasco Services Incorporated. 1977. Jersey Central Power & Light Company, Oyster Creek Nuclear Generating Station, alternative cooling water system study, volume 3, exhibits. Ebasco Services Incorporated, New York, NY. Submitted as part of the 316(a) & (b) Demonstration for the Oyster Creek and Forked River Nuclear Generating Stations.

Fitzgerald, Dr. T. K. 1977. An evaluation of the economic benefits and costs of alternative cooling systems at the Oyster Creek Nuclear Generating Station. National Economic Research Associates, Inc. (Submitted as part of the 316(a) & (b) Demonstration for the Oyster Creek and Forked River Nuclear Generating Stations).

Kahal, M. I. 1988. Determination of retrofit costs at the Oyster Creek Nuclear Generating Station. Exeter Associates, Inc., Silver Spring, MD. (Included as an appendix to Summers, J. K., A. F. Holland, S. B. Weisberg, L. C. Wendling, C. F. Stroup, R. L. Dwyer, M. A. Turner, and W. Burton. 1989. Technical review and evaluation of thermal effects studies and cooling water intake structure demonstration of impact for the Oyster Creek Nuclear Generating Station, revised final report, volume II – appendices. Prepared for New Jersey Department of Environmental Protection Division of Water Resources. Versar, Inc., ESM Operations, Columbia, MD).

Harrington, Dr. W. 1988. Estimating the economic value of fisheries resources at the Oyster Creek Nuclear Generating Station. Exeter Associates, Inc., Silver Spring, MD. (Included as an appendix to Summers, J. K., A. F. Holland, S. B. Weisberg, L. C. Wendling, C. F. Stroup, R. L. Dwyer, M. A. Turner, and W. Burton. 1989. Technical review and evaluation of thermal effects studies and cooling water intake structure demonstration of impact for the Oyster Creek Nuclear Generating Station, revised final report, volume II – appendices. Prepared for New Jersey Department of Environmental Protection Division of Water Resources. Versar, Inc., ESM Operations, Columbia, MD).

Reddy, B. J., and J. H. Wile. 1988. Assessment of Versar analysis of cost and benefit estimates of modifying the cooling system of the Oyster Creek nuclear plant. Prepared for GPU Nuclear Corporation. National Economic Research Associates, Inc. (Submitted to NJDEP along with GPU Nuclear. 1988. GPU Nuclear comments on Versar's draft final report titled "Technical review and evaluation of thermal effects studies and cooling water intake structure demonstration of impact for the Oyster Creek Nuclear Generating Station, volumes I and II.

Ebasco Services Incorporated. 1992. GPU Nuclear Corporation, update of alternate cooling water system study for Oyster Creek Nuclear Generating Station, volume 1, technical and economic evaluation. Ebasco Services Incorporated, New York, NY.

Ebasco Services Incorporated. 1992. GPU Nuclear Corporation, update of alternate cooling water system study for Oyster Creek Nuclear Generating Station, volume 2, environmental effects and cost analyses. Ebasco Services Incorporated, New York, NY.

MISCELLANEOUS INFORMATION

Most of the biological and physical/chemical data gathered by Ichthyological Associates, Inc. and Ecological Analysts, Inc. are stored in a database called OCEAN. As part of the ownership transition during 2000-2002, GPU was supposed to provide AmerGen with a copy of the OCEAN database.